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by

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Preparation of this document

This *World review of capture fisheries and aquaculture insurance* was prepared by Raymon van Anrooy and Fabiola Espinoza of the FAO Fisheries and Aquaculture Division (NFI), together with fisheries insurance consultants David Japp, Diego Valderrama, Krishna Gopal Karmakar, Peter Lengyel, Shinoj Parappurathu, Suchitra Upare, Uwe Tietze, Timothy Costelloe and Zongli Zhang.

This review is an update of previous FAO publications on the state of world aquaculture insurance (van Anrooy *et al*., 2006) and the state of world capture fisheries insurance (van Anrooy *et al*., 2009). It analyses the developments in the insurance industry serving both sectors over the past decade.

The present review includes four national reports and five regional reports, which cover the top ten marine capture fisheries and aquaculture producers in the world. National reports are provided for China, India, the Russian Federation and the United States of America. Other major producers are covered in the regional reports: Asia (Bangladesh, Indonesia, Japan, the Philippines, and Viet Nam), Africa (Egypt, Morocco, Namibia, Nigeria and South Africa), Europe (France, Italy, Norway, Spain and the United Kingdom of Great Britain and Northern Ireland), Latin America (Brazil, Chile and Peru) and Oceania (Australia, New Zealand).

The reports are based on extensive desk research, complemented by responses to an online survey conducted by FAO in 2020 among underwriters serving the capture fisheries and aquaculture industries. The information collected resulted in a comprehensive overview of the state of insurance for both sectors. The results were presented at a webinar entitled "Guidelines for increasing access of small-scale fisheries (SSF) to insurance services", which was held on 29 October 2021 with participation from more than 70 finance and insurance experts. The webinar was organized jointly by the Global Network for capacity building to increase access of small-scale fisheries to financial services (CAFI-SSF Network) and the Asia Pacific Rural and Agricultural Credit Association (APRACA).

The publication was edited by Edward Fortes, with formatting and design assistance provided by Magda Morales and Marianne Guyonnet of FAO's Fisheries and Aquaculture Division.

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Acronyms and abbreviations

ABNJ	areas beyond national jurisdiction
AFZ	Australian Fishing Zone
APPIK	Asuransi Perikanan bagi Pembudidaya Ikan Kecil (Indonesia)
ARIA	All-Russian Insurance Association (Russian Federation)
BFAR	Bureau of Fisheries and Aquatic Resources (Philippines)
BMP	better management practice
CTA	Cape Town Agreement (IMO)
DWFN	distant water fishing nations
EEZ	exclusive economic zone
EMFF	European Maritime and Fisheries Fund
FCIC	Federal Crop Insurance Corporation (USA)
FISHCOPFED	National Federation of Fishermen Co-operatives Ltd. (India)
FMIS	Fisheries Mutual Insurance Scheme (Japan)
FVIA	Fishing Vessel Insurance Association (Japan)
GDP	gross domestic product
GRP	group risk plan (USD)
GWP	gross written premiums
HAB	harmful algae bloom
H&M	hull & machinery (insurance)
ICCAT	International Commission for the Conservation of Atlantic Tunas
IDRA	Insurance Development and Regulatory Authority (Bangladesh)
IG	International Group of P&I Clubs
IMO	International Maritime Organization of the United Nations
ILO	International Labour Organization of the United Nations
IUU	illegal, unreported and unregulated (fishing)
kW	kilowatt
LOA	length overall
MAT	marine, aviation and transit (cargo) insurance
MFI	microfinance institution
MMAF	Ministry of Marine Affairs and Fisheries (Indonesia)
NAAI	National Association of Agriculture Insurers (Russian Federation)
NGO	non-governmental organization
PCIC	Philippines Crop Insurance Corporation
PMSBY	Pradhan Mantri Suraksha Bima Yojana (India)
PMFBY	Pradhan Mantri Fasal Bima Yojana (India)
PSI	Principles for Sustainable Insurance (PSI) initiative (UN environment)

PTSLP	Post-Tsunami Sustainable Livelihood Progamme (India)
P&I	protection and indemnity (insurance)
RAS	recirculating aquaculture systems
RFMO	regional fishery management organization
RNRC	Russian National Reinsurance Company (Russian Federation)
RSHB	Russian Agricultural Bank (Russian Federation)
SAMSA	South African Maritime Safety Authority
SBC	Sadharan Bima Corporation (Bangladesh)
SERNAPESCA	National Service for Fisheries and Aquaculture (Chile)
SHG	self help group
SIFFS	South Indian Federation of Fishermen Societies
SIDS	small island developing states
SME	small and medium-sized enterprise
SSF	small-scale fisheries
TAC	total allowable catch
USA	United States of America
USDA	United States Department of Agriculture
USD	United States dollar
VLOPU	very large offshore production unit

Executive summary

This *World review of capture fisheries and aquaculture insurance* presents the findings of regional and national studies conducted in 2020. The studies included major capture fisheries and aquaculture producers in Asia (Bangladesh, China, India, Indonesia, Japan, the Philippines, and Viet Nam), Africa (Egypt, Morocco, Namibia, Nigeria and South Africa), Europe (France, Italy, Norway, the Russian Federation, Spain and the United Kingdom of Great Britain and Northern Ireland), the Americas (Brazil, Chile, Peru, and the United States of America) and Oceania (Australia, New Zealand).

The main conclusions on capture fisheries insurance are:

- The number of fishing vessels covered by marine hull insurance is estimated at around 450 000 worldwide. Some 61 percent of the insured fishing vessels are found in Asia, followed by the Americas (18 percent), Europe (14 percent) and Africa (6 percent).
- For large-scale industrial fishing fleets, the supply of marine hull and other insurance services meets demand. At least 90 percent of the estimated 67 800 large-scale fishing vessels operating worldwide (> 24 m in length) are covered by marine hull insurance.
- Between 50 percent and 60 percent of the semi-industrial fishing vessels (12–24 m in length) are covered by marine hull insurance. Of the estimated 430 000 semi-industrial fishing vessels operating worldwide, tens of thousands do not have insurance cover.
- Over 95 percent of the 2.3 million motorized small-scale fishing vessels (< 12 m in length) operate uninsured. Most small-scale fishers worldwide still do not have access to adequate insurance services that meet their specific needs and conditions.
- Underwriting experiences in fishing vessel insurance have generally been good over the 2009–2019 period. On average, 39 percent of the insurance and reinsurance companies and brokers who responded to the FAO survey reported "Good" to "Very good" underwriting experiences, and 41 percent reported "Neutral" results.
- Access to accident, life and health insurance services for crew on fishing vessels and small-scale fishers in developing countries has improved in recent years. In Asia, at least 4 million fishers are covered by specific insurance programmes.

The main conclusions on aquaculture insurance are:

- The number of aquaculture insurance policies in force in 2020 was estimated at over 40 000 worldwide. Indonesia and China were the largest markets for aquaculture insurance, with 15 000 and 12 000 policies in force respectively. Some 83 percent of aquaculture stock mortality insurance policies in Asia were issued in 2020. In Europe and the Americas around 2 700 and 2 500 aquaculture farms were reported to be insured, respectively.
- Large-scale aquaculture producers with well-financed operations are best served by the insurance industry. Medium- and small-scale farmers, on the other hand, continue to lack coverage, especially in developing countries, with limited insurance options and high premium rates. The gap between the supply and demand of aquaculture insurance worldwide is far from being closed. Overall, the provision of aquaculture insurance services is therefore inadequate, particularly in Asia.

- In various countries in the Asian region (e.g. China, Indonesia, Viet Nam, Japan), but also in the United States of America, aquaculture insurance is encouraged by government support through premium subsidies schemes, favourable legislation and/or pilot insurance programmes for small-scale producers.
- The range of species and culture systems covered by aquaculture policies worldwide is diverse and has increased in recent years, though most insurers continue to focus on insuring the aquaculture species and systems they are most familiar with.
- The underwriting experiences of aquaculture insurance companies largely vary depending on the year, the company and the country concerned. On average, 40 percent of the insurance and reinsurance companies and brokers who responded to the FAO survey reported "Good" to "Very good" underwriting experiences in the 2009–2019 period. Meanwhile, 36 percent reported "Neutral" results in the aquaculture stock mortality insurance business. The insurance industry therefore seems to have consolidated the market, finding ways to improve business and increase profitability.

This world review also offers in-depth discussion of key areas of the capture fisheries and aquaculture insurance market. These include supply and demand, market structure and conduct, underwriting practices, perils covered, fishing vessels, aquaculture species and the production systems insured, the policies in force, risk management, handling of claims, and the varying underwriting experiences in the five regions. Finally, it provides conclusions and recommendations to increase the provision of insurance services to fisheries and aquaculture stakeholders worldwide.

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1. Introduction, background and review objectives

Capture fisheries and aquaculture encounter risks arising from the environment, as well as the social and economic contexts in which they operate. Environmental risks such as natural disasters can cause damage to, and the loss of, fishing vessels and aquaculture facilities, while operational risks such as on-board accidents can result in injuries and fatalities. Biological risks such as the occurrence of toxic algal blooms may lead to aquaculture stock mortality. For fishers and fish farmers, who work under harsh conditions and usually lack access to social security schemes, these risks pose serious threats to their livelihoods. Climate change, and the related increase in the frequency and intensity of extreme weather events in some regions, also make the conditions in which fishers and aquaculture farmers operate riskier and more challenging. In this context, the 1995 FAO Code of Conduct for Responsible Fisheries (FAO, 1995) and the 2007 Work in Fishing Convention (C188) of the International Labour Organization (ILO) recognize insurance as an important tool to protect the fisheries and aquaculture sectors.

Through insurance, the cost of unexpected losses or damages is shared between the insurer and the person or company who buys the insurance. By providing reliable and timely compensation after an incident or natural disaster, insurance can contribute to safeguarding incomes and livelihoods, reduce the financial impact on the subscriber, facilitate restarting production, and stabilize the contribution of the fisheries and aquaculture sectors to the national economy.

In 2006 and 2009, FAO carried out two world reviews on aquaculture and capture fisheries insurance respectively. These reviews aimed to provide an overview of the insurance service provision to both sectors, raise awareness and guide stakeholders in implementing appropriate frameworks for the development of insurance.[1] In terms of capture fisheries insurance, the 2009 review reported that, worldwide, around 500 000 fishing vessels were covered by marine hull insurance. In 2006 it was estimated that between 7 500 and 8 000 aquaculture insurance policies were in force, covering at least 3 000 aquaculture enterprises.

In 2009 more than 40 percent of the approximately 500 000 fishing vessels insured were flagged to Japan. Of the remainder, some 20 percent could be found in China, and 15 percent in the United States of America. In Europe, an estimated 50 000 fishing vessels were insured. In other countries and regions, the estimated number of fishing vessels insured was generally only a few thousand or less. In Asia, the region with the highest aquaculture production, aquaculture insurance services were limited, and sector growth was slow. Aquaculture operations in Europe, North America and Oceania were generally better served by insurance. However, also in these regions the number of companies offering capture fisheries insurance was limited (when compared to other lines of insurance) and the number of aquaculture insurers was even smaller. According to the two reviews, private insurers generally dominated the insurance market for both sectors in most regions. Only in Asia were public (state-owned) insurance companies and mutual insurers the most common providers. In terms of risk management and

[1] The finding of these reviews are reported in the FAO Fisheries and Aquaculture Technical Papers No. 493 (van Anrooy *et al.*, 2006) and No. 510 (van Anrooy *et al.*, 2009).

claim handling practices, standardized procedures were reported to be in place, with some minor variations at the regional level. The two reviews showed that insurance service supply was adequate for industrial capture fisheries and large-scale aquaculture operators. Ten years ago most of the 30 million small-scale fishers and fish farmers were not covered by any insurance service.

Much has changed in the fisheries and aquaculture sectors and the insurance industry worldwide since FAO published these reports. In 2018, global capture fisheries and aquaculture production reached an unprecedented record of 179 million tonnes, with nearly half of this figure derived from aquaculture. Over the last ten years, aquaculture has been the fastest-growing animal-food-producing sector, and now provides 52 percent of fish for human consumption (FAO, 2020a). The number of people employed in capture fisheries production was stable over the 2010–2018 period and estimated at 39 million. Over the same period, the number of people employed in aquaculture increased by some 10 percent, from nearly 19 million to close to 21 million (FAO, 2020b). In the insurance industry, globalization and the opening of markets has facilitated reinsurance and enabled insurance companies to operate in more countries. Information technology, together with digitization and other innovations, have also influenced the structure, conduct and performance of the insurance market.

This review aims to:

i) provide an update of the status of capture fisheries and aquaculture insurance in the world;
ii) guide decision-makers in the formulation and implementation of appropriate policies, legal and regulatory frameworks, in order to increase fishers and fish farmers' access to insurance;
iii) promote the implementation of best practices within the insurance industry, in addition to sound schemes that meet the particular business characteristics of the fisheries and aquaculture industries; and
iv) raise awareness of the important role of insurance in the sustainable development of fisheries and aquaculture.

Furthermore, this review contributes to the implementation of:

i) the 1995 FAO Code of Conduct for Responsible Fisheries (FAO, 1995);
ii) the FAO Blue Transformation Strategy 2022–2030;
iii) the 2015 Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines; FAO, 2015) in terms of promoting measures to facilitate access to insurance coverage for small-scale fishers and fish farmers; and
iv) the United Nations Sustainable Development Goals (SDGs), in particular Goal 14 ("Conserve and sustainably use the oceans, seas and marine resources for sustainable development"). The information presented is also relevant for Goal 8 ("Promote inclusive and sustainable economic growth, employment and decent work for all"), Goal 12 ("Ensure sustainable consumption and production patterns"), and Goal 13 ("Take urgent action to combat climate change and its impacts").

This review consists of four national and five regional reports, which describe the state and trends in capture fisheries and aquaculture insurance of 23 major marine capture fishing and aquaculture nations. The national reports cover China, India, the Russian Federation and the United States of America. The regional reports focus on major producers in each region. They cover the following countries: Bangladesh, Indonesia, the Philippines and Viet Nam (Asia), Egypt, Morocco, Namibia, Nigeria and South Africa (Africa), France, Italy, Norway, Spain and United Kingdom of Great

Britain and Northern Ireland (Europe), Australia and New Zealand (Oceania) and Brazil, Chile and Peru (Latin America). All countries included in the previous reviews are again covered in this edition, except for Canada, and three countries have been added: Brazil, Indonesia and the Philippines.

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2. Summary overview of world capture fisheries and aquaculture insurance

This chapter provides information on the review methodology applied, as well as the main findings from the regional and national reports.

2.1 METHODOLOGY

Each national and regional report is based on desk research and responses to an online insurance survey conducted in June–July 2020. The online survey targeted insurers, reinsurers, insurance brokers, surveyors and risk adjustors involved in the fisheries and aquaculture insurance businesses. It collected information on insurance products and services for the fisheries and aquaculture sectors, as well as underwriting and risk management practices, and the challenges and opportunities applicable to these lines of insurance.

The online survey obtained 60 responses for capture fisheries insurance, including 48 responses from direct insurers/reinsurers, and 12 responses from brokers, surveyors and loss adjusters. The surveys also received 63 responses on aquaculture insurance, including 40 responses from direct insurers/reinsurers, and 23 responses from brokers, surveyors and loss adjusters. Respondents came from 29 countries: Australia, Bangladesh, Brazil, China, Chile, Fiji, Finland, France, Germany, Greece, India, Italy, Japan, Kenya, Kiribati, Malaysia, New Zealand, Nigeria, Norway, Peru, Portugal, the Russian Federation, Singapore, Slovenia, South Africa, Spain, Switzerland, the United Kingdom of Great Britain and Northern Ireland, and the United States of America. Not all respondents completed the survey fully, especially when queries related to underwriting capacity; these experiences were not always detailed for confidentiality reasons. In addition, some authors held informal interviews with experts from the insurance industry, as well as with government representatives involved in the fisheries finance and insurance market, to complement the information.

2.2 CAPTURE FISHERIES AND AQUACULTURE PRODUCTION IN THE WORLD

FAO estimated global fish production at 179 million tonnes in 2018; of this, 96.4 million tonnes (54 percent) came from capture fisheries, and 82.1 million tonnes (46 percent) from aquaculture. Over the past decade, aquaculture has recorded the most considerable growth in terms of production, having increased by around 56 percent from 2008 to 2018; capture fisheries increased by about 19 percent in the same period. The estimated value at first sale (i.e. off-vessel or farm gate) amounted to USD 401 billion (FAO, 2020). Almost 62 percent of this figure (USD 250 billion) originated from aquaculture – an increase of about 26 percent compared to 2008. By 2018, aquaculture production had therefore reached an all-time production record. The sector has made a significant leap forward and remains the fastest-growing animal-food-producing sector in the world. Fish and fisheries products are among the most traded food items, and world exports of this produce reached USD 165 billion in 2018. In the period between 1976 and 2018, the trade of fish and fisheries products has grown at a rate of 6.7 percent per annum in nominal terms, and 4.1 percent in real terms (FAO, 2020a).

Most regions have seen some increase in marine capture fisheries production over the last decade, except Oceania, where production was stable. South American production showed large ups and downs, mainly due to fluctuations in anchovy catches. The seven largest capture fisheries producers – namely China, India, Indonesia, Peru, the Russian Federation, the United States of America and Viet Nam – have remained largely unchanged over the last decade. Together these countries accounted for around 50 percent of total global capture fisheries production. In terms of aquaculture, production continues to be largely dominated by Asia, which is responsible for 89 percent of total global production. Africa (especially Egypt and Nigeria) and the Americas also showed increases in aquaculture production shares over the past years, while Europe and Oceania showed a relative decline. China has remained the major fish producer in the world, accounting for 15 percent of total marine capture fisheries production in 2018. With 57 percent of total global production, China was also the largest aquaculture producer, followed by India (9 percent), Indonesia (6 percent), Viet Nam, Bangladesh and Egypt (FAO, 2020a).

2.3 THE INSURANCE MARKET

Over the last decade the global insurance market has grown at a compound annual rate of 2.7 percent. In 2018, the industry's total gross written premium (GWP) was estimated at USD 5.2 trillion, with non-life insurance (where capture fisheries and aquaculture are included) accounting for 46 percent (Staib *et al.*, 2019). Asia is the fastest–growing region in terms of GWP for non-life insurance, and its growth potential for the coming years lies specifically within the liability and agriculture business lines (Staib *et al.,* 2019).

Generally, capture fisheries and aquaculture insurance are both specialty lines within the marine and agricultural insurance markets. China is an exception, as capture fisheries and aquaculture are both included under agricultural insurance. Globally, marine insurance accounted for only 1 percent of total non-life insurance premiums in 2018 (Staib *et al.*, 2019). Data on global fishing vessel insurance premiums is not available. Hohl (2019) has reported that the global aquaculture insurance market has grown considerably over the last decade; in 2017 it reached an estimated total premium of USD 161 million – roughly 0.5 percent of the total agricultural premium collected in that year. Given that this insurance market is relatively fragmented and minor (when compared to other lines), estimates of national capture fisheries and aquaculture insurance premiums are generally not provided.

Regulatory framework improvements by governments worldwide, together with implementation initiatives to remove market entry barriers, have contributed to opening domestic insurance and reinsurance markets to foreign companies. These developments have helped increase access to insurance services for both sectors, especially in countries in Africa, as well as in China and the Russian Federation. In some countries, such as Peru and Brazil, restrictions on the type of insurance products that can be offered by foreign-based insurers continue to hamper the introduction of new underwriting policies (as is the case for aquaculture insurance). It is expected that these restrictions will be relaxed in the coming years.

As in many other classes of insurance, reinsurance plays a major role in the insurance market serving the capture fisheries and aquaculture sectors. Europe is the centre of the capture fisheries and aquaculture insurance and reinsurance market. Some of the largest reinsurance and insurance companies, such as Lloyd's of London, Swiss Re, Munich Re and Hannover Re, are located in Europe and offer insurance and reinsurance solutions worldwide.

2.4 SUPPLY AND DEMAND

As in the previous FAO capture fisheries and aquaculture insurance reviews, the structure, conduct, performance (SCP) framework will be applied to analyse the state of capture fisheries and aquaculture insurance. According to this framework, the observable structural characteristics of a market influence the conduct of participants within that market, the combination of which in turn determines market performance. This section will examine the **market structure** (i.e. the number, size and diversity of companies) as well as the factors that influence **market conduct** (i.e. product differentiation, price-setting mechanisms, the control or standardization of service quality, and the regulatory mechanisms that influence a company's activity). Overall, these elements influence the **market performance** (in profitability and efficiency terms), which will be further assessed in the underwriting experiences (section 2.10) of this summary overview.

2.4.1 Market structure

2.4.1.1 Capture fisheries

The number of capture fisheries insurance suppliers in most of the countries analysed in this report has remained stable or decreased slightly. This trend is the result of consolidation in the sector, supported by the implementation of stricter regulatory reforms against non-complying companies (e.g. in the Russian Federation). Added to this is a stabilization or decline in demand for capture fisheries insurance policies (specifically hull insurance) from industrial operators.

The market concentration for this line of business remains considerably high and seems to have increased over the last decade, with a few companies covering up to 80 percent of the market in countries such as Australia, Chile, New Zealand, Peru and the Russian Federation. Although the number of fishing vessel insurers has not grown and market concentration is relatively high, fishing vessel owners seeking insurance still have abundant options to choose from. In some countries, such as Chile and Peru, fishing companies have gone through a process of merger and acquisitions: this has resulted in only a few large fishing companies dominating the demand side of the market and seeking insurance. These large fishing companies are often able to acquire coverage from the international insurance market, thus increasing their insurance options.

Private insurance companies continue to dominate the capture fisheries insurance market in Chile, Europe (and the Russian Federation), the United States of America, Oceania and Peru, as well as most countries in Africa. In Asia, public insurers, public–private partnerships (PPPs) and mutual insurance companies continue to play crucial roles in supplying insurance services, especially to the small-scale fisheries sector.

2.4.1.2 Aquaculture

In Chile, Europe, Oceania and the United States of America, the number of underwriters serving the aquaculture sector has remained stable over the past decade. However, the range of aquaculture underwriting services offered and the pool of risks they cover has grown. In Africa, Asia and Brazil, the ease of insurance market regulations, added to an opening up to foreign-capital investments, have both allowed international aquaculture insurers to enter the market. Yet the number of commercial insurance companies that are willing to cover aquaculture risks in those regions has remained small. Overall, insurers continue to be highly risk-averse, notably towards small-scale producers, new aquaculture ventures, and the culture of species they have no knowledge of. Some insurers only cover specific risks.

In most countries, the aquaculture insurance market concentration is high on the supply side, especially in Africa and Oceania, with few competitors on the market. In Brazil there is a monopoly on aquaculture stock mortality insurance, as only one company is providing these services in 2020. In most national markets competition

between aquaculture insurance underwriters is limited, and some insurers have high market shares. The nature of this business line, in which policies differ according to species, growing systems and identified risks, requires a technical knowledge of aquaculture production systems, which reduces competition in this market.

Private insurance companies dominate the supply side of the aquaculture insurance market in most regions. The exception is Asia, where public and mutual insurance companies continue to play a vital role in providing insurance, especially to the small-scale sector. In recent years, the participation of private insurance companies in public-sector-supported insurance schemes has increased in some Asian countries. One example is China, where an increasing number of private companies – motivated by government support through subsidies and/or tax relaxations – are participating in public insurance schemes, or delivering independent insurance products to the sector. In India, the private sector continues to be reluctant to participate in public–private aquaculture insurance schemes; this is mainly the result of bad experiences in the past.

2.4.2 Market conduct

2.4.2.1 Capture fisheries

The reported decrease in the number of fishing vessels in the world in recent years has affected the demand for capture fisheries insurance, especially for marine hull insurance. The global fishing fleet has decreased by 3 percent compared to 2006. In 2018, the fleet was estimated at 4.56 million vessels, of which 2.86 million (63 percent) were motorized (FAO, 2020). The implementation of fleet capacity management plans, fisheries management and conservation plans has caused this decline. However, not all countries have experienced the same trend. While Asia still has the largest fleet in the world (68 percent of the global total), its relative share of the world's fishing fleet has declined slightly; this is mainly influenced by China, which has reported a 20 percent decrease in its fleet in recent years. The European countries, Japan, New Zealand, the Russian Federation and the United States of America have similarly reported reductions in their fishing fleets. By contrast, the size of fishing fleets in Australia, Chile and Peru has been stable or only decreased marginally in recent years. Africa's fleet has steadily increased, such that it now makes up about 20 percent of the global total. However, there are data gaps in fishing vessel information, and the reported numbers may not be accurate, given that many small-scale vessels are not included in national fleet records or vessel registries (Van Anrooy *et al.*, 2021). FAO estimates that 82 percent (i.e. 2.3 million vessels) of the motorized fishing fleet is smaller than 12 m in length. By contrast, the number of large-scale industrial fishing vessels (overall length of at least 24 m) was estimated at 67 800 in 2018. These constitute around 3 percent of the global motorized fishing fleet (FAO, 2020).

The demand for fishing vessel insurance from large-scale industrial fishing fleets has reduced or remained stable in most countries covered in this review (except for Africa and some countries in Asia). This is often the result of established fleet capacity management regimes. In contrast, the demand from semi-industrial and small-scale fishing fleets is increasing, although the supply of insurance to these fleets is not meeting demand.

Generally, the supply of fishing vessel insurance has remained stable or slightly increased. In most countries covered in this report the supply of fishing vessel (hull) insurance is adequate and competitive for large-scale industrial fishing vessels, especially for those operating in areas under the mandate of regional fisheries management organizations (RFMOs). Such vessels are usually well covered by insurance (marine hull insurance as well as P&I). Moreover, as they operate in areas beyond national jurisdiction (ABNJ) and in the exclusive economic zones (EEZs) of countries other than those they are flagged to, their insurance needs are often set by RFMOs, in line

with International Maritime Organization (IMO) conventions, and/or the laws of the coastal states of the EEZs they operate in or pass through. Some RFMOs demand specific insurance coverage for fishing observers on board.

Various IMO conventions include compulsory insurance requirements for large vessels, and do not distinguish between merchant marine or fishing vessels. In order to manage risks and improve safety standards related to maritime activities, the IMO has adopted the following conventions:

- International Convention on Civil Liability for Oil Pollution Damage 1969 (CLC; IMO, 1992). The CLC introduced the concept of compulsory insurance, which allows claimants to obtain prompt and effective compensation even in cases where the shipowner may have lost all their assets.
- International Convention on Civil Liability for Bunker Oil Pollution Damage 2001 (Bunkers Convention; IMO, 2001). The Bunkers Convention obliges shipowners of vessels of 1 000 tons or more to obtain either insurance or another type of financial security to cover liability, as established under international law or any applicable international regime. This does not exceed the limits provided by the Convention on Limitation of Liability for Maritime Claims 1976 (LLMC Convention), as amended by the 1996 Protocol thereto (amended in turn by IMO Legal Committee Resolution LEG.5(99) of 19 April 2012). To evidence this compulsory insurance a certificate will be issued by the competent authority attesting that insurance or financial security is in force. This certificate must always be carried on board (Martinez & van Anrooy, 2020). This requirement implies that most fishing vessels with an overall length of 60 m (and most fishing vessels in Europe with a length of 55 m or more) should have cover for liability.
- Protocol of 2002 to the Athens Convention relating to the Carriage of Passengers and their Luggage by Sea 1974 (Athens Convention; IMO, 2002). This convention is particularly relevant for fisheries observer programmes, as it concerns a shipowner's liability towards passengers.
- Nairobi International Convention on the Removal of Wrecks 2007 (Wreck Removal Convention; IMO, 2007). The Wreck Removal Convention mainly focuses on the removal of wrecks that may pose a hazard to navigation or the marine environment. It applies to any seagoing vessel – and therefore also to fishing vessels – and provides the basis for a shipowner's liability with regard to wreck removal costs. This convention also includes a compulsory insurance requirement for vessels of 300 tons or more flying the flag of a state that is party to this convention. The vessel's registered owner is required to have insurance or other financial security to cover wreck removal costs. Similarly, as in the Bunkers Convention, the insurance certificate is to be carried on board. A gross tonnage of 300 tons is equivalent to a vessel of 24 m, as stipulated in the 2012 IMO Cape Town Agreement. As a consequence, an international legislative requirement exists for compulsory insurance for most of the estimated 67 800 fishing vessels of 24 m of length or more that are operating worldwide.

A total of 102 and 56 countries ratified the Bunkers and Wreck Removal conventions respectively. A small number of large fishing vessels, which operate only in the EEZs of countries that have neither ratified these conventions nor have national legislative requirements for vessel insurance, could be excluded from the compulsory insurance requirement.

Overall, supply meets demand for insurance services of large-scale industrial fishing vessels. It is estimated that more than 90 percent of large-scale industrial vessels are covered by marine hull insurance. All industrial fishing vessels that are less than 40 years old and well-maintained can be easily insured. Insurers have a preference for newer and steel-hulled vessels, as book and insured values are higher, but marine hull insurance is

generally also available for older industrial fishing vessels and those constructed from other hull materials. The widespread application of automatic identification systems (AIS) and vessel monitoring systems by vessels fishing in the ABNJ and under RFMO management regimes facilitates the monitoring of fishing operations. There is also a benefit to AIS for insurers, as they can track where their insured vessels are located.

Semi-industrial fishing vessels, generally between 12 m and 24 m in length, are also commonly covered by marine hull insurance. Of the global motorized fishing fleet, 15 percent fall into this category – equivalent to some 430 000 vessels. Globally, it is estimated that between 50 and 60 percent of these vessels are covered by marine hull insurance. In European countries, Japan, Oceania, the Russian Federation and the United States of America, a larger proportion of semi-industrial fishing vessels are insured. In these countries the supply of insurance for this category therefore meets demand. However, in Asia, Latin America and particularly Africa, there are still tens of thousands of semi-industrial fishing vessels operating without marine hull insurance.

Private insurers worldwide are slowly warming to the idea of supplying insurance services to small-scale vessels. Yet the demand for marine hull insurance from small-scale operators is high and largely unmet by supply. Considering that less than 5 percent of the 2.3 million small-scale motorized fishing vessels (< 12 m in length) are currently covered by marine hull insurance, there is room for expanding the insurance market to cover this category in most regions.

The increasing frequency and intensity of extreme weather events as a result of climate change makes work at sea more hazardous and increases fishers' vulnerability (Barange *et al*., 2018). It is therefore worrying that overall insurance penetration in capture fisheries remains low. The reasons why large, internationally active insurers are not interested in covering small-scale producers are the same as those reported a decade ago. This sub-sector is less attractive to insurers because of small-scale fishers' limited access to other financial services, which may facilitate the payment of premiums and insurance payouts, in addition to their low financial literacy and/or awareness of the needs/advantages of insurance (Tietze & van Anrooy, 2019). The same study also points to the high administrative costs associated with dealing with remote fishing communities.

Concerns regarding safety at sea, in addition to the high numbers of accidents and fatalities in small-scale fisheries, have prompted some governments in Europe, Asia and the Americas to introduce compulsory third-party liability insurance for small fishing vessels (see 2.7.3). This trend has become evident in the last decade and is likely to increase demand for third-party liability, P&I and marine hull insurance services from owners of small-scale fishing vessels.

2.4.2.2 Aquaculture

Asia accounts for an 89 percent share of world aquaculture production (FAO, 2020). Despite the importance of aquaculture in this region, Asia continues to be underserved by aquaculture insurance. Only a few countries reported having increased the share of aquaculture production covered by insurance in recent years. It appears that aquaculture insurance service provision cannot keep up with the sector's growth. In China, the central government has committed to increasing the availability of aquaculture insurance. It demonstrated this commitment through the establishment of enabling legal and regulatory frameworks and the greater allocation of funds for premium subsidies. The commitment has resulted in an increase in the total aquaculture area underwritten in the country, which now accounts for more than 50 000 hectares. The insured area is still very small however, at less than one percent of the estimated 7.1 million hectares used in China for aquaculture in 2018 (DOF/MARA, 2019). Small-scale aquaculture operators seem to have slightly more access to mutual and commercial insurance schemes than a decade ago. Most of the aquaculture insurance

programmes are in a pilot phase, with coverage limited to specific areas and production systems. Other Asian countries such as Indonesia, the Philippines and Viet Nam, have also promoted aquaculture insurance through legal and regulatory framework reforms and enabling government policies. These governments have established programmes that subsidize aquaculture stock mortality insurance premiums, in line with those for agriculture crops. There is limited participation from the private insurance industry in these programmes, as most are operated by public insurers. The limited awareness among fish farmers of the benefits of insurance and of the insurance premium subsidy programmes mean that most aquaculture production in Asia is not insured.

The aquaculture insurance market in Chile, Europe (excluding the Russian Federation), Oceania (New Zealand and Australia) and the United States of America has developed over the past decade. These regions/countries have traditionally been served well by aquaculture stock mortality insurance. The number of insurance suppliers has increased and the insurance products available cover a wider range of risks.

This process has been driven by:

1) an increased knowledge among brokers and insurance sector experts of aquaculture production processes and risk management, following an accumulation of experience over the years;
2) investment in technological developments, research and innovation by large- and medium-scale export-oriented aquaculture enterprises, which has led to improved risk management practices in aquaculture operations; and
3) a focus on a few high-value species (e.g. salmon, seabass and seabream), produced in large-scale aquaculture systems (marine cage culture in particular), using largely standardized production processes.

For large- and medium-scale aquaculture farms of salmon, seabass and seabream, the supply of insurance services meets demand. These farms have various insurance options to choose from. By contrast, the supply of insurance services is not meeting demand from small-scale operators and those farmers that grow different species or use less standard production systems. In the United States of America, the introduction of new types of insurance programmes, subsidized by the Federal Government, has made aquaculture insurance more available recently. However, since these programmes only cover certain species, the industry as a whole still lacks comprehensive coverage. In the Russian Federation, the recent launch of state-subsidized aquaculture stock mortality insurance is expected to boost the development of this line of business. In Peru, the aquaculture insurance industry has not reported major growth. In Brazil, stock mortality insurance for tilapia has recently become available on the market. In these countries, large-scale commercial aquaculture enterprises have insurance options to choose from in the international market, provided they grow the aforementioned species in standardized systems. Small-scale aquaculture operators remain largely uninsured.

In Africa, the aquaculture insurance market is in its infancy. While the opening-up to the international insurance market has theoretically increased the availability of insurance and reinsurance options, the appetite for aquaculture risks from underwriters in the region is limited. There is also a lack of mutual insurance associations, which could provide aquaculture insurance services to farmers. In some countries such as South Africa and Egypt, governments promote access to microfinance and credit for small-scale aquaculture enterprises. This has led to an improvement in farm management practices, although similar government support to promote aquaculture insurance is not available. There is a substantial gap between demand and supply for aquaculture stock mortality services in most, if not all, countries in Africa where aquaculture is practised.

FAO estimates that around 20 million people were engaged in aquaculture production in 2018 (FAO, 2020). The vast majority are small-scale farmers, nearly 80 percent of which are located in Asia. The number of small-scale aquaculture farmers in Africa and South America is growing. The limited supply of aquaculture insurance to these farmers is problematic. The reasons why underwriters do not cover small-scale producers are similar to those for capture fisheries insurance and remain the same as those reported a decade ago. Small-scale aquaculture producers often lack access to financial and extension services. This reduces farmers' access to better risk management practices and technological advances. The lack of access to other financial services to facilitate premium payments, poor financial literacy and/or low awareness of the needs and benefits of insurance are insurers' main reasons for not catering for this large group of farmers. Added to these are the high administrative costs incurred when dealing with remote rural communities. On the demand side, small-scale farmers regard the insurance solutions offered as too costly, because of the high premiums associated with limited compensation for stock mortality.

There are some trends that affect the supply and demand of aquaculture insurance positively, which may help to reduce the gap in supply. Governments increasingly recognize the socioeconomic importance of aquaculture. Aquaculture development is one of the objectives of most blue economy and blue transformation policies. Governments set ambitious production targets and work on enabling policy and regulatory frameworks to support its growth. Subsidies to reduce aquaculture insurance premium costs are available in various countries: China, Indonesia, Japan, the Philippines, the Russian Federation, Spain and Viet Nam. Public investment programmes that support aquaculture innovation and technology uptake are promoted in Chile, Europe, Oceania and the Russian Federation. These programmes have broadened interest in investment, which in turn has intensified producers' willingness to seek better insurance coverage to protect themselves from the growing risks and uncertainties associated with their investments.

2.5 UNDERWRITING

Insurance policies for the capture fisheries and aquaculture sectors are available directly from insurance companies and from insurance brokers. In terms of underwriting practices, the London market Institute Fishing Vessel Clauses (1987), remain the main point of reference for capture fisheries and aquaculture insurance policies worldwide. Most underwriters use these clauses and amend specific terms and conditions based on each company's experience and the client's requirements. As reported in the 2006 and 2009 reviews, insurers for both capture fisheries and aquaculture insurance require detailed information on every production operation offered for insurance. Applicants need to complete specific application forms as part of the underwriting process.

Europe continues to be the benchmark for insurance underwriting for the capture fisheries and aquaculture sectors. The headquarters of multinational insurance companies serving both sectors are located in Europe. Reinsurance services for capture fisheries and aquaculture are available in the London Market and from major reinsurers, such as Swiss Re, Scor, Munich Re and Hannover Re. Due to the ongoing market liberalization process, Europe-based insurers and reinsurers increasingly extend their services to other regions, especially to Africa, Asia and Oceania. Through the establishment of branches or specialized subsidiaries, they aim to generate business and meet specific demands in these regions. European reinsurers also provide their services to public insurance companies and fishery mutual insurance associations, as in China and Japan. The P&I clubs are also expanding their presence to other countries such as South Africa, Namibia and some Asian countries, providing third-party liability coverage for both sectors.

While mutual insurance schemes have become common in capture fisheries insurance, these arrangements have also become increasingly established for aquaculture insurance in recent years, especially within the small-scale sector in Asia. In China and Japan nearly 80 percent of the capture fisheries/aquaculture policies are underwritten through mutual arrangements. In China, legislative reforms clarified the management and operations of mutual insurance associations. The creation of independent legal entities to operate such schemes, currently under discussion, is expected to further increase coverage by mutual arrangements.

In China, new models and partnerships for the underwriting of aquaculture operations, particularly in the small-scale fisheries sector, have been piloted successfully. In these models, private insurance companies, aquaculture cooperatives and fisheries administrative agencies collaborate. Aquaculture cooperatives support commercial insurers in identifying and assessing risks, while insurers provide incentives to encourage farmers to adopt better risk management practices. Alongside this, the government provides premium subsidies. However, most of these schemes cover only certain aquaculture species and culture systems.

Responses to the survey revealed that the underwriting capacities of insurers serving both sectors vary greatly between countries and regions. For capture fisheries insurance (vessel insurance) the net underwriting capacity on a single risk varies from USD 1 million to USD 20 million, while the gross capacity (with reinsurance) varies from USD 3.5 million to USD 100 million. For insurance companies providing aquaculture insurance, the net underwriting capacity on a single risk varies from USD 200 000 to USD 20 million, while the gross capacity (with reinsurance) varies from USD 400 000 to USD 200 million.

2.6 PERILS COVERED

2.6.1 Capture fisheries

The perils covered by capture fisheries insurance have not changed much in recent years. "All risks" remains the most common type of insurance for capture fisheries policies. Only in India is the coverage primarily "named perils".

According to survey responses, perils commonly covered include:

- damage to or loss of fishing vessels caused by natural calamities such as storms, lightning, tsunamis, earthquakes, and floods;
- accidents caused by human error;
- accidents caused by technical/mechanical failure; and
- accidents or damage caused by marine debris.

Additionally, but to a lesser extent, insurers also cover for loss or damage of fishing vessels caused by war, hostile action, attack, piracy, capture, seizure or detention, as well as theft and damage due to vandalism. Depending on the individual needs of vessel owners, specific perils to be covered by the policy can be included.

2.6.2 Aquaculture

In Europe, Oceania, the United States of America and the Russian Federation, both "all risks" and "named perils" types of insurance are available to cover stock mortality. In Asian countries, including China and India, aquaculture stock mortality insurance policies are limited to the "named perils" type of coverage. State-subsidized aquaculture insurance programmes, such as those in the United States of America and the Russian Federation, cover only "named perils". The named perils differ depending on the growing system. The main types of perils covered by aquaculture insurance are:

- natural disasters such as storms, typhoons, hurricanes, floods and red tides;
- extreme weather events such as low temperature and frost; and
- diseases such as shell disease, vibriosis, celidas and parasitic diseases.

Underwriters also reported covering losses due to theft, riots, strikes or other similar circumstances. Other risks included predation, environmental pollution from different sources, technical failure (mechanic breakdown, failure of equipment), as well as deoxygenation or other changes in the water quality that might lead to stock mortality.

2.7 POLICIES IN FORCE

Capture fisheries insurance policies generally cover fishing vessels (i.e. marine hull), gear/equipment protection (i.e. machinery) and/or provide safety and liability protection (i.e. P&I insurance, employer's/crew liability and public liability). Insurance for catch loss and revenue variations are not common. For aquaculture insurance, policies mainly provide coverage for stock mortality (*in situ* and in transit), although P&I (including third-party liability) and protection for buildings and onshore aquaculture equipment are also widely available.

Unlike for other lines of insurance, most countries do not keep records of the number of capture fisheries or aquaculture policies in force. The wide variety of insurance products and services,[2] as well as the different ways these products are provided (e.g. mutual insurance, private insurance, etc.) make it nearly impossible to present an accurate estimate of the number of policies in force at any moment. Furthermore, insurers are generally not ready to share such information as they deem it confidential. Despite this, authors of the regional and national reports have attempted to provide rough estimates of the size of the fishing vessel insurance and aquaculture insurance markets.[3]

2.7.1 Fishing vessel insurance policies

It is estimated that around 450 000 fishing vessels are currently covered by marine hull insurance. Considering that the total number of engine-powered (motorized) fishing vessels worldwide was estimated at 2.86 million in 2018 (FAO, 2020), only about 15.7 percent of the global engine-powered fishing fleet is currently insured. This means that less than 10 percent of the global fishing fleet (powered and non-powered) is insured. The 2009 capture fisheries review roughly estimated the number of vessels insured at around 500 000.

Japan remains the country where most of the insured vessels worldwide are located (around 37 percent of the global estimate). Approximately 112 000 fishing vessels are insured in Japan, representing 81 percent of the total number (138 174) of active fishing vessels in the country in 2019. The mandatory nature of fisheries vessel insurance in this country is the main cause of the high proportion of fishing vessels insured. The significant fleet reduction in Japan has consequently had an impact on the reduction of vessels insured. The number of insured fishing vessels fell by 46 percent between 2008 and 2019, from 208 582 to 112 000.

China is the second-largest market for marine hull insurance of fishing vessels, with at least 55 500 vessels covered (Figure 1). This equated to 6 percent of the country's total number of motorized fishing vessels in 2019 (863 900). The number of fishing vessels insured in China appears to have fallen from an estimated 100 000 in 2009. In the United States of America, it is estimated that approximately 50 000 fishing vessels carry marine hull insurance. In Europe around 60 000 fishing vessels are estimated to be covered by marine hull insurance, including around 50 000 in the European

[2] In capture fisheries insurance, the same policy may sometimes cover liability and hull insurance, while in other cases it is necessary to purchase two separate policies to obtain full coverage. For aquaculture insurance, P&I and protection of equipment/infrastructure are usually provided as separate policies from stock mortality.

[3] The reports present rough estimates based on statistics of the total number of fishing vessels, insurance sector data, and the responses to the FAO survey. Alternatively, they have applied a similar approach to that adopted in the previous FAO reviews. For aquaculture insurance, the estimates are mainly based on the results of the FAO survey.

Union's Member States' fishing fleets. In India, about 7 000 vessels are insured, which accounts for only 5 percent of all mechanized and motorized fishing vessels in the country. In Africa there are still a very small number of fishing vessels insured: they amount to approximately 28 000 mainly semi-industrial and industrial fishing vessels. In the Russian Federation, at least 2 300 fishing vessels currently carry insurance, while in Oceania the number of fishing vessels insured is estimated to be about 3 500. In South America (Peru and Chile) at least 976 fishing vessels are covered, while in other South American countries it is estimated that another 3 500 fishing vessels carry marine hull insurance. The requirement for financial service providers to demand that vessels purchased on credit carry marine hull insurance has no doubt contributed to the number of vessels insured.

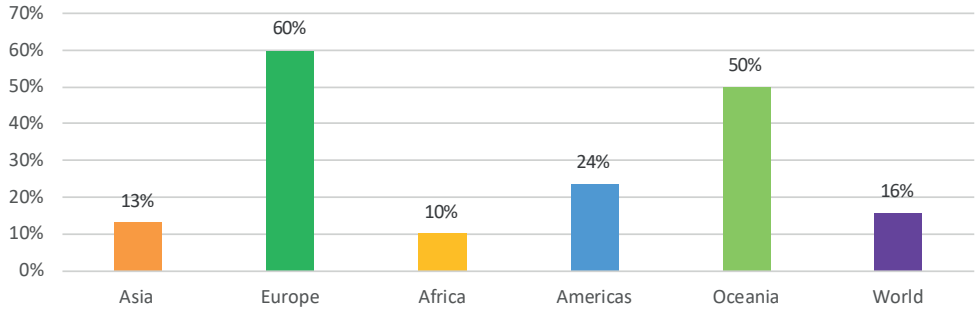
While 74 percent of the global powered fishing fleet has its base in Asian countries, the percentage of powered vessels insured in Asia is estimated at 13 percent. By contrast, although Europe hosts only an estimated 3.4 percent of the global fishing fleet (FAO, 2020), an estimated 60 percent of the powered fishing vessels in Europe is covered by hull insurance. The fishing fleets in the European region, Oceania and North America are thus better served by the insurance industry than their counterparts in Asia and Africa (Figure 1).

Major improvements in fishing vessel insurance coverage were observed in the Philippines and Viet Nam, with the number of fishing vessels insured in these two countries now higher than in Europe. State-supported premium subsidy programmes and enabling legislation are understood to be the main drivers behind this improvement.

2.7.1.1 Vessels insured

As reported in the previous FAO reviews, insurance services are more commonly available for marine fishing vessels (coastal and offshore) and, to a lesser extent, for inland fishing vessels. The most common types of fishing vessels insured worldwide do not differ much from those reported a decade ago. They are: bottom trawlers, pelagic trawlers, purse seiners, seiners, longliners and tuna pole-and-line vessels. The types of hull materials accepted for insurance coverage remain broadly the same: steel, glass-reinforced plastic (GRP), aluminium and wood. In some cases, a hull made of ferro-cement can also be insured. However, not all fishing vessel types and hull materials can be covered in all regions and countries. Insurers generally also take into consideration the fisheries targeted, the area of operation and the availability of reinsurance. The accident and vessel insurance history are also factors considered by insurers. However, the age and state of maintenance of the hull and engine(s) remain the most important factors for insurers when underwriting fishing vessels. The maximum age of a fishing

FIGURE 1
Percentage of powered fishing vessels that are insured by region, 2020



vessel that insurers are prepared to insure varies between 20 and 40 years. For wooden hull vessels the economic life cycle is shorter than for steel-hulled vessels; a factor also taken into account by insurers.

Marine hull insurance is still mostly purchased by semi-industrial and industrial large-scale fishing vessel owners, particularly those targeting high-value commercial fisheries and operating in ABNJ or EEZs of other countries. Small-scale fishing vessels are usually not covered by insurance. Specifically in regions where there is a large small-scale fishing fleet, such as Africa, Asia and Latin America, it remains a challenge for small vessel owners to obtain marine hull insurance.

2.7.1.2 Equipment and gear insured

Marine hull insurance policies generally cover damage and loss of the hull and main machinery (e.g. the engines and main equipment). Additional coverage for fishing gears, on-board processing equipment and electronic systems can often be included. Stand-alone policies to cover damage/loss of fishing gears and equipment are not common. The type of fishing equipment and gear covered are specified in the policy. The conditions applied depend on the fishing activity and the country where the policy is issued. For instance, in some cases it is necessary to prove total loss or complete damage. Gears should be totally destroyed, lost or damaged to such an extent that they cannot be recovered to admit claims, as in India). In other cases, such as Europe, claims for loss of fishing gear can only be made if the loss occurred as a result of a specific event.

Fishing gears commonly insured include purse seines, trawl, gillnets and longlines. On-board processing equipment such as industrial freezers and electronic equipment (e.g. navigation aids, net monitoring and control systems, fishfinders, echosounders, sonar, radar and global positioning systems) and lifeboats are also insurable in most cases.

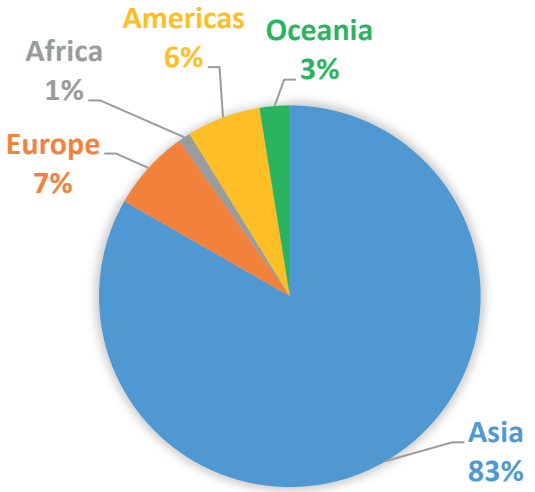
2.7.2 Aquaculture policies

An estimated 40 000 aquaculture policies were in force worldwide in 2020, based on the figures provided in national and regional reports. The 2006 aquaculture review estimated the number of aquaculture policies in force globally at 7 500–8 000. While a comparison with the data provided in the 2006 review is not possible, as the number of insurance companies that replied to the surveys is larger and consists of different companies, one thing is certain: the number of insurance policies for aquaculture has quadrupled over the last 15 years.

In 2006 some 5 000 aquaculture insurance policies were in force in Asia and an estimated 2 500–3 000 in other regions. By 2020 the number of aquaculture insurance policies in force in Asia had increased to at least 32 000, including 15 000 in Indonesia and 12 000 in China. In these two countries the reported area of aquaculture pond production insured exceeded 72 000 hectares, but this is likely an underestimate. In Europe, around 2 700 of an estimated 17 000 aquaculture establishments were covered by insurance. In the Americas nearly 2 500 aquaculture farms were reported to be insured, of which the great majority could be found in the United States of America. For Oceania, it was estimated that nearly half of the aquaculture establishments carry some kind of stock mortality insurance. In Africa the number of aquaculture farms insured was estimated at less than 400 (Figure 2).

The number of aquaculture stock mortality insurance policies in force is likely to be underestimated, as survey respondents did not always provide information on this subject in view of data confidentiality. Moreover, while the main global aquaculture producing countries are covered in this review, there are smaller aquaculture producers who could have aquaculture insurance policies that are not included in the above estimates.

FIGURE 2
Distribution of aquaculture stock mortality insurance by region, 2020



2.7.2.1 Species insured

The diversity of aquaculture species subject to insurance worldwide is large. However, insurers continue to prioritize species that they are most familiar with, such as Atlantic salmon, gilthead bream, rainbow trout and seabass. Table 1 provides a summary of the aquaculture species for which stock mortality insurance is commonly available. Insurers did report being prepared to cover other species, based on demand, and provided they obtain the information necessary to conduct a proper risk management analysis.

Compared to the 2006 aquaculture review, new species reported to be covered by insurance include: pangasius catfishes (particularly *Pangasianodon hypophthalmus)*, cobia (*Rachycentron canadum*), croaker (*Micropogonias* spp.) and the European flat oyster (*Ostrea edulis*).

Insurers indicated that Atlantic cod, octopus, turtle and tilapia (in Brazil) are among the species that they would be prepared to insure in the near future. While shrimp (*Penaeus* spp.) can currently be insured, a few insurers indicated that providing cover for extensive shrimp culture operations (in ponds) remains very challenging. Lack of stock control, frequent disease outbreaks and the difficulty of estimating biomass have resulted in a limited appetite for this species from insurers. To manage the uncertainties in extensive shrimp culture they make their policies more expensive and unattractive to most producers.

2.7.2.2 Growing systems insured

The main growing systems insured are offshore cage culture, onshore pond culture, recirculation aquaculture systems (RAS), raceway systems and offshore-submersible and semi-submersible systems. In addition, hatcheries and on-growing units can be covered, mainly in Europe. Shrimp hatchery production remains unattractive for insurers. Table 2 shows the aquaculture production systems reported as insured. Many insurers indicated RAS as a very risky operation because of its technical sophistication. The first year of operation of recirculation systems often leads to problems that cause production losses. Most insurers are therefore cautious when asked to insure starting RAS operations.

TABLE 1
Aquaculture species for which stock mortality insurance is available worldwide

Species group	Currently insured (common name, scientific name)
Fishes	Atlantic salmon, *Salmo salar* Tuna, *Thunnus* spp. Rainbow trout, *Oncorhynchus mykiss* Gilthead (sea) bream, *Sparus aurata* Halibut, *Hippoglossus hippoglossus* Seabass, *Dicentrarchis labrax.* Tilapia, *Oreochromis* spp. Croaker, *Micropogonias* spp. Cobia, *Rachycentron canadum* Pangasius catfish, *Pangasius* spp.
Molluscs	Abalone, *Haliotis* spp. Blue Mussel, *Mytilus edulis* Hard clam, *Mercenaria mercenaria* European flat oyster, *Ostrea edulis*
Crustaceans	Lobster, *Homarus* spp. Shrimp, *Penaeus* spp. Prawn, *Macrobrachium rosenbergii*

Source: FAO survey (2020).

2.7.3 Other types of insurance for capture fisheries and aquaculture operations

High-profile pollution cases and accidents at the sea have led governments, as well as regional and international regulators, to implement laws and regulations that require the maritime fleet (including large-scale fishing vessels) to apply higher safety standards and carry insurance cover (see 2.4.2.1). Industrial fishing companies therefore increasingly seek P&I insurance solutions to protect their business against third-party claims.

European Union Member States are bound by the Directive 2009/20/EC of the European Parliament and of the Council of 23 April 2009 on the Insurance of Shipowners for Maritime Claims (EC, 2009). The Directive requires Member States to put in place legislation that demands that shipowners of vessels with a gross tonnage of 300 tons or more carry insurance against maritime claims. The obligation to insure is also aimed to protect victims and help eliminate substandard ships; it also applies to foreign-flagged vessels operating in their territorial waters and using the ports of European Union Member States. The Member States can still apply stricter measures than those set out by the Directive. The number of registered fishing vessels of 300 tons or more in the European Union amounted to nearly 2000 vessels in 2020.

Various European countries such as Albania, Malta, Spain, and the United Kingdom of Great Britain and Northern Ireland, have established minimum limits for the sum insured (per incident or occurrence) (Martinez and Van Anrooy, 2020). Compulsory third-party liability insurance cover in these countries generally also extends to smaller vessels with lower minimum sums insured. Regulations have been put in place that require fishing vessel owners to insure their vessels in order to register them, and/or to obtain/renew fishing licenses or authorizations.

TABLE 2
Aquaculture production systems insured

Location	Culture system
Offshore	marine cages, barges, oyster and mussel hang culture/rope/line and bottom culture
Onshore	ponds, greenwater tanks, recirculation aquaculture systems (RAS), submersible and semi-submersible systems, raceway and gravity tanks, hatcheries and on-growing units

Source: FAO survey (2020).

The number of countries that now require third-party liability or P&I cover for fishing vessels is increasing worldwide. Japan was one of the first countries that established compulsory insurance requirements for fishing vessels. In the United States of America, state regulations exist whereby it is compulsory for vessel owners to have insurance to cover crew members against injuries while performing activities at sea. In the Russian Federation, specific regulations require fishing vessel owners to acquire compulsory liability insurance – such as employee liability and public liability insurance – to cover damages caused to third parties by collision, pollution or other causes. In other countries such as China and Indonesia there are pilot programmes in various provinces, but accident insurance for crew and third-party liability cover is not compulsory.

As described in section 2.4.2.1, it is believed that most of the estimated 67 800 fishing vessels of 24 m of length or more operating worldwide carry compulsory third-party liability insurance: this is to comply with international legislative requirements and the binding recommendations of RFMOs. The demand for third-party liability and P&I insurance is expected to increase, and is seen as a potential niche for insurers to continue providing profitable services to the capture fishing industry.

In the aquaculture sector, the demand for public, employer and transport liability insurance, as well as insurance to cover loss or damage to farm infrastructure, is increasing among large-scale aquaculture operators. The implementation of stricter environmental and labourer protection laws, as well as high costs related to incidents such as cage collapse and sinking, are causing aquaculture operators to seek these types of insurance to protect their investments. As aquaculture operations are expected to continue to move offshore, where the likelihood of incidents is higher, the demand for such insurance solutions is expected to increase further.

2.8 RISK MANAGEMENT

The risk management processes for capture fisheries insurance have not changed much over the last decade. Due to the strong influence of the London Market on fishing vessel insurance underwriting practices, risk management processes are largely standardized. However, insurers shape their risk assessment criteria according to the specificities of the fishing vessel insured. All insurers carry out pre-acceptance surveys and vessel owners are required to submit supporting documents as a precondition for issuing a policy. The latter include the management and ownership history of the vessel, the vessel registration status, its valuation certificate, and a loss/claim history or record of incidents.

Concerns about illegal, unreported and unregulated (IUU) fishing are increasingly receiving attention from the marine insurance industry (see Box 1). Especially in Europe, some insurers have started to deny their services to vessels on the combined IUU vessel list.[4] In most cases insurers retain the right to inspect the vessel physically before issuing the policy or at any time during its validity, though some insurers noted that this only happens if the vessel is insured at a high premium. Vessels that have been insured before, and for which the policies are extended, are usually not physically inspected and not checked for being listed on the combined IUU vessel list. Premiums are determined individually based on vessel characteristics such as the size, age, hull material, risks covered, and damage or losses claimed in recent years. Both in-house surveyors and independent specialists are used to determine the condition of vessels offered for insurance.

[4] This list is maintained by Trygg Mat Tracking (iuu.vessels.org) on behalf of the RFMOs.

BOX 1

Insurance against illegal, unreported and unregulated (IUU) fishing

IUU fishing – that is, the deliberate breaking or avoidance of fishing rules – is a globally pervasive and persistent problem. It undermines efforts to conserve and manage fish stocks in all capture fisheries (FAO, 2001), and contributes to the depletion of fishery resources and the destruction of marine habitats. Moreover, it is often associated with crimes including fraud, money laundering and forced labour. It also disproportionately affects coastal communities in developing countries, where there is limited effective monitoring of fishing.

The insurance sector can play a significant role in helping to combat IUU fishing. Much like legitimate operators, those that engage in IUU activities make use of insurance services. If access to insurance is restricted, illicit operators may find it difficult to maintain financial viability and continue fishing. Additionally, if the insurance sector introduces requirements such as for vessels to be registered with an International Maritime Organization (IMO) number, and to be equipped with, and use, vessel-tracking technology accessible to the public, greater transparency and accountability of fishing operators can be achieved.

In 2017 Oceana, an environmental non-profit organization, and the UN Environment's Principles for Sustainable Insurance (PSI) initiative (UNEP, 2021), facilitated the development and launch of a formal statement to this effect. In it, the insurance industry committed to not knowingly insuring or facilitating the insurance of IUU fishing vessels. To date, over 30 insurers and brokers have signed this statement; guidelines to support companies in meeting these commitments have also been promoted (Oceana, 2021).

In order to investigate the level of awareness of IUU fishing among underwriters serving the capture fisheries sector, questions related to this issue were included in the FAO survey. Just over half of the respondents reported being aware of the UN Environment's PSI Initiative.[5] Of these, 90 percent indicated having procedures in place to avoid contracts with IUU fishing vessels. Over half the respondents that answered affirmatively to either question represented companies based in Europe. Advocacy efforts led by Oceana and the PSI were mostly conducted in English, which may explain the higher awareness among European insurers. Furthermore, both the European Union and the United Kingdom of Great Britain and Northern Ireland have regulations in place that prohibit companies supporting IUU fishing, including through the provision of insurance services. This may also help to explain why 79 percent of all respondents from companies based in Europe indicated that they have procedures in place to avoid contracts with IUU fishing vessels, as compared to 63 percent of respondents globally.

While it is encouraging that significant action has been taken within the insurance industry to assist efforts in combating IUU fishing, further awareness raising and improvements in due diligence should be encouraged. Companies that exert greater scrutiny when assessing contracts with higher-risk vessels can reduce their risk of exposure to legal liabilities, fraud, reputation damage and the possibility of being associated with other crimes. When advocating for the implementation of these actions in developing countries, these efforts should also be coupled with calls for increased access to social protection for fishers and fish workers, as well as requirements for decent working standards.

If this strategy to limit access to insurance services for IUU fishing operations is adopted by all service providers to the global fishing fleets, transparency and accountability will be enhanced. This could help bring about a transformative change in the industry and contribute to improving working conditions and safety, as well as reducing forced labour and other crimes associated with IUU fishing.

[5] A total of 40 respondents from 13 countries within Europe, Asia, Africa, Latin America and Oceania responded to the related questions in the survey.

In terms of aquaculture insurance, insurers tend to be more cautious in establishing pre-requirements and risk management practices prior to issuing an aquaculture policy. Risk management surveys are widely used to complement application forms and to certify that the aquaculture stock is free of disease, and/or that equipment/facilities are

in conditions worthy of insurance. Insurers generally request supporting documents such as management audits, logbooks, breeding management and farm records. Some insurers reported requiring other preconditions, including access to clean water sources and approved farm waste levels.

While management surveys and assessments can be carried out by both in-house and independent surveyors, use of the latter has increased in recent years. For species of a high commercial value, risk management assistance is generally provided throughout the policy, with the overall aim of reducing risks to both aquaculture production and the insurance services. In Chile, the European Union and Norway, the increasing technological sophistication of aquaculture operations has made risk management assistance highly specialized. It plays an important role in supporting the introduction of efficient research and technology-driven aquaculture operations.

When insurance is provided through mutual insurance associations to capture fisheries and aquaculture operators, in-house risk surveyors are generally used. The associations take proactive roles in risk management operations to minimize their basket of risks. When insurance is facilitated by fishing associations or aquaculture cooperatives, as in China and Japan, members are often engaged in risk management practices and maintain a close relationship with the insurance provider, which helps to manage risks more effectively.

2.9 HANDLING OF CLAIMS

The guidelines and procedures for handling claims for capture fisheries and aquaculture insurance policies have remained largely the same as those reported in the 2006 aquaculture review and the 2009 capture fisheries review. Insurance companies require policyholders to report any event that might lead to a claim, or any loss or damage, immediately after an incident occurred. Reporting an accident or possible future claim allows insurance companies to provide immediate and specialized assistance (e.g. salvage a sinking vessel) to mitigate or prevent/reduce losses. Incidents can be reported in writing, by phone or other effective means. The maximum reporting period for loss or damages depends on the insurance company. Insurers commonly require other relevant documents, such as photographs of the loss or damage, and police reports.

Insurance companies use independent and in-house loss adjustors to manage fishing-vessel-related insurance claims. In aquaculture, the use of both types of loss adjustors is reported in most regions. In Chile, New Zealand, Norway, the United Kingdom of Great Britain and Northern Ireland, and most recently China, where aquaculture insurance is well established, insurance companies usually rely on experienced in-house loss adjustors. In the case of mutual insurance companies, or when insurance is provided through a community organization, the loss adjustment process is facilitated by some appointed member of said organization. External, specialized loss adjusters are usually not appointed by mutual insurers. In most cases, the cost of loss adjustment is borne by the insurance company, while in other cases, such as in India, a service charge is applied in some policies.

Insurance policies often come with a deductible; this is the share of the insured loss not compensated by the insurer. The deductible is often negotiable for large companies but is generally set at standard levels for SMEs in fisheries and aquaculture and cannot be negotiated. Higher deductibles commonly mean lower premium payments for insurance policies. In China and India deductibles range from 10 to 20 percent of the assessed claim amount.

2.10 UNDERWRITING EXPERIENCES

2.10.1 Fishing vessel insurance

Table 3 shows the underwriting experiences in fishing vessel insurance (from 2009 to 2019) reported in the FAO survey by insurance/reinsurance companies, brokers and loss assessors. In total, 45 respondents from 13 countries provided information on their fishing vessel insurance underwriting experiences.[6]

While these experiences differ widely between insurance companies, regions and years, they are generally good and appear to have improved over the last few years. Both 2018 and 2019 seem to have been particularly good, as more than 50 percent of respondents reported "Good" to "Very good" profits from capture fisheries insurance. In 2016 and 2017, more than 80 percent of respondents reported having either "Neutral", "Good" or "Very good" underwriting experiences in their capture fisheries insurance portfolio. Across all years in the 2009–2019 period, except 2013, more than 70 percent of respondents rated their profits as "Neutral", "Good" or "Very good". Only in 2013 more than 30 percent of respondents report "Bad" or "Very bad" underwriting experiences in this line of business. In the years 2010, 2014 and 2015, around 27 percent of respondents reported "Bad" underwriting results.

Overall, the underwriting experience for fishing vessel insurance seems to have been reasonably balanced (between "Good" and "Neutral") in all of the countries included in this review. In India in particular, underwriting experiences appear to have been generally good in recent years.

Various national and regional reports indicated that reductions in the fishing fleet over the last decade (particularly in Europe, Japan and the United States of America) have affected the capture fisheries insurance market. However, while the fleet reductions mean that there are fewer fishing vessels to insure, the latter has not necessarily resulted in severe losses in the insurance market. In some cases, older vessels were withdrawn from the fleet and newly built vessels generally have higher insured values. In the European Union, the European Maritime Fisheries Fund (EMFF), supports the implementation of the reformed Common Fisheries Policy (CFP). The EMFF facilitates Member States' investment in the modernization of their fishing fleets. In a similar vein, the Russian Federation promotes the replacement of older

TABLE 3

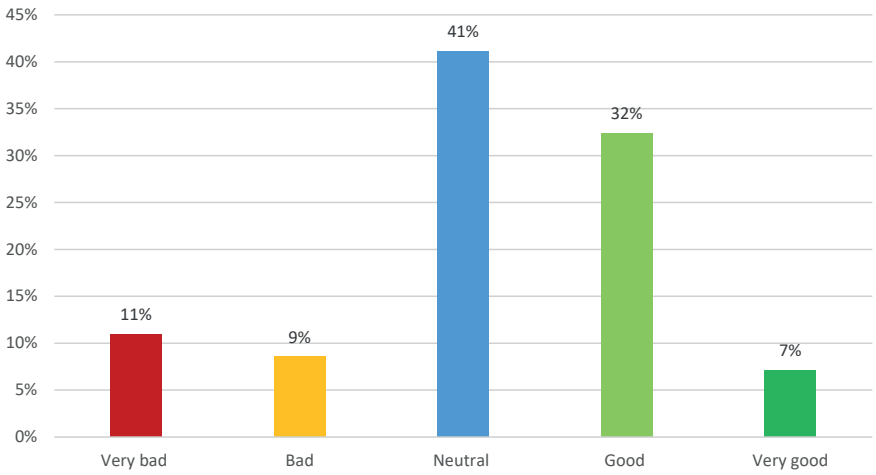
Underwriting experiences of insurance/reinsurance companies, brokers and surveyors involved in the provision of fishing vessel insurance between 2009 and 2019

Year	Very bad	Bad	Neutral	Good	Very good	Total responses
2019	9%	7%	29%	33%	22%	45
2018	12%	5%	28%	36%	19%	42
2017	10%	8%	41%	33%	8%	39
2016	13%	3%	42%	37%	5%	38
2015	16%	11%	38%	27%	8%	37
2014	12%	15%	40%	27%	6%	33
2013	19%	13%	43%	25%	0%	32
2012	3%	3%	59%	35%	0%	31
2011	6%	13%	46%	35%	0%	31
2010	13%	13%	41%	30%	3%	30
2009	7%	3%	45%	38%	7%	29

Source: FAO survey.

[6] Respondents to the capture fisheries underwriting experience questions in the survey originated from the following countries: Brazil, Chile, Greece, India, Japan, Nigeria, Norway, Peru, South Africa, Spain, the Russian Federation, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

FIGURE 3
Underwriting experiences in fishing vessel insurance (averages for 2009–2019)



vessels by newer vessels with more advanced technologies. These trends are positive as they generally mean fewer claims and losses for the insurance industry. Indeed, the higher vessel safety standards demanded in the European Union and the United States of America have decreased the number of insurance claims, as accidents at sea have been reduced. These factors may explain the overall positive performance in the capture fisheries insurance market over the last decade.

Figure 3 illustrates underwriting experiences in fishing vessel insurance in the period from 2009 to 2019. On average, 39 percent of respondents reported "Good" to "Very good" underwriting experiences, and 41 percent reported "Neutral" results.

However, it should be noted that these experiences mainly refer to large-scale industrial fishing fleets, which dominate the capture fisheries insurance market. Poor risk management in some of the insured fisheries in developing countries (mainly small-scale fisheries) is affecting the global performance of this line of business. In India, the mutual insurance model and government support through revolving funds seems to have prompted a positive trend with previously fluctuating underwriting experiences becoming much more positive and reliable.

2.10.2 Aquaculture insurance

Table 4 shows the underwriting experiences of aquaculture stock mortality insurance from 2009 to 2019, as reported by insurance/reinsurance companies, brokers and loss assessors in the FAO survey. In total, 52 respondents from 16 countries provided information on their underwriting experiences in aquaculture stock insurance.[7]

Underwriting experiences in aquaculture stock mortality insurance differ greatly between insurers, regions and years, but generally "Good" or "Neutral" profits were reported. In 2019, 37 percent of insurers reported having made profits on aquaculture stock mortality insurance. In seven out of the last ten years some 70 percent or more of respondents reported "Neutral" to "Very good" underwriting experiences. While in 2017 and 2018 some 78 percent of respondents reported "Neutral" to "Very good" underwriting experiences, the years 2013, 2016 and 2019 were described as "Bad" to

[7] Respondents to the aquaculture underwriting experience questions in the survey originated from the following countries: Australia, Brazil, Chile, China, France, India, Italy, Japan, Nigeria, Norway, Peru, South Africa, Spain, Russian Federation, United Kingdom of Great Britain and Northern Ireland, and the United States of America.

TABLE 4
Underwriting experiences of insurance/reinsurance companies, brokers and surveyors involved in the provision of aquaculture stock mortality insurance between 2009 and 2019

Year	Very bad	Bad	Neutral	Good	Very good	Total responses
2019	12%	21%	30%	37%	0%	52
2018	12%	10%	43%	27%	8%	49
2017	11%	11%	35%	36%	7%	44
2016	24%	10%	45%	21%	0%	42
2015	8%	16%	36%	32%	8%	38
2014	11%	5%	37%	39%	8%	38
2013	8%	24%	33%	32%	3%	37
2012	11%	9%	31%	40%	9%	35
2011	12%	18%	29%	32%	9%	34
2010	9%	12%	35%	32%	12%	34
2009	6%	15%	43%	33%	3%	33

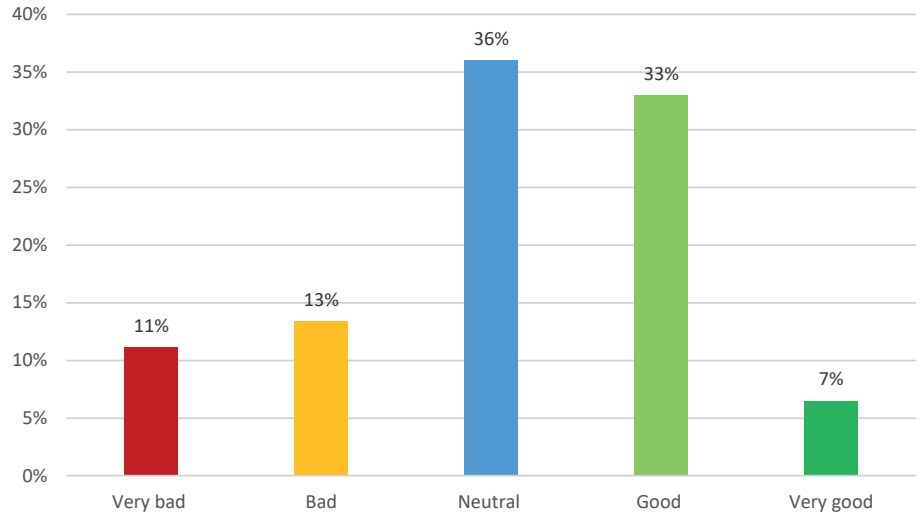
Source: FAO survey.

"Very bad". By contrast, the years 2012 and 2014 appear to have been good for the aquaculture insurance market, as nearly 50 percent of insurers reported "Good" or "Very good" profits.

No conclusions can yet be drawn about whether the aquaculture insurance industry is experiencing a positive trend as most insurers need a few more "Good" to "Very good" years to compensate for past losses. The average underwriting experiences in aquaculture stock mortality insurance for the 2009–2019 period are outlined in Figure 4. On average, 40 percent of respondents reported "Good" to "Very good" underwriting experiences, and 36 percent reported "Neutral" results. However, these average underwriting experiences provide good evidence that the industry has achieved some kind of stability in recent years.

Overall, underwriting experiences in Europe, Chile, China and the Russian Federation proved to be profitable in the 2009–2019 reporting period, with a majority

FIGURE 4
Underwriting experiences in aquaculture stock mortality insurance (averages for the period 2009–2019)



of years considered "Very good" or "Good". Technological advancements and better risk management practices are the main reasons of these good underwriting experience, especially for high-value, export-oriented aquaculture species and largely standardized production systems aquaculture in Chile, Europe and Oceania (New Zealand and Australia). In India and Africa, aquaculture stock mortality insurance results were rather mixed, with more years reported as "Neutral" or "Bad".

Insurers continue to have a preference for insuring large aquaculture companies and focus on a small number of commercial species. Risks are thus not well spread over species and production systems. Some insurers are therefore vulnerable to high losses caused by single events such as algal blooms or outbreaks of disease, consequently, the focus on a limited number of production systems and species can undermine their underwriting experiences. In China, the premium subsidies provided in state-operated programmes, as well as the implementation of pilot aquaculture insurance programmes in which private sector insurers, mutual organizations and farmers' organizations operate together, have all had a positive effect on underwriting experiences. Recent aquaculture insurance premium subsidy programmes in the Russian Federation also appear to have had a positive influence on the underwriting results of the companies involved.

2.10.3 Common aspects that explain underwriting experiences

The increase in the frequency and intensity of extreme weather events such as typhoons, cyclones and storm surges, added to biological factors like red tides, have all negatively affected the underwriting experiences of both sectors in recent years. Several cyclones in India, and typhoons across China, Japan and the Philippines (especially in 2013 and 2018), caused damage to capture fisheries and aquaculture assets as well as to stocks. The number of claims increased as a consequence, with losses for some insurers and reinsurers in the industry. In the winter of 2019, a storm surge significantly affected aquaculture operations in South Africa and resulted in greater claims. In 2016, a destructive algal bloom event in southern Chile generated around USD 100 million in estimated losses for the insurance industry – the largest ever experienced in the aquaculture insurance market. Other biological factors such as diseases have also been recorded as causing significant losses in Africa, Chile and Europe.

Premium subsidy programmes are undoubtedly a key determinant of insurance companies' underwriting experiences. These programmes make insurance more attractive for fishing vessel owners and aquaculture companies; a greater number of insurance policies mean that financial risks can be spread across a wider pool of participants. However, profitability is not always guaranteed by increased economies of scale in the insurance business. For instance, in China, where relatively high subsidies are available for fishing vessel insurance premiums (20–60 percent), the overall business performance of fisheries insurance tends to be only marginally profitable. The reason being that insured Chinese fishing fleet consists of many small-scale vessels, which are often poorly maintained and more susceptible to losses and/or damages. This situation is changing, following significant investments in fleet modernization in China over the last decade. Consequently, it is is expected that the profitability of fishing vessel insurance services in China will improve in the near future.

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1. INTRODUCTION

China is the world's leading producer of marine capture fisheries and aquaculture. In 2018 its output accounted for 15 percent and 60 percent of these sectors' respective global totals (FAO, 2020).

However, both fisheries and aquaculture are highly dependent on the climate and the level of resources available. In China, natural disasters such as typhoons, and accidents originating from technical failures, cause injuries, loss of life and market risks; such events influence the overall economic performance of the sector and the people whose livelihoods depend on it. For example, in 2018 natural disasters caused the loss of 830 000 tonnes of aquatic products and 868 sunken vessels (China Fishery Statistical Yearbook, 2019). As a result of these disasters, 43 people died or disappeared and CNY 15.7 billion (USD 2.41 billion) were lost.[1]

Through its implementation of a policy-oriented fishery insurance programme, and through Document No.1,[2] the central government has emphasized the importance of insurance for the fisheries and aquaculture sectors. However, although insurance for fishing and aquaculture operations has been available in the country for decades, and recently benefited from increased government support, the gap between supply and demand is still significant.

This chapter provides an updated overview of the current state of capture fisheries and aquaculture insurance in China. The analysis is based on the latest information from publicly available sources, a literature review, and the results of the online FAO survey conducted for the purposes of the global review.

2. STATUS OF CAPTURE FISHERIES AND AQUACULTURE PRODUCTION

Fisheries production in China has steadily increased over the past ten years. From 2008 to 2018, total fisheries production increased by about 1.3 times, from 48.96 million to 64.58 million tonnes. This increase is mainly due to the growth of aquaculture production in the country, which represented about 77 percent of total fish production in 2018. In the same year, the total value of fisheries production was CNY 1 282 billion (USD 197 billion), which made up approximately 1.4 percent of the nation's GDP (China Fishery Statistical Yearbook, 2019). Around 13.2 million people are active in the capture fisheries and aquaculture value chains, with approximately 4.7 million and 1.6 million of them directly involved in aquaculture and capture fisheries production, respectively (China Fishery Statistical Yearbook, 2019).

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1 The average CNY–USD exchange rate applied throughout this chapter is CNY 6.515 = USD 1, as per the International Monetary Fund (2020).

2 Document No. 1 originally refers to the first document issued by the Central Committee of the Communist Party of China each year. On 1 October 1949, the Central People's Government of the People's Republic of China began to issue "Document No. 1". It is also used by the Central Committee and the State Council as a policy document for important rural issues.

2.1 Capture fisheries

While China remains the world's largest marine capture fisheries producer, whose output made up 15 percent of the global total in 2018, its catches have declined slightly over the past ten years, leveling off at about 14 million tonnes per year. Similarly, in the 2008–2018 period marine fishing also declined as a proportion of China's total fisheries production, from 25.7 percent to 22.7 percent. The structure of capture fisheries production in terms of species has remained stable. The highest landings involved hairtail (*Trichiurus japonicus*), with 0.94 million tonnes, which accounted for 13.1 percent of fish production. This was followed by anchovy (*Engraulis japonicus*), of which 0.66 million tonnes were harvested, accounting for 9.2 percent of fish production (China Fishery Statistical Yearbook, 2019).

2.2 Aquaculture

China also continues to be the largest aquaculture producer in the world, whose output accounts for 59 percent of global production. However, the last couple of years have seen a slowdown in production increase. In 2017, aquaculture production grew by 2.2 percent, while 2018 saw a 1.6 percent increment (FAO, 2020). Nevertheless, in general terms both marine aquaculture and inland aquaculture output have grown rapidly as a proportion of total fisheries production over the past decade. From 2008 to 2018, the proportion of marine aquaculture production increased from 27.4 percent to 31.5 percent, while inland fishing production increased from 42.3 percent to 48.9 percent of the country's total fisheries production.

In 2018, the country had 7.2 million hectares devoted to aquaculture, of which 5.14 million were in fresh water and 2.04 million hectares were in sea water (Godfrey, 2019). The main species produced in the country are: pacific cupped oyster, grass carp, silver carp, bighead carp, common carp, crucian carp, tilapia, crayfish, white shrimp and Japanese kelp. The first six species from this list each recorded production volumes of over 2 million tonnes in 2018. In the same year, aquaculture production in China was valued at around CNY 945.64 billion (USD 145 billion). The value of freshwater aquaculture accounts for 62.2 percent of the country's total aquaculture production value (China Fishery Statistical Yearbook, 2019).

3. THE INSURANCE MARKET

Over the last decade, the commercial insurance market has grown rapidly in China, and it is now considered one of the main drivers of insurance industry growth worldwide. In 2018, China accounted for 11 percent of global premiums, a figure which is expected to increase to 20 percent by 2029 (Staib, 2019).

In 2018, the total non-life premiums in the country (which include capture fisheries and aquaculture insurance) amounted to USD 176 billion, with agriculture listed as the second-largest business line with 4.5 percent of the total premiums (Li, 2018). The number of commercial insurance companies operating in the country has steadily increased in recent years, owing to the easing of China's regulatory framework. Commercial insurance companies have well-established insurance systems and offices nationwide. They have significant financial capacity, well-established regulations and procedures, and lengthy experience in servicing insurance buyers. As of 2017, there were 62 domestic non-life commercial insurance companies in China and 22 foreign branches.[3] Although foreign commercial insurance companies have acquired greater importance in the non-life insurance sector (including marine insurance) since they were allowed to enter the Chinese market, the People's Insurance Company of China

[3] This data considers domestic and foreign insurers. There is no official data on the size of China's corporate insurance market. Large domestic insurers are believed to be the dominant players. Foreign insurers have formed close ties with multinationals that have branches and subsidiaries in China (Li X., 2018).

(PICC), established in 1949, continues to be the market leader with a 33.5 percent share in 2017. In recent years brokers and insurance agencies have become particularly important in the insurance market: this is primarily because of a relaxation in the regulations on qualification examinations and certification for insurance intermediaries since 2015. In 2016, brokers and insurance agencies collectively accounted for 2.1 percent of the total non-life business.

Both capture fisheries and aquaculture are considered part of the agricultural sector in China. Insurance for these markets is therefore also regarded as an integral part of agricultural insurance. China is the second-largest agricultural insurance market after the United States of America, driven mainly by government subsidies. According to the China Banking Regulatory Commission (CBIRC), China's agricultural insurance premium income grew by an average of 14 percent per year between 2013 and 2018, reaching CNY 57.26 billion (USD 8.8 billion) in 2018.[4] In 2019, the entire industry's agricultural insurance yielded an underwriting profit of CNY 1.74 billion – although this was down CNY 649 million from the same period the previous year. Since 2004, the agricultural insurance system has been guided by the central government's "policy-oriented agricultural insurance system". Specifically, the central government has emphasized the relevance of agriculture insurance policy through Document No. 1, and promoted the diversification of agricultural insurance through both commercial and mutual insurance companies/associations (which include fisheries insurance). The State Council has put forward specific guidance for the development of agricultural insurance, which included the promotion of premium subsidies in 2007. In 2013, the State Council promulgated the first Regulation on Agricultural Insurance. The regulation aimed to provide a foundation for the development of China's agricultural insurance system, in close coordination with commercial insurance companies and legally established agriculture associations offering mutual insurance. Among other things, the regulation encourages each local government to formulate its own ancillary policies and financial subsidies to support insurance programmes. In recent years, the central government has also promulgated several policies and regulations through the Ministry of Finance and the CBIRC, which aim to strengthen the agricultural insurance market. They include financial support for reinsurance, subsidies for premiums and taxation policies.

4. SUPPLY AND DEMAND

4.1 Supply

In China, cover for both capture fisheries and aquaculture continues to be provided through the mutual insurance offered by fisheries mutual insurance associations, as well as commercial insurance offered by private (domestic and foreign) companies. Appendix 1 outlines the structure of China's fisheries and aquaculture insurance provision.

Capture fisheries

Mutual insurance associations

Fisheries mutual insurance, operated under the Ministry of Agriculture and Rural Affairs (MARA), has been available in the country for roughly the past two decades, and continues to be the main modus operandi for fisheries insurance. The China Fishery Mutual Insurance Association (CFMI) has successfully established itself as the central mutual insurance organization in the national market.[5] CFMI has been providing fisheries insurance services (vessel and life insurance) to the sector since its inception

[4] The year-on-year growth rates from 2013 to 2018 were 27.43 percent, 6.26 percent, 15.08 percent, 11.42 percent,14.69 percent, and 19.54 percent.

[5] Formerly known as the China Fishing Vessels Owners Mutual Assurance Association, it was renamed CFMI in 2007.

TABLE 1
China Fishery Mutual Insurance and its main associations

Name	Location	Year established
China Fishery Mutual Insurance Association*	Beijing	1994
Guangdong Fishery Mutual Insurance Association	Guangzhou	1993**
Zhejiang Fishery Mutual Insurance Association	Hangzhou	2004
Shandong Fishery Mutual Insurance Association	Jinan	2006
Jiangsu Fishery Mutual Insurance Association	Nantong	2008
Hebei Fishery Mutual Insurance Association	Qinhuangdao	2009
Liaoning Fishery Mutual Insurance Association	Dalian	2011
Fujian Fishery Mutual Insurance Association	Fuzhou	2011
Hainan Fishery Mutual Insurance Association	Haikou	2013 (stopped in 2015)***
Ningbo Fishery Mutual Insurance Association	Ningbo	1996

Source: CFMI.
**A pilot version was launched in 1993; the national mutual association was established in 1994.
***The loss ratio exceeded the local government's capacity to support the association.

in 1994. The organization has the largest membership of fishing vessel owners, fishers and farmers in the country, all of whom join on a voluntary basis. Currently the CFMI has 9 local fisheries mutual insurance association branches, 31 provincial insurance agencies, and more than 800 municipal and county insurance agencies. These outlets can be found across all coastal capitals and the major inland provinces, as well as China, Hong Kong SAR and China, Macao SAR (Table 1). Local associations operate their programmes independently, using their own legal representatives and keeping the premiums they earn, though they do receive some financial support from central and local government.

In 2018, the CFMI accounted for CNY 1.88 billion (USD 0.29 billion) of aquaculture premium income, which in turn represented 3.1 percent of the country's total net agricultural insurance premiums in the same year.[6] In terms of fisheries insurance, the CFMI and its branches account for about 95 percent of the total fisheries insurance business in China (FAO, 2017). In 2008, the CFMI struck a reinsurance cooperation agreement with Willis Insurance Brokers Co. Ltd and the British RSA Insurance Group. This created a new underwriting model for mutual insurance organizations in fisheries, whereby professional insurance brokerage companies arrange reinsurance with the international reinsurance market (Sun Y, 2009).

Commercial insurance and reinsurance companies

Since 2008, central and local governments at various levels have increased their financial support for fisheries insurance, and an increasing number of commercial insurance companies have joined the market. There are currently about 18 commercial insurance companies underwriting fisheries or aquaculture insurance in China.

Most of the main commercial insurance companies – such as the PICC, China Pacific Insurance (Group) Co. Ltd. (CPIC), China Ping An Insurance (Group) Co. Ltd., and China Continent Insurance – underwrite fishing vessel insurance, fisherman's life insurance and aquaculture insurance. Other companies provide only fishing boat insurance and/or fisherman's life insurance. Commercial insurance is also available for distant-water fishing fleets, as it is seen as low-risk and vessels generally have good on-board equipment. Of the 18 insurance companies that provide insurance services to the capture fisheries sector, 12 provide distant-water fishing fleet insurance.

[6] This is an estimated figure based on the total premium income from fishery and agricultural insurance.

Aquaculture

Theoretically, all associations or commercial insurers who provide agricultural insurance could also provide aquaculture insurance. However, the latter has only been developed since 2004, when a number of pilot projects were launched, most of which were supported by the central government through its policy-oriented agricultural insurance system. In 2008, the CFMI and its local mutual insurance associations formally initiated aquaculture mutual insurance programmes both for indemnity-based and index-based insurance. They were able to do so thanks to the support provided by the provinces through the premium subsidies. Since then, aquaculture insurance programmes have been implemented in Beijing, Shanghai, Chongqing, Anhui, Jiangsu, Fujian, Guangxi, Shandong, Zheijiang and Jilin. Yet despite this government support, most of the CFMI associations only provide cover for damage to fishing vessels and loss of life, and very few provide aquaculture insurance products.

Commercial insurance companies started to become involved in aquaculture insurance pilot programmes in close consultation with CFMI, and encouraged by the government's policy-oriented insurance programme, which offered premium subsidies and favourable tax conditions. Of the professional agricultural insurance companies,[7] only five underwrite aquaculture insurance. Recently, international reinsurers such as Swiss Re have joined the aquaculture insurance programme. Groupama-AVIC Property Insurance, a large French international insurer of agricultural activities, with a branch in Sichuan province, is still the only foreign insurance company providing aquaculture insurance in China. Appendix 2 provides an overview of the types of insurance policies and main insurance companies providing services to the capture fisheries and aquaculture sectors.

4.2 Demand

Capture fisheries

The number of fishing vessel in the country has decreased over the past ten years. In 2008, there were 1 039 400 fishing vessels registered with a gross tonnage of 8.95 million tons; in 2018 this number had fallen to 863 900 vessels (gross tonnage of 10.80 million tons). Of this total, nearly 72 percent (622 008 vessels) were motorized fishing vessels, with a gross tonnage of 10.41 million tons, and a total power of 20.74 million kilowatts. In 2008, 1.81 million people were employed in capture fisheries, but this number fell to 1.63 million in 2018 (China Fishery Statistical Yearbook, 2019).

Overall, over the past decade the total number of fishers and fishing vessels covered by mutual insurance has gradually decreased. In 2010, the CFMI provided insurance to 850 000 fishers and 71 400 fishing vessels (China fisheries yearbook, 2010). In 2019, mutual fisheries insurance covered 660 000 fishers,[8] with 55 000 vessels covered in the same year (Table 3). Bearing in mind that, according to the latest estimates, the number of active fishers has fallen to 1.32 million in China, this means that almost half of the fisher population is covered by mutual insurance. By contrast, only a small fraction of fishing vessels (around 6 percent) are covered by insurance.

Aquaculture

The total area used for aquaculture in China in 2018 was 7.2 million hectares, of which marine aquaculture covered 2.04 million hectares, and freshwater aquaculture covered 5.14 million hectares. In 2018 there were 9 209 aquaculture enterprises or cooperatives nationwide. The total aquaculture area currently underwritten in the country accounts for only 5 percent of the total insurable area (China Fishery Channel, 2018).

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[7] Professional agricultural insurance company refers to a joint-stock insurance company that specializes in, or mainly engages in, agricultural insurance.

[8] Number of fishermen covered by personal safety mutual insurance or fishermen's marine personal accident insurance.

5. UNDERWRITING

In China, capture fisheries insurance policies are all indemnity-based, and commonly involve both fishing vessel insurance and fisherman's life insurance. Aquaculture policies include indemnity-based and index-based insurance. Underwriting is provided by mutual insurance and commercial insurance under the government's policy-oriented programme. Since 2015, following the implementation of the "Trial Procedure for Organizational Supervision of Mutual Insurance", the government clarified the legal identity of fisheries mutual insurance associations. In doing so, it broadly solved the issue of multiple management and the ambiguity of the mutual insurance association. In 2010, the CBIRC and the MARA issued a joint document to promote reform of the fisheries mutual insurance system. According to this note, a national fisheries mutual insurance organization was to be created, spearheaded by the CFMI, to undertake the operations it developed. It would form an independent legal entity offering property, liability, accident insurance and reinsurance for the sector.

Information on the net capacity of companies providing insurance services to the fisheries and aquaculture sector – with and without reinsurance – is not available. Based on responses to the survey, the CFMI's net capacity (in USD) on any single risk is USD 72 million, while its gross capacity (with reinsurance) on any single risk is USD 103 million.

Subsidies

Since the Ministry of Agriculture issued the "Notice regarding the central government's pilot project for premium subsidies for fisheries mutual insurance" in 2008, subsidies for insurance premiums in the fisheries sector have evolved rapidly. The project has trialed and developed subsidized insurance programmes in key fishing areas such as Shandong, Zhejiang, Guangdong, Jiangsu, Hainan, Liaoning and Fujian. Moreover, the regulation issued by the government encourages city- and county-level financial departments to increase subsidies for policy-based aquaculture insurance. In 2019, Document No. 1 proposed improving agricultural insurance policy and exploring the implementation of a pilot programme for the insurance of local agricultural products. This pilot programme includes specific aquaculture production in some coastal provinces.

Since 2008, the Ministry of Agriculture has provided approximately CNY 10 million (USD 1.5 million) annually to fisheries insurance programmes through financial support and subsidies (MARA, 2020). As well as the support provided by central government through the policy-oriented fishery insurance programme, local governments have been encouraged to provide premium subsidies for local mutual associations that provide insurance services.

Since 2004, successive provinces – including Zhejiang, Jiangsu, Guangdong, Shanghai and Sichuan – have provided budgetary allocations for premium subsidies to fisheries and aquaculture insurance one after the other. Premium subsidy rates vary from place to place, from 20 to 80 percent of the premium, based on the economic development status of the local government. The subsidies have clearly encouraged more farmers to join the insurance programme: in Sichuan, Jiangsu and Shanghai, high premium subsidy percentages for aquaculture (60–80 percent) proved to be a strong incentive for participation. Nevertheless, despite support from central and local government, penetration for fisheries and aquaculture insurance remains rather low. This is partly due to these sectors' lack of underwriting profitability, and the lack of accurate statistical data to determine damage and loss, which would support the structure of premiums. Appendix 3 shows some local government initiatives for providing subsidies for fisheries and aquaculture insurance over the last years.

Innovative underwriting models

Various models for policy-based commercial insurance have emerged over the last few years. Private insurance companies offer insurance services to aquaculture cooperatives through so-called "cooperative plus commercial insurance" models. Aquaculture cooperatives have also become major producer organizations in the country. These cooperatives are organized by local farmers who often cultivate the same species, share information and experiences. They also procure their seed and feed supplies and market their products collectively, as well as adopting collective risk management practices and technologies. Based on this model, local governments and aquaculture cooperatives work with commercial insurance companies to design new insurance products; they share insurance liabilities and underwrite fisheries reinsurance to improve the underwriting capacity and services of fisheries insurance. As an example, a 2016 cooperation between an aquaculture cooperative and Anxin Agriculture Insurance Company agreed that the insurance company would pay a bonus to the cooperative if the annual loss ratio was lower than 60 percent.

In 2013, the China Fisheries Mutual Insurance Association and Guoyuan Agricultural Insurance Co. Ltd. signed a co-insurance cooperation agreement for aquaculture, thus creating a "mutual-commercial aquaculture insurance" model. The establishment of a fisheries risk protection system through cooperation not only effectively compensates for the defects of the market mechanism, but also ensures the stability of fisheries production and fishermen's incomes. Ultimately, this increases enthusiasm among fishermen to restart work after a natural disaster or accident, and promotes efficiency in the sector. In 2017, Fujian Provincial Fisheries Mutual Insurance Association and the Fujian provincial branch of China Life property insurance signed the "Fujian Aquaculture Weather Index Mutual Insurance Cooperation Agreement" to provide risk protection for aquaculture together.

Reinsurance

All mutual associations share the risks from their insurance portfolios with the CFMI and some commercial insurance companies through reinsurance. As commercial insurance companies have well-established systems and are financially capable, this allows them to provide reinsurance services to these associations. In 2020, the China Agricultural Reinsurance Company was established, co- sponsored by nine institutions including the MARA, China Reinsurance (Group) Corporation and the Agricultural Development Bank of China. This new reinsurance company was considered a catalyst for the improvement of the agricultural reinsurance system and the establishment of a catastrophe risk dispersion mechanism. The latter will contribute to further expanding underwriting capacity and enhancing the development of innovative products, which will benefit the capture fisheries and aquaculture insurance market.

6. PERILS COVERED

Capture fisheries insurance policies are of the "all-risk" type; the perils covered by commercial insurers and mutual associations do not vary a great deal. Fisheries insurance generally covers the total loss of fishing boats and the partial damage of boats, equipment and/or gear caused by natural disasters such as severe weather, storms, lightning, tsunamis, flooding or accidents. Life insurance covers death or injury on board, as well as crew medical expenses in the event of an accident.

In aquaculture insurance the policies are limited to "named perils". The insurer generally provides coverage for economic losses arising from the death of stock caused by natural disasters such as typhoons, floods and red tides. Policies also cover extreme weather events such as low temperature or frost, technical failures, environmental

TABLE 2
Fishing boat insurance premium rates (Hainan province, 2019)

Material / Age / Engine power (P)	Steel or iron fishing boat				Wooden or other material fishing boat			
	Vessel (age year)				Vessel (age year)			
	y≤10	10< y≤20	20< y≤30	y>30	y≤5	5< y≤10	10< y≤15	y>15
	Premium rate				Premium rate			
P≥735 kW	0.70	0.85	0.95	1.10	0.90	1.00	1.15	1.25
367.5 kW≤P < 735 kW	1.00	1.10	1.25	1.40	1.20	1.35	1.45	1.60
147 kW≤P < 367.5 kW	1.20	1.35	1.50	1.65	1.50	1.65	1.80	1.95
44.1 kW≤P < 147 kW	1.45	1.60	1.75	1.90	1.90	2.10	2.25	2.40
P<44.1 kW	1.70	1.85	2.05	2.20	2.55	2.70	2.90	3.05

pollution (sea water/fresh water) as well as major diseases. Depending on the policy and insurance provider, these perils can also be covered by insurance if they damage the aquaculture facilities themselves.

7. POLICIES

7.1 Capture fisheries

Capture fisheries insurance policies in China can be split into two categories: fishing vessel insurance and life insurance for fisherfolk. Generally, mutual and commercial fishing vessel insurance policies can cover full loss as well as partial damage to vessels, fishing gear and other equipment. Comprehensive fishing vessel insurance policies can also cover injury, death, search and rescue expenses, and legal expenses incurred during litigation. The mutual insurance policy for fishing vessels can cover third-party liability, as per prevailing legislation, but the mutual insurance amount shall not exceed the established limits.

The total number of capture fisheries insurance policies is unknown. However, data obtained from the CFMI on the number of fishing vessels and net premiums can provide some insight. Table 3 shows the total number of fishers and fishing vessels covered by mutual insurance from 2010 to 2019, as provided by CFMI. In 2019, the number of fishing vessels insured through mutual insurance was 55 500, while 660 600 fishers were covered by life insurance. This data does not consider the number of vessels or fishers covered by commercial insurance, which is currently unknown. Taking this data into account – and considering that in 2018 the total number of fishing vessels was 863 900 – it is reasonable to suggest that Chinese fishing vessels are largely underserved by insurance (only around 6 percent are covered by mutual fisheries insurance).

Although insurance policies vary from place to place and between associations, a vessel's insured value often ranges between 50 and 80 percent of its assessed value. This value is determined by the quality of the vessel, based on the type of hull, engine power and hull age. The annual premium generally amounts to 1–2 percent of the sum insured. For example, the CFMI in Hainan offers premium rates for their fishing boat commercial insurance policies, which range from 0.70 to 3.05 percent according to the hull material, vessel age and power of the engine (see Table 2).

7.2 Aquaculture

Stock mortality insurance is the most common and widely developed type of aquaculture insurance in China. The exact number of aquaculture insurance policies in the country is unknown; however, according to inquiries within the industry and

research publications on the topic, nationwide penetration of aquaculture insurance remains fairly limited (Zheng, 2018). One mutual insurance association responded to the FAO survey stating that they had around 3 500 aquaculture policies in force in 2019, and had underwritten 3 950 aquaculture units in the same year. Another association reported having 7 878 policies in effect, which provided coverage to 412 aquaculture enterprises. The other insurance companies that responded did not reveal similar information. Table 3 shows the total aquaculture area and aquaculture cages covered by mutual insurance from 2010 to 2019, as provided by the CFMI. According to the CFMI data, the total aquaculture area insured through fisheries mutual insurance associations has increased tenfold, from 4 500 hectares covered in 2013 to 50 800 in 2017.[9] Conversely, the number of aquaculture cages insured fell by half from 2016 to 2017. This reduction is a consequence of a stricter environmental protection policy the government has implemented in recent years. The policy stipulates the gradual removal of cages and net pens from water bodies such as rivers, lakes and reservoirs, with the aim of addressing the country's environmental problems, notably those specifically related to water quality (Louis H, 2019).

Species insured

The following species are insured under the government's policy-oriented aquaculture insurance programme: freshwater finfish, white shrimp, crayfish, crab, oyster, mussel, sea cucumber, seaweeds, and laver. Insurance companies who replied to the FAO survey also reported covering tilapia, carp, salmon, halibut, seabass, gilthead (sea) bream, croaker, abalone, lobster and prawn.

Growing systems insured

Growing systems insured under the government policy-oriented aquaculture insurance programme include: sea cage culture and industrial aquaculture. Respondents to the survey also reported covering the following growing systems: longline culture, oyster and mussel (hang culture/rope/line and bottom culture), raceways and gravity tanks, ponds, offshore submersible and semi-submersible systems, as well as recirculation aquaculture systems (RAS).

Other types of insurance

Both commercial insurance companies and mutual insurance associations currently provide index-based weather insurance. So far, wind index insurance has been launched in Dalian of Liaoning, Weihai of Shandong, Hainan, Guangxi and Ningbo; typhoon index insurance has been launched in Ningbo and Fujian; temperature index insurance has been launched in Suzhou of Jiangsu and Ningbo; and red tide index insurance has been launched in Fujian province. The main index-based types of insurance being piloted in China are hydrological, wind speed and temperature index insurance. Appendix 4 outlines the main programmes offering this cover in the country.

Another type available is price index insurance. This type refers to the economic losses farmers suffer because of fluctuations in the price of aquatic products, and is particularly relevant when prices are lower than expected. However, this type of insurance has not yet been tested on a large scale, and it is only provided in Fujian province by the Fujian Fishery Mutual Insurance Association.

One insurance company reported to the FAO survey that it covered farming facilities and offshore equipment as well as hatcheries and on-growing units. However, based on the author's inquiries these types of policies are still at an exploratory stage and are not being widely offered in the country.

[9] There is no information available on the number of aquaculture hectares insured by commercial insurance companies.

TABLE 3
A summary of fishery/aquaculture insurance supply by CFMI in China

Category	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Insured fishers (full-time)	850 000	930 000	929 400	978 900	930 500	945 500	808 900	757 400	710 000	660 600
Fishing vessels insured	71 400	73 000	69 700	71 200	75 100	77 900	67 600	62 700	57 500	55 000
Aquaculture area insured (hectares)	-	-	-	4 500	17 300	17 100	24 500	42 500	29 500	50 800
Aquaculture cages	-	-	-	429	1 951	2 590	1 368	684	-	-
Premium income (in billion CNY)	0.81	1.06	1.15	1.43	1.56	1.61	1.67	1.76	1.88	2.01
Claim payment (in billion CNY)	0.281	0.379	0.377	0.530	0.551	0.660	0.850	0.813	-	-

Source: China Fisheries Yearbook 2010–2018; CFMI, 2020.

8. RISK ASSESSMENT

8.1 Capture fisheries insurance

The risk assessment procedures applied by mutual insurance associations and insurance companies continue to be largely the same as those outlined in the 2009 capture fisheries review (Van Anrooy *et al.*, 2009). The main measures taken to reduce risks involved in underwriting capture fisheries activities are:

- Fishing vessels must obtain the "Fishing vessel inspection safety certificate" (provided by a risk assessment professional) as a requirement for insurance.
- The insured value to insure against total loss or partial damage ranges from 50 to 80 percent of the vessel's assessed value; this can be determined by the type of hull (i.e. wooden or steel), engine power, and the age of the vessel.
- Usually, a clause called "under-insurance" is included in the policy. For example, if the vessel's total value is CNY 1 million, it can be insured at CNY 800 000. At the time of partial damage the insurer will pay only a proportion of CNY 800 000, while the insured will have to cover the remainder of the loss.
- A deductible is generally applied to the insurance policy. If losses are lower than the deductible, no compensation is provided; if the losses are high, the insurer covers the insured amount minus the deductible.
- There are limits on the age and number of crew members insured.[10]

8.2 Aquaculture

Based on the survey responses, mutual insurance associations use both independent surveyors and develop their own policy terms and conditions. Insurers commonly use risk assessment practices that are carried out in close coordination between the insurance company or mutual insurance association and the policyholder. If the underwriting is issued through a cooperative, the cooperative provides technical support for the risk assessment. Broadly, the risk assessment procedures applied by mutual insurance associations and insurance companies when covering aquaculture is largely the same as that indicated in the 2006 aquaculture review (Van Anrooy *et al.*, 2006):

- The insured party must hold a "breeding certificate" and a current pond lease contract, which certify that the insured party has received professional training, has no fraudulent insurance records, and has complete aquaculture log records.
- A deductible is applied to stimulate policyholders to implement risk management strategies. In recent pilot projects, 20–30 percent of risks were assumed by the insured; this percentage depends on the different causes of stock mortality.

[10] Crew members should be aged from 16 to 65; every crew member working on board should be insured.

- The insurance company sets up an insurance account for each cultured species, and compensation is only paid from the dedicated account. In other words, the maximum total insurance compensation per year (except for the year of the event for which the claim is made) shall not exceed the total income from insurance premiums, after deducting the aquaculture mutual insurance catastrophe risk fund and the management fee. If the assessed loss is within the limits of the mutual insurance fund, compensation will be provided.

9. HANDLING OF CLAIMS

Mutual insurance associations and insurance companies apply similar claim settlement procedures for both capture fisheries and aquaculture insurance. Usually, they use their own loss adjuster specialists for this purpose. For fishing insurance, the policyholder must submit an accident report no later than 24 hours after an accident has occurred; after reaching the first port they must communicate the accident to the fisheries administration, the fishing port supervision and the mutual insurance association.

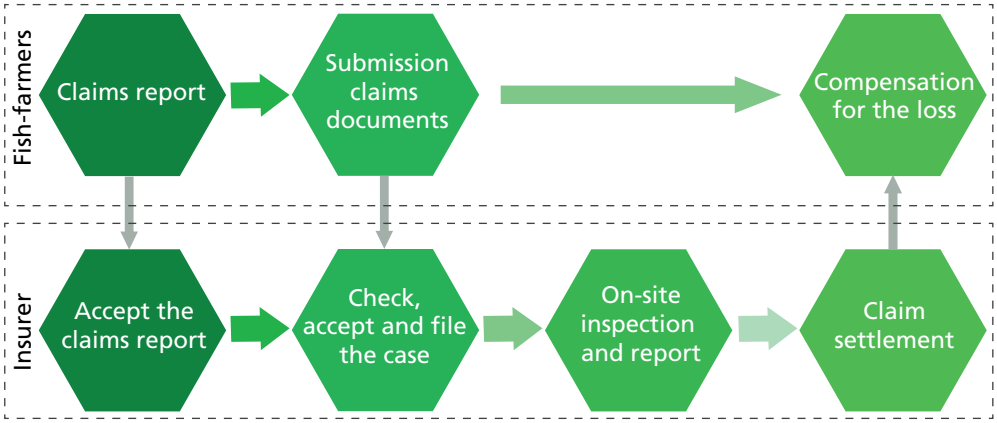
For aquaculture insurance, farmers must report losses to the insurance company and provide pictures and written descriptions of farming losses. In most claim settlement procedures the CFMI follows seven steps after the claim report has been filed (for both capture fisheries and aquaculture insurance; Figure 1). While most mutual insurance associations follow these steps, each company settlement process uses specific terminology.

With respect to index-based weather insurance policies, the information involved is relatively simple. First, meteorological data from Meteorological Bureau stations located near the aquaculture farm are used for reference. When the weather index reaches the agreed threshold value on the insurance contract, the insurer will act. The association or company therefore does not need to distinguish the risk situation of a single insured person, nor do they need to carry out risk classification, rate determination or risk area planning.

10. UNDERWRITING EXPERIENCE

No information regarding the underwriting experience of the mutual insurers and insurance companies providing fisheries and aquaculture cover was available. According to reports, the total income from aquaculture insurance premiums in China in 2018 was CYN 610 million (USD 94 million). This figure equated to about 1 percent of all agricultural insurance premiums, with a comprehensive payout ratio of 95.4 percent (Wenbin, 2020). Natural disasters – and specifically tropical cyclones – generate

FIGURE 1
Claim settlement process for traditional fisheries insurance



large economic losses, particularly in highly exposed regions such as those where coastal fishing and aquaculture communities live. These natural disasters therefore influence underwriting results in the sectors. According to the China Fishery Statistical Yearbook (2019), typhoons, floods, disease, drought, and pollution affected 0.6 million hectares of aquaculture farming in 2018, causing a loss of 0.83 million tonnes of aquatic products, as well as economic losses of over CNY 15.76 billion (USD 2.4 billion).

Examples of some mutual insurance companies' loss ratios from the last year may provide an indication of underwriting experiences in capture fisheries insurance. For instance, a mutual insurance association in the Ningbo municipality of Zhejiang provides services to enterprises (boatowners' liability) and individual fishers. The premium rate for liability insurance is 0.45 percent, with an insured value of CNY 500 000 (USD 76 000) for loss of life, accident injury of CNY 300 000 (USD 46 000) and additional medical insurance of CNY 50 000. The premium rate for fishing vessel insurance is 0.25 percent of the value of the vessel insured. The association received a premium subsidy of 20 percent from the Ningbo municipal government and 50 percent from the county government. Data in 2013 and 2014 indicate good performance, as the total premium income was significantly higher than the indemnity paid, resulting in low loss ratios (Table 4). In 2017, by contrast, the comprehensive loss ratio reached 95 percent.

In Anhui province, a pilot aquaculture insurance scheme was jointly operated by the CFMI and the Guoyuan Commercial Insurance Company. In 2014, the pilot programme was implemented in 28 counties, and by 2015 it covered 31 counties (Table 5). The premium rate was 7 percent of the insured value, with the insured value of CNY 2 000 per *mu*.[11] The government subsidized 70 percent of the premium. Available data indicate a good performance in 2015 in Anhui. In 2017, however, the comprehensive loss ratio of aquaculture was much higher in Ningbo, at 77.5 percent.

Information reported in the FAO survey which relates to the underwriting results (in economic terms) does not reveal any specific trends. While in 2018/2019 respondents reported "good" and "neutral" underwriting experiences, in previous years responses had ranged from "very good" to "very bad" or "neutral". According to Yu *et al*, (2017) few of the insurance companies that provided aquaculture insurance in 2014 were likely to have a loss ratio much beyond 70 percent stop-loss point.

TABLE 4
Performance of fisheries mutual insurance in Ningbo, Zhejiang province

Year	No. of insured vessels	No. of insured fishers	Premium income (in million CNY)	Indemnity paid (in million CNY)	Loss ratio (%)
2013	5 861	23 600	58.4	31.6	54
2014	5 574	23 053	70.7	34.3	48
2017	4 580	21 000	78.9	75	95

Source: ZFMIA, 2020.

TABLE 5
Performance of freshwater aquaculture mutual insurance in Anhui province and Ningbo city

Year	Region	No. of insured aquaculture farmers	Aquaculture area (*mu*)	Premium income (in million CNY)	Indemnity paid (in million CNY)	Loss ratio (%)
2014	Anhui	382	140 000	16.02	3.03	18.9
2015	Anhui	628	170 000	24.64	10.72	43.5
2017	Ningbo	-	34 000	13.5	10.46	77.5

Source: Haichaninfo, 2020; ZFMIA, 2020.

[11] Note: 1 mu = 666.7 m^2.

11. CONCLUSIONS

In recent years, the gap between supply and demand of insurance for capture fisheries and aquaculture appears to have narrowed slightly. This change is most likely the result of the political and legal support for agricultural insurance, increased subsidies, and the entry of new agricultural insurance companies with domestic and foreign capital. These improvements notwithstanding, supply is not yet close to meeting demand in the country. Insurance penetration in the capture fisheries sector remains low, especially for small-scale fishing vessels, with only about 6 percent of the total number of vessels registered in the country covered by insurance. The provision of aquaculture insurance has increased, with more products and species insured. Nevertheless, compared to the total production area, the production area actually insured remains very low (at around 5 percent), and small-scale farmers are unable to acquire insurance policies. The main developments in capture fisheries and aquaculture insurance in China are summarized below:

- The central government has provided clear policy guidelines and regulations that encourage authorities, agencies and mutual insurance companies to promote agricultural insurance (including fisheries and aquaculture) as a risk management tool. This includes frameworks for the implementation of agricultural insurance subsidies, as well as for the supervision and management of mutual insurance organizations.
- The core of fishing insurance services in the country continues to be provided by the CFMI, which underwrites 95 percent of the country's fisheries and aquaculture insurance business. The government encourages private insurance companies to provide commercial insurance under the policy-oriented programme, with support through subsidies and tax breaks. Commercial insurance companies cooperate with local government, fishery administrative agencies, and aquaculture cooperatives in the provision of aquaculture insurance.
- The 'mutual plus commercial' and 'cooperative plus commercial' models have proved to be successful in finfish aquaculture insurance; both commercial insurance companies and cooperatives have benefited from these models.
- The newly established China Agricultural Reinsurance Company (2020) is expected to expand its underwriting capacity and enhance the development of innovative products for the capture fisheries and aquaculture insurance market.

Despite the progress detailed above, considering that China remains the world's largest producer of seafood, it is clear that the high demand for insurance in these sectors is still not being met, especially in the small-scale sector. Some of the main constraints are:

- Although the central government has put forward policy and regulatory reforms to promote the development of aquaculture insurance in the country, it is clear that such development varies from region to region. Only a few provinces such as Shanghai, Anhui, Jiangsu and Zhejiang have incorporated aquaculture insurance into their premium subsidy schemes. Without an institutional arrangement in place, pilot insurance schemes provide insufficient, unstable and discontinuous subsidy funds, restricting further and ongoing support for aquaculture insurance.
- With the improvement and gradual development of China's aquaculture insurance industry, premium income from marine aquaculture insurance has increased. Nevertheless, freshwater aquaculture insurance continues to dominate the market. Freshwater aquaculture insurance has accounted for over 99 percent of aquaculture insurance premium income in the country since this form of insurance was introduced (Sun, 2009), although the loss ratio was initially

relatively high (Nong, 2008). At the same time, mariculture was the country's fastest-growing food sector (5–6 percent per year) in recent years, with national policies promoting technological innovation to increase production and quality per unit area. Insurance for this sub-sector must therefore be promoted to cover the increasing demand for insurance among mariculture farmers.

- The limited availability of historic data in the sector makes it difficult to assess production risks properly.
- Although there have been successful arrangements between insurance companies and aquaculture cooperatives to develop joint insurance schemes, these programmes remain pilots and are not widespread among culture systems and species. The aquaculture insurance business is therefore still seen as less profitable compared to other insurance businesses, which hinders its development.
- The high technical complexity of aquaculture activities, the sector's high business risks due to high transaction costs (e.g. process claims for indemnity-based insurance), moral hazards and/or adverse selection, continue to be the major constraints for the development of aquaculture insurance.

12. RECOMMENDATIONS

The following recommendations are the product of research conducted by the author and suggestions made by survey respondents.

- The government should provide subsidies through a two-tiered support mechanism. This means not only providing support by partially covering premium costs, but also supporting fishers to adopt sustainable production technologies. The latter will in turn reduce operational risks, creating a more attractive scenario for insurance companies to cover operations.
- The China Insurance Regulatory Commission should continue to open up the insurance market, allowing more foreign insurance companies to access domestic fishery insurance. The latter would lower the fiscal burden on governments and enhance the market's capacity for solvency. Underwriters could then also use the capital market to spread fishery-related risk, and develop other financial tools such as asset securitization and catastrophe bonds.
- Attention should be directed towards strengthening the technical knowledge of fisheries/aquaculture insurance personnel – insurance brokers, insurance assessors and others – notably with respect to production techniques and insurance management.
- Existing fisheries insurance companies should strengthen cooperation among themselves, introducing advanced management expertise and systematically cultivating talent through the school–business cooperation platform.
- Efforts should also be made to increase insurance awareness among fisherfolk and aquaculturists. Numerous studies have demonstrated that raising awareness can reduce moral hazard and increase the market share in the agricultural insurance market. Popular science publicity and online promotion are both effective tools to spread insurance knowledge, improve the recognition of social insurance, and enhance the competitiveness of the fishery/aquaculture insurance industry.
- Following the example of the Republic of Korea or Japan, where fisheries insurance is compulsory, the central government should promote a "moderately compulsory" fisheries insurance policy. Specifically, this mechanism could support the uptake of insurance in some key areas, such as employers' and third-party liability.
- Diversifying aquaculture insurance policies to cover a broader range of aquaculture systems and species farmed in the country should be prioritized; this includes developing policies to cover mariculture operations.

- Innovative insurance models that encourage collaboration between private insurance companies, mutual associations and cooperatives should be encouraged and extended, with the aim of covering other regions, aquaculture systems, species and fishing operations across China.

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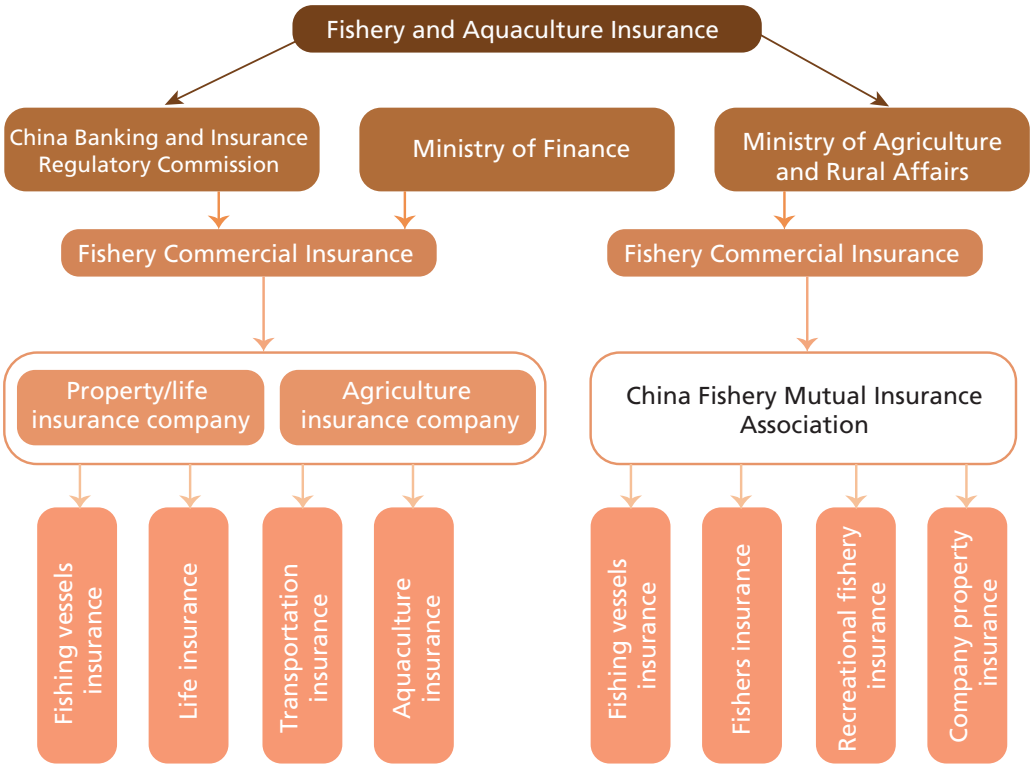
APPENDIX 1

Structure of China's fisheries and aquaculture insurance provision



APPENDIX 2

Types of insurance policies and the main insurance companies providing these services

Insurance types	Insurer
Fishing vessel insurance	
"Anxin Escort Shield" the masses fishing boat comprehensive insurance	Anxin Agricultural Insurance Company
Nansha fishing boat foreign mutual insurance	China Fishery Mutual Insurance Association
Fishing boat mutual insurance; The total fishing boat insurance (Hainan Province)	China Fishery Mutual Insurance Association
Fishing boat commercial insurance	PICC Property and Casualty Insurance, Land Insurance, China United, the Pacific, Ping An Property Insurance and other national property insurance companies
Fisherman's life Insurance	
Fishermen's personal safety mutual insurance; The total protection of fishermen at sea; Fishermen's personal accident insurance (Hainan Province)	China Fishery Mutual Insurance Association
Employers' liability mutual insurance	China Fishery Mutual Insurance Association
Employers' Nansha foreign mutual liability insurance	China Fishery Mutual Insurance Association
Aquaculture insurance	
"Safe to Fortis" aquaculture insurance	Anxin Agricultural Insurance Company
Aquaculture insurance	The Groupama-AVIC Property Insurance Co. Ltd.
Aquaculture mutual insurance	Zhejiang Fisheries Mutual Insurance Association
Freshwater Aquaculture (Fish) Insurance (Anhui Province)	Guoyuan Agricultural Insurance Co., Ltd.
Local Finance Freshwater Aquaculture Insurance (Henan Province)	Zhongyuan Agricultural Insurance Co., Ltd.
Typhoon index aquaculture insurance	Fujian Fisheries Mutual Insurance Association

Source: adapted from Zheng H. *et al.*, 2018; Zheng H. *et al.*, 2020.

APPENDIX 3

Fishery insurance premium subsidies in China 2015–2020

Area	Subsidy ratio	Subsidy scope	Sources of funds	Policy support
Tianjin	60 percent	Fishery mutual insurance	Provincial finance	Fishery Mutual Insurance Financial Subsidy Policy in Tianjin Municipal, 2015
Jiangsu	25 percent	Fishery mutual insurance	Provincial finance	Notice on Implementing Agricultural Insurance, 2015
Fujian	40 percent	Aquaculture typhoon index insurance	Central finance 30 percent; county-level finance 10 percent	Fujian Aquaculture Typhoon Index Insurance Pilot Program, 2019
Guangdong	40 percent	Fishing boat insurance and fishermen's life insurance	Municipal and county-level finance 40 percent[2] (Pearl River Delta region); provincial finance 30 percent and municipal and county-level finance 10 percent[3] (others)	Guangdong Province's Policy of Fishery Insurance, 2019
Guangdong	50 percent	Aquaculture insurance	Municipal and county-level finance	Guangdong Province's Policy of Aquaculture Insurance (Trial), 2019
Hainan	60 percent	Fishermen's personal accident insurance at sea and fishing boat insurance	Provincial finance 50 percent; municipal and county-level finance 10 percent	The Implementation Plan of Hainan Province's Agricultural Insurance Work in 2015

APPENDIX 4
Index-based insurance programmes in China

Company	Region	Commodity	Perils	Year started
PICC	Dalian of Liaoning	Marine ranching	Wind index	2013
PICC	Rongcheng in Weihai city of Shandong	Seaweeds	Wind index	2014
Pacific Property Insurance	Hainan	Sea cage culture	Wind index	2014
PICC	Dalian of Liaoning	Laver	Wind index	2015
Pacific Property Insurance	Suzhou	Crab	Temperature index	2015
PICC Guangxi	Guangxi	Oyster; White shrimp	Wind index	2015
Pacific Property Insurance	Dalian	Sea cucumber	Temperature index	2015
Pacific Property Insurance	Ningbo	Laver	Wind index	2017
PICC	Ningbo	White shrimp	Typhoon index	2020
Fujian Fishery Mutual Insurance Association	Fujain	Marine aquaculture	Typhoon index	2018
Fujian Fishery Mutual Insurance Association	Fujain	Marine aquaculture	Red Tide Index insurance	2020
Fujian Fishery Mutual Insurance Association	Fujain	Large yellow croaker	Price Index insurance	2020
PICC Guangdong branch; Ping An Guangdong branch	Guangdong	Aquaculture	Catastrophe Index insurance	2017
Hebei Fishery Mutual Insurance Association	Hebei	Scallop culture	Wind index	2016

National report of India

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1. INTRODUCTION

India is endowed with a broad range of marine and aquatic resources, which support a thriving fish economy. Bounded by the Indian Ocean along its southern, eastern and western borders, India's exclusive economic zone (EEZ) extends over a distance of 8 129 km and encompasses an area of 2.02 million km^2. As well as the ocean, a variety of inland water bodies – rivers and canals, reservoirs, lakes, lagoons, floodplain wetlands, and brackish water ponds – all add to the diversity of aquatic resources in the country. India is the fourth-largest capture (marine and inland) fisheries and second-largest aquaculture nation in the world (FAO, 2020a). The Government of India estimates that the fisheries sector supports the livelihood of nearly 16 million people in India at the primary level, and almost twice that number along the value chain (Government of India, 2018). The sector contributed 1.10 percent (in current prices) to the country's total gross value added (GVA) during the triennium ending 2018–19. The inland sector contributed 72 percent of total fish production – estimated at 13.42 million tonnes – with the remainder provided by the marine sector. Fish and fishery products contribute substantially to the country's foreign exchange earnings through exports, which were valued at about USD 6.73 billion in 2018–19. Fishery exports accounted for about 2.5 percent of total exports, and close to 20 percent of agricultural exports from India (Government of India, 2019a).

Fisheries are a state concern in India, insofar as the primary responsibility for the governance and management of fishery production systems rests with state governments. From the mid-1980s to the early 2000s, technological advancements in vessel, navigation and gear operation allowed the expansion of capture fisheries (Ghosh, 1998; Salagrama, 2004). However, low economic viability and other constraints associated with offshore and deep-sea fishing programmes limited the sector's further expansion, thereby constraining its potential to meet a growing demand for fish (James, 2014; Parappurathu *et al*., 2020). The latter, together with success in the mass production of freshwater carp and brackish water shrimp, resulted in a greater emphasis on the aquaculture sector. As a result, inland aquaculture production has almost tripled over the past two decades (Government of India, 2018).

However, the risks associated with capture fishery and inland production systems have also increased in recent years, and the growing frequency of extreme weather events in the Indian Ocean has had severe consequences for coastal inhabitants in terms of loss of life and property. In this light, over the past three to four decades the government has made efforts to strengthen fishery and aquaculture insurance in the country. These interventions have largely been carried out through public insurance companies, with low participation from the private sector. More specifically, over the past ten years capture fisheries insurance has been operated by government-administered schemes, while aquaculture insurance has mostly been demand-driven, offered by public insurance companies with little participation from the private

sector. This chapter provides an overview of the present state of capture fisheries and aquaculture insurance in India, with a particular focus on trends over the past ten years. The chapter is based on a literature review as well as insights obtained from an online survey involving some of the insurance sector's key stakeholders.[1]

2. STATUS OF CAPTURE FISHERIES AND AQUACULTURE PRODUCTION

2.1 Capture fisheries

Capture fisheries, both marine and inland, provide income and employment to about 3.8 million resource-poor coastal inhabitants, and 1.2 million inland fishers. The sector contributes close to 40 percent of the country's fish production.

In 2019, marine fish production was estimated at roughly 3.56 million tonnes. Valued (ex-vessel) at USD 8.70 billion (CMFRI, 2020a), the sector's output comprised approximately 1 200 different species of fish and shellfish. Meanwhile, the inland capture fisheries sector contributes close to 2 million tonnes of fish every year.[2] After peaking at 3.9 million tonnes in 2012, marine capture production has shown signs of stagnation; this is mainly due to the pelagic resource crisis brought about by climate change and unsustainable fishing practices (Kripa *et al.*, 2018; Rohit *et al.*, 2018; Dineshbabu *et al.*, 2020). This is evident from the sharp fall in the growth curve of marine fish landings over the last decade (2010–2019). Growth is now estimated at -0.13 percent, compared to 2.94 percent in the previous ten years (2000–2009).

Pelagic resources supplied the largest share of marine fish landings in 2019, at 48 percent; this was followed by demersal (34 percent), crustaceans (12 percent) and molluscs (6 percent) (CMFRI, 2020a). The main fish species/groups landed include ribbon fishes (7.7 percent), cephalopods (7.5 percent), penaeid prawns (5.5 percent), non-penaeid prawns (5.1 percent), lesser sardines (4.8 percent), Indian mackerel (4.5 percent), threadfin breams (4.3 percent) and oil sardines (4.1 percent). Interestingly, a species once deemed less important – red-toothed triggerfish (*Odonis niger)* – has emerged as a major resource. Whereas it once contributed less than 1 percent to total marine fish landings, over the last two to three years this has increased to 3–7 percent (CMFRI, 2020a). A high variability in landings has also been observed over the last decade in important resources such as oil sardine, Indian mackerel, threadfin breams and penaeid prawns.

2.2 Aquaculture

Aquaculture evolved into a viable commercial farming practice from the traditional backyard activity it was in India three to four decades ago. The sector gained momentum in the 1980s with the introduction of scientific carp farming, aided by breakthroughs in breeding and culture technologies (Ayyappan, 2006).

In terms of annual fish production, aquaculture had surpassed capture fisheries by the mid-1990s, while over the past decade it has been growing at an annual rate of 7–9 percent. Total aquaculture production in India was estimated at 7.7 million tonnes in 2018–19, which accounts for about 80 percent of total inland fish production (Government of India, 2019b). In value terms (ex-farm), aquaculture production increased from USD 5.49 billion in 2009 to USD 13.18 billion in 2018 (FAO, 2020b). Nowadays, aquaculture in the country makes use of a variety of production systems including intensive pond culture, coastal aquaculture, cold water fisheries, integrated fish culture with poultry and horticulture, brackish water cage culture, and pen culture.

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1 Six responses from insurance companies servicing capture fisheries and five participants from aquaculture were received. Additionally, information was collected through telephone conversations with representatives from civil society and fisherfolk organizations engaged in facilitating insurance services.

2 An official estimate of inland capture fisheries production is currently not available.

About 80 percent of farmed fish is made up of carps; these include major carps (rohu, catla, mrigal, etc.), minor carps and exotic carps (common carp, silver carp, grass carp, etc.). Catfish and other freshwater finfish constitute the rest of the production portfolio. On the other hand, crustaceans and molluscs such as prawns/shrimps, crabs, mussels and oysters, contribute only about 8 percent to total production. Total carp production has increased by almost 2 million tonnes over the last decade, through the intensification of culture practices. The ex-farm value of the production of major carps was estimated at USD 6.56 billion in 2018. In the 1990s and early 2000s shrimp production was mainly dominated by tiger shrimp (*Penaeus monodon*), Indian prawn (*P. indicus*), giant freshwater prawn (*Macrobrachium spp*) and scampi. However, severe incidences of diseases such as white spot syndrome (WSS) have led to a sharp fall in production. The sector was rebooted after 2009 with the introduction of vannamei shrimp (*Liptopenaeus vannamei*), an exotic species (Salunke *et al.*, 2020). This species currently accounts for over 90 percent of total shrimp production in Indian aquaculture, which was estimated at 0.69 million tonnes and valued at USD 5.35 billion in 2018 (Government of India, 2018).

The aquaculture sector is supported by a thriving seed production industry that produced about 52 262 million fry in 2017–18. The seed requirement for the *vannamei*-dominated shrimp culture industry is mainly met through certified hatcheries that import the Specific Pathogen Free (SPF) brood stock, mostly from East Asian Countries (CAA, 2020).

3. THE INSURANCE MARKET

The insurance industry in India consisted of 58 companies in 2019, 24 of which were engaged in life insurance business, and 34 of which deal with general insurance (non-life insurance). Over the last decade (2009–2019), 2 new life insurance companies and 12 new general insurance companies have joined the sector. Both public-owned and private companies are currently active in the insurance business, with an overall insurance penetration of 3.7 percent (premiums as a percentage of GDP in 2017) and an overall business of approximately USD 280 billion in 2020 (IBEF, 2020). The sector is growing at a rate of 15–20 percent annually. Together with banking services, insurance services contribute about 7 percent to the country's GDP. In 2018–19 the value of life insurance companies' gross direct premiums was estimated at USD 70 573 million, while that of general insurance companies was USD 23 956 million. Non-life insurance, which includes marine and aquaculture insurance, constitutes about 25 percent of total premiums generated from the entire insurance business. Out of the gross direct premiums generated from all segments of general insurance, the marine segment made up only 2 percent, with the bulk of business concentrated in other segments such as motor, health and fire, among others (IRDAI, 2020a).

Since its inception in 2000, the Insurance Regulatory and Development Authority of India (IRDAI) continues to be the only statutory body invested with a regulatory role over insurance business in the country. Among life insurers, the Life Insurance Corporation (LIC) is currently the sole public-sector company active. On the other hand, there are five public non-life insurance companies engaged in general insurance business; these include: National Insurance Company Limited (NIC), New India Assurance Company Limited (NIAC), Oriental Insurance Company Limited (OIC), United India Insurance Company Limited (UIIC) and Agricultural Insurance Company Ltd (AIC). The latter administers most of the government-sponsored public insurance schemes in the crop sector. Other stakeholders in the insurance market include individual and corporate agents, brokers, surveyors and third-party administrators mainly servicing health insurance claims. Of the total gross premium income generated by non-life insurance business, public insurance companies account

for about 45 percent of the market share. The general insurance market is highly concentrated, with only a few companies, public and private. In 2018–19, 78 percent of premium income was generated by 11 major companies (IRDAI, 2020b).

The General Insurance Corporation of India (GIC), which was the sole public-sector entity dealing with non-life insurance business before 2000, was converted into a national reinsurer and renamed as GIC Re. Apart from GIC Re, there are ten foreign reinsurance companies that operate in India. They include: Munich Re, Swiss Re, SCOR SE, Hannover Re, RGA Life Re, XL SE, Lloyd's Re, General Re, Axa France Vie and Allianz Re. In 2018–19 the net written premium for all reinsurance companies combined was estimated at USD 6 397 million, of which 85 percent pertained to GIC Re alone (IRDAI, 2020b). However, reinsurance operations in agricultural and allied portfolios are rather limited. Over the past decade, the Government of India has made several attempts to enhance the penetration of various types of insurance products in the country. Some of the recent schemes include "Pradhan Mantri Jeevan Jyoti Bima Yojana" (PMJJBY) for life insurance; "Pradhan Mantri Suraksha Bima Yojana" (PMSBY) for general insurance; "Pradhan Mantri Vaya Vandana Yojana" (PMVVY) and "Varishtha Pension Bima Yojana" (VPBY), both of which provide special cover for senior citizens; "Pradhan Mantri Fasal Bima Yojana" (PMFBY) for crop insurance; and finally the "Restructured Weather Based Crop Insurance Scheme" (RWBCIS). In the 2019–20 national budget, 100 percent foreign direct investment (FDI) for insurance intermediaries was allowed, thereby easing the access of global corporations into the Indian insurance business.

4. SUPPLY AND DEMAND

4.1 Capture fisheries

Over the past three decades, the Indian government has undertaken several initiatives to cover the variety of risks associated with marine and inland fishing. These centrally sponsored insurance schemes operate primarily with the participation of public insurance companies.

The most widely offered insurance product in the capture fisheries sector is accident insurance, which covers the life or risk of disability for active fishers while involved in fishing operations. Until recently, accident risks (life and disability) were covered under the "Group Accidental Insurance Scheme for Active Fishermen", which was launched in 1991–92. The premium under this scheme was heavily subsidized to encourage high uptake. Since 2015, the scheme has been part of the PMSBY umbrella scheme and covers a host of occupational sectors, including all types of general insurance for citizens in the 18–70 age group. The National Federation of Fishermen Co-operatives Ltd. (FISHCOPFED, established in 1980), an apex organization of fisherfolk cooperatives in India, has been spearheading the government's efforts to enhance the reach and penetration of life and disability insurance schemes. FISHCOPFED mostly operates through its subsidiary federations at the state and district levels and provides subsidy support to eligible beneficiaries. With regard to vessel insurance, this is provided by all four public sector insurance companies in India. Many of the policies issued are credit-linked, as banks often insist for insurance cover for the vessels they finance.

Alongside these central government schemes there have also been attempts to cover the specific risks of fisherfolk at the local level, with the intermediation of state governments, non-governmental organizations (NGOs) and fisherfolk organizations/societies. Some of the notable NGOs/fisherfolk cooperatives that have been facilitating insurance administration for fishers include the Kerala State Co-operative Federation for Fisheries Development Limited (Matsyafed), and the South Indian Federation of Fishermen Societies (SIFFS). Matsyafed has been offering specific insurance schemes (accident insurance as well as marine hull insurance) for more than a decade in partnership with public and private insurance companies. Elsewhere, SIFFS used to

play an active role in providing diverse life and non-life (including vessel, equipment and gear) insurance services to its members (Van Anrooy *et al*., 2009). However, its activities are currently limited to facilitating government insurance schemes through its district federations. Similarly, the Trivandrum District Fishermen Federation (TDFF), which used to offer a wide-ranging set of insurance products to fishers, no longer retains its active presence in this realm.

Microinsurance schemes targeting vulnerable beneficiaries have been attempted in India, drawing on grassroots-level support from NGOs and fisherfolk self-help groups (SHGs). Only a few of such initiatives are in operation, however. The need to insure coastal assets – particularly immovable properties such as fishermen's houses and storage structures – became all the more necessary after the tsunami of 2004, which caused such large-scale destruction and death. Bajaj Allianz, in collaboration with CARE India, launched a microinsurance scheme in 2007 to cover over 75 000 fishermen in Tamil Nadu. The scheme proved to be a boon for the people affected by cyclone Nisha, which struck the Tamil Nadu coast in November 2008. Over 16 000 claims were submitted within a few months of the incident. However, due to the losses incurred by the insurance company, this scheme did not continue beyond 2010 (Allianz, 2010), and no such schemes are known to be operating in coastal areas at the time of writing. Since 2017, a comprehensive insurance scheme has been operating in six coastal districts stretching from Thiruvallur to Kanyakumari, under the aegis of the International Fund for Agricultural Development (IFAD) – the Post-Tsunami Sustainable Livelihood Progamme (PTSLP). The scheme covers thousands of fisherfolk in the target areas and is run by a community organization, PTSLP Fishing Asset Risk Mutual Society (PFARMS), which was incorporated for this specific purpose. The organization operates insurance schemes in partnership with district-level fishermen federations (DLFSF) that are connected to the SIFFS and insurance companies (at present, UIIC). The scheme covers various risks such as life, health, personal accident and fishing assets (fishing vessels and equipment) (IFAD, 2020).

Private-sector involvement in fisheries insurance has been patchy, barring a few attempts by companies such as Bajaj Allianz and Reliance General Insurance Company Ltd in the past, with limited success. The private sector's general reluctance to enter the market can be attributed both to these previous, unsuccessful attempts, and concerns relating to profitability.

Apart from other inherent risks associated with capture fishing, mariculture and aquaculture, the demand for insurance in fisheries in India mainly stems from the recurrence of extreme climatic events along the Indian coast. The four states on the eastern coast of India (Andhra Pradesh, Odisha, Tamil Nadu and West Bengal) are particularly vulnerable, with over 308 cyclones (103 of which were severe) having hit the coast between 1891 and 2000. In recent years, 29 more have followed in quick succession, the latest being Amphan, a super-cyclonic storm that hit the coasts of West Bengal and Odisha in May 2020 (NCRMP, 2020). Other factors have also influenced the demand for insurance in the capture fisheries sector, such as: the number of active fishers, the number and type of fishing vessels, the level of risk insurers are willing to take on, and the increasing emphasis on fisheries infrastructure development by the Government of India.

Fisherfolk population

As per official statistics available from the Government of India for the year 2017, 5.4 million people are engaged in full-time fishing activities – this includes marine and inland fisheries as well as aquaculture of various types. That aside, 3.2 million people are involved on a part-time basis and 2.5 million on occasional basis. About 4.9 million people are then engaged in various activities along the fish value chain (e.g. marketing

of fish, input delivery, etc.) (Government of India, 2018). A profile of the marine fisherfolk population is provided in Appendix 1, based on the 2016 Marine Fisheries Census.

Size of the fishing fleet

As per the 2016 Marine Fisheries Census, the fishing fleet in India consists of about 164 302 vessels, which comprises 42 656 mechanized/semi-industrial vessels, 95 957 motorized vessels, and 25 689 non-motorized vessels (Appendix 2). The mechanized sub-sector is the main contributor to total fish landings (83 percent), whereas the motorized sub-sector engages the largest number of active fishers (62 percent) and contributes to 16 percent of landings. Compared to the 2010 census, the mechanized and non-motorized fishing fleet have shrunk by about 45 percent and 50 percent respectively, while the motorized fleet has grown by about 35 percent. Several reasons have been put forward for the shift away from mechanized fishing, such as concerns regarding economic viability and target resource decline. The general trend towards technological advancement in the sector has resulted in an increase in motorization and a reduction in non-motorized fishing vessels.

Fishing-related infrastructure

There are 7 major fishing harbours, 52 commissioned minor fishing harbours, and 181 commissioned fish landing centres across the coastal belt of India; this is where most fish are landed. There are also over 1 000 beach landing centres, where limited modern berthing and fish-handling facilities cater to the needs of artisanal fishermen (Government of India, 2019c). The Government of India has recently devoted considerable attention to infrastructural development in fisheries and aquaculture. Initiatives include the establishment of fishing harbours and landing centres, the technological upgrading of fishing fleets, and the development of market facilities and cold storage networks.

In 2018–19 the Indian Department of Fisheries created the Fisheries and Aquaculture Infrastructure Development Fund (FIDF), dedicated to catalyzing the development of fisheries and aquaculture (Lok Sabha Secretariat, 2019). Apart from this, various types of subsidies and technical assistance were extended, first under the 'Blue Revolution Scheme' (Neel Kranti Mission) and subsequently under the Pradhan Mantri Matsya Sampada Yojana (PMMSY) umbrella scheme, which superseded the former from May 2020.

A consolidated summary of the various types of insurance schemes in the capture fisheries sector is provided in Table 1.

4.2 Aquaculture

Much like capture fisheries, aquaculture insurance has a long, albeit mixed history in India. The principal risks in India's aquaculture sector had mainly been addressed through two public insurance schemes developed in the early 1990s: i) the brackish water shrimp insurance scheme; and ii) the inland fish insurance scheme. These schemes came in response to demand from entrepreneurs and were administered by the four public sector general insurance companies (van Anrooy *et al.*, 2006). The main focus was on covering the risks associated with shrimp farming, namely the incidence of disease and environmental pollution. The inland fish insurance scheme provided cover for the fry, fingerlings, grow-out fish and brood stock of a large range of freshwater species (including common carp, silver carp, Indian carps, tilapia and catfish). The above schemes operated successfully in the first few years after they were introduced, but were later discontinued as a result of the companies' hesitation to handle the excessive risks involved.

TABLE 1
Description of insurance schemes available in capture fisheries sector in India

Types of risks insurable	Present status	Specific schemes
Life/disability of fishermen/boat crew	Central government schemes available in all states but with different levels of penetration. Fairly well covered in the State of Kerala and the State of Tamil Nadu.	Accident insurance coverage available through the central scheme "Pradhan Mantri Suraksha Bhima Yojana" (PMSBY) (FISHCOPFED, 2020), the Fishermen Group Accident Insurance Scheme of Matsyafed and the KFWFB in Kerala (Matsyafed, 2020). Group accident insurance schemes are offered by state governments in Kerala and Tamil Nadu, while accident insurance is offered by the Post-Tsunami Sustainable Livelihood Progamme (PTSLP) in Tamil Nadu. Microinsurance schemes available through the DHAN Foundation in Andhra Pradesh (DHAN Foundation, 2020).
Partial damage and total loss of fishing vessels	Damage to vessel hull/engine and loss of vessels are both covered. Scant coverage for inland fisheries.	Direct vessel insurance schemes and credit-linked schemes are offered by the public general insurance companies; Vessel insurance is offered by Matsyafed in Kerala for member fishermen on vessels purchased under their subsidized loan scheme. Subsidized vessel insurance schemes are offered by the State of Tamil Nadu government, while vessel insurance is available under the 'Fishing Asset Insurance' scheme of PTSLP in Tamil Nadu (IFAD, 2020). Special risk coverage against the damage of vessels is offered by boatowners' associations based in certain harbours (e.g. Neendakara harbour in the Kollam district of Kerala, Paradeep harbour in Odisha; Mangrol harbour in the Junagadh district of Gujarat) (Parappurathu *et al.*, 2017).
Loss of/and damage to equipment/ fishing gears	Very few independent schemes on offer.	Specific insurance policies offered by public insurance companies on demand. Certain vessel policies also cover gears, but with extra premiums, and they are not available for the inland sector.
Damage to fishers' coastal assets	In the recent past a few schemes have been offered by private companies, in partnership with NGOs.	A joint programme operated by Bajaj Allianz and CARE India was active in the coastal districts of Tamil Nadu in the 2007–2010 period. No other schemes are currently known to cover disaster risks for the immoveable coastal assets of fisherfolk.

Private companies are still adopting a cautious approach with regard to entering the aquaculture insurance market, as they have for some time. Some private insurance companies such as Universal Sompo General Insurance Company Ltd. provide insurance cover for freshwater and brackish water fish and prawn production systems, but on demand, and subject to specific underwriting requirements. Apart from these, no other notable attempts by the private sector to cover the risks in fisheries and aquaculture have recently been reported. Access to such schemes is extremely difficult due to the exorbitant premiums, which range from 5 to 7 percent of the sum insured and the stringent management requirements. These factors lead to a very limited number of subscriptions. Lesser enrollment results, *inter alia*, in a smaller risk pool, which only further increases premium rates.

Over the past two decades, the Indian government has stepped up its engagement in the aquaculture sector by extending the necessary infrastructural facilities, technical backstopping, and institutional and regulatory support. Various central government schemes have occasionally offered specialized components. Among other things, the schemes aimed to facilitate: the setting up of brood banks and hatcheries, the establishment of cage farms, the modernization of fish seed farms, fish feed mills/plants, the establishment of diagnostic laboratories for disease, and aquatic quarantine facilities (Lok Sabha Secretariat, 2019). The technical, financial and extension requirements of small-scale fish farmers were addressed through a network of 429 branches of the Fish Farmers Development Agency (FFDA) and 39 branches of the Brackishwater Development Agency (BFDA). These branches cover all potential districts in all of the country's coastal states and Union Territories (UT). Since its inception in 2006, the National Fisheries Development Board (NFDB) has played a key role in coordinating development activities in the fisheries sector. The Coastal Aquaculture

Authority (CAA), established in 2005, oversees the regulatory and promotional activities in coastal areas. Most recently, the Indian government created a new Ministry for Fisheries, Animal Husbandry and Dairying in May 2019, splitting the Ministry of Agriculture and Farmers' Welfare to give more focused attention to the sector's needs. With enhanced infrastructure, funding and technical support, aquaculture in India is gradually transforming into a highly intensive commercial enterprise with larger operations, a greater diversity of species and brighter business prospects. This has amplified the investment stakes, intensifying the associated risks and uncertainties, which in turn necessitates better insurance coverage.

Mariculture is an emerging sector in the country. Encouraged by the positive responses of entrepreneurs, several state governments are currently contemplating large-scale investments in this area (Gopalakrishnan *et al.*, 2017). Nevertheless, as in other aquaculture ventures, mariculture units are highly capital-intensive and susceptible to the risks posed by natural calamities such as cyclones and tsunamis, and other perils such as disease and HAB infestation. In 2017, the State of Kerala introduced an insurance scheme for mariculture farmers (green mussels) in the Padanna estuary region. The scheme was discontinued due to excessive claims. Besides this initiative, the insurance industry has limited underwriting experience for mariculture. However, given the potential for entry of new entrepreneurs into this lucrative activity, comprehensive insurance coverage for mariculture facilities must be introduced.

A consolidated summary of the various types of insurance schemes in the aquaculture sector is provided in Table 2.

5. UNDERWRITING

Insurance companies in India generally carry out underwriting formalities directly, with their own staff. However, in specific cases they may also involve insurance brokers and other financial intermediaries or institutions. Each company sets a gross underwriting limit for any specific risk covered, for each region where the services are

TABLE 2
Description of insurance schemes available in the mariculture/aquaculture sector in India

Sector/Enterprise	Types of risks insurable	Present status	Specific schemes
Mariculture/ cage culture in inland waters/sea farming	Loss/damage of marine/ inland cages. Loss of marine/inland fish crop in cages/ seaweed culture. Loss of farmed bivalve stock.	The insurance industry has limited underwriting experience in mariculture as it is an emerging sector in the country. Only selective coverage available.	No central schemes currently available. Public and private insurance companies are yet to develop specialized insurance products for mariculture.
Freshwater aquaculture	Loss of finfish crop. Damage to farm structures.	Several public as well as private insurance schemes available. Generally priced high due to high risk. Not readily available.	No central schemes currently in operation. Schemes offered by public insurance companies and certain private insurance companies are available on demand. No central schemes currently in operation.
Brackish water aquaculture	Loss of brackish water fish/shellfish crop. Damage to farm structures.	Several schemes on offer for shrimps and finfishes grown in alternative culture systems. Not readily available.	No central schemes currently in operation. Schemes offered by public insurance companies and certain private insurance companies are available on demand.
Fish/shellfish hatcheries/brood banks	Loss of fish fries/ fingerlings/brood stock. Damage to hatchery/ brood bank equipment/ machinery.	Only selective coverage available. Only selective coverage available.	No central schemes currently in operation. Public and private insurance companies extend coverage based on specific requests considering economic viability and other underwriting requirements.

offered. However, such limits vary widely across companies, depending on the capacity of reinsurers, and the target production systems covered. The formal involvement of fishery institutions, cooperatives and NGOs, is ensured when the insurance products require larger community involvement and to respond to the specific needs of a particular production system.

5.1 Capture fisheries

Accident insurance covering the life/disability risks of active fishermen is the most widely offered insurance product in the capture fisheries sector in India. The "Group Accidental Insurance Scheme for Active Fishermen" covers up to INR 200 000 for accidental death and full disability, and INR 100 000 for partial disability.[3] A nominal subsidized premium of INR 12 per annum is deducted from the beneficiary's bank account through the auto-debit facility, in a single instalment. The Matsyafed runs a similar scheme through which compensation of INR 1 million (approximately USD 13 500) can be paid to the dependents of fishermen who die in accidents. This same scheme also covers partial disability and hospital expenses for injured fishermen, with payments varying from case to case. To make the scheme affordable for fishermen, only a nominal annual premium of INR 448 per person is charged. In this case the insurance coverage is provided by the companies, but the procedural formalities such as underwriting, risk assessment and claim settlement are facilitated by Matsyafed employees. Similarly, the Kerala Fishermen's Welfare Fund Board (KFWFB) administers a group accident insurance scheme for active fishermen aged between 18 and 70 who are enrolled in one of their welfare schemes. An accident death/permanent total disability coverage of INR 1 million is provided for an annual premium of INR 446 per person, which is fully subsidized by the state government (GoK, 2020). As the policy term is limited to one year in both schemes, Matsyafed and KFWFB adopt a competitive bidding process every year to determine the insurance company partners.

The asset insurance programme run by PFARMS, as part of the Post-Tsunami Sustainable Livelihood Progamme (PTSLP), is an innovative hybrid model based on a mutual risk-sharing mechanism, which compensates small-scale fishermen for the loss of fishing equipment. The PFARMS collects a premium of 1 percent of the value of the fishing asset(s) insured every year, adjusted by 20 percent annually for depreciation. The individual claims of fishermen (less than ten at a time) are settled by PFARMS, while in the event of massive losses resulting from disasters, the insurance company takes over claim settlement responsibilities. Recently, the claims of about 330 fishing vessels lost in the Gaja cyclone were settled by the UIIC under the scheme (FAO, 2019).

No information could be obtained on the net and gross capacity (with reinsurance) of any single risk for capture fisheries insurance in value terms (i.e. at any single location or with respect to an aggregation of locations). The insurers contacted were not prepared to divulge this information as they considered it commercially sensitive.

5.2 Aquaculture

The underwriting criteria of the few private companies who offer aquaculture insurance (on demand) include:

- farmers' ability and willingness to maintain stringent pond-management conditions, including regular liming, manuring, feeding, de-weeding, de-silting, etc.;
- ensuring proper water movement through inlets/outlets/sluices;
- maintaining proper water quality;

[3] As per the OECD (2021) the average INR–USD exchange rate in 2020 was IND 74.105 = USD 1.

- maintaining strict sanitation in and around the water body;
- ensuring safe stocking;
- taking measures to avoid the introduction of infected seeds;
- preventing diseases/infestations from neighbouring fields;
- taking immediate steps to eradicate any diseases and other infestations if noticed;
- ensuring the timely provision of extension services to the farm for risk management; and
- maintaining proper records of all management activities undertaken.

Aside from the above, it is mandatory for farmers to arrange for the relevant farm registration from the Coastal Aquaculture Authority (CAA)/State Fisheries Department/Marine Products Export Development Authority (MPEDA)/National Centre for Sustainable Aquaculture (NACSA).

6. PERILS COVERED

6.1 Capture fisheries

The majority of capture fisheries insurance policies and schemes currently available in India cover only "named perils". However, certain companies offer "all-risks" cover. Based on survey responses, the perils generally covered in the capture fisheries sector include:

- natural disasters such as cyclones, storms, lightning, tsunamis, earthquakes, floods, etc.;
- accidents due to technical/mechanical failure;
- accidents due to human error such as stranding, sinking, collision;
- accidents caused by a third party;
- damage caused by marine debris;
- theft and damage by vandalism; and
- fire and explosion.

Only a few policies cover risks such as war, hostile actions, piracy, acts of terror, capture, seizure, detention, etc. The insurers generally follow the Institute Fishing Vessel Clauses as a base,[4] but with suitable adaptation/customization.

6.2 Aquaculture

In aquaculture, none of the companies that responded to the 2020 survey offered "all-risks" cover. The commonly covered named perils include: (i) natural disasters; (ii) extreme weather events such as high/low temperature, frost; (iii) environmental pollution; (iv) summer kill/incidence of specified diseases; (v) harmful algal blooms; and (vi) theft or other similar disturbances.

Common exceptions included: the malicious/willful destruction of fish stock (crop) due to negligence, error, omission or improper management; the partial loss of any kind; losses due to natural mortality/under-growth/overcrowding; any lack of compliance with statutory government orders; and destruction caused by nuclear accidents/weapons.

7. POLICIES IN FORCE

7.1 Capture fisheries

Insurance products in the capture fisheries sector cover the following risks: (i) life/disability of fishermen/vessel crew; (ii) partial damage and total loss of fishing vessels; and (iii) loss/damage of equipment/fishing gears.

[4] A description of these clauses is available in Hudson *et al.* (2012).

Accident (life and disability) insurance

The life and disability insurance cover for fishers, provided under the central government scheme facilitated by FISHCOPFED, had over 3 million beneficiaries in 2019 (Appendix 3). The highest number of beneficiaries came from the State of Odisha, followed by the State of Tamil Nadu.

The Fishermen Group Accident Insurance Scheme operated by Matsyafed in Kerala covered the risks of 96 704 fishers in 2019–20. The premium collected was INR 43.3 million (approximately USD 584 000) at the rate of INR 448 per subscriber. Out of the total 48 claims sent to Matsyafed in 2019, only 19 were settled in the same year, with a total disbursement of INR 1.5 million.

Vessels (hull) insurance

Survey responses indicated that the number of independent vessel insurance policies in force in India is quite low. Taken together, the four public insurance companies currently hold less than 1 000 active policies. Including those insured through non-governmental organizations, it is estimated that the total number of vessels insured in India is in the range of 5 000–7 000; this is about 3-4 percent of all crafts in the fishery. As there is no official information on the number of vessels (hull) insured, this estimate should be seen as a close approximation of the total number of policies active in the country.

The most commonly insured vessel types include trawlers, purse seiners, gillnetters and longliners. Most of these small-scale, fisher-operated craft in India are made of wood or fibre-reinforced plastic (FRP) and have relatively low longevity. An age limit is therefore generally prescribed for vessels to be eligible for insurance coverage. This varies between a maximum of 10 and 25 years depending on the company. A recent study by Parappurathu *et al.* (2017) also highlighted the low adoption of vessel and gear insurance products in India. The study attributed the observed pattern to a variety of factors including high insurance premiums, a poor record of claim settlement, hassles with policies and claims, and low financial literacy and risk perception among fishermen, among others. As subscription is low, insurance companies are hesitant to develop other products that are affordable. Companies are also concerned about past experiences of malpractice, such as the intentional dumping of old and less energy-efficient fishing vessels to secure claims.

Equipment and gears insured

Certain vessel insurance policies disbursed by public insurance companies are available with additional coverage of fishing gears and on-board communication, as well as navigation equipment for an extra premium. No independent, standalone schemes exclusively covering damage to fishing gears and equipment are currently on offer. The insurance companies generally insist on the total loss of vessels, gears and equipment, in order to admit claims.[5]

Under the PTSLP fishing asset insurance scheme that covers small fishing vessels, gears and other fishing equipment, a total of 7 538 policies were disbursed in the year 2018–19 with a gross premium collected worth INR 5.3 million.[6] Of the 194 claims settled in the same year, 7 were admitted by PFARMS against a disbursement worth INR 0.34 million; the remaining 187 claims (worth INR 2.7 million) were met by the United India Insurance Company (UIIC).

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[5] Total loss refers here to "a damaged state wherein cost of repairing the asset to its pre-damaged condition exceeds its present value before accident, adjusted for depreciation".

[6] A detailed breakdown of policies into different categories of assets insured (vessel, gear, equipment, etc.) was not available.

7.2 Aquaculture/mariculture

Risks in the aquaculture sector mainly include: (i) loss of farmed fish stock due to disease incidence and extreme weather; (ii) loss/damage to farm structure/cages; and (iii) damage to hatcheries and nurseries, equipment and machinery, primarily due to natural disasters leading to shortage of seed supply.

Species insured

A variety of finfish species commonly raised in inland production systems are covered, including Rohu, Catla and Mrigal, Pangasius and Tilapia. Insurance products covering the risks of brackish water culture shrimps and prawns – such as *Vannamei* spp. shrimp, Indian prawn, tiger shrimp, scampi, etc. – are also available on the market. However, the supply of insurance policies for other shellfish species (crab, oyster, etc.) is relatively low.

Growing systems insured

Based on demand, companies currently underwrite insurance policies for a variety of growing systems, including ponds, green water tanks, hatcheries and on-growing units, aquarium systems, and recreational fisheries systems.

In 2017, an attempt by the Government of Kerala's department of fisheries made green mussel farming in backwater systems eligible for insurance cover for the first time in the country. Other systems such as marine and brackish water cages, longline culture systems, and recirculation aquaculture systems (RAS) are not eligible for cover at the time of writing. There are no clear estimates available on the number of aquaculture policies currently in force in India.

8. RISK MANAGEMENT

Underwriting of insurance policies in India is subject to a set of guidelines issued by the IRDAI, which is revised from time to time. Apart from this, insurance companies follow their own guidelines, terms and conditions. They assess the risks and hazards involved in every production operation based on extensive data collected, before developing a suitable insurance product.

The risk assessment process is carried out in both capture fisheries and aquaculture, using pre-acceptance surveys conducted by designated/independent risk management surveyors and evaluators. The surveyor then issues a pre-acceptance certificate upon completion of the evaluation. In the case of schemes facilitated and managed by community organizations or NGOs, separate risk assessment protocols and procedures are followed with the help of their own staff/risk assessment surveyors. For instance, the district federations of SIFFS in Tamil Nadu assist the PTSLP in assessing the risks before issuing policies to the target beneficiaries. The long-term experience of community organizations, together with their close ties to local fishing communities, help ensure better assessments of the risks involved, thereby improving a programme's chances of success. In capture fisheries, insurance companies generally insist on specific technical criteria/pre-conditions such as: a maximum age limit, the vessel's type and specification, the status of its registration, and the vessel owner's ability to undertake optimum management practices to minimize risks.

9. HANDLING OF CLAIMS

Generally, standard guidelines and procedures for availing claims are stipulated when policies are issued. Damages and losses need to be reported immediately after

an incident in a prescribed format, and with supporting documents.[7] The insurance companies undertake loss adjustment either using their own staff or independent loss adjusters.

In cases where insurance products are administered with the intermediation of community organizations such as Matsyafed and SIFFS, these organizations facilitate the loss adjustment process. The policies often come with a "deductible percentage" ranging from 10 to 20 percent of the amount of the assessed claim, a cost which the insured party must bear. Additional deductions are also applicable in the case of non-compliance with policy terms. The cost of loss adjustment is generally borne by the companies, but a service charge (1–2 percent) is deducted on certain policies. For almost all insurance products currently available in capture fisheries and aquaculture in India, claims are only admitted in the event of the total loss of the insured property.[8] This often creates resentment among the insured, as even genuine claims with significant damages are not compensated. However, in the case of fishermen's accident insurance there are provisions to cover partial disabilities, either by meeting hospital expenses or by paying a previously agreed sum based on certificates issued by registered medical practitioners.

In aquaculture, stringent underwriting requirements relating to crop management involve subjective judgments on the part of insurance surveyors at the time of the claim settlement process. This leaves room for dissatisfaction for the insured party. For example, Parappurathu *et al.* (2017) reported that fishers and fish farmers' lack of confidence in claim settlement procedures is a major reason for the low uptake of insurance in fisheries and aquaculture in India. However, the study adds that insurance companies are equally concerned about fraudulent claims, based on their past experiences, notably in the capture fisheries segment. A major reason for this is a lack of adequate technological solutions in place to assess the veracity of incidents that mostly happen at sea. Interventions are therefore needed to strengthen the institutional mechanisms for risk management and the handling of claims, in order to boost customer uptake of insurance products.

10. UNDERWRITING EXPERIENCES

10.1 Capture fisheries

The underwriting experiences of insurance companies in India have been mixed and enormously varied in recent years.

The experience of personal accident insurance schemes, operated with the intermediation of community organizations such as FISHCOPFED, SIFFS/PTSLP, Matsyafed and KFWFB, has been encouraging. High enrollment rates in these programmes have ensured that claim ratios are considerably lower than the premiums collected. However, not all vessel insurance schemes have yielded positive results for the insurance companies associated with them. For instance, the underwriting experiences of NIC and NIAC on the east coast have been difficult over the last few years because of several cyclones, which have wrought severe damage to fishermen's assets. A further dissuading factor in the past has been the moral hazard associated with vessel insurance, with several instances of fishers sinking their old vessels to fraudulently secure claims. Parappurathu *et al.* (2017) identified this as one of the several constraints associated with vessel insurance. However, respondents to the FAO survey made no specific reference to moral hazard as an immediate limiting factor.

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[7] Supporting documents vary from case to case and include the First Information Report (FIR) registered by the police in the case of an accident; a postmortem report/death certificate issued by a local health agency in the event of the death of a crew member; photographs and other proof of incident such as lab reports in the case of aquaculture losses due to disease, HAB, natural calamities, etc.

[8] The Matsyafed vessel insurance scheme is an exception, as there is provision to meet repair charges in the event of accidents.

By contrast, the PTSLP's "Fishing Asset Insurance" scheme in Tamil Nadu has been quite satisfactory in recent years, despite lower premium rates charged from the insured fishers. The mutual insurance mode under which PFARMS operates helps to evaluate a claim properly before settlement, thereby minimizing the moral hazards associated with such schemes. Moreover, a revolving fund – maintained with member contributions as well as a state government grant – acts as a cushion to absorb claims that are higher than normal (FAO, 2019).

10.2 Aquaculture

The underwriting experience in aquaculture insurance is closely related to the high risks faced by farming operations, including a high probability of disease incidence, harmful algal blooms (HAB) and other eventualities. In 1995–96, the white spot syndrome (WSS) outbreak severely affected shrimp farms, which had disastrous consequences for most of the industry's entrepreneurs (Government of India, 2002; Balakrishnan *et al.*, 2011). Freshwater farms also encountered several problems with the outbreak of diseases such as viral haemorrhagic septicaemia, spring viremia, argulosis, epizootic ulcerative syndrome (EUS) and viral nervous necrosis (VNN) (Sahoo and Goodwin, 2012). This resulted in an exponential increase in claims. Regrettably, the public-sector companies operating the two insurance schemes could not handle this increase effectively, and this forced them to discontinue the insurance programmes.

Since then, public insurance companies have become more reluctant to operate in the sector. Despite exercising caution when underwriting aquaculture insurance schemes in major culture hubs, public-sector companies were discouraged by adverse experiences involving a high incidence of disease and a low implementation of risk management practices by fishermen. The feedback received from public company executives in the survey suggests that while there were a few pockets of success, the past ten years have seen poor underwriting experiences in most regions.

The poor outlook for the segment, coupled with low demand from entrepreneurs (due to high costs), has forced companies to withdraw their schemes altogether in several parts of the country where aquaculture operations are particularly risky. Lack of government support through centrally sponsored schemes or a premium subsidy programme has also had an adverse impact on the general appetite for underwriting aquaculture.

11. CONCLUSIONS

Despite the fact that fisheries and aquaculture in India have shown vibrant growth in the recent past, the risks associated with the sector and its diverse stakeholders have only been modestly addressed. Public-sector insurance companies continue to be at the forefront of providing insurance coverage to coastal fisherfolk and aquaculture entrepreneurs in the country, as they have for the past three to four decades. They have mainly been active in implementing central government schemes for life and disability cover for fisherfolk, as well as providing vessel and aquaculture insurance on demand. However, these companies are yet to develop viable insurance packages to cover fishing gears/equipment and fisheries infrastructure. Private insurers, while active in agriculture and its associated portfolio, have still not been able to build a stable presence in the sector, despite having made a few attempts in the past decade. Conversely, several non-governmental organizations such as SIFFS and PTSLP, as well as fisher/producer cooperative societies such as FISHCOPFED and Matsyafed, have proved their enduring presence by facilitating insurance administration in association with the service-providing companies. These organizations have played a wide-ranging facilitation role, starting with the provision of risk assessment and underwriting assistance, to effective claim handling and the distribution of a beneficiary's compensation.

In the capture fisheries sector, fishermen's accident insurance schemes have performed quite well, with high subscription rates and forward-looking underwriting experiences. Lately, group accident insurance schemes have shown that they have wider customer acceptance than personalized individual accident insurance schemes; this is largely due to the greater flexibility they offer. In this environment, both the government and independent schemes offered by fishermen societies have performed well, with more effective coverage, relatively speaking, in southern coastal states such as Kerala and Tamil Nadu. On the other hand, fishing asset insurance and coastal immovable asset insurance, which are intended to protect fishers from extreme weather events and freak accidents at sea, have remained more or less a non-starter. Estimates suggest that only 3–4 percent of all craft in the fisheries sector hold vessel insurance. This figure includes the total active policies provided by public insurance companies as well as those insured through quasi-government/co-operative/non-governmental organizations.

The case of aquaculture insurance is similar. Insurance companies have still not proved successful in improving the level of underwriting in major culture hubs. Several factors including a low-risk financing culture among fishermen/entrepreneurs, a lack of awareness, unaffordable schemes, problems with the claim settlement process, and reservations regarding the timely receipt of compensation, have all kept fishers away from such risk management solutions. The insurance companies have approached the sector with caution due to concerns relating to moral hazard, high risk perception, poor customer acceptance and dwindling profitability. In a nutshell, aquaculture insurance in India is languishing in a vicious cycle of high risk and low affordability, such that only large players in the sector can access it; this leaves out the majority of small aquaculture farmers. Considering this, appropriate technological and institutional interventions are required to bridge the trust deficit between the service providers and beneficiaries.

The insights developed through this review suggest that prospects for risk management solutions in fisheries and aquaculture would brighten only if customized, and affordable products were developed to suit the specific needs of the target group in each region. This mainly involves developing a clear understanding of the risk profile, levels of affordability, income stream patterns, borrowing and repayment behaviour. It also requires an understanding of attitudes towards risk management solutions, as well as the value systems and morality of the target population, which differ substantially across regions and cultural settings. In this context, the working experience of cooperative organizations and civil society organizations are crucial. Microinsurance has the potential to capitalize on the group dynamics of fishing communities and the 'social capital' developed by community organizations in dealing with systemic risk(s). Another promising alternative is "mutual insurance", which has replaced traditional insurance in fisheries and aquaculture sectors in several East Asian countries. Here, instead of transferring the risks to a third-party insurance company, the members of the community act as insurers themselves, pooling risks and generating funds through regular contributions that are in sync with the collective performance of the risk pool group (Xinhua *et al*., 2017; Skogh, 1999). However, the economic viability and practical feasibility of scaling up microinsurance and mutual insurance in India's fisheries sector is yet to be fully understood, and therefore waiting to be explored.

12. RECOMMENDATIONS

Proactive measures are necessary to turn the tide on fisheries and aquaculture insurance in India. Changes must involve the government, public and private insurance service providers, as well as due participation from civil society organizations and the fishing community at large. Based on the above discussion, some specific recommendations to achieve this objective are presented below:

i. There is a general lack of awareness regarding risk financing culture and insurance solutions among fishermen and aquaculture farmers. This gap may be bridged through appropriate extension efforts and popular campaigns. The insurance industry should collaborate with local-level extension services operated by states/NGOs/the private sector/farmers and fisher organizations such as FISHCOPFED, the network of Aqua Club Societies for shrimp farmers, the State Fisheries Seed Corporation (SFSC), Aqua Chaupal, etc. Furthermore, insurance companies should recruit personnel or outsource the services of local insurance agents to facilitate the marketing of insurance products at the grassroots level, along with additional advisory/extension services.
ii. The risks involved in fisheries and aquaculture are highly diverse and vary significantly across types of fishing fleet, fishing techniques followed, type of fish culture, source of inputs, culture practices adopted, and so on. More importantly, the sensibilities of target populations vary considerably across ethnic groups within a given community and across regions. A general, 'one-size-fits-all' approach does not augur well in terms of enhancing the adoption of fisheries insurance in India. The insurance industry therefore needs to take proactive steps to develop customized risk solutions that suit the specific requirements of fishers and aquaculture farmers in each region. For this, alliances could be forged with suitable community organizations and cooperatives that have more grassroots-level experience of working with the fisher communities.
iii. It may be desirable to gradually introduce legal coercion to enhance the adoption of fisheries insurance. As a first step, necessary legislative provisions may be incorporated into the Marine Fisheries Regulation Acts (MFRAs); this would ensure mandatory insurance coverage for mechanized vessels beyond a certain size or catch capacity.
iv. One of the primary reasons for the low adoption of fishing vessel and asset insurance in the coastal regions is the prohibitive cost of the policies currently on offer. Moreover, no options are available to pay premiums in installments, or in a way that matches fish landing patterns. Innovative solutions whereby the payment of insurance premiums is linked to catch revenues, or more broadly with seasonal incomes, could significantly alter the way fishermen approach insurance packages. A similar scheme operated by Matsyfed in Kerala, whereby the interest on loans is paid back on a daily basis through deductions made on fishing revenue (Parappurathu *et al*., 2019) could be emulated for this purpose.
v. Compensation for the partial loss of insured assets/crops is currently not covered in most insurance policies. Considering the high demand from fishers and aquaculture farmers for such a feature, partial losses could be admitted as an add-on feature with additional premiums. Even though the risk involved with such a feature would be high, it could be surpassed by virtue of the possible higher subscription of fishers interested in securing their vessels from small incidents, and a subsequent enlargement of the risk pool.
vi. Risks associated with mariculture enterprises are currently not covered. New insurance packages covering the risks of mariculture units/marine and inland cages, sea farming /bivalve units, brood bank/hatchery units, and seaweed farming units, need to be introduced on a priority basis to contain risks in emerging sectors. In this regard, the government could introduce specific policies and programmes to bring emerging as well as hitherto underexplored enterprises under the risk management net.

vii. Parametric, index-based insurance schemes that apply payouts based on pre-set weather or climatic threshold levels could be introduced on a pilot basis to cover damages incurred by fisheries infrastructure, coastal and inland aquaculture units and mariculture units.

viii. Private insurance service providers could be encouraged to enhance their involvement in fisheries so that the overall competitiveness and efficiency of service delivery in the sector is boosted. As a preliminary step, the government may consider involving interested private insurance companies as partners in ongoing public insurance schemes. This in turn could improve their experience and pave the way for new alliances with community organizations active elsewhere in the sector.

ix. There is an imminent need to simplify the claim-handling procedures associated with fisheries/aquaculture insurance products. Technological advancements in the realms of satellite-based monitoring technology/ICT could be used to provide simple but foolproof mechanisms for verifying insurance claims. Further measures are also needed to minimize delays in the claim settlement process.

x. Emerging platforms such as microinsurance have proved successful in several coastal regions in the country. Given the strong network of microfinance institutions (MFIs) and self-help groups (SHGs) in the fishing communities in India, bundling disaster risk insurance packages with existing microcredit schemes – covering household assets or personal accidents, for example – could prove a viable option. Insurance could also be bundled with savings programmes for these groups, with financial assistance from the banking sector.

xi. Mutual insurance has proven potential, especially in cases where it is expensive and cumbersome to assess the risk profile of participants and manage it in a cost-effective manner. It is particularly relevant in the case of disaster risks pertaining to immovable coastal assets, where an individual member of a community would have little interest in adopting expensive, personalized insurance solutions. The government could encourage stakeholders involved in the sector (fishery cooperatives/NGOs/autonomous bodies) to launch pilot projects in this segment with the commensurate institutional, economic, policy and logistical support. The consequent risk pools could be assured with adequate reinsurance support from public/private insurance/reinsurance companies.

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APPENDIX 1

Profile of marine fisherfolk population by state, 2016

State/UT	Fishing villages (No.)	Fisher families (No.)	Number of marine fishers occupied				Total fisherfolk population (No.)
			Active fishers	Allied activities	Other than fishing	Total occupied	
West Bengal	171	81 067	92 341	32 620	291	125 252	368 816
Odisha	739	115 228	118 953	68 673	6 876	194 502	517 623
Andhra Pradesh	533	155 062	136 078	88 713	15 128	239 919	517 435
Tamil Nadu	575	201 855	218 694	77 308	17 692	313 694	795 708
Puduchery	39	14 347	12 493	6 820	1 197	20 510	50 270
Kerala	220	121 637	137 248	64 747	9 672	211 667	563 903
Karnataka	162	32 479	35 502	24 792	5 912	66 206	157 989
Goa	41	2 986	2 758	2 743	782	6 283	12 651
Maharashtra	526	87 717	76 928	94 852	12 042	183 822	364 899
Gujarat	280	67 610	77 943	54 899	6 821	139 663	354 992
Daman-Diu	12	3 163	3 867	632	131	4 630	15 836
Lakshadweep	10	4 163	6 488	2 553	1 848	10 889	27 934
Andaman & Nicobar	169	5 944	7 788	2 393	1 191	11 372	26 521
Total	**3 477**	**893 258**	**927 081**	**521 745**	**79 583**	**1 528 409**	**3 774 577**

Source: Marine Fisheries Census, 2016 (CMFRI-DoF, 2020b).

APPENDIX 2

Fishing crafts in coastal states of India by type

State/UT	Trawlers	Gill-netters	Dol netters	Liners	Ring seiners	Purse seiners	Others	Total mechanized	Motorized	Non-motorized	Total
West Bengal	2 004	1 764	191	31	0	0	24	4 014	6 564	476	11 054
Odisha	1 390	358	0	0	0	0	0	1 748	5 678	1 256	8 682
Andhra Pradesh	1 176	0	0	0	0	0	0	1 176	12 078	6 965	20 219
Tamil Nadu	5 022	441	0	16	219	0	7	5 705	31 279	6 115	43 099
Puduchery	223	0	0	0	78	0	0	301	1 362	656	2 319
Kerala	2 654	417	0	2	646	81	0	3 800	13 868	4 016	21 684
Karnataka	3 071	40	0	0	0	669	0	3 780	5 879	2 225	11 884
Goa	600	0	0	0	0	209	49	858	942	182	1 982
Maharashtra	3 408	584	1 637	0	0	230	8	5 872	6 788	2 865	15 525
Gujarat	9 875	2 556	1 552	0	0	0	0	13 983	11 123	756	25 862
Daman-Diu	1 063	342	14	0	0	0	0	1 419	396	177	1 992
Total	**30 486**	**6 502**	**3 394**	**49**	**943**	**1 189**	**88**	**42 656**	**95 957**	**25 689**	**164 302**

Source: Marine Fisheries Census, 2016 (CMFRI-DoF, 2020b).

APPENDIX 3

Coverage of fishers under the PMSBY scheme by state

State	Number of fishers insured in 2018–19
Bihar	58 277
Chhattisgarh	205 897
Goa	11 840
Himachal Pradesh	12 650
Jammu & Kashmir	15 961
Jharkhand	37 856
Karnataka	40 641
Madhya Pradesh	131 451
Maharashtra	46 900
Odisha	1 150 000
Punjab	3 416
Rajasthan	11 220
Tamil Nadu	481 386
Telangana	265 236
Uttrakhand	1 324
Uttar Pradesh	103 333
West Bengal	132 995
North-Eastern states	144 436
Union Territories	67 614
Total	**3 039 374**

Source: FISHCOPFED, 2020.

National report of the Russian Federation

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1. INTRODUCTION

Engaging in capture fisheries and aquaculture involves a variety of risks. In terms of frequency of occurrence, the principal categories are: production and technical risks such as equipment breakages (e.g. hull leakage, collisions at sea, engine failure); commercial risks such as a decrease in demand on certain fish products caused by market saturation or rising prices; and financial risks such as the fluctuation of wholesale prices or currency exchange rates (Simacheva, 2010). Other relevant risks in the sector include transport risks relating to old vessels or inexperienced crew; environmental and climatic risks such as natural disasters; and finally ecological risks such as major pollution events (Simacheva, 2010).

The aquaculture sector has its own distinct concerns. Aquaculture management or 'planning' risks have been identified as the main issue affecting these activities (Serbulov *et al*., 2012), but there are other relevant risks. These include technical and technological issues (stock mortality, low productivity and security, equipment malfunction, changes in product quality, and consumer health risks), external factors (such as environmental risks, non-performing suppliers and subcontractors, the market situation, customer behaviour, legal risks and social protests), in addition to risks of an organizational nature (also termed organizational complexity). Other areas such as a lack of space or access to water, a lack of qualified specialists, conflicting legal requirements and the sector's dependence on imports, have all been quoted as significant obstacles to the development of aquaculture in the Russian Federation. Cases of technical failure and disease outbreaks leading to the mass mortality of fish have also been reported (Karabut, 2019a; 2019b). In some cases, these factors can lead to bankruptcy for aquaculture enterprises.

Most economic sectors in the Russian Federation use risk management tools that aim to avoid or minimize risks. These include the diversification of business activities, hedging, insurance or self-insurance. Insurance is seen as one of the most important tools in risk management, mitigating the financial consequences of risk events by compensating the losses incurred. The Russian Federation has developed a number of legal, policy and strategic documents that have governed the development of its insurance sector. However, these documents do not specifically refer to fisheries or aquaculture insurance, nor do the current Aquaculture Development Strategy (valid until 2020) or the Fisheries Development Strategy (valid until 2030).

The adoption of Federal Law No. 109-FZ (April 2018) on state support for agricultural insurance and the state-supported insurance for aquaculture species as commodities was an important step, providing the legal basis for subsidizing aquaculture (stock) insurance premiums from the federal budget. In capture fisheries there is currently no sector-specific insurance legislation; this area is mainly regulated by Federal Laws No. 81-FZ of 30.04.1999 (Mercantile Marine Code) and No. 24-FZ of 07.03.2001 (Code of Inland Aquatic Transport).

This chapter provides an overview of the current situation in capture fisheries and aquaculture insurance in the Russian Federation. It is based on information drawn from responses to the FAO online survey, as well as other relevant information compiled from publicly available sources.[1] The information on capture fisheries is a revision of the corresponding chapter in the 2009 capture fisheries review (Ahmad, 2009). Information on the Russian Federation was not available in the 2006 aquaculture review (Van Anrooy *et al*., 2006); it is therefore compiled here for the first time.

2. STATUS OF CAPTURE FISHERIES AND AQUACULTURE PRODUCTION

2.1 Capture fisheries

The Russian Federation has access to an enormous fisheries resource base. The country's shores touch a total of 12 different seas, and its inland fisheries resources stretch over 27.8 million hectares of lakes and reservoirs, as well as 523 000 km of rivers. The country's marine fisheries fleet is active in Russian inland and territorial waters and the country's exclusive economic zone (EEZ), as well as in EEZs of other countries, the convention areas of regional fisheries management organizations (RFMOs) and the high seas.

In 2018, the Russian Federation was the fifth-largest producer of fish in the world (FAO, 2020a), with a total production of 5.1 million tonnes from marine and inland capture fisheries. This figure represents an increase of 73 percent when compared to 2004. Marine fisheries accounted for 95 percent of this catch, with the remaining 5 percent coming from inland waters.

The main species produced by marine capture fisheries include Alaska pollock (35 percent of total marine landings), pink salmon (10 percent), Pacific herring (8 percent) and Atlantic cod (7 percent) (FAO, 2020b). The share of salmon species has almost doubled since the 2009 capture fisheries review, reaching over 13 percent of total catch in 2018, while the share of blue whiting dropped from 11 percent to 3 percent (FAO, 2020b). Year on year, capture fisheries production increased by an average of 4 percent between 2004 and 2018 – a trend which is expected to continue. This growth has taken place despite a continuous decrease in the size of the fishing fleet, a process that the Russian government tried to reverse in 2017 by linking quota allocations to domestic shipbuilding contracts (the so-called "investment quotas"). However, this initiative has yielded only moderate progress up until now (Vedeneeva, 2019). The main drivers behind the greater output are the increased production in the Russian Federation's EEZ (from 1.8 million tonnes in 2004 to 3 million tonnes in 2014), and the growing demand for seafood in both the domestic and export markets. According to the Working Group of the Presidium of the State Council (2015), the value of fish exports increased from USD 1.5 billion in 2004 to USD 3.8 billion in 2014. The Fisheries Development Strategy, adopted in 2019, calls for an increase in capture fisheries production to 5.3 million tonnes by 2025, and 5.4 million tonnes by 2030. This will partly be achieved by increasing catches in the high seas (Ministry of Agriculture of the Russian Federation, 2019).

2.2 Aquaculture

From 2008 to 2018, the production volume of Russian aquaculture increased from 115 680 tonnes to 204 032 tonnes, with an increase of more than 9 percent in the last year of that period. The total value of aquaculture production was USD 792 million in 2018, the highest figure since the collapse of the Soviet Union. The production value has more than doubled in the last decade, and increased by 25 percent in one year alone (2017–2018).

[1] A total of five responses from Russian Federation insurance companies were received: two from insurance companies providing services to the capture fisheries sector, and three from insurance companies providing insurance services to the aquaculture sector.

Production is dominated by finfish. In terms of volume, the most important aquaculture species, in decreasing order, are common carp, silver carp, rainbow trout and Atlantic salmon. In terms of value, the four leading species are the same, albeit in a different order: rainbow trout is followed by common carp, Atlantic salmon and silver carp. While the positions of the top three species have remained unchanged over the last decade, Atlantic salmon production has been a success story. Its reported production volume increased by a factor of 400, from 51 tonnes in 2008 to 20 566 tonnes in 2018 (even if with major year-to-year fluctuations). This pushed grass carp from its previous position as fourth on the list to fifth.

Inland aquaculture currently provides 83 percent of total aquaculture production in terms of both volume and value. Nevertheless, marine aquaculture is growing at an impressive rate. The period between 2008 and 2018 saw an almost eightyfold increase in production volume, while production value increased by almost 120 times. By comparison, inland aquaculture saw increases of 47 percent and 81 percent respectively in the same values (FAO, 2020c). Geographically, aquaculture production is mostly concentrated in the southern (Rostov region, Krasnodar territory, Astrakhan region) and northwestern parts of the country (Karelia, Murmansk region). However, the fastest growth is observed in the Far East (Primorsky Krai) (Karabut, 2019b).

3. THE INSURANCE MARKET

The insurance sector has consolidated in the last decade, which has led to larger companies and an increasing market concentration, as Ahmad (2009) predicted in the 2009 capture fisheries review. Assisted by regulatory measures taken against pseudo-insurance schemes and non-compliant companies (Grigoryeva, 2010; Lvov, 2010; Insurance Today, 2020), the number of insurance companies fell from 2 950 in 1996, to 850 by 2009 and 242 by 2020. As of June 2020, there were 165 insurers, 63 insurance/reinsurance brokers and 10 mutual insurance organizations registered on the Russian market. A total of 46 companies offered reinsurance, of which 42 also provided direct insurance services (Insurance Today, 2020).

As of 2019, because of legal restrictions there were only 24 insurance companies with some share of foreign capital on the Russian market. Russian law only permits foreign insurance companies to establish subsidiaries, not branches in the Russian Federation. Although the ratio of these companies' combined authorized share capital relative to the total authorized share capital of all domestic insurers cannot exceed 50 percent (Finmarket, 2019), the actual ratio has decreased in recent years. Indeed, the ratio fell from 22.2 percent in 2010 to 10.8 percent in 2019 (Yudin, 2018; Finmarket, 2020a). While Russian companies actively cooperate with many major foreign reinsurance companies, the latter do not need a Russian licence to accept Russian companies' risks into reinsurance. As a result, these companies are not listed among those active on the Russian market. However, foreign investors' access to the Russian insurance market is likely to be eased from 2021. Thanks to a recent law amendment, and as a consequence of the Russian Federation's accession to the WTO (Finmarket, 2019), foreign insurers will soon be allowed to open branches in the Russian Federation.

Overall, the Russian insurance market reveals a generally growing trend, as evidenced by a 76 percent increase in premium incomes between 2004 and 2019, from USD 13.1 billion to USD 23.2 billion. Between 2015 and 2019, the proportion of life insurance premiums in the total market increased from 13 percent to 28 percent. Within the non-life insurance category, the proportion of voluntary property insurance decreased from 37 percent to 26 percent in the same period (National Rating Agency, 2020). This category includes vessel insurance (hull and machinery, H&M), shipowners' public liability insurance (protection and indemnity, P&I), and agricultural insurance.

In the field of agricultural insurance, the most important legislative development in the last decade was the adoption of Federal Law No. 260-FZ in 2011, which allowed the provision of state support to agricultural insurance premiums. In 2016, a set of compulsory common rules and standards was adopted for agricultural insurance. From 2018 to 2019, the sector's premium income increased by 55.4 percent, from USD 56.7 million to USD 88.1 million (Insurance Today, 2020). However, despite last year's growth, premium income in the agricultural insurance business reveals a generally downward trend, having decreased from USD 311.4 million in 2010 to USD 88.1 million in 2019. In the first quarter of 2020 there were 22 companies in the agricultural insurance sector, of which 11 offered subsidized insurance products (Insurance Today, 2020). The concentration of this segment is one of the highest, with the top ten companies covering 96.5 percent of the market (up from 61.8 percent in 2014). In 2018, the scope of Federal Law No. 260-FZ was extended to aquaculture stocks, while in 2019 a standard set of rules was adopted for subsidized aquaculture insurance, along with standard methodologies for the evaluation and loss assessment of aquaculture stocks. These changes have paved the way for the growth of this insurance class in the coming years (National Rating Agency, 2020). The state subsidy covers 50 percent of the premium.

The All-Russian Insurance Association (ARIA), of which many insurers in the Russian Federation are members, was established in 1994. As an organization it is actively engaged in promoting insurance to the public, as well as supporting the direct insurance and reinsurance companies active in the Russian Federation. It also closely cooperates with several partners, one of which is the National Association of Agriculture Insurers (NAAI), founded in 2007. The latter's objectives include the development of the agricultural insurance market, promoting insurance among farmers, assisting the efficient use of state support for agricultural insurance, and compensating agricultural producers if their insurers go bankrupt. Membership of the NAAI is voluntary, although since 2016 it has become mandatory for companies offering subsidized agricultural insurance.

4. SUPPLY AND DEMAND

4.1 Demand

The demand for both capture fisheries and aquaculture insurance in the Russian Federation is expected to be closely related to the structure and size of the fisher/fish farmer population, the size of fishing and aquaculture companies, and the size of the fishing fleet. In addition, the increasing demand for fish, both worldwide and domestically, will also affect demand.

In 2019, there were 7 400 businesses in the Russian fisheries and aquaculture sector (not including fish processing, distribution and other downstream industries). Overall sector employment in 2018 exceeded 60 000 people, including 48 900 people in capture fisheries (only fishers) and roughly 12 000 people in aquaculture. About 17 percent of the above numbers worked in small and microenterprises, while a further 55 percent were employed by the informal sector – i.e. private entrepreneurs, family farms and other entities without a legal status. The majority of capture fisheries businesses are private enterprises, and small operators dominate the sector. In 2012 for example, 60 percent of the 1 031 shipowners possessed only one fishing vessel, while only three companies owned 16 or more catching vessels. Domestic shipbuilding has also mostly been limited to small-scale vessels in the last decade (Working Group of the Presidium of the State Council, 2015).

The size of the Russian fishing fleet has not fluctuated in recent years. As of 2018, it consisted of about 2 300 vessels, with an average age of 28.5 years (Timofeev, 2019). The number of fishing vessels with an engine power of over 55 kW decreased by 30 percent between 2002 and 2014, of which 2 009 had been operating for longer than their safe

service life of 20 years. Although the number of fishing vessels has remained stable over the last few years, the poor condition of the fishing fleet is considered a serious obstacle to increasing fisheries output. The Fisheries Development Strategy adopted in 2019 envisages the modernization of the fishing fleet, notably by increasing the share of new, Russian-built vessels in the total fleet to 80 percent (Ministry of Agriculture of the Russian Federation, 2019). As a part of the effort to stimulate domestic shipbuilding, and increase and modernize the fishing fleet, a system of "investment quotas" was introduced in 2017. This system distributes a part of the fishing quota among stakeholders, who then order new vessels from Russian shipbuilding firms. As a result, fishing companies placed orders for 43 new fishing vessels with a combined cost of over RUB 160 billion (approximately USD 2.55 billion) in a period of only two years (Vedeneeva, 2019).[2] By way of comparison, only 30 fishing vessels were built in the Russian Federation between 2010 and 2016, for a total cost of RUB 2.29 billion (approximately USD 36.5 million). The latter may act as a key factor in a potential future increase in marine insurance premiums.

Another important driver for capture fisheries insurance is an increasing demand for fish worldwide. In the Russian Federation, following a period of growing fish consumption between 2010 and 2014, per capita consumption had fallen slightly by 2018, to 22.1 kg. This reduction was brought about by the worsening macroeconomic situation, as well as a 70 percent fall in fish imports (caused by economic sanctions against the Russian Federation). On the basis that marine fisheries output of the Russian capture fisheries fleet is not sufficient to meet the growing appetite for fish, the development of aquaculture production has been promoted in recent years. The Fisheries Development Strategy sets targets for a threefold increase in aquaculture production, from 204 032 tonnes in 2018 to 618 000 tonnes by 2030. To meet this ambitious objective, current production capacities will either need to increase significantly, or a greater focus on intensification will be required. The former also implies attracting more workforce to the sector, and the Fisheries Development Strategy calls for increasing the employment in fisheries and aquaculture to 160 000 persons by 2030. In either case, the sector will need significant investment. The strategy envisages a cumulative investment of RUB 613 billion (approximately USD 9.78 billion) into fisheries and aquaculture in the years 2017–2030 (Ministry of Agriculture of the Russian Federation, 2019).

4.2 Supply

The capture fisheries and aquaculture insurance market is characterized by a decreasing number of underwriters and growing market concentration. The number of companies providing the three major classes of insurance products most relevant to fisheries and aquaculture in 2010 and 2020 are shown in Figure 1.

The level of market concentration is evident in the fact that the top five companies cover over 80 percent of the market in each of these insurance classes. The top 20 companies are already responsible for more than 99 percent of provision (Insurance Today, 2020).

	Number of companies in 2010	Number of companies in 2020
Hull & machinery insurance (H&M)	98	41
Protection & indemnity insurance (P&I)	50	26
Agricultural insurance	67	22

Source: Insurance Today (2020).

[2] For the purposes of consistency, the average RUB–USD exchange rate for 2018 has been used throughout this chapter. As per the OECD (2021), this was USD 1 = RUB 62.7.

Fisheries insurance has a long history in the Russian Federation, going back to the early nineteenth century (Ivashchenko, 2018). It has many internationally established and traditional solutions which, while not specific to capture fisheries, provide sufficient protection for vessels, equipment and crew alike. Some of these insurance products (crew insurance, public liability for pollution) are also mandatory for different categories of vessels in the Russian Federation.

Conversely, aquaculture insurance is relatively new in the country. The most important risk factors for the industry include losses suffered as a result of weather-related diseases, heat waves that cause decreasing water levels and low oxygen concentrations in the south, and storms and ice in the north. These risks, in addition to the lack of methodologies for loss assessment and frequently changing legislation, have meant that underwriters are reluctant to insure aquaculture enterprises. In cases where insurance products have been offered, the underwriters' strategy of risk minimization has resulted in unattractive terms for aquaculturists. Some policies cover only cases of 100 percent stock mortality, and do not pay out anything if lower mortality rates occur. Unsure whether they would receive compensation in the event of a loss, farmers have not wanted to pay high premiums. In some cases, aquaculturists have been required to have insurance to access credit – yet the coverage of such policies was mostly limited to catastrophic loss, meaning that farmers saw insurance only as a bureaucratic obligation (Dementyev, 2018).

In 2018 the government issued Federal Law No. 109-FZ, expanding the scope of subsidized agricultural insurance to cover aquaculture stocks. However, the calculation methodology for insurance value and loss for aquaculture stocks was only finalized in 2019. In the same year, subsidized aquaculture insurance was available in just two regions of the Russian Federation, and only for salmon. This was extended to salmonids, sturgeons and catfishes in all regions in 2020 (Bizhdov, 2019; Finmarket, 2020b). Some limited information is already available on new insurance contracts under this scheme. For example, on 15 July 2020 the Russian Agricultural Bank (RSHB) Insurance announced that it had signed a subsidized aquaculture insurance contract with a company in the Republic of Karelia. The insurance amount was announced as RUB 70 million, although information on premiums was not accessible. There is a significant interest in subsidized aquaculture insurance among producers of other groups of aquatic animals (e.g. scallops and mussels), and this may lead to the future expansion of this kind of insurance. However, the lack of sufficient experience of these groups and the missing methodologies for risk assessment and loss estimation have been cited as obstacles on the insurers' side (Abasheva, 2020).

There is no specific government programme supporting the provision of insurance to small-scale fisheries. Underwriters generally provide insurance services regardless of the size of the vessel or the company. In agricultural insurance, RSHB Insurance is the market leader, even though it ranks only fifteenth in the non-life class of the insurance business. The premium income from agricultural insurance represented 0.4 percent of the total in 2019 (Insurance Today, 2020). Statistical data on companies offering aquaculture insurance are not readily available. In principle, companies that wish to provide state-subsidized agricultural insurance (including aquaculture insurance) must be members of NAAI and must apply the common set of rules developed by the organization. The NAAI membership currently includes 15 insurance companies, of which at least 9 companies (RSHB Insurance, Rosgosstrakh, Avangard-Garant, Soglasie, VSK, Energogarant, SOGAZ, MAKS, Absolut) offer insurance for aquatic animals.

5. UNDERWRITING

Traditional insurance arrangements dominate the capture fisheries and aquaculture insurance market in the Russian Federation. For example, none of the survey respondents reported offering index-based insurance, while the existence of mutual insurance arrangements was indicated only in the capture fisheries sector. There are currently legal restrictions on the establishment of mutual insurance associations by agricultural producers. Prevailing legislation also includes other restrictions (such as limitations on the number of possible members in a mutual insurance association), which strongly limit the field of operation of such organizations. As such, there are currently only ten registered mutual insurance associations on the Russian market, with a 0.01 percent overall share of total premiums. By contrast, no information has been found on similar associations active in marine insurance. P&I insurance schemes are generally offered by commercial insurance companies in the Russian Federation.

The activities of underwriters are primarily regulated by Federal Law 4015-I of 27.11.1992 on the Organization of Insurance Business in the Russian Federation, which does not specifically limit the foreign activities of underwriters licensed in Russia. In view of the international character of marine insurance, underwriters of capture fishery risks typically conduct their business through international cooperation. Of the two respondents to the fisheries insurance survey, one was also active in other European and Asian countries, as well as in Africa and the Pacific region, while the other reported operating only in the Russian Federation. The Russian underwriters are increasingly active internationally. The websites of some insurance companies (for example, Ingosstrakh) list several foreign fishing operators among their customers. Conversely, all respondents to the aquaculture insurance survey reported only underwriting aquaculture risks within the country. The capture fisheries and aquaculture insurance services provided by respondents were available both directly (through the insurance company's staff) and through insurance brokers.

According to responses to the survey, the insurance companies had wide-ranging underwriting capacities. In capture fisheries insurance, net underwriting capacities on single risks ranged from USD 5 million to USD 100 million, while gross capacities (i.e. with reinsurance) ranged from USD 100 million to USD 500 million. In aquaculture insurance only one respondent provided this information, reporting a range from USD 1 million (net capacity) to USD 7 million (gross capacity). For higher values, reinsurance is generally sought on the international or domestic market.

No structured information on capture fisheries reinsurance was found, but information on the individual companies' websites provides a good overview of the current situation. Reinsurance cover for marine business is typically provided by foreign-owned reinsurance companies. Ingosstrakh, the Russian market leader in marine insurance, reportedly has a maximum reinsurance capacity for its obligatory reinsurance treaties of USD 100 million for H&M insurance, and USD 1 billion for P&I insurance. The lead reinsurers are Antares Syndicate 1274, COF Syndicate 1036, XL Catlin Syndicate 2003 and Hiscox Syndicate 33 (Ingosstrakh, 2019, 2020). SOGAZ, the second-largest company in the sector, provides marine risk reinsurance as part of an obligatory reinsurance treaty; their maximum underwriting capacity is USD 100 million and the lead reinsurer is Munich Re.

In agricultural insurance, reinsurance is also mostly provided by international companies. In 2015 and 2016, 93 percent and 94 percent of the total reinsurance premium in these respective years ended up abroad. In 2017, this value dropped to 88 percent as a result of the establishment of the Russian National Reinsurance Company (RNRC) in 2016. The RNRC accepts risks for facultative reinsurance from direct insurers and insurance brokers both in the marine and non-marine field, and the latter includes aquaculture insurance. Since 2017, all insurers are obliged to offer RNRC at least a 10 percent share in all risks ceded for reinsurance. This has made

RNRC the market-leading Russian company in reinsurance of agricultural risks, receiving 36 percent of the total premium ceded to reinsurance in the Russian market (NAAI, 2018). No systematic information on aquaculture reinsurance was found, apart from some scattered data on underwriters' websites. For instance, RSHB Insurance has reinsurance agreements on its aquaculture risks with RNRC, Partner Reinsurance Europe SE and other reinsurers.

Of the existing insurance schemes, state-supported aquaculture insurance, first introduced in 2019, deserves particular attention. According to the law, subsidized insurance is possible for finfish, invertebrates and algae, but the specific conditions are set in the state-approved Agricultural Insurance Plan at the regional level. As of 2020, only certain groups of finfish (salmonids, sturgeons and catfishes) could be insured under this scheme, though the actual groups depend on the region. The insurance policy must last at least one year and the insurance amount can be 70–100 percent of the value of the fish insured (deductibles of 0–30 percent of the insured value apply). An important feature of state-subsidized aquaculture insurance is that policyholders do not suffer losses even if the underwriter goes bankrupt, as NAAI will pay any claims in such circumstances. As a rule, the amount of state subsidy is 50 percent of the premium, but the actual maximum subsidy tariffs are determined by the Agricultural Insurance Plan, depending on the species and the deductible in question. For example, in the case of salmonids, in 2019 these ranged from 1.32 percent (with a maximum deductible of 30 percent) to 6 percent (with zero deductible). The size of the subsidy is determined by multiplying the insurance amount by the subsidy tariff and dividing it by two. If the insurance tariff determined by the underwriter is lower than the subsidy tariff, then the subsidy equals 50 percent of the premium (which, in turn, is calculated by multiplying the insurance tariff by the insurance amount). Policyholders must first pay their own 50 percent share of the premium as an initial instalment; once paid, they can apply to the relevant government agency for the state subsidy (Bizhdov, 2019).

6. PERILS COVERED

6.1 Capture fisheries

Capture fisheries insurance policies underwritten in the Russian Federation can be of the "all risks" and "named perils" type. According to the survey responses, coverage is provided against: natural calamities; wars, hostile actions, attack, piracy, capture, seizure or detention; accidents due to technical/mechanical failure; accidents caused by human error; accidents caused by a third party; accidents or damage caused by marine debris; and theft and damage by vandalism. Based on the vessel insurance rules drawn up by the individual underwriters and published online, most insurance companies offer "Total Loss Only", "Damage Only" and "Loss and Damage" types of cover.

There are also several additional combinations, depending on the insurance company. Two examples are "Limited Liability for Loss and Damage" (AlfaStrakhovanie), or "Loss and Damage Due to Marine Risks" (Rosgosstrakh), both of which limit the scope of the standard "Loss and Damage" clause to certain named risks. In general, the perils covered include: damage to, and loss of, fishing vessels caused by natural calamities (e.g. volcanic eruptions, earthquakes, lightning or tsunamis, storms), or mechanical failure/human error (e.g. fire, explosion, grounding or collision). The costs of damage prevention, mitigation or vessel salvaging are often also covered if the perils that were prevented or mitigated are included in the policy. Additional coverage can generally be obtained for losses or damages caused by loss of freight, strikes, wars, hostile actions, attack, capture, seizure, and/or detention.

6.2 Aquaculture

State-subsidized aquaculture insurance is of the "named perils" variety. It covers only the loss of aquaculture stock caused by the following perils: listed diseases and mass mortality caused by toxic pollutants; natural disasters (wind and storm damage, flooding, typhoons, tsunamis, ice damage, extreme drops in the water level or extreme temperature fluctuations); electric, water supply and/or heating system failures attributable to natural disasters (if the production technology requires said system); and fire.

In addition to subsidized insurance, voluntary aquaculture insurance is also available. This can either be purchased independently or as an add-on to the subsidized insurance policy. Voluntary insurance can be both of the "all risks" and the "named perils" type. The latter can cover the following risks: disease (a broader list than in subsidized insurance); natural disasters (a broader list than in subsidized insurance, such as lightning, earthquake or volcanic eruption); technical failures (if not the result of negligence by the policyholder); mortality caused by exogenous physical, chemical or biological agents; and predation, malicious acts or confiscation by authorities. Aquaculture stocks in transit (e.g. live fingerlings or brood stock) are also insured by some insurance companies.

7. POLICIES IN FORCE

7.1 Capture fisheries

Vessels insured (including hull and machinery insurance)

Official data on the number of fishing vessels insured was not available.

In the first quarter of 2020 there were 3 592 H&M insurance policies in force (Insurance Today, 2020), but this included all kinds of vessels, not only fishing ones. As a very rough indication, one survey respondent reported having 209 valid capture fisheries insurance policies in 2020. In this particular case, these 209 policies corresponded to 209 insured vessels – each vessel was therefore insured separately. Meanwhile, another company reported over 50 valid policies representing a much broader range of insurance products (P&I, marine liabilities, onshore/offshore equipment, public liability, employers' liability, transport liability and vessel insurance), which corresponded to more than 500 insured vessels. A combination of anonymous responses, a very low number of data sources, and the fact that the numbers reported in the survey include both H&M and P&I policies, make it impossible to estimate the total number of fisheries H&M policies in force in the country.

The previous review of capture fisheries in Russia (Ahmad, 2009) assumed that all powered fishing vessels registered in the country (at that time 2 256) were insured. Applying the same logic and considering the total number of powered fishing vessels registered in 2018, one can assume that the total number of fishing vessels insured currently sits at around 2 300. However, it is important to highlight that this is a rough estimate using the information available and should be treated as such.

Based on responses to the 2020 survey, all types of fisheries (inland, inshore and offshore) and many different types of vessels can be covered by insurance (seiners, purse seiners, trawlers, longliners, trap/pot fishing boats, multipurpose and polyvalent vessels, small-scale vessels, fish carriers/fish transport vessels, fishery research and training vessels).

Equipment and gears insured

Other vessel components can be insured in addition to the hull. These may vary from the engines and propulsion systems to on-deck and below-deck installations, fishing gear, electronic equipment, lifeboats, hydraulic systems, launches and daughter vessels, as well as outboard engines. Official statistical data regarding the number of insurance policies for equipment and gears were not available.

Other classes of capture-fisheries-related insurance

Under the Mercantile Marine Code of the Russian Federation, all shipowners must have mandatory employers' liability insurance to cover the salaries, life, and health of the crew. They must also carry public liability insurance or other financial coverage relating to potential damages from pollution when the vessel transports harmful and/or dangerous substances. In inland navigation, the Code of Inland Aquatic Transport makes it compulsory for shipowners to have public liability insurance covering damages caused by collision, pollution caused by oil or other substances, damage to infrastructure or third-party property, as well as the expenses associated with the salvaging of sunken vessels. Based on this, all fishing vessels, marine or freshwater, must be in possession of some form of liability insurance.

In addition to obligatory insurance, the Mercantile Marine Code also specifies the financial responsibility of vessel operators in several other cases (such as damages caused by collision). This situation creates a demand for insurance, in response to which underwriters have developed a wide range of liability insurance products. Information on several of these is available on the respective companies' websites. Products include, among others, liability towards third parties or the crew; liability for collision with floating or stationary objects; liability for pollution (such as oil spills); liability for cargo and other property; and quarantine costs or costs of legal procedures. In the first quarter of 2020 there were 3 977 shipowners' liability (P&I) policies in force (Insurance Today, 2020), but this number included all kinds of vessels, not only fishing vessels. Statistical data on the number of fishing vessels insured are largely unavailable; concrete information was only found on the website of AMT Insurance, which currently provides P&I insurance for 77 fishing vessels.

7.2 Aquaculture

Based on responses to the 2020 survey, the estimated number of valid aquaculture insurance policies is 28, across 18 enterprises. However, even though the three respondents include the current Russian market leader in agricultural insurance, the number of respondents is considerably lower than the number of companies known to offer aquaculture insurance. The number of policies outlined above is thus most likely underestimated. In any case, the number of businesses covered is a negligible proportion of the 4 300 aquaculture enterprises reported in the Russian Federation (Ministry of Agriculture of the Russian Federation, 2019).

Species insured

Species insured by survey respondents currently include Atlantic salmon (*Salmo salar*), rainbow trout (*Oncorhynchus mykiss*) and other salmonids; sterlet (*Acipenser ruthenus*) and other sturgeon species; cyprinids, blue mussel (*Mytilus edulis*), European flat oyster (*Ostrea edulis*) and cupped oysters (*Crassostrea* spp.); giant river prawn (*Macrobrachium rosenbergii*), penaeus shrimps (*Penaeus* spp.) and kelp (*Laminaria* spp.). Catfish were not mentioned among the species insured even though the subsidized aquaculture insurance scheme was extended to this group in 2020 (along with salmonids and sturgeons). Respondents were also prepared to insure species outside their current portfolio, such as other finfish, crustacean and mollusc species, as well as echinoderms. One company also reported its openness to insuring aquatic organisms kept in zoos. No specific taxonomic group was excluded from potential future insurance; the only limitations mentioned were of a technical nature: underwriters were not willing to insure companies with less than three years of experience, and/or without adequate registration of the animals' movements.

Growing systems insured

A wide range of offshore and onshore growing systems can be insured. These include cages, longline culture, oyster and mussel growing systems, offshore submersible and semi-submersible systems, raceways and gravity tanks, ponds, hatcheries and on-growing units, recirculation and recirculating aquaculture systems, and aquarium systems. Survey respondents did not explicitly exclude the possibility of insuring additional growing systems in the future.

Other aquaculture-related insurance

Even though the term "aquaculture insurance" is typically understood as the insurance of aquaculture stocks, another range of less sector-specific insurance products is also available to aquaculture operators. These include public liability, employers' liability, transport liability, business interruption insurance, as well as building and onshore equipment insurance. However, these are considered separate products and not a part of aquaculture insurance; they are thus not covered by the state-subsidized insurance scheme. No specific information is available on how many aquaculture companies carry such insurance.

8. RISK MANAGEMENT

Both in the capture fisheries and aquaculture sectors most underwriters apply preconditions to issuing an insurance policy in order to minimize risks. These technical criteria may include the age, seaworthiness, class and flag of the vessel as well as, in the case of capture fisheries, the previous history of accidents. In the case of aquaculture, they may also require adequate record-keeping, minimum fish rearing experience and the existence of approved norms of technological losses (mortality) during production. Other insurers apply different conditions. For example, Ingosstrakh asks for insured vessels to be surveyed by a member of the International Association of Classification Societies (IACS). None of the respondents reported having specific procedures in place to exclude vessels sanctioned for their involvement in illegal, unreported and unregulated (IUU) fishing from insurance. However, some underwriters' rules state that losses related to IUU fishing activities are not covered. In the field of aquaculture, RSHB does not issue an insurance policy if the animals:

- are ill, injured, malnourished or test positive for infectious diseases;
- are kept in areas where a state of emergency has been declared;
- are kept in conditions not corresponding to sanitary, epidemiological and technical norms;
- have not undergone routine vaccination;
- are kept in farms or areas affected by infectious and/or parasitic diseases;
- are kept in farms or areas where a quarantine has been declared in order to prevent the spreading of infectious diseases (with the exception of animals not susceptible to the disease in question).

Typically, insurance companies ask the policyholder to submit the relevant supporting documents or declarations at the time of applying for insurance. They also retain the right to physically survey the vessels/aquaculture facilities either before issuing the policy or at any time before it terminates, using either their own surveyors or independent ones. The insurance policies normally contain provisions for reducing risks (e.g. geographic areas to be avoided, in the case of capture fisheries insurance; or procedures to be followed during production, in the case of aquaculture insurance). Policyholders are also required to inform the underwriter immediately if any circumstance arises that can significantly increase the risk of loss. In such cases, the underwriters normally maintain the right to unilaterally change the terms of the insurance policy or increase the premium.

Capture fisheries insurance premiums are generally determined individually, taking into account the size, age, type and market value of the vessel, the service area, the risks covered, the deductible and loss statistics in recent years. Several companies apply a system of correction coefficients to determine the insurance premium. In state-subsidized aquaculture insurance, the premium amount is determined based on insurance tariffs (expressed as a percentage of the insurance amount), which depend on the production region, the species, the farming system and the deductible applied. Insurance companies can also apply correction coefficients to the established basic premiums to adjust them in line with the actual level of risk, based on the local conditions.

In-house expertise as well as independent professional surveyors are used in risk assessment in both capture fisheries and aquaculture insurance.

9. HANDLING OF CLAIMS

As outlined by Ahmad (2009) in the previous capture fisheries review, the Russian Federation already possesses a well-developed claims handling system, based on internationally accepted principles.

This statement remains true today. As a rule, insurance companies require policyholders to report any damage or loss in written form immediately after they become aware of it. If they fail to do so and this impedes the insurance company from taking measures to mitigate the loss, the insurer may refuse payment either completely or in part. However, the maximum period wherein this report may be accepted varies widely: from 2–3 days (e.g. Absolut Insurance, RSHB Insurance) to several months (Ingosstrakh). The policyholder is also typically required to take any possible and reasonable action for loss mitigation, either on his own or following guidance from the insurer, if the latter is available. Failure to do so may also be a reason for the refusal of compensation. In some cases, policyholders are also required to seek the insurer's written approval before admitting responsibility for an accident, agreeing to a peaceful settlement of a dispute, paying any claims by third parties, or taking any other action involving financial obligations. Occasionally, the insurance company may act on the policyholder's behalf in legal proceedings.

Both in-house loss adjusters and foreign independent adjusters are used in claim-handling procedures for capture fisheries and aquaculture insurance.

10. UNDERWRITING EXPERIENCE

The market-leading companies in marine and agricultural insurance (Ingosstrakh, SOGAZ, Alfastrakhovanie, Rosgosstrakh, Soglasie) have more than ten years' experience in their respective fields. The only exception among the most prominent companies is RSHB Insurance: its agricultural insurance licence only dates back to 2012, yet in 2017 it reached the leading position in the agricultural insurance market and has kept it ever since (Insurance Today, 2020). Survey respondents reported 8–11 years' experience in underwriting capture fisheries and aquaculture risks. Conversely, aquaculture insurance is a relatively new sector in the Russian Federation. Although some companies have 8–10 years' experience in the field, the limited interest from both insurers and aquaculture farmers in this area has not allowed the aquaculture insurance business to flourish. The lack of loss assessment methodologies for different species groups and production systems is a further obstacle to development. Nevertheless, the introduction of state-subsidized aquaculture insurance, and the establishment of a working group on the development of the corresponding procedures in 2018, has led to some increased optimism and an interest in aquaculture insurance among aquaculture farmers (Dementyev, 2018).

The underwriting experiences reported (expressed in financial results) vary widely between respondents and fluctuate significantly over the years. Neither a clear overall trend nor links with sectoral trends can be discerned. Some companies suggest an apparent improvement, where the perception gradually changes from poor to neutral, or neutral to good. One company reported stable good results over the years. One respondent active in aquaculture insurance reported stable, neutral results following some very good years in the early 2010s. One company active in capture fisheries insurance reported moderate improvements over the years followed by a very bad year in 2019. The years perceived as the best (i.e. when the majority of respondents reported good results) were 2012 in aquaculture insurance and 2018 in capture fisheries insurance.

Concrete data on annual, aquaculture-related claim payments were only found for RSHB Insurance (Hrabskov, 2019). According to these payments, the total payout – mostly related to insurance of trout and salmon in Murmansk Region and the Republic of Karelia – was around RUB 118 million (approximately USD 1.9 million) in 2013–2018. The payments peaked in 2016 and 2017 at RUB 70.9 million (USD 1.1 million) and RUB 24.9 million (USD 400 000) respectively, while other years typically yielded around RUB 5 million (USD 80 000).

11. CONCLUSIONS

Although capture fisheries insurance represents only a small segment of insurance business in the Russian Federation in terms of premium income, the sector is well developed in institutional terms. Since the last review of capture fisheries insurance in the Russian Federation by Ahmad (2009), the sector has undergone significant consolidation and concentration, with a decrease in the number of companies and an increase in their size and capital. The sector is well integrated into the international fisheries insurance business, which makes it sufficiently efficient and resilient. The negative trends of the last decade notwithstanding – fall in premiums income, decrease in the number of fishing vessels – some positive developments have taken place. The federal government's focus on renewing the fishing fleet and increasing the share of domestically built vessels is particularly noteworthy in this sense. The desire to exploit high seas fisheries resources more effectively, and the corresponding initiative of building industrial fishing vessels, also provides an opportunity to increase marine insurance premium income. The government seems to be committed to the development of both the fisheries sector and the insurance business, having adopted strategies for both (even if the insurance development strategy does not specifically mention fisheries and vice versa).

By contrast, aquaculture insurance is a relatively new business, which has started to develop in the last ten years. Previously its development was slow, owing to the reluctant attitude of both farmers and underwriters. However, the launch of state-subsidized aquaculture insurance in 2019, combined with the development of common rules for this segment, may eliminate some of the previous problems and increase interest in aquaculture insurance. The strategic objective of increasing fish production and consumption is another important driver for both capture fisheries and aquaculture insurance. Indeed, the significant private investment in fisheries and aquaculture envisaged by the sectoral strategy represents a considerable financial risk for investors and farmers, which may increase the interest in insurance products. Credit institutions' requirement that their customers insure fishing vessels and aquaculture infrastructure may also contribute to business development.

As well as the above, the planned liberalization of the Russian insurance market – allowing foreign providers to enter the field – could play an important role in increasing competition in the provision of insurance services, and expand the range of products on offer.

Yet in spite of these opportunities the sector still has to overcome a number of serious structural problems. The insurance market is dominated by a small number of large companies, which limits competition. Those who reportedly purchase aquaculture insurance are mostly the largest aquaculture companies in the Murmansk Region and the Republic of Karelia. Despite the apparent interest, aquaculture insurance uptake still seems low compared to the number of aquaculture businesses. The situation in capture fisheries insurance is better because of mandatory liability insurance, the sector's well-established mechanisms, and the operators' desire to avoid damage and accidents. On the other hand, the poor state and old age of the fishing fleet, together with the associated high premiums, may limit the availability of fisheries insurance for some fishing businesses.

Finally, underwriters reported the following constraints in the development of fisheries and aquaculture insurance: the limited knowledge of the aquaculture sector and its needs among insurers; the lack of sectoral partners who could act as insurance agents; and the limited financial literacy of fishers and poor access of fishers to financial services. These structural and technical problems need to be addressed in order to bring growth and stability to the sector and allow it to develop sustainably.

12. RECOMMENDATIONS

Based on the weaknesses and opportunities identified, as well as the suggestions from survey respondents, the following recommendations can be made to stakeholders:

- The government, in cooperation with ARIA, NAAI, and fisheries and aquaculture sector stakeholders, should develop a strategic document on the development of fisheries and aquaculture insurance. This document should provide clarity on the fisheries development strategies, and promote awareness on fisheries insurance.
- Lifting the current legal restrictions on mutual insurance may help to diversify the insurance offering, and contribute to the availability of affordable insurance solutions. This particularly applies to small-scale capture fisheries and aquaculture enterprises.
- A further expansion of the state-subsidized aquaculture insurance scheme is important, with the development of appropriate procedures and loss assessment methodologies for more species. Such an expansion would allow more farmers to insure their stocks.
- Producer associations and other sectoral organizations should be more involved in promoting the development of insurance, and act as agents in negotiating insurance schemes and policies. Good examples of such cooperation are the agreements concluded by RSHB Insurance with the Eurasian Aquaculture Alliance and the Association of Inland Fisheries and Aquaculture Enterprises.
- Insurance can also be a tool for promoting sustainable fisheries and aquaculture practices among policyholders. Underwriters often require policyholders to follow best practices in order to minimize production risks, but these requirements could also place a greater emphasis on sustainability. In fisheries, a stricter attitude should be taken towards companies and vessels involved in IUU fishing activities. In aquaculture, apart from the health management of stocks, the environmental impacts of farms should also be considered.
- Underwriters are advised to implement appropriate capacity development measures to improve in-house competence on fisheries and aquaculture. Encouraging more effective cooperation with sectoral organizations could also help insurance companies develop new insurance products attuned to the needs of the fisheries and aquaculture sector.

- The development of international cooperation, both at the level of NAAI and individual underwriters, could help adapt the success stories and existing solutions devised by other actors in the sector. For example, the country could learn from existing state-subsidized insurance schemes in Austria, Canada, Greece, Portugal, Spain and the United States of America, or the loss assessment methodologies developed for certain aquaculture stocks.
- Several respondents indicated that they would welcome cooperation with FAO in the development of fisheries and/or aquaculture insurance. The assistance of FAO is mostly expected in the form of awareness-raising and the promotion of insurance among fishers and aquaculturists.

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National report of the United States of America

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1. INTRODUCTION

In 2018, the United States of America was the fifth-largest marine capture fisheries producer in the world, with a total production of 4.72 million tonnes (FAO, 2020a). This amounted to 86 percent of marine capture fisheries production in the North American region. In the same year, the country positioned itself as the seventeenth-largest aquaculture producer in the world, with a total marine and freshwater production volume of 0.47 million tonnes and a total farm gate value of USD 1.2 billion (FAO, 2020b).

Since the 2009 capture fisheries review (Van Anrooy *et al*., 2009) and the 2006 aquaculture review (Van Anrooy *et al*., 2006), substantial progress has been made in the sustainable management of fisheries and aquaculture in the country. The Annual Report to Congress on the Status of U.S. Fisheries (NOAA, 2020) highlights the work done with respect to maximizing fishing opportunities, while ensuring the sustainability of fisheries and fishing communities. As a result, the number of stocks on the undergoing overfishing list dropped to an all-time low in 2019. The number of stocks on the overfished list increased slightly because of several factors, including those beyond the control of domestic fisheries management. In this context of improved fisheries management and increasing aquaculture production, a variety of insurance providers continue to assist the sector in mitigating the risks inherent to fisheries and aquaculture operations.

This chapter provides an overview of the present state of fisheries and aquaculture insurance in the United States of America, analysing the changes over the past ten years, since the publication of the last FAO reviews. The analysis is based on information from the responses to the FAO online survey and desk research. The chapter also contains information provided by insurance industry representatives, brokers, as well as commercial fishing enterprises.

2. STATUS OF CAPTURE FISHERIES AND AQUACULTURE PRODUCTION

2.1 Capture fisheries

Capture fisheries take place in many of the country's coastal waters, its exclusive economic zone (EEZ), rivers and lakes, and play an important role in the nation's economy. Overall, in 2016, American commercial and recreational saltwater fishing generated more than USD 212 billion in sales and supported 1.7 million jobs. As per Kitts *et al*. (2020), some of the most important and economically significant fleets for the American commercial fishing industry are:

(i) West Coast groundfish trawl catch share programme- large non-whiting groundfish trawl vessels;
(ii) West Coast groundfish trawl catch share programme- small non-whiting groundfish trawl vessels;
(iii) West Coast groundfish trawl catch share programme- whiting trawl vessels;
(iv) Northeast limited access scallop dredge- full-time;
(v) Northeast limited access scallop dredge- part-time;

(vi) Gulf of Mexico shrimp trawl vessels; and
(vii) Hawaii pelagic longline vessels.

Capture fisheries involving American fishing fleets also occur in the EEZs of other nations and in areas beyond national jurisdiction (ABNJ), such as the tuna fisheries of the Western Central Pacific.

Since 2011, capture fisheries production in the country has remained stable, at between 4.9 million and 5.1 million tonnes. The 4.49 million tonnes of fish and shellfish landed in 2018 represents an increase of 0.172 million tonnes (3.6 percent) on the previous year (NOAA, 2019). The value of the landings also increased to USD 5.4 billion, up USD 110 million (2.1 percent) from 2016. Overall, the most highly valued American commercial species were: salmon (USD 688 million), crab (USD 610 million), lobsters (USD 594 million), shrimp (USD 531 million), scallops (USD 512 million), and Alaska pollock (USD 413 million). In terms of volume, the nation's largest commercial fishery remains Alaska pollock (NOAA, 2019).

2.2 Aquaculture

Marine aquaculture in the United States of America contributes to seafood supply and supports commercial fisheries, while restoring habitat and at-risk species. In addition, it maintains economic activity in coastal communities and at working waterfronts in every coastal state. In 2017, the United States of America produced USD 1.5 billion of aquaculture seafood – an increase of 1.2 percent on 2016 – with a total volume of 0.3 million tonnes. The top American marine aquaculture species were oysters (USD 186 million), clams (USD 129 million), and Atlantic salmon (USD 61 million) (NOAA, 2019b). Most marine aquaculture production consists of bivalve mollusks such as oysters, clams, and mussels. Salmon and shrimp make up most of the rest, although advances in technology and management techniques are making more species available to the American consumer. In terms of production, the Pacific (including Alaska and Hawaii) and Atlantic regions produced the most significant level of aquaculture production, each realizing 39 percent of the total production by value.

3. THE INSURANCE MARKET

The insurance market in the United States of America continues to be the largest market in terms of direct premiums. It is also one of the most efficiently regulated and advanced markets in the world. In 2018, the American insurance industry's written net premiums added up to USD 1.22 trillion, with property/casualty (P/C) (non-life) premiums accounting for 51 percent of total insurance premiums (III, 2020). Information on capture fisheries insurance premiums specifically is not readily available. However, data on ocean marine insurance may roughly indicate the size of capture fisheries insurance, as it provides coverage for all type of vessels for property damage (vessels and cargo) as well as associated liabilities. In 2019 the net premiums for this line of insurance were USD 3.2 billion – i.e. only 1.3 percent of total written net premiums in all commercial lines of insurance (III, 2020). When compared to data relating to the same line of insurance provided in the 2009 capture fisheries review (Van Anrooy *et al.*, 2009), the share of capture fisheries insurance appears to remain marginal.

Each state continues to have its own statutes and rules to regulate all types of insurance under its jurisdiction, including capture fisheries and aquaculture. In the United States of America, the McCarran-Ferguson Act of 1945 is the guiding legislation on insurance. The Office of the Insurance Commissioner of each state oversees, among other issues, an insurer's solvency and market conduct. To a greater or lesser extent, they also review and rule on requests for rate increases for coverage. Over the last few years, the insurance industry has been promoting the modernization of

insurance regulations in the country, as they see the current situation as overly complex and burdensome. The industry's proposals involve implementing a dual (federal/state) chartering system or initiative to modernize the state system, which would create a framework for a national system of state-based regulation with uniform standards (III, 2020).

The United States of America has one of the most stable subsidized agricultural insurance programmes in the world. Since 1938, the government has promoted crop insurance under the United States' Federal Crop Insurance Corporation (FCIC – considered the central pillar of federal support for agriculture. In the 1980s, the programme underwent significant reforms. Among other things, it created a public–private partnership for the provision of commodities insurance and expanded its definition of "agricultural commodity" to aquaculture. While agricultural insurance penetration through the federal subsidized programmes is considered one of the highest in the world – at between 72 percent and 90 percent (FAO, 2011) – the total premium collected through the FCIC in 2020 accounted for only 0.77 percent (USD 10 billion) of the total premiums collected by the insurance industry that year (USDA, 2020a).

4. SUPPLY AND DEMAND

4.1 Supply

The insurance suppliers for capture fisheries and aquaculture operations include commercial insurance providers, brokers, mutual insurance/self-insurance programmes and government agencies. Both the 2006 aquaculture review and the 2009 capture fisheries review noted that there seem to be a small number of relatively large insurance companies in the United States of America. These companies offer commercial marine capture fisheries and aquaculture insurance in each of the country's fisheries regions, and this broadly appears to remain the situation today.

The American Institute of Marine Underwriters (AIMU) is a trade association that represents the American ocean marine insurance industry as an advocate, educator and information centre. It has 42 insurance/reinsurance companies and 34 brokers among its members, all of whom provide insurance services to the marine sector. Many of these insurance companies offer marine insurance products such as cargo, hull, protection and indemnity, as well as insurance for yachts and recreational fishing boats – yet those offering policies for commercial fishing boats, and fish and shellfish farms, appear to be rather limited. It is important to consider that not all private companies that provide insurance to the sector are members of the AIMU; this data should therefore be treated with caution.

Mutual insurance companies owned and operated by the policyholders (i.e. fishers) also play an important role in the insurance market. Their main purpose is to provide insurance coverage for their members, assist the members with advice to reduce or mitigate risks, and provide assistance in the event of emergencies/ accidents. Mutual insurance companies sometimes also provide deposit/savings and limited credit facilities. No information is available on the specific market share of mutual insurance associations for captures fisheries or aquaculture.

Aquaculture insurance services have been available in the United States of America since the 1970s. Commercial insurance is available for a number of species including salmon, trout, striped bass and abalone operations through private insurance companies. The aquaculture insurance sub-sector in the United States of America is treated similarly to agriculture crop and livestock insurance, insofar as premiums continue to be heavily subsidized, mainly through the FCIC. The Risk Management Agency, a subset of the United States Department of Agriculture (USDA), created through the Crop Insurance Reform Act of 1994, administers the programme.

The latest major revision of the programme through the U.S. Agriculture Risk Protection Act of 2000 (Pub.L. 106–224; USDA, 2020b) significantly increased the programme's government subsidy for crop insurance. This change specifically applied to producers with no individual policy coverage, including aquaculture farmers. Through this revision, new types of insurance programmes which benefit aquaculture producers were created, such us revenue insurance (i.e. Whole-Farm Revenue Protection – WFRP) and insurance protection based on individual historic yields (Bowen, 2019).

Despite these reforms, the aquaculture industry still generally lacks mainstream coverage. Under FCIC only two aquaculture species have specific insurance policy programmes: oysters, through the Group Risk Plan (GRP) Oysters risk management tool; and clams, under the Aquaculture Dollar Plan Clams programme. Other aquaculture species can also be insured through the Whole-Farm Revenue Protection – WFRP and the No-insured Crop Disaster Assistance programme. However, there are some limitations as to the number of aquaculture producers who can apply for such insurance coverage (further explanation is provided in section 5, "Underwriting"). Over the last few years, American fish and shellfish farmers have lobbied extensively to get other economically important aquaculture species covered under the FCIC, but these efforts have largely failed. For example, after several years of lobbying from the catfish industry, the United States Congress concluded in 2016 that it was not possible to have catfish production covered under the federal programme. Owing to significant data problems and actuarial concerns, insurance policies to protect catfish farmers could not be provided. Similar attempts to include salmon under the FCIC were not accepted, on the basis that the international insurance market is well equipped to provide insurance for this species (Bowen, 2019).

Currently, there are 15 private insurance companies authorized by the United States Department of Agriculture Risk Management Agency (USDA RMA) to underwrite crop insurance. The number of companies that provide aquaculture insurance is unknown (III, 2020).

4.2 Demand

As far as the demand and actual use of fisheries and aquaculture insurance services is concerned, there are no statistics collected or databases maintained that include the number of fishing vessels or aquaculture enterprises insured. The number of insurance premiums associated with them is equally unknown. The reason for this lack is that the licensing and regulation of insurance providers is the prerogative of elected insurance commissioners at state level in the United States of America. In the case of licensing and registration of fishing vessels and aquaculture enterprises/fish and shellfish farms, proof of insurance is not a requirement – in the same way as it is not for vehicles. However, it can be assumed that in terms of market share of capture fisheries and aquaculture insurance, a small number of large companies or associations of companies (which have their own fishing fleets) are market leaders in the fishing sector. These companies can be regarded as potential buyers. Potential insurance demand also exists among many commercial fishers who operate small businesses and produce for the local market. It should be stressed, however, that these market segments are only *potential* buyers of insurance, given that it is not known how many actually buy insurance.

The demand for insurance is also driven by the Jones Act. The Jones Act is a American federal statute that provides a means for crew members who are injured as a result of negligence to recover damages caused by injury. It is the maritime version of workers' compensation. The Jones Act is Section 27 of the Merchant Marine Act of 1920, which applies to merchandise being transported by water between American ports (USDT, 2020). The Jones Act focuses on issues related to maritime commerce but also provides sailors with additional rights, including the ability to seek damages

from the crew, captain, or shipowner in the case of injury. Although enacted before the aquaculture sector even began in the United States of America, the requirement for aquaculture producers to acquire Jones Act endorsement is still subject to discussion. Given the additional financial burden of acquiring this type of responsibility, aquaculture producers are pushing to extend their coverage to aquaculture workers.

5. UNDERWRITING

Besides marine hull insurance coverage, which typically covers vessels and equipment, most commercial fishing vessels carry third-party/protection and indemnity insurance. This includes shellfish farming operations, even in cases where tidelands are leased for the purpose of oyster and clam growing.

Additionally, mutual or self-insurance programmes offer a variety of policies, some of them offered only in certain states and geographic areas of the country. Particularly in the Pacific Northwest and Alaska, self-insurance programmes play an important role in capture fisheries insurance. One example is the Coastal Marine Fund (CMF), which is a self-insurance programme for commercial fishing vessels. Formed in 1993, CMF operates in Washington State and Alaska, and is committed to the responsible operation of commercial fishing vessels, working for the elimination of careless and reckless operations. The fund's member–owners create and maintain funds for loss reimbursement and share the risk of loss and damage to their vessels; they also assist fellow members' vessels in distress (CMF, 2020). According to the author's research with fishermen operating on the northwest Pacific coast out of Westport, WA, insurance premiums for mid-sized fishing vessels can range from 4 to 5 percent of the vessel's value. These figures should be seen as indicative and not representative in any way, given that precise information on the underwriting capacity of insurance companies that provide capture fisheries insurance is not available.

The FCIC offers aquaculture insurance policies to insure against the loss of oyster and clam production, with coverage terms depending on the type of crop and the county in which the crop is produced (USDA, 2020a). Individual factors, risk management practices or the ways in which the species are reared or propagated, are not considered as factors in deciding whether to provide coverage. The Oysters Group Risk Plan (GRP) is available in nine counties in Louisiana: Cameron, Iberia, Jefferson, Lafourche, Plaquemines, St. Bernard, St. Mary, Terrebonne and Vermillion. The plan only insures crops:

(i) for which the grower has an insurable share;
(ii) that are for fresh market sale;
(iii) that are from leased or owned oyster beds; and
(iv) that are not grown for experimental or research purposes.

GRP Oysters uses county-level landing data as the basis for determining a loss and coverage levels from 70 percent to 90 percent are available, in increments of 5 percent. For the Aquaculture Dollar Plan Clams programme, the grower needs to submit inventory records for her/his insurable clams, enclosed with his/her application. Indemnities are paid for insured causes of loss that reduce the inventory value by more than the selected deductible (the inventory may be increased throughout the insurance period for an additional premium). This programme is available in selected counties of Massachusetts, South Carolina and Virginia and only insures crops that:

(i) are grown by a person who has grown or managed a clam farming operation in at least three of the previous five crop years;
(ii) are grown in a county for which a premium rate is provided in the actuarial documents;

(iii) are grown in an acceptable location, for which GPS coordinates and a clam inventory value report has been provided; and
(iv) use a practice that fixes the insurable clams to the land within the growing location.

As of 31 August 2018, policies underwritten under the Aquaculture Dollar Plan Clams programme generated a total premium of USD 624 000 (57 percent of which was subsidized) – a marginal portion of the total premium generated through the Federal Crop Insurance Corporation (0.006 percent).

Two other insurance programmes – the Whole-Farm Revenue Protection (WFRP) and the Noninsured Crop Disaster Assistance Program (NAP) – are designed to provide insurance to aquaculture producers growing species other than oysters or clams, or which do not meet the requirements for the aforementioned programmes. The WFRP provides a risk management safety net for all commodities on the farm (including aquaculture) under one insurance policy, protecting the farm against the loss of revenue that has been earned or is expected to be earned from: (i) commodities produced during the insurance period; (ii) commodities bought for resale during the insurance period; and (iii) commodities on the farm including aquaculture. The programme has been available since 2015 in all 50 states and available coverage levels range from 50 to 85 percent, in increments of 5 percent. While this is a promising option for aquaculture producers, one of the drawbacks of the programme is that it requires the farmer to provide five consecutive years of tax forms, or three consecutive years if the individual qualifies as a beginning farmer (Bowen, 2019). In addition, the coverage is limited to producers with a revenue from aquaculture production of less than USD 1 million. These restrictions can inhibit the availability of coverage for new aquaculture producers from this programme (Bowen, 2019). The WFRP programme was reviewed in 2020 on the initiative of east coast shellfish grower associations (with outreach to west coast shellfish grower associations), so as to make it work better for growers and their needs. The Noninsured Crop Disaster Assistance Program (NAP) aims to be a safety net for agriculture producers who would not qualify for the other crop insurance programmes. The NAP offers basic coverage for "catastrophic loss" (natural disasters and some disease) and it is likely to be a good option for new producers looking to acquire insurance, as it has fewer restrictions (i.e. no yield or revenue history). Nonetheless, aquaculture producers need to make sure their adjusted gross income does not exceed USD 900 000 to qualify for the programme.

Besides indemnity insurance, some private insurance companies offer indemnity-based stock mortality insurance for aquaculture production. Indemnity-based stock mortality insurance is a risk-transfer solution available to farmers who operate with recorded stock control procedures, irrespective of species or environment. These types of policies are primarily written on a "named peril" or "all risk" basis that provides a list of potential perils, from which a client can decide the breadth of cover they feel is appropriate to their particular circumstance (Meslee, 2020).

In light of the COVID-19 pandemic and the negative effects it has had on fisheries and aquaculture in the United States of America and elsewhere, the importance of providing other risk mitigation practices that cannot be covered by insurance became apparent. On 7 May 2020, the Secretary of Commerce announced the allocation of USD 300 million in fisheries assistance funding to states, tribes and territories with coastal and marine fishery participants negatively affected by COVID–19 – as per Sec. 12005 of the Coronavirus Aid, Relief, and Economic Security Act (also called the CARES Act).[1]

[1] Section 12005 authorizes the Secretary of Commerce to assist fishery participants affected by the COVID–19 pandemic.

6. PERILS COVERED

6.1 Capture fisheries

Commercial insurers' terms and conditions for capture fisheries insurance vary from "all risk" to "named perils" coverage. Broadly, the following perils are covered: collision, fire, theft, windstorm, lightning or vandalism, as well as failure or breakdown of machinery.

6.2 Aquaculture

The types of risk that can be insured depend on the policies offered by the commercial insurance companies. Generally, the terms and conditions vary from "all risk" to "named perils", with rates and perils determined according to the characteristics of each individual applicant's circumstances. Broadly, commercial aquaculture insurance covers offshore and onshore perils, including natural disasters such as typhoons, tsunamis, floods and red tides. It also covers extreme weather events such as low temperature and frost, theft and malicious acts, predation or physical damage caused by predators or other aquatic organisms, environmental pollution (seawater/freshwater) and mechanical breakdown.

Crops insurance under the FCIC provides only "named peril" coverage, for losses that adversely affect production or revenue as a result of natural disasters. Specifically, the GRP Oyster provides coverage against unavoidable loss caused by drought, flood, hurricane and other natural disasters, while the Aquaculture Dollar Plan Clams programme covers the following perils: oxygen depletion (due to vegetation, microbial activity, harmful algae blooms, or high water temperature), diseases, freeze, hurricanes, increase or decrease in salinity, tidal waves, storm surges or ice floes.

7. POLICIES IN FORCE

7.1 Capture fisheries

Most of the capture fisheries insurance policies in force are for vessel hull coverage, which provides protection for the physical damage to or loss of the boat, machinery and equipment. Protection & Indemnity insurance is also offered widely for fisheries insurance (usually as part of the policy). The actual number of policies in the United States of America is unknown.

Vessels

Information on the total number of fishing vessels in the country is not available. The United States Coast Guard estimates that in 2019 there were some 58 000 registered commercial fishing vessels (USCG, 2020). It is expected there is still a considerably higher number of commercial vessels operating in the country, which are registered and licensed by each state, but information on the total number of these vessels is not available.

It can be assumed that many of the fishing vessels involved in shore/offshore commercial fisheries activities in the country are insured. A safe estimate would assume that this is the case for at least 50 000 commercial fishing vessels. However, this number is likely to be only a fraction of the total number of fishing vessels insured, as the total number of fishing vessels registered by each state was not available. This figure is therefore a very rough estimate based on the information available and should be treated as such.

Equipment and gears

Generally, commercial insurers offer additional coverage for fishing equipment, which can be added to the fishing vessel insurance policy. The type of fishing equipment and gears usually covered include, but are not limited to: power poles, fishfinders, rods and reels, lures, rigs, and line, tackle boxes, depth finders, and trolling motors.

Other fishery-related insurance

In addition to the fishing vessels/equipment insurance, insurance companies provide other types of coverage. For example, the MIS- Maritime International Insurance, a commercial insurer operating in South Carolina, Connecticut, Massachusetts and North Carolina, offers coverage for:

- protection & indemnity
- loss of earnings
- pollution liability
- Jones act crew coverage.

As well as the above, Sea Mountain Insurance, an independent insurance company operating in the states of Alaska, Washington, Oregon, California, Nevada, Arizona, Florida and Maine, also offers coverage for:

- marine general liability
- loss of hire
- breach of warranty
- personal effects.

7.2 Aquaculture

Commercial aquaculture insurance policies generally provide coverage for stock mortality but can also include coverage for offshore property, liability, commercial boats, as well as coverage under the Jones Act. Under the Federal Crop Insurance Corporation, the Group Risk Plan Oysters provides coverage against widespread loss of production in the culture of oysters, and the Aquaculture Dollar Plan Clams provides coverage for stock mortality insurance based on a production inventory. The Whole-Farm Revenue Protection indemnifies the aquaculture producer for a loss of income resulting from a covered occurrence, rather than solely the loss of crop.

The 2018 USDA census found 3 456 aquaculture farms in the United States of America. These included 1 450 farms with pond culture systems, 741 using raceway systems, 452 with recirculation systems and 399 with cage-culture systems, as well as farms with other or mixed production systems (USD, 2019). The actual total number of aquaculture insurance policies in effect countrywide is unknown. With respect to the policies underwritten under the FCIC, 57 Aquaculture Dollar Plan Clams policies had been issued in the country as of 31 August 2020, while 2 068 policies were underwritten through the Whole Farm Revenue Protection programme in the same period (USDA, 2020c). No information on the policies underwritten under the Group Risk Plan (GRP) Oysters was available.

Species insured

Currently only clams and oysters are covered by the crop insurance programme under the FCIC. As previously indicated, other aquaculture species can still qualify for the Whole-Farm Revenue Protection or the Noninsured Crop Disaster Assistance programme. Aside from these, it appears that international private sector insurance companies provide coverage for halibut, seabass, tilapia, rainbow trout, pangasius catfish, gilthead (sea) bream, carp, mussel, croaker, clam, oyster and lobster.

Growing systems insured

It appears that most of the aquaculture growing systems in the United States of America can be insured. These include freshwater ponds (64 percent of all aquaculture farms in the country), cages or nets (5 percent), green water tanks (9 percent) and recirculation systems (11 percent).

Other types of insurance

Besides aquaculture crop mortality insurance, commercial insurance companies offer other types of coverage for aquaculture producers. For example, the Duncan and Associates insurance broker and Bankers Insurance LLC provide aquaculture insurance services in all 50 states. Apart from crop insurance they also offer the following coverage to aquaculture farmers:

- business property insurance for buildings and equipment;
- general liability insurance;
- commercial car insurance for vehicles used in aquaculture business;
- dive operations insurance; and
- maritime employer's liability (Jones Act) insurance to protect business from employment-related lawsuits due to work-related injuries.

8. RISK ASSESSMENT

Typically, in the case of marine capture fisheries, independent marine surveyors are used to inspecting damage and verifying claims, adopting well-established claims procedures and forms. When determining insurance premiums, risks are assessed by taking into accounts factors such as the age and condition of a fishing vessel, its area of operation and the type of fishing carried out, as well as the skipper's record and experience. In the aquaculture sector, insurance agents typically inspect and verify damages and losses, and settle claims.

9. HANDLING OF CLAIMS

9.1 Capture fisheries

Independent loss adjusters and in-house experts are used in the claim-handling processes. Claims must be reported immediately, as soon as damage has occurred – including when it is likely that damage to the fishing vessel/equipment, or the loss thereof, will occur in the near future. There are several ways for the policyholder to report, either by completing a file claim form or by contacting the broker or insurance company directly. As for other sectors serviced by the insurance industry, policies include standard guidelines for the policyholder to make claims.

9.2 Aquaculture

The processing of aquaculture claims is handled in a similar manner to agriculture insurance. To raise a claim under the FCIC crop insurance programme, the policyholder must file a written notice of damage or loss of production. They must file a claim for each unit within 72 hours of their initial discovery of the damage or loss of production, and no later than 15 days after the end of the insurance period. If necessary, a loss adjuster will be sent to inspect the damaged crop and gather information relating to the damage.

10. UNDERWRITING EXPERIENCES

As was the case in previous reviews, both the survey carried out by FAO and the additional enquiries made by the author failed to yield any information from underwriters active in the capture fisheries and aquaculture business. It is possible that they deem this information confidential.

Although there is no official information on the underwriting experiences in capture fisheries, the reduction in lost vessels and crew fatalities registered in recent years could be a factor that has affected the fall in the number of claims. Overall, this outcome has benefited the insurance industry that serves the sector. The number of lost vessels and fatalities has declined steadily since 2012, reaching 27 lost vessels and 18 fatalities respectively in 2019 (USCG, 2021). This decline can be attributed primarily to the introduction of safety regulations in 2012. These regulations require fishing

vessels operating more than 3 nautical miles from the territorial sea baseline to receive mandatory examinations to ensure they are complying with safety equipment transport requirements. The main causes of fishing vessel accidents in the 2011–2019 period were: material failure/malfunction, grounding, flooding, fire and loss of stability.

Insurance providers in the United States of America described their profit-loss over the past ten years in the aquaculture insurance business in rather negative terms. Based on the loss ratio information of claims under the Aquaculture Dollar Plan Clams (AQDOL) – available in the FCIC commodity year statistics – over the last seven years the insurance provision for this species showed good actuarial results (USDA, 2020c). The maximum loss ratio registered was 4.66 in 2015. However, the loss ratios for 2020 were much more positive, with 0.04 for AQDOL and 0.15 for WFRP.

Respondents to the FAO survey from the United States of America identified the following constraints to the development of their capture fisheries/aquaculture insurance business:

(i) limited knowledge of the demand and needs of the capture fisheries/aquaculture sectors in terms of insurance services; and
(ii) a lack of enabling policies and regulatory frameworks for providing insurance services to the capture fisheries/aquaculture sectors.

11. CONCLUSIONS

There are currently no statistics collected or databases maintained on the number of fishing vessels or aquaculture enterprises insured, nor any information on the types of insurance they carry. This makes it difficult to assess how effectively risks in the fisheries and aquaculture sectors are covered, and whether enterprises and their employees are sufficiently protected.

The absence of this information places a burden on states and the Federal Government. In the context of the climate-change-related extreme weather events, and natural disasters that negatively affect fisheries and aquaculture production and productive assets, the government is expected to assist the sectors with their recovery. If more aquaculture and capture fisheries enterprises were covered by insurance there would be less need for local or federal government assistance in the event of oil spills, or when hurricanes sink and destroy fishing vessels or aquaculture facilities.

There are a number of providers offering insurance policies that cover a range of perils in the capture fisheries and aquaculture sectors. These include commercial insurers, mutual or self- insurance programmes, and the risk management agency of the USDA. While it is commonly observed that owners of fishing vessels and aquaculture enterprises purchase indemnity insurance, efforts to convince capture fishery and aquaculture enterprises of the benefits of insurance (by NOAA and the U.S. Department of Commerce, for example) seem limited.

Various insurers and brokers informed FAO that there has been strong interest from aquaculture growers in the United States of America for a specific risk-management option for their aquatic crops, and such interest is growing exponentially. Producers and their associations are hopeful that this will slowly translate into further development of Federal Crop Insurance products by the United States Risk Management Agency (RMA) for more cultured species and production systems.

Currently, only a few aquaculture crop insurance plans are available, yet none of these address the true needs of the industry in a consistent and fair manner. The plans available are either limited by commodity type, restricted geographically, or impose constraints with regard to revenue valuations of the product/operation. Ultimately, the hurdles associated with determining insurance coverage eligibility, added to the inconsistencies in coverage, translate into limited producer participation.

12. RECOMMENDATIONS

With a view to improving risk assessment and management in the fisheries and aquaculture sectors in the United States of America, the following interventions are suggested:

- Through its Department of Commerce and NOAA, the U.S. Government could strive to get data from the capture fisheries insurance sector and conduct surveys aimed at vessels owners. This information is critical to developing more appropriate insurance products.
- As a follow-up to a recent techno-economic performance review of selected fishing fleets in the United States of America carried out by NOAA (Kitts *et al*., 2020), which covered seven commercially important fishing fleets, a sample of the vessels could be surveyed again with a focus on insurance. Among other things, the vessel owners could be asked whether they carry insurance, and if so, what type of insurance. Further questions could cover who is providing the insurance, the claims they have submitted and types of claims, how these were settled, their satisfaction or otherwise with the insurance cover, and suggestions to improve insurance services. This survey sample would also enable an estimate of the percentage of vessels that carry insurance.
- A similar survey could be conducted for aquaculture insurance by the appropriate NOAA offices, in cooperation with the west coast and east coast shellfish grower associations. Insurance providers that provide insurance for commercial fishing and aquaculture could be contacted by NOAA and asked for information and their views. While insurance companies have not been responsive to surveys sent out by FAO or queries by consultants, they would likely respond to NOAA. Such a survey would provide a solid baseline for future updates. Based on the findings of these surveys, recommendations could be prepared on how insurance services – and thereby risk management – could be expanded and made more useful and inclusive. One further recommendation would be for the U.S. Department of Commerce to establish a database through NOAA and support the analysis of survey results.
- Finally, information regarding the insurance coverage of fishing vessels and fish and shellfish farms could be collected by licensing and registration authorities at the state level. When renewing the licenses/registration of commercial fishing vessels, and fish and shellfish growing enterprises, owners should be required to provide information on the type of insurance they have. This information could then be shared with the U.S. Department of Commerce and NOAA.

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Oceania

Asia

Africa

Europe

America

The current state of capture fisheries and aquaculture insurance – Regional reports

Regional report of Africa

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1. INTRODUCTION

The objective of this report is to provide an overview of the current state of fisheries insurance in Africa, with a focus on updating the information presented in the 2006 aquaculture review (Van Anrooy *et al.*, 2006) and the 2009 capture fisheries review (Van Anrooy *et al.*, 2009).

In this report, African fisheries includes both wild capture fisheries (marine, brackish water and freshwater systems) as well as aquaculture production. More specifically, wild capture includes the large-scale commercial offshore fisheries, nearshore fisheries within territorial limits (12 nautical miles) and artisanal (small-scale) fisheries that use a multitude of gears, vessels types, and target many different fish species. Aquaculture would include sophisticated offshore marine cage culture for finfish and shellfish ("mariculture") as well as more basic aquaculture production systems, such as community-based pond culture. Aquaculture production systems may also vary in design between closed and open systems, both of which have very different technological and environmental characteristics. This broad diversity in the operations of both wild capture and aquaculture entail quite different risks for insurers. To try to capture this variation, and the insurance profiles of both wild capture and aquaculture, five African countries have been used as examples for the purposes of this study. The five selected countries are Egypt, Morocco, Namibia, Nigeria and South Africa. These countries were selected based on of the amount they contribute to capture fisheries and aquaculture production in Africa, as well as to provide an equal representation of the African subregions, namely: northern Africa (Egypt and Morocco), western Africa (Nigeria) and southern Africa (Namibia and South Africa).

The information compiled for this chapter draws on a range of reference materials. These include generic reports such as the latest FAO report on the state of world fisheries and aquaculture (FAO, 2020a), FAO Country Profiles (FAO, 2021), data from the World Bank archives (World Bank, 2020) and a regional review of aquaculture in North Africa (El Sayed, 2017). Where available, country-specific data have been obtained and referenced in the pertinent sections. Occasional reference is made to examples from countries other than those selected. In addition, the report also draws on the results of the FAO survey on fishery and aquaculture insurance conducted within the framework of the overall study. However, it should be noted that the number of responses to the survey from Africa was low, in general terms;[1] in some instances data have therefore been augmented by using information available from the websites of insurers.

[1] The survey was administered online and received responses from six participants representing insurance companies servicing capture fisheries, and three participants from aquaculture from Nigeria and South Africa. From the total number of responses received, five surveys were fully completed.

2. THE STATE OF CAPTURE FISHERIES AND AQUACULTURE PRODUCTION

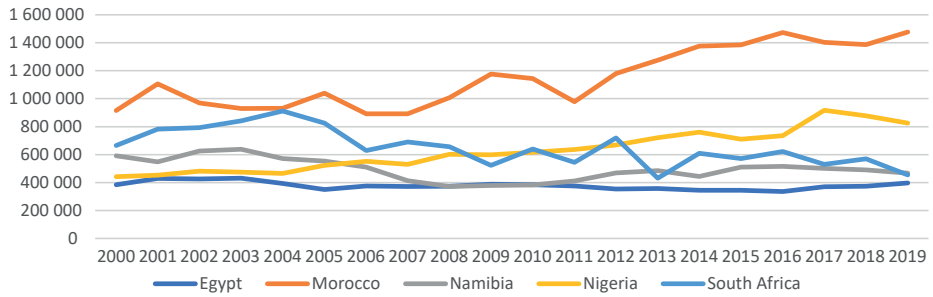
Africa's contribution to world fisheries production is relatively modest,[2] with the region's capture fisheries production accounting for only 7 percent of global production. However, Africa is the second-largest region after Asia in terms of number of fishers and aquaculture workers: with an estimated 5.4 million fishers and aquaculture workers, it represents 9 percent of the world total. FAO divides fisheries areas broadly into subregions; yet while Africa's proportional global contribution in each of these areas is rather low, inland waters produce 3 million tonnes and make up 25 percent of total global inland fisheries production. This dichotomy demonstrates the importance of artisanal fisheries in Africa, and in particular the importance of the African lakes, including Lake Victoria. This context is important for a region with high levels of poverty.

With regard to aquaculture, in general terms Africa seems to lag behind with respect to the global growth trend. However, the most recent data suggest that aquaculture development in the region is accelerating faster than the global average (FAO, 2020a), and the sector now accounts for 16–18 percent of total fish production in Africa. Aquaculture in Africa is primarily carried out in inland fresh water systems. Countries such as South Africa and Egypt are expanding their aquaculture and applying new technologies – the introduction of cage-culture systems in mariculture is one example – and Egypt in particular has developed its aquaculture infrastructure (freshwater production) significantly since the 1960s.

Figure 1 and Figure 2 show the differences between the five selected countries in both wild capture fisheries and aquaculture. These relative differences in proportion and scale have a direct influence on the type and extent of the insurance demand.

FIGURE 1

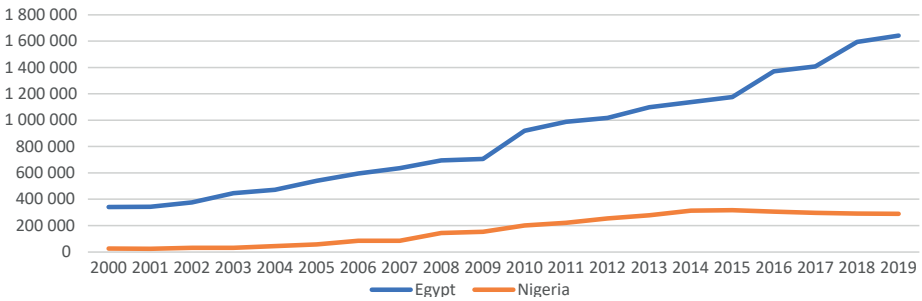
Total wild capture fish production in tonnes in the five selected African countries, 2000–2019



Source: FAO Fishery and Aquaculture Statistics. Global capture production 1950-2019 (FishstatJ).

FIGURE 2

Total aquaculture production in tonnes in Egypt and Nigeria, 2000–2019 period



Source: FAO Fishery and Aquaculture Statistics. Global aquaculture production 1950-2019 (FishstatJ).

[2] Information presented in this section is mainly based on FAO (2020a) and FAO FishStatJ - Software for Fishery and Aquaculture Statistical Time Series, available at www.fao.org/fishery/statistics/software/fishstatj/en

South Africa

In economic terms, South Africa's commercial fisheries industry is relatively small, contributing 0.5 percent to the country's GDP and directly employing some 4 000 people; about 140 000 jobs depend on related activities (Augustyn *et al.,* 2019). The total landed value of these fisheries was most recently estimated at USD 700 million. The largest and most valuable commercial sectors include the deep-sea trawl fisheries, small pelagic purse seine fisheries, squid jig fishery, offshore west coast rock lobster trap fishery, and the line and net fisheries (DAFF, 2016). Some 29 000 small-scale fishers depend on and are concentrated in a few coastal areas where they play a significant part in the local economies.

In terms of aquaculture, marine aquaculture is still in its infancy (with a value currently estimated at USD 34 million in South Africa) but has been identified by the government as a growth industry worthy of support (Augustyn *et al.,* 2019). The mariculture industry is focused on Saldanha Bay, where mussel and oyster culture has been designated an Aquaculture Development Zone (ADZ), which now also includes cage-culture trials for salmon. Onshore aquaculture for abalone is a small but lucrative industry that is well established on the country's south-western coasts.

Namibia

Namibia is Africa's fourth-largest capture fisheries nation behind Morocco, South Africa and Mauritania. The main Namibian commercial species are hake and horse mackerel. Other species of more recent importance include orange roughy, the deepwater crab trap fishery, monkfish, rock lobster and the large pelagic fisheries for tuna. The majority of fish stock are considered to be optimally utilized. The fishing industry generates approximately USD 680 million in export revenue (2016) – the second most important forex earner after mining.[3] The fishing industry provides some 16 800 direct jobs, 70 percent of which are in the hake fishing and processing sector. Horse mackerel processing is an emerging employment creator, together with mariculture (MFMR, 2015; MFMR, 2017; NPC, 2016).

With regard to aquaculture, mariculture is a developing industry based predominantly in Walvis Bay and Lüderitz Bay (ATFALC, 2012). Walvis Bay and Luderitz Bays have mariculture farms for oysters and mussels as well as onshore production of abalone; mariculture production is modest, however, at less than 2000 tonnes annually.

Morocco

Fisheries in Morocco account for about 3 percent of its GDP. Capture fisheries production was estimated at 1.4 million tonnes in 2017 (Cervantes *et al.,* 2018), with the bulk harvested from the Atlantic side. Current wild capture production is the highest in Africa, at almost 1.5 million tonnes (FAO, 2019). The main species caught are small pelagics, dominated by anchovy and sardine (about 70 percent). The high seas fishery sector targets tuna species, which are taken by international vessels, mostly from European Union as well as Russian and Asian fleets. In 2017, the fisheries sector in Morocco provided direct employment to 111 464 people; if the direct and indirect employment provided by small-scale fisheries were to be included, the number could be as high as 400 000 people. However, the small-scale sector remains largely undeveloped primarily due to the lack of infrastructure, harbour facilities and processing plants.

Aquaculture production is rather limited and amounted to approximated only 1 200 tonnes in 2017, employing around 250 people. It produces European seabass, gilthead seabream and oysters, and takes place mainly in marine cage culture. Inland aquaculture mostly involves carp production.

[3] Namibian dollar (NAD) 10 billion. Average exchange rate in 2016 was 14.7 NAD = 1 USD.

Nigeria

Nigerian fisheries contribute about 0.5 percent to the national GDP. Fisheries are diversified and split broadly between marine wild capture (36 percent), inland water systems (33 percent) and aquaculture (31 percent) with a total production of 734 731 tonnes reported in 2016. More than 80 percent of Nigeria's total domestic capture fisheries production is generated by artisanal small-scale fishers from the coastal, inshore creeks of the Niger Delta, as well as lagoons, inland rivers and lakes. These fishers mostly use canoes. Further offshore, into the EEZ, tuna and tuna-like species are targeted by a small domestic fleets as well as foreign vessels under specific licensing agreements managed through the International Commission for the Conservation of Atlantic Tunas (ICCAT).

Nigeria is the largest aquaculture producer in sub-Saharan Africa, mainly focused on fresh or brackish water. Since 1999 aquaculture production has grown steadily to over 300 000 tonnes. The latest (2018) production figure reported was 291 000 tonnes with an off-farm value of approximately USD 840 million (FAO, 2020b), mostly driven by freshwater production. Catfish, typically grown in ponds and tanks, is the most farmed species in Nigeria, constituting over half of the total aquaculture production by volume.

Egypt

Capture fisheries production in the last decade has remained relatively static, at around 350–400 000 tonnes. In 2018 the estimated capture fisheries production was 373 000 tonnes (FAO, 2020b).

Aquaculture production, on the other hand, has grown rapidly over the last two decades, and from 2003 onwards surpassed production from wild capture fisheries. In 2018, aquaculture production was reported to be 1.56 million tonnes, accounting for around three-quarters of the country's total fish production. The off-farm value was estimated at USD 1.47 billion in the same year (FAO, 2020b). Tilapia culture in freshwater and inland impoundments is most common, followed by flathead grey mullet culture. There are an estimated 115 000 hectares of aquaculture ponds in the country. In terms of marine culture, European sea bass and gilthead seabream are the primary species, although other species such as the meagre (drum) and shrimp are also produced in modest quantities.

3. THE INSURANCE MARKET

Even though the insurance industry across Africa continues to be one of the most "disrupted", the industry has done well in spite of recent economic and political uncertainty, with positive development and large opportunities for growth (PWC, 2020).

In the overall global ranking of insurance, the African market continues to grow. African insurance premiums accounted for USD 6 691 million in 2016. While globally insurance premiums increased by 5 percent between 2017 and 2018, the African insurance market has remained stable, at only 1.31 percent of the global premium (by extrapolation this also broadly applies to the fisheries and aquaculture sectors) (SwissRe, 2020). Within Africa, South Africa is by far the leading country with USD 48.269 billion in premiums, or 70.59 percent of the whole continent's premium income. Morocco, was ranked second in Africa with 6.7 percent of the share of total premiums. Egypt, Nigeria and Namibia all contribute about 2 percent each. Specifically with regard to turnover per class of business (2016–2017), maritime insurance (a category that includes capture fisheries and aquaculture insurance) is proportionately higher in Egypt (5.4 percent) and Morocco (1.51 percent) and does not feature significantly in the other selected countries: in other words, the maritime sector makes up a very small proportion of the total insurance business in South Africa (Atlas Magazine, 2020).

The African Reinsurance Corporation (Africa Re) remains the leading pan-African reinsurance company and the largest reinsurer in Africa in terms of net reinsurance written premiums.[4] From the moment of its inception, Africa Re had a strong political motivation, namely to strengthen the base for insurance in Africa through cooperation. There are currently 43 members out of 53 African countries and it has the highest reinsurance turnover of all reinsurers in Africa (Africa-Re, 2020). Lloyd's of London, the largest global insurer for marine risks, is also prominent in marine insurance throughout Africa. Lloyd's is licensed to provide reinsurance in Morocco, Nigeria and Egypt, though in Morocco it is required to cede an obligatory 10 percent of all business to the Société Centrale de Réassurance (SRC). Local Moroccan insurance companies are required to offer the SRC up to 50 percent of any reinsurance contracts. Although Lloyd's underwrites most of the bigger insurance groups when it comes to all-risk marine insurance, it is primarily a hub for buying and selling a variety of coverages: not just marine insurance, but also professional and indemnity insurance.

There are numerous periodical reviews undertaken on the insurance sector in Africa (PWC, 2020; KPMG, 2019). These reports show that African insurance markets and companies are growing, in some countries, such as Morocco, and that the insurance markets have not yet been fully liberalized, allowing foreign companies to underwrite. One of the main drivers of transformation in African insurance is the regulatory framework modernization. For example, due to the easing of the regulatory framework that facilitates the development of a micro-insurance framework in South Africa, the insurance market now offers alternatives to reduce the cost of insurance at the lower end of the market. This is particularly pertinent when it comes to fisheries and aquaculture insurance in Africa, given the prevalence of numerous small-scale producers and value chain stakeholders.

4. SUPPLY AND DEMAND

Capture fisheries

South Africa and Nigeria are the two largest economies in Africa. For this reason alone, these countries have well-established insurance/reinsurance and underwriting networks. More specifically, the insurance (and reinsurance) market in South Africa can be said to be by far the largest in the region. According to KPMG (2019) there are at least 37 short-term insurers, in South Africa, 22 long-term insurers and 8 reinsurance companies (no domestic or international breakdown available). Together the top five short-term insurance companies have a market share of 52 percent (Marr *et al.,* 2011). In Nigeria there are 57 insurance companies, of which 28 are "non-life" insurers, while in Morocco, Namibia and Egypt there are reported to be 19, 30 and 32 companies respectfully, with the market dominated by the largest groups and the many smaller companies playing only a minor role. While the number of insurers providing capture fisheries and aquaculture insurance services is currently unknown, what is certain is that, at least in Nigeria and South Africa, there is a strong presence of national and international marine insurers. This is due to the strong dependence on the oil and gas industry in Nigeria, while in South Africa it is related to the country's importance to marine traffic around Africa (the "cape").

Fisheries characteristics and its relationship with demand/supply of insurance

Supply and demand for insurance is expected to be proportional to the scale of the economies in specific regions and the extent of the country-specific fisheries. Namibia and South Africa both have large industrial fisheries, with a significant investment in large capital items. Both fisheries comprise wet fish and freezer vessels, as well

[4] The Africa Re is based in Nigeria it also has a subsidiary in South Africa, the African Reinsurance Corporation (South Africa) Ltd.

as sophisticated processing plants producing high-quality value-added products. In Namibia, there were 116 Namibian-registered commercial fishing vessels in 2018–2019. The dominant fleet comprises demersal trawlers that include both large freezer vessels (up to 70 m in length), as well as a smaller fleet of monk trawlers. In South Africa, fisheries include about large 60 offshore trawlers (up to 80 m length overall or LOA), 100 small purse seine boats (10-30 m LOA), about 40–50 factory freezer squid jiggers, 450 line-fish boats (up to 10 m LOA) as well as many rock lobster trap boats and thousands of smaller, undecked small fishing boats. With large-scale fisheries dominating the fisheries sector in both countries, and with such high investment in large capital items, insurance can be considered as a prerequisite for most companies or even individual boat owners to operate; as such, there is a clear demand for fisheries insurance services in both countries.

The significant diversity of fisheries and vessel types in South Africa ensures that the demand for insurance services for fishing boats, and any related gear and infrastructure, is equally diverse. Furthermore, because of its unique location at the southern end of the continent and the maritime sector's consequent exposure to the southern ocean, South Africa has greater marine-related risks associated with oceanic and climatic events; these are expected to contribute to higher risk and an increased demand for insurance.

In Nigeria there is a split between the small domestic fleet targeting shrimp, the tuna pole-and-line fishery, and the many artisanal craft used in the pelagic fishery, which range from 5.8 m to 7.9 m LOA. Further north, the Moroccan fleet ranges from larger industrial vessels targeting small pelagic stocks to nearshore small-scale fishers using a multitude of vessel types. In Egypt, the number of powered fishing vessels was estimated at 3 840 in 2018, while the non-powered vessels added up to over 23 000 (FAO, 2020b). Most of the vessels are small wooden craft of less than 10 m in length, powered by inboard or outboard engines, and suitable for coastlines with many small landing sites. Only an estimated 2.5 percent of craft are large, steel-hull vessels with engines of more than 500 horsepower. The commercial fisheries and their associated gears are also highly diverse. While this is the most recent information available to FAO, it clearly shows the small-scale nature of the fisheries in these countries. As a consequence, and as is the case with other North African countries, insurance cover for these fleets, and the land-based seafood processing facilities that serve them, is low.

Freshwater fisheries are typically small-scale and it is only in the large African lakes – such as Lake Victoria and Lake Malawi – that larger vessels are found, where operations are sufficiently organized and may incorporate fish processing facilities. The cold chain management of fishery products is critical, and throughout Africa, whether inland or along coastlines, maintaining and financing ice plants and other cooling facilities is challenging for communities. Poor cold chain management is essential for the export of high-quality fish products that can lead to higher profits for fishers. It also negates the viability of insurance cover, as insurers and underwriters are generally averse to risks associated with poor product quality control.

In countries such as in Egypt, where vessel numbers are high but comprise many thousands of smaller vessels and nearshore domestic and artisanal fishers, insurance is markedly low. This was also demonstrated in the survey undertaken by FAO for this study, in which smaller size classes of fishing vessel (0–12 m) were poorly represented in the vessel size categories insurers reported providing coverage to in the region. By contrast, in countries such as Namibia and South Africa, where large-scale industrial fleets are predominant in production, the demand for insurance services by these fleets is largely met. Overall, while the insurance market seems to show considerable potential in the selected countries, the high proportion of small-scale fleets in the region means that the insurance of fishing vessels is low when compared to fisheries in other parts of the world.

It is worth highlighting that the environmental disasters that have occurred in recent years (e.g. oil spills) have had an impact on the maritime insurance and reinsurance industry globally, including in the Africa region. Underwriters have been more conservative in the last decade, and this has influenced the maritime insurance market, including fisheries.[5] This has also resulted in increased demand for P&I insurance cover for pollution and other potential environmental impacts, as well as sensitivity to the need for professional indemnity for environmental practitioners. This demand not only applies to the maritime transport and oil and gas industry but also specifically to the fishing industry in South Africa and Namibia. Further, pressure from civil society and NGOs has resulted in maritime regulatory authorities – such as the South African Marine Safety Authority (SAMSA) – increasingly focusing on the fishery sector and enforcing anti-pollution measures, including awareness of both macro- and microplastics pollution.

Regulatory frameworks

Besides the economic and country-specific fisheries characteristics, local regulatory frameworks can also influence the supply and demand for insurance. Specifically, in South Africa, the stringent safety standards of the South African Maritime Safety Authority (SAMSA) dictate that all maritime transport should meet IMO requirements (e.g. regulations: DOT Notice R651 on the safety of navigation and DOT Notice R153 on Marine Pollution IBC codes) (DOT, 2019a,b) and vessel owners must produce safety certificates before being granted a fishing license. A similar standard applies to Namibia. While this framework does not require insurance *per se*, many new boats that are built in South Africa and require financing also require insurance. Other countries in Africa, such as Namibia and Morocco, will have similar stringent maritime safety measures for fishers and their boats that are consistent with global standards (e.g. IMO).

In this respect it is worth noting that South Africa has ratified the IMO Cape Town Agreement (CTA) of 2012, the Convention on Training and Certification for Fishing Vessels personnel (STCW-F) of 1995 and the ILO Work in Fishing convention (C188) of 2007. Morocco and Namibia have ratified the STCW-F and C188 conventions, while Egypt and Nigeria have not ratified any of these three international instruments, which include requirements for the safety and insurance of vessels and fishing crew, among other aspects.

With regard to small-scale fisheries, the institutional mechanisms and financial systems available to implement insurance policies (e.g. microfinance loans, specialist brokers) are absent from many fishing communities in Africa. In South Africa the development of small microenterprises (SMEs) has been promoted, including the financing of new fishing enterprises; the same is true for the aquaculture sector in Egypt (Naziri, 2011). In recent years an increasing number of financial institutions in South Africa have delivered finance for SMEs, including in the fishery sector, which has been used for the purposes of working capital, asset-based and property finance (Marr *et al.*, 2011). These financial institutions include: Business Partners Ltd, Khula Enterprise Finance, and to some extent the Industrial Development Corporation (IDC). Business Partners (formerly the Small Business Development Corporation) provide financing for fishers to build boats and other infrastructure, but will only do so where collateral is available. In countries with significant small-scale fisheries that coexist with industrial fisheries, the need for microfinance is high. However, while the availability of microfinance might increase investments in these small-scale fisheries, it

[5] This is borne out by the author's own professional experienced of undertaking EIAs for fisheries and offshore oil and gas surveys and installations, where practitioners are now required to increase their professional indemnity cover when providing advice on marine-related assessments, due to the perceived increased risks (Japp, personal communication, 12 October 2021).

may not necessarily result in increased use of insurance, as microfinance schemes have a strong community-driven approach, which sometimes include a mutual insurance programme.

Foreign-flagged fishing vessel operations are not permitted in South African and Namibian waters (only in exceptional circumstances). Morocco, on the other hand, and to a lesser extent Nigeria, license fishing boats with foreign flags. These fleets are subject both to national requirements – e.g. operational requirements within a country's jurisdiction – and flag State control. Morocco has a Sustainable Fishery Partnership Agreement (SFPA) with the European Union, which aims to facilitate European Union boats (predominantly flying a Spanish flag) to fish inside the Moroccan EEZ, mostly for tuna and small pelagic species, while also financing the development of fisheries-related infrastructure and research. These foreign vessels have more stringent operational requirements and therefore must carry higher insurance protection against risk (such as that mentioned in relation to the European Union directives). In these cases operators generally have international cover to meet the requirements at all jurisdictional levels including for risks associate with maritime security (Bockmann, 2019).

Aquaculture

Although there is a paucity of information on the demand for aquaculture insurance in Africa, the situation overall does not appear to be that different from the 2006 aquaculture review (Van Anrooy *et al*., 2006). Aquaculture insurance does not appear to be widely used across the African continent, with the exception of Egypt and South Africa.

Egypt has the largest aquaculture industry in Africa and is mainly freshwater-based, with a market value of over USD 1.3 billion; globally, it is second only to China (Mactaggart, 2011). The aquaculture industry in Egypt now provides 65 percent of the country's fish needs, with virtually all the output coming from small- and medium-scale privately owned farms (Marr *et al*. 2011). Although up-to-date information on the number of hatcheries and aquaculture cooperatives operating in Egypt is not available, considering the relatively high production of aquaculture it is clear that there is a well-established sector in the country, with a high but unmet demand for aquaculture insurance. Programmes aimed at stimulating and supporting the development of aquaculture in Egypt have been implemented over the years, such as the support provided by the European Commission and World Bank to the Social Fund for Development (SFD).[6] Aquaculture insurance was not a priority in these programmes and therefore these services continue to be almost non-existent. Limited credit availability is clearly one of the main factors slowing down the development of Egyptian aquaculture (and probably also that of other countries in Africa), primarily because of high interest rates for loans; associated with this, insurance is a prerequisite to cover the risk. To facilitate access to the SFD funds for small enterprises (including aquaculture) the Cooperative Insurance Society (CIS) for SMEs, supervised by the Egyptian Insurance Supervisory Authority (CIS), provides credit guarantee services so that 80 percent of an SME's loan through a participating bank is covered in the event of default, with the remaining 20 percent shared equally by the bank and the Small Enterprise Development Organisation.

In South Africa, the most established aquaculture sectors are the abalone and mussel farms. Infrastructure for abalone is well established (land-based), thanks to high demand from an established international market (Asia and China), but the number of farms is limited. Risk to these farms is high, particularly for disease and low oxygen events that can lead to poisonous red tide outbreaks, and operators insure this.

[6] More information is available at: https://www.worldbank.org/en/topic/socialsustainability/overview

Poaching of abalone is also a high risk in South Africa, albeit one that is not generally covered by insurance. Marr *et al.* (2011) note that one of the elements constraining the development of aquaculture in South Africa is an inaccessible financial sector and poor financial support services, including insurance. This situation does not seem to have changed significantly in recent years (Calydon, personal communication, 2020). Overall, while there is a government-supported aquaculture industry in South Africa the financing of small aquaculture businesses is constrained by externalities that also include limited access to insurance services for small-scale producers.

5. UNDERWRITING

As in other parts of the world, fishing companies in Africa may require insurance to cover assets (i.e. vessels, factory, cold storage, motor vehicles, and machinery) as well as loss of profits / business interruption following a loss. They will also have employees that they need to insure with group life and accident insurance, employee health benefits, etc. On the sales side, trade and/or credit insurance may be a requirement, including forward cover for exchange rate risk. International and domestic insurance companies providing services in Africa provide all these types of insurance (i.e. P&I, vessel insurance, stock mortality, marine/public/employees/product liability, business interruption and building, and onshore/offshore equipment insurance). Risks generally not covered would include, for example: exchange rate fluctuations, loss of fishing time and poor catch rates, which can lead to other consequential losses. One insurer providing services only in Africa reported to the FAO survey that his/her company provided indemnity-based insurance to cover aquaculture stock mortality against natural disasters and diseases.

Insurance companies in Africa offer their services mainly through insurance brokers. For example Marsh, one of the global leaders in insurance broking services, has a subsidiary in Africa and acts as broker for various companies and clubs. In South Africa, P&I Associates have offices in the main ports and are the principal P&I representatives in the southern African region. P&I Associates represent 13 clubs (IGIP, 2020), each of which is an independent, not-for-profit mutual insurance association, providing cover for its shipowner and charterer members against third party liabilities relating to the operation of ships. Business in Africa appears marginal and few clubs advertise their market areas as "Africa" (only the *Shipowners Club* appears to have a significant African profile and presence in the selected countries). It is therefore difficult to determine accurately the number of specialist underwriting companies that explicitly serve the fishing industry in Africa. In the case of aquaculture insurance, respondents from the FAO survey reported that in addition to insurance brokers, they provide their services through a formal cooperation with aquaculture associations/cooperatives.

With respect to the size (capacity) of risk that companies are able to underwrite, the insurance companies that responded to the FAO capture fisheries insurance survey (from Nigeria and South Africa, but who provide services in the entire region) reported having a net capacity range of up to USD 1 million. In the case of aquaculture insurance, a company from Nigeria responded to the FAO survey with a net capacity of up to USD 23 000. For anything greater than the values indicated it is likely that the companies would seek reinsurance.

6. PERILS COVERED

The terms and conditions of the insurance policies that are available to capture fisheries and aquaculture can be applicable to both as "all risks" or "named perils".[7] The insurance companies who replied to the FAO insurance survey reported that they are able to cover most perils, at the discretion of the insured party, and based on a negotiation with the insurer. Some perils such as natural calamities/disasters, technical failures and collision might apply equally to both wild capture and aquaculture insurance. Broadly, natural disasters and extreme weather events are ranked among the most common insured perils. Cover for war and hostile acts are less frequently covered by insurers.

Capture fisheries

Perils can include accidents resulting from human error or those caused to third parties, and damage due to marine debris, as well as theft or vandalism. In the specific case of Africa, vessel hijackings off the coast of Somalia and West Africa (Nigeria) have been prevalent over the last decade; it is therefore understood that insurers do not insure for such events unless operators have additional security on board.

Aquaculture

Perils covered often include diseases, red tides,[8] water pollution and other environmental events, such as oil pollution, which are common risks to aquaculture operations in Africa. For example, in the Saldanha Bay Aquaculture Development Zone (ADZ) in South Africa, marine rope and cage cultures for oysters and mussels are prone to seasonal outbreaks of "red tides". The infestation of the shell-boring polychaetes such as *Polydora websteri* in the commonly grown pacific oysters (*Crassostrea gigas*) resulted in a reduction of oyster aquaculture in many parts of the world (including South Africa and Namibia) and losses from it are covered in some insurance policies. Oil pollution and or other environmental events (anthropogenic) are a common risk in many parts of Africa, particularly in enclosed areas or where systems are in proximity to effluent outfalls (and where heavy metals may be prohibitive especially for filter feeders); risks of this kind may be covered by insurance (Calydon, personal communication, 2020).

Although it may be assumed that most aquaculture systems and risks are similar on a global scale – and common perils are therefore potentially covered by aquaculture insurance in Africa – it is important to stress that each aquaculture location has unique risks. For example, in South Africa, poachers who once focused on abalone (and which led to the collapse of the abalone wild-capture industry), have now shifted their attention to the farmed product: theft and vandalism is therefore now a real peril for the aquaculture industry in the country. Technical perils, such as pump failures in closed (recirculation) systems, are not covered extensively, most likely because human error would be a significant contributing risk factor.

7. POLICIES

Capture fisheries

The total number of policies in the capture fisheries sector is presently unknown. A couple of insurers from Nigeria and South Africa each reported having more or less 50 capture fisheries insurance policies in effect; however, it is reasonable to estimate that the total number of policies is larger, especially in those countries. It can be assumed that the main standard types of marine policies – namely hull, cargo, freight revenue

[7] "All risks" is an open peril policy that covers everything except what is specifically excluded in the policy; a "named perils" insurance policy covers only what is specifically noted in the policy.

[8] Red tide is a poisonous plankton event associated with high water temperature that can effectively decimate production.

and negligence – are applied to the capture fisheries sector in each of the countries selected. The insurance companies consulted indicated that the type of policies issued would relate to both generic and specific aspects of each policyholder.

Generally, based on responses to the survey, 60 percent of respondents indicated that they provide insurance for offshore and coastal fisheries, while fewer indicated that they provided coverage for inland fisheries. This is consistent with the interpretation that the predominantly small-scale fishers found in Africa (inland and marine), together with the associated fisheries comprising small vessels and highly variable gear types, are not insured.

Vessels insured

The exact number of fishing vessels insured in the selected countries of Africa is currently unknown. The author is mindful of the fact that numbers available in FAO annual statistics (FAO, 2020b) can be misleading, in particular with regard to fisheries in Africa. Nigeria, for example, has an estimated 30 673 fishing vessels; Egypt some 3 840 motorized and 23 352 unmotorized fishing vessels; Morocco has 20 256 motorized vessels and only 325 unmotorized fishing vessels. There is more confidence in the fleet statistics of large-scale industrial vessels, such as in South Africa (1780 vessels) and Namibia (180 vessels). It is reasonable to assume that a large share of the industrial fishing vessels operating are insured. Taking this into consideration, 116 industrial fishing vessels are insured in Namibia, and 225 in South Africa, including hake trawlers and small pelagic purse seiners. Nearly 2 000 large-scale industrial fishing vessels are insured in Morocco.[9] Most of these vessels insured target high-value species and large volumes, such as hake and shrimp trawlers, squid freezers, pelagic longliners and small pelagic purse seiners.

In the absence of good data on the number of fishing vessels insured in the small-scale fisheries sector, and based on the author's expertise, the majority of small-scale fishers are expected to be significantly underinsured. For the purposes of this report it has therefore been assumed that only 10–20 percent of the registered vessels in Egypt, Nigeria and South Africa currently carry insurance. In this regard, it has also been assumed that at least 20 percent (666) of the 3 330 registered vessels from the minor fisheries sectors (small-scale and recreational) in South Africa are insured. According to the most recent FAO statistics (FAO, 2020b) the fishing fleet in Nigeria consists of 30 673 engine-powered fishing vessels, of which it is assumed that only 10 percent (3 067) are insured. In Egypt, meanwhile, the total number of fishing vessels insured remains very uncertain. As with the other countries in this report, for the purposes of consistency it is has been assumed that an estimated 10 percent of the total powered fleet registered in Egypt is insured. In 2018 the fleet comprised 3 840 vessels, meaning that approximated 384 were insured.

Applying the above assumption, the estimated number of fishing vessels insured in the five countries covered in this report is about 6 500 vessels. However, it is important to note that these data are based on the approximate numbers reported for Africa – in excess of 400 000 (FAO, 2020b) – which include both powered and non-powered vessels. The powered vessels make up only 34 percent of the total and include outboard motor-driven vessels, most of which are not covered by insurance. A conservative estimate would suggest that insured vessels therefore constitute an even smaller proportion of the 34 percent of powered vessels classified as part of the "African" commercial fleet operating in the main commercial fishing areas, which include the Benguela, Canary, Agulhas and Somali ecosystems. The proportion of vessels insured

[9] Data on the total number of commercial fishing vessels is based on Warman (2019).

in Africa is therefore estimated at no greater than 20 percent of the number of powered vessels; in other words, a maximum of 28 000. This figure constitutes no more than 7 percent of fishing vessels of all types active in Africa.

It is also worth mentioning here that at the end of 2019 the IMO Global Integrated Shipping Information System (GISIS) database included just over 25 000 fishing and fishing-related vessels, including 2 436 fishing vessels and 60 fishing-related vessels registered by African countries. The registered vessels are large-scale vessels, generally of 24 m LOA or longer, and they have an IMO number. Nearly all of these are insured. The average age of African fishing vessels in the IMO database is 32 years, and a recent review by FAO (Van Anrooy *et al*., 2021) showed that the average vessel hull age of semi-industrial and industrial fleets in South Africa and Senegal was 34 years. The high vessel age (and the state the vessel is in) may also have an effect on the insurability of some of the vessels.

The types of fishing vessels that are insured will also depend upon the target fishery (inshore and offshore fisheries) and area-specific operations. In South Africa, and to a lesser extent in Namibia, insurance policies are broadly expected to cover steel and glass-reinforced plastic (GRP). In South Africa, craft in the local bait boat (pole-and-line) fishery for albacore tuna, which is mostly composed of wooden-hulled vessels (up to about 20 m), are now systematically being replaced with GRP-built vessels. Considering many of these vessels are being purchased through financing institutions for which insurance is a condition – to cover for any loans, for instance – it is expected that these types of fishing vessels will be increasingly covered by insurance in the future. Offshore tuna fleets, which fish either in national waters of the selected and other African countries, as well as transshipment vessels (carriers), are fully insured (including P&I).

Equipment and gears insured

As expected, insurers mostly cover hull damage and loss; however, policies may also incorporate coverage for fishing gears, on-board processing equipment, and electronic systems (navigational aids, fish finders). The specific type of equipment and gears covered by the insurance should be specified in the policy. In the selected African countries nearly all vessel types, fishing equipment and gear types can be covered by insurance services.

Others fisheries-related insurance

Specifically in Morocco, Namibia, Nigeria and South Africa, offshore tuna longliners carry P&I insurance in addition to hull insurance; this is mainly because they also operate regionally, outside the EEZs (on the high seas), in areas regulated by regional fisheries management organizations (RFMOs). The contracts for deployment of fisheries observers with the tuna RFMOs off the coast of Africa – namely the Indian Ocean Tuna Commission (IOTC) and the International Commission for the Conservation of Atlantic Tunas (ICCAT) – require a Memorandum of Understanding (MOU) between the observer service providers and the fishing vessel operator. This memorandum specifies that the vessel must carry P&I insurance. Although there can be exceptions, liability covering third-party personnel on these vessels is normally provided. Commonly these vessels are also covered for environmental damage to third parties, such as oil pollution. The coverage is generally arranged through the P&I clubs.

Most of the larger operators with significant capital investments – specifically, the large commercial fishing companies in South Africa and Namibia – are covered by P&I insurance; these include the large freezer and wetfish trawlers targeting hake and horse mackerel, for instance. There are numerous P&I brokers in the main ports that provide these services to industrial fishing fleets throughout Africa.

Aquaculture

There is no specific information on the total number of aquaculture insurance policies in effect in the countries covered in this report. One Nigerian insurance company who provides policies in Africa reported having 200 active aquaculture insurance policies. Given the scale of the aquaculture sector in Egypt it is highly likely that some larger aquaculture establishments are covered, but no official information on the subject was found during the desk review. The intensive and highly technical abalone farms in South Africa are known to be insured, primarily for loss of stock (Calydon, personal communication, 2020).

Species insured

Based on responses from the FAO survey, tilapia, carp, croaker and shrimp are the main species covered by aquaculture insurance in the region. Tilapia is the most popular species insured, and the most common aquaculture species in Africa. The 2006 aquaculture review indicated that shrimp farms were insured only in Madagascar. Considering that shrimp farming has expanded in Africa in recent years – including to Mozambique, South Africa and Tanzania – it is likely that large shrimp farms in those countries are also covered by insurance. It is important to note though that many shrimp farm facilities, such as those in South Africa, are no longer productive; similarly, many of the farms in east Africa have been affected by high shrimp mortality due to disease.

Growing systems insured

In many parts of rural Africa, including the selected countries, basic pond culture is the dominant growing system. Closed recirculation systems are also frequently insured. FAO survey respondents reported insuring both these growing systems, in addition to cages, and hatcheries that provide fingerlings for tilapia in Egypt and on-growing units.

The aquaculture production systems insured in South Africa may include, for example, the abalone land-based systems that use both recirculation and water drawn directly from the sea. In the Saldanha Bay ADZ previously discussed, open-water salmon cage culture is being trialled. In South Africa and Namibia open-water farming of pacific oysters and black mussel is established, and uses rope longlines, rafts and cages. Sections of these designated farmed areas for mussels and oysters in the Saldanha Bay ADZ were destroyed by a recent storm surge event, though it is unclear whether this resulted in any insurance claims.

Other aquaculture-related insurance

Details on the aquaculture systems and species insured were not found. Respondents to the FAO survey also reported providing insurance coverage to buildings and onshore equipment, as well as coverage for business interruption and product/public liability. Africa produces less than 2 percent of the global volume of aquaculture (FAO, 2020a); moreover, apart from Egypt and Nigeria, where facilities are quite advanced, aquaculture is generally practised by small- or medium-scale farmers with low investment and simple technologies. Insurance of aquaculture stocks and facilities is therefore well below the global average.

8. RISK MANAGEMENT

Survey respondents indicated that they use risk management surveys as a component of their decision-making processes, calling on both independent and their own risk management surveyors to undertake risk profiling (for capture fisheries and aquaculture). The FAO survey showed that insurance and understanding the risks in aquaculture is relatively new. In capture fisheries, the risks are largely well understood,

but in the aquaculture industry insurers are more reluctant to insure stocks when the information is deficient. Although aquaculture has developed significantly over the last few years, particularly in Egypt, there is still a lack of historical information and trends, both of which underwriters and insurers require to assess the risks involved.

Furthermore, there are some specific risks that are more prevalent in African fisheries: political instability, climate change and variability in water supply and quality, theft and vandalism. Climate change can lead to changes in resource availability, increasingly unstable weather, and sea conditions that may affect fisheries; water scarcity may also affect aquaculture production.

One respondent to the FAO survey reported that some specific minimum technical criteria are required prior to covering fishing vessels; this includes: year of build, classification certificate and loss/claim report history. These minimum requirements would be impossible for small-scale fishers to meet. Indeed, classification is not available for most fishing vessels, particularly small-scale.

While small-scale fishers are undoubtedly in need of risk protection, the means (capacity) by which these risks can be mitigated – financial or otherwise – through insurance protection is mostly lacking. The minimum technical criteria for insuring aquaculture are: stock information, water quality information, feeding regime and the availability of the right personnel.

9. HANDLING OF CLAIMS

Respondents to the FAO survey, including those African countries selected for this report, indicated that both company-owned and independent loss adjusters are used to assessing claims against policies. Concomitant with other sectors of the insurance industry, claims must be reported immediately, and policies have standard guidelines for the policyholders to make claims. Claims can be challenged and be subject to litigation.

Maritime damage/loss-claiming processes can be complex and involve multiple cost layers, such as loss of vessel (hull), loss of catch and fatalities or injury to crew Environmental impact compensation, as well as restitution for IUU fishing that has resulted in damage to fish stocks, have also both appeared in insurance claims in recent years (Williams, 2013).

Insurers will deal with claims in Africa in exactly the same way as they deal with them elsewhere. P&I cover is available for most and possibly all the liabilities a shipowner is likely to face. P&I clubs have extensive experience working with shipowners to respond to such cases, whenever and wherever they may happen, and it is very much in the mutual interest of these parties to work closely together. The litigation related to the sinking of the trawler *FV Lindsay* (SAFLII, 2021) provides a useful example in this regard. Depending on the nature and extent of a claim, adjustments may be needed, in which case it is essential to have an experienced and knowledgeable expert available who can get to the scene quickly. While this may be challenging at sea, it is certainly appropriate for aquaculture, where the facility is more accessible.

10. UNDERWRITING EXPERIENCE

The specific underwriting experiences reported to the FAO survey by the insurance companies operating in Africa is insufficient to draw any direct conclusions regarding the underwriting experience for these industries. While one company reported having good/very good experiences for a few years (over the course of the last 10 years), others reported neutral to bad experiences.

In recent years, extensive red tide events, as well as oil spills, collisions and vessel engine failures (as a result of bad engineering) have resulted in insurance claims. For instance, in 2016/2017 an extensive red tide event resulted in claims for massive stock losses at abalone farms off the Western Cape in South Africa. Insurance covered the

risk of stock loss associated with "harmful algal blooms" (or red tide); however, the insurance obligations for stock loss did not meet the insured party's expectations. This resulted in some abalone farms no longer insuring their stocks, and retaining cover only for their buildings and machinery.

Natural events have also resulted in aquaculture insurance claims, such as the storm surge that destroyed significant portions of exposed mussel and oyster longlines, rafts and cages in Saldanha Bay ADZ in the winter of 2019. Nevertheless, there is no information on how these claims affected the insurance industry underwriting experience. In the case of the abalone farms, site location as well as the design of growing systems play a big role in assessing biological or industrial threats from natural events. For example, a farm that has a closed recirculation system might consider minimizing or doing away with stock insurance, as they are able to isolate themselves from the environment during pollution events; however, this means sophisticated water quality monitoring measures must be in place on a 24/7 basis.

Bearing in mind that aquaculture insurance is a poorly developed market in Africa, the lack of loss assessment methodologies for different species groups and production systems could be an obstacle to the industry's development. The limited technical understanding of the complexity of aquaculture systems and operations is another limiting factor for insurance coverage – central to this is the apparent lack of qualified technical personnel able to undertake professional loss assessments.

11. CONCLUSIONS

Fisheries and aquaculture in Africa can be divided into two broad categories: 1) fisheries or aquaculture systems that are well established and managed within a strong governance framework; and 2) those that can be defined as largely unregulated and subject to high levels of uncertainty. These may be further divided into those established, offshore industrial fisheries under effective management, and the small-scale fisheries and aquaculture systems that are prevalent along the coast (marine) and in freshwater lakes.

There is an increasing interest, both in Africa and worldwide, in growing the "Blue Economy". A greater use of marine space (including the expansion of offshore aquaculture) and a general increase in complexity in terms of how the marine environment is used is therefore expected. As a result, the fishing and aquaculture industries will need to take measures to protect themselves against the risks associated with doing business. The higher risks associated with other users of the same marine/coastal space include maritime traffic and other forms of offshore development – the oil and gas industry, offshore mining – which may potentially also result in user conflicts. These risks will be further exacerbated by climate change.

With reference to small-scale fisheries, while there is a growing recognition of the key role this sector plays in livelihoods in Africa, the insurance cover available to it continues to be inadequate. The prognosis for fisheries exploited by coastal communities and in inland freshwater systems in Africa is not good, as most fisheries are already over-exploited, and effort levels – in terms of the number of fishers and the fishing gears used – are unsustainable.

There is thus a gap in the insurance coverage of small-scale fisheries. Very few small-scale fishers have vessel insurance and the number of small-scale fishers in Africa covered for accidents, such as through life and disability insurance services, is very small. The FAO survey showed that the range of insurance services available to industrial fishing vessel operators is not adequately extended to small-scale fisheries. Although there are initiatives in Africa relating to the microfinancing of SMEs, even where these are supported by governments (such as in South Africa), there is little to no evidence that the risks to small-scale fishers and their operations are being mitigated with appropriate insurance services. The insurance situation for small-scale fishers has

therefore not improved significantly since the 2006 aquaculture review (Van Anrooy *et al*., 2006)) and the 2009 capture fisheries review (Van Anrooy *et al*., 2009) carried out by FAO.

Aquaculture is being strongly promoted as an alternative livelihood in Africa, yet the growth in the sector also brings increased environmental risks to aquaculture systems. Although it is clear local insurers and brokers have access to the international insurance market, the aquaculture insurance market in Africa is still in its infancy.

12. RECOMMENDATIONS

The global demand for safe seafood, produced in a sustainable manner and under safe and decent working conditions, will require African fisheries meeting internationally agreed basic standards, such as those of the IMO Cape Town Agreement and ILO Work in Fishing Convention. In order to meet these international standards, industrial fisheries should proactively seek better and more comprehensive insurance cover.

Given the vulnerability of small-scale fishing communities and their importance for livelihoods in Africa in general, fisheries governance should include the protection of these communities in order to reduce risks. The current insurance models used by the established fisheries and aquaculture industries globally, and in parts of Africa, are clearly not suitable for application to small-scale fisheries in the same way. Resolving this disparity will require the development of an alternative approach to insurance. The nature of SSF is underpinned by co-management; it is likely that insurance and protection against the risks associated with small-scale fisheries will best be achieved through constructive stakeholder engagement, including with the maritime insurance industry. Microfinance and microinsurance service providers could play a key role, as they do for other sectors

Information is also critical to understanding the insurance needs of small-scale fishers. If fishers are to be protected in any way against the risks, insurers need data on their fisheries. This can be achieved through use of technological innovations such as mobile networks (catch and effort reporting) and vessel tracking. Mobile systems are currently being trialled in Beach Management Units (BMUs) in Kenya and Tanzania, for example, as a means of tracking vessels and fishers. This has many benefits connected to safety at sea, incident reporting and the deterrence of IUU fishing. Such systems (using mobile telecommunications) can report directly into a consolidated database, from which information can easily be accessed. Moreover, early warnings for storms can be sent out to reduce the number of fishers at sea during bad weather.

Aquaculture (marine and freshwater) is a significant growth area in Africa. To better understand the sector's risks, monitoring and data collection is needed to support the development of effective business models that incorporate the financing of risk protection. This process should be driven by government and management authorities in close collaboration with stakeholders, including the insurance industry and fishers.

Most African countries have fisheries and aquaculture policies and legislation in place, yet these policies and legislation are largely silent on the question of insurance in these important industries. Government support for increasing insurance coverage of small-scale producers in fisheries and aquaculture, through premium subsidies and awareness-raising programmes, could be appropriate.

The FAO survey revealed a poor awareness of the benefits of insurance among fishers and farmers. Raising awareness of the value of insurance for the continuation of capture fisheries and aquaculture business, as well as to mitigate the effects of disasters, is vital. It is therefore essential to engage stakeholders in the development and promotion of suitable insurance products.

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Regional report of Asia

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1. INTRODUCTION

The capture fisheries and aquaculture sectors are important to the Asia-Pacific region in terms of food and nutritional security, revenue generation and employment. However, major risks such as accidents, natural calamities and disease can affect fishing and aquaculture operations and their profitability. These risks can be mitigated by providing insurance coverage to fisheries and aquaculture assets. In order to increase awareness of insurance coverage for the sector worldwide, FAO therefore originally prepared separate insurance reviews for both areas: the 2006 aquaculture review (Van Anrooy *et al.*, 2006) and the 2009 capture fisheries review (Van Anrooy *et al.*, 2009).

This chapter aims to provide updated information on capture fisheries and aquaculture insurance in five countries: Bangladesh, Indonesia, Japan, the Philippines and Viet Nam. These countries were selected for review due to their importance in terms of capture and aquaculture production within the Asian region. Overviews of the situation in China and India are presented in separate chapters, and should be read in conjunction with this regional chapter. The information presented is based on a literature desk review and interviews with experts from the industry. The online survey conducted for this global review in 2020 did not yield many responses from the capture fisheries and aquaculture insurance industry in Asia.

2. STATUS OF CAPTURE FISHERIES AND AQUACULTURE PRODUCTION

In 2018, Asia (excluding China) accounted for a significant share of total global fish production, at 34 percent. In terms of aquaculture production, Asia (excluding China) accounted for the largest market share in 2018 with 42 percent; this constituted an increase of 19 percent compared to a decade before.

Bangladesh

The fisheries sector in Bangladesh is composed of marine and inland capture fisheries, as well as a large aquaculture sub-sector that includes both freshwater pond production of finfish (carp, tilapia, catfish, and other species) and coastal shrimp and prawn farming in brackish water. Fisheries and aquaculture contribute around 3.5 percent of national GDP (gross domestic product) and 1.4 percent of total export earnings to the country. As per Bangladesh Economic Review Report 2020, the GDP growth of the fisheries sector currently stands at 6.1 percent (MOF, 2021). Capture fisheries production in 2018 was 1.87 million tonnes. Aquaculture production has shown an increasing trend in recent decades from a total production of 881 000 tonnes in 2005 to 2.4 million tonnes in 2018 (FAO, 2020c). Bangladesh ranks third in inland capture fishery production and fifth in world aquaculture production. The country currently stands fourth in terms of tilapia production in the world and third in Asia.

Japan

The Japanese fishing industry is one of the most important in the world, and in 2018 the country was the eighth-largest producer in the world. While seafood production has continued to decline steadily over the past decade, combined fishery and aquaculture production reached 4.42 million tonnes in 2018: an increase of 120 000 tonnes (or 3 percent) compared to 2017. Capture fisheries production was 3.1 million tonnes, while aquaculture production of fish, crustaceans and molluscs reached 643 000 tonnes in 2018 (FAO, 2020c). In terms of production value, capture fisheries and aquaculture sales declined by 3 percent in 2018 compared to 2017. The decline was primarily due to the outbreak of *Anisakis spp*. parasites in bonito tuna, which resulted in a price drop, coupled with a sharp fall in squid catches. The production value of marine fisheries decreased by JPY 23.5 billion to JPY 937.9 billion (approximately USD 8.5 billion); that of marine aquaculture decreased by JPY 19.1 billion to JPY 506 billion (USD 4.6 billion); and that of inland water fisheries and aquaculture decreased by JPY 5.6 billion to JPY 114.1 billion (USD 1 billion).[1] In 2018 there were 151 701 fishers, a fall of 61 percent in the industry's labour force compared to 1988 level (MAFF, 2020).

Viet Nam

The overall capture fisheries and aquaculture production of Viet Nam was estimated at 7.32 million tonnes in 2018 (FAO, 2020b). The growth in overall output in recent years can be attributed to the expansion of the aquaculture sub-sector. Viet Nam's key aquaculture species include pangasius, shrimp and tilapia, though the country increasingly cultivates bivalves and marine fishes such as cobia, seabass and grouper. In 2018, the Ministry of Agriculture and Rural Development adopted a master plan that seeks to develop the industry for black tiger shrimp and white leg shrimp, aiming to double shrimp production in order to attain 1.3 million tonnes with a farm area of 750 000 hectares. In 2018, Vietnamese exports of brackish water shrimp were valued at USD 4 billion. Based on the master plan, this export value is expected to triple in the next decade (Ojamaa, 2018). In capture fisheries, tuna production has also developed in the past few years.

Indonesia

At 7.2 million tonnes, Indonesia's marine capture fisheries' output was second only to China's in 2018. The country is also reported to be the world's third-largest consumer of seafood after China and Japan. Its aquaculture industry is dominated by freshwater finfish species, notably tilapia, catfish (*Clarias* spp.), carps and pangasius catfish, followed by brackish water farming of shrimp and milkfish (Badan Pusat Statistik, 2018). Aquaculture production in 2018 was around 5.4 million tonnes with an estimated ex-farm value of USD 12 billion (FAO, 2020c). The contribution from mariculture, excluding seaweed farming and bivalves, remains marginal. Over the last five years white-leg shrimp production has increased the fastest (FAO, 2019).

The number of powered fishing vessels in 2018 was estimated at 460 000, while the number of fishers was estimated at over 2.6 million persons (FAO, 2020c). According to Ministry of Marine Affairs and Fisheries (MMAF), the number of large industrial fishing vessels has decreased by 18 percent over the last 15 years: from 4 487 in 2006–7, to 3 677 in 2017.

[1] For the purposes of consistency, the average JPY–USD exchange rate for 2018 has been used throughout this chapter. As per the OECD (2021), this was USD 1 = JPY 110.

Philippines (the)

Total capture fisheries production in the Philippines has steadily declined in recent years, reaching only 0.93 million tonnes in 2019. Meanwhile, aquaculture production has increased continuously over the last decade, reaching 2.36 million tonnes in 2019 (PSA, 2020). The share of aquaculture in the country's total fish production thus increased from 36.4 percent in 2000 to 54.2 percent in 2017. Marine aquaculture accounted for nearly 90 percent of aquaculture production volume, which consists largely of aquatic plants. Inland aquaculture accounted for 14.1 percent of the Philippines' aquaculture production in terms of volume and 23.3 percent in terms of value. Milkfish, giant tiger prawn and Nile tilapia were the top three aquaculture species by value, accounting respectively for 37 percent, 21 percent and 13 percent of the Philippines' aquaculture production value in 2017 (FAO, 2020a).

3. THE INSURANCE MARKET

Bangladesh

The insurance industry in Bangladesh is regulated by the Insurance Development and Regulatory Authority (IDRA), an independent body established under the IDRA Act 2010. The types of companies recognized and authorized to conduct insurance business are the following: i) public limited companies incorporated under the Companies Act; ii) cooperatives that were previously registered under the Insurance Act 1938; and iii) subsidiaries of foreign incorporated insurance companies. Since the entry into force of the IDRA Act, cooperative insurance societies are authorized to conduct insurance business, which includes the provision of agriculture insurance. All insurers in the country are obliged to underwrite a minimum percentage of their business to the crop, livestock, poultry and fisheries sectors. In the case of non-life insurance, insurers must write policies for a minimum of 0.1 percent of their gross written premium with rural and social sectors. This is likely to make a significant impact on insurers to design and develop products for the rural sector and to consider distribution strategies.

Under the Microcredit Regulatory Act, nongovernmental organizations (NGOs) and microfinance institutions (MFI) are restricted to acting as a broker or intermediary. They effectively serve as delivery channels for fishery and aquaculture insurance products, distributing life and general policies to their members that are issued and underwritten by registered and approved insurance companies. The Bangladesh Insurance Association (BIA) represents the interests of all private insurance companies in the market and works closely with IDRA on matters relating to the Bangladesh insurance industry.

By 2016 Bangladesh's insurance sector consisted of 78 insurance companies, of which 46 provided general insurance services. There are also two state-owned companies: the non-life insurer, Sadharan Bima Corporation (SBC) and the life insurer Jiban Bima Corporation (JBC).

While banks are the main providers of credit in the country, MFIs have the largest network, with a wide range of clients. At least 649 MFIs are licensed in the country, but only three players account for 70 percent of total loans by value. Crop insurance is currently not offered, though there are two donor-supported initiatives on agricultural crop insurance under implementation (weather-based crop index insurance). Some index-based insurance initiatives supported by NGOs have also been piloted in the country (World Bank, 2018a).

Japan

The Japanese insurance market is the largest in Asia and the second largest in the world. The structure of the market for capture fisheries and aquaculture insurance in the country has not changed over the past decade. The Government of Japan continues to play a major role in the capture fisheries insurance market and subsidizes

insurance premiums. Japan's national capture fisheries insurance policy is an integral part of national fishery disaster countermeasure policies. The latter aim to provide an equitable level of support to small-scale fishers who experience damage or lose their fishing vessel(s), catch, equipment and gears because of natural disasters or accidents. The insurance system guarantees fishers the continuation of their fishing operations.

Based on the 1965 Fishery Accident Compensation Act, fishery insurance in Japan is offered through a mutual system that covers capture fishing, aquaculture, hatchery and breeding units, as well as other fishery-related facilities. Mutual insurance is mandatory for all fishers and fish farmers, and implemented and managed through a three-tier structure. There are two categories of fisheries insurance: i) Fishing Vessel Insurance (FVI), which provides an element of stability in the management of fishery operations; and ii) the Fisheries Mutual Insurance Scheme (FMIS). Both FVI and FMIS are mutual assistance programmes operated primarily by the fishers themselves. At the village level, these schemes are operated through the office of Fisheries Cooperative Associations (FCAs). At the prefecture level, the Fishing Vessel Insurance Associations (FVIAs) manage the fishing vessel insurance programmes, while the Fisheries Mutual Insurance Associations (FMIAs) manage the mutual insurance programmes. The system is supported by subsidies from central government and special funds for rehabilitation from disasters.

Viet Nam

Over the last decade Viet Nam's insurance market has been transformed from a state-owned monopolistic sector to a more open industry, with both domestic and foreign stakeholders. In 2020 there were 71 insurance enterprises in Viet Nam, including 32 non-life insurance companies (Statista, 2021). The overall market share for agricultural insurance is minimal, accounting as it did for less than 1 percent of the entire non-life insurance business in 2015 (FAO, 2016b).

Since 2018, the Government has issued numerous policies to support agriculture and rural development. Through Decree N.58/2018/ND-CP, for example, the government regulated agriculture insurance (including aquaculture) and increased the funding of subsidies for insurance premiums. Based on this decree, aquaculture producers can receive subsidies for their insurance premiums. These range from 20 percent for enterprises that apply large-scale agricultural production technologies, all the way up to 90 percent for those classified as poor farmers.

Indonesia

Insurance and reinsurance in Indonesia are governed by Law No 4 (2014) on insurance, while the market is supervised and regulated by the Financial Services Authority or Otoritas Jasa Keuangan (OJK). There are currently 75 general insurance companies active in the country, 60 of which are life insurance and 15 are non-life insurance; there are also 6 re-insurers (Statista, 2021a). Through Law No 7/2016 concerning the Protection and Empowerment of Fishermen, Fish Farmers and Salt Farmers, the Indonesian government made the provision of insurance mandatory at both the central and local levels (FAO, 2016a). Moreover, such insurance had to include livelihood protection from risks of natural disasters, climate change and pollution. In 2017, based on the Directorate-General of Capture Fisheries Regulation (Number 1/ Per-DJDP/17) the government introduced the Insurance Premium Assistance Programme for Fishermen (BPAN) through the MMAF. This fully subsidized insurance programme is designed to support small and traditional fishermen to avoid losses that could result in occupational risks (Ani *et al.*, 2019).

Philippines (the)

The main insurance regulatory body is the Insurance Commission (IC), under the Department of Finance (DOF). The IC supervises and regulates both life and non-life insurers, mutual benefit associations, health maintenance organizations and charitable trusts. The Philippine Crop Insurance Corporation (PCIC) is a corporation owned and run by the government, which operates as an agency of the Department of Agriculture. Since 1978 it has been the agency tasked with implementing the government's agriculture insurance programme. Its principal mandate is to provide insurance protection to farmers and fishers against losses arising from natural calamities and fish diseases, although it also provides protection to non-crop agricultural assets. The corporation operates outside the regulation of the IC, and therefore determines premium rates. At present, PCIC has seven insurance lines, one of which is for fisheries insurance, introduced in 2011. The National Reinsurance Corporation of the Philippines (PhilNaRe) is the sole reinsurer.

4. SUPPLY AND DEMAND ISSUES

Bangladesh

Bangladesh is considered one of the countries most exposed to natural disasters in the world; these threats include cyclones, floods, droughts and earthquakes. Tropical cyclones and the associated storm surges originating from the Bay of Bengal cause many casualties in coastal regions, and have a significant impact on fishing fleets and coastal aquaculture. Major floods, which in some cases can affect more than 60 percent of the country, cause damage to inland aquaculture pond culture systems.

In the 1990s the SBC and JBC introduced shrimp and prawn culture insurance to cover both the loss of fish stock and loss/damage to installations, buildings, ponds, and feedstock on site. Coverage was provided against named perils such as floods, cyclones and tide surges. However, due to poor underwriting results, the SBC withdrew the policy in 2004. According to the World Bank (2018a), Bangladesh is in the nascent phase of developing shrimp insurance programmes. Pilot insurance programmes have included a named-peril product for commercial shrimp producers located in Khulna Region, and an all-risk type of cover for shrimp hatcheries located in Cox's Bazar. However, based on information shared by insurance experts and the Department of Fisheries (DOF) in January 2020, there is still no insurance programme in operation to cover these aquaculture activities.

In recent years, Bangladesh has successfully implemented a life insurance programme. It was implemented by DOF in order to identify actual fishermen and provide registration and identity cards between 2012 and 2017. The programme covered both fishermen and fisherwomen. Identity cards were issued that contained detailed information about the individual and his/her family, the date the ID card was issued, the national ID card number and the fisher ID card number. The ID card project was successful, and coverage for accidents and loss of vessels is planned for the future (FAO, 2019).

Japan

The Japanese government provides financial support to mutual insurance programmes, namely the FVIs and the FMIs, operated by fishers themselves through either the FCAs (at the village level) or through FVIA or FMIAs (at the prefecture level). The type of governmental support and the structure of the capture fisheries insurance value chain both continue to be largely the same as that reported in the 2009 capture fisheries review (Van Anrooy *et al*., 2009).

The government provides premium subsidies to small-scale fishers and fish farmers, with rates depending on the vessel size and types of insurance. The Central Society of Fishing Vessels Insurance Association reinsures and provides backup insurance for

policies under the FVI held by FVIAs at the prefecture level. By contrast, the National Federation of Fisheries Mutual Insurance Associations reinsures the policies under the FMIs held by FMIAs. The FCAs continue to be the focal point at the village level for issuing policies, insofar as they provide consultation and guidance to fishers/fish farmers. They can also act as legal representatives and sign insurance contracts on behalf of the fishers/fish farmers, and carry out some administrative tasks for the FVI or FVIAs. The policies in force are broadly categorized under: i) fishing vessel insurance and contracted value (basic damage insurance and cargo insurance), and ii) fisheries mutual insurance scheme (harvest insurance and gear insurance).

The number of vessels and people engaged in capture fisheries has fallen in recent years. The period from 2004 to 2014 saw a reduction in the fishing fleet of nearly 29 percent (from 128 352 to 91 475 vessels). The decrease was largely the result of restrictions imposed on international fisheries by several regulations, which restricted the size and age of catch, including juveniles. The reduction in stocks of targeted fish species is another cause of the ongoing decline in the fishing fleet. Other reasons include an ageing workforce and the younger generation's limited interest in fishing jobs (FAO, 2019).

In 2018, the government revised the Fisheries Act for the first time in nearly 70 years, which finally confirmed the government's authority to regulate fishing. The purpose of the new legislation was to establish a basic fisheries production system. Although some target fisheries stocks have shown signs of recovery in recent years, it is expected that Japan's fishery productivity will continue to drop owing to the reasons listed above. Demand for fishing vessel insurance is therefore on a downward trend.

Viet Nam

In 2011, the Government of Viet Nam implemented a pilot premium subsidy programme for agricultural insurance. The programme was introduced to compensate farmers (including fish farmers) in five provinces for damage caused by several perils, namely: storms, floods, droughts and some fish diseases. The programme was implemented by the Ministry of Finance, along with the Ministry of Agriculture and Rural development (MARD) and the People's Committees of select provinces/cities. It was supported with technical assistance, actuarial services and reinsurance capability by Swiss Re. The implementing insurance partners were Bao Minh, Bao Viet and VINARE (Viet Nam National Reinsurance Corporation), which designed and provided insurance products and services on a not-for-profit basis. While 7 487 households participated in the programme, with around 5 809 hectares of shrimp and catfish aquaculture area insured, the aquaculture policy was taken out of the programme in 2013 because of high losses (a loss ratio of nearly 306 percent). Six years later, in 2019, the government issued Decision No. 22/2019/QD-TT, which provided rules for a new agricultural insurance programme. Based on this new regulation, individuals engaged in agricultural production who are from poor or near-poor households are entitled to support for up to 90 percent of agricultural insurance premiums. Aquaculture producers, cooperatives, associations or large-scale producers that apply advanced technology practices are entitled to support of up to 20 percent of their agricultural insurance premiums. According to this legislation, the premium subsidies will be provided in 2020 and then the programme will be evaluated.

In 2016, the government enacted Decree No.67/ July 2014 (Article 5) on several fisheries development policies (Vietnam Law & Legal Forum 2020). This decree provides for insurance premium support to owners of offshore fishing vessels. The scheme's beneficiaries are members of fishing cooperatives/associations with a minimum engine capacity of 90 HP.

Premium subsidies include:

1. Annual support of 100 percent of ship crew insurance premiums for every ship crew member working on board.
2. Annual support for insurance premiums of ship hulls, equipment and fishing gears on board (against all risks) at the following levels:
   a. 70 percent of the insurance premium, for ships with a total main engine capacity of between 90 HP and 400 HP.
   b. 90 percent of the insurance premium, for ships with a total main engine capacity of 400 HP or over.

Indonesia

The MMAF implements the BPAN programme in cooperation with the PT Asuransi Jasa Indonesia insurance company. This programme is only for fishers registered with MMAF, and who have been issued fishing cards. It provides insurance for active fishers in the event of an accident (damage or loss of fishing facilities due to natural calamities) or loss of life while performing fishing activities. The compensation provided to fishermen in the event of an accident, or loss of life, while performing fishing activities is as follows:

i) death: 100 percent of the sum insured, or Rp 200 million (approximately USD 14 000);[2]
ii) fixed defect: maximum 50 percent of sum assured, or Rp 100 million (approximately USD 7 000);
iii) cost of medical treatment: maximum 10 percent sum assured, or Rp 20 million (approximately USD 1 400) (Safitri, 2018).

To further minimize risks for small-scale producers practising freshwater and brackish water farming, MMAF has implemented an aquaculture microinsurance scheme under its Program Asuransi Perikanan bagi Pembudidaya Ikan Kecil (APPIK programme). The scheme covers fish stock mortality arising from disease and natural calamities and provided an initial allocation of Rp 1.5 billion (USD 105 000) in 2017. The insurance product launched was the Shrimp Cultivation Business Insurance (*Asuransi Usaha Budidaya Udang* – AUBU), as the initial focus was on shrimp culture (Asei, 2017). The MMAF plans to expand the aquaculture insurance scheme for marine fish farming and insure farmed species like seaweed, grouper fish, star pomfret and white snapper in 2021.

The programme is currently being implemented through a form of synergy between the MMAF, the Financial Services Authority (OJK) and Indonesian General Insurance Association (AAUI). The designated implementing insurance company is PT Asuransi Jasa Indonesia, supported by a consortium of 12 insurance companies.

Philippines (the)

In 2011, the PCIC introduced its first specialized fisheries insurance programme, which aimed to provide protection for fish farmers/growers against losses to unharvested fish stock resulting from natural calamities and *force majeure* events. The insurance protects inland aquaculture operations – including structures such as fish ponds, fish cages and fish pens – and covers the input production cost, value of the respective fisher/fish farmer's own labour and those of the members of their respective household, and the value of hired labour force according to the Fisheries Farm Plan and Budget (FFPB). The premium rate ranges from 2 percent to 12 percent depending on the result of the pre-coverage evaluation of risks and other factors, such as agro-climatic conditions and

[2] For the purposes of consistency, the average Indonesian Rupee (Rp)–USD exchange rate for 2018 has been used throughout this chapter. As per the OECD (2021), this was USD 1 = Rp 14 237.

terrain, project management factors and production and loss records. Coverage begins at the time of stocking and continues until the harvest, as indicated in the FFPB; it must also be duly certified by an accredited fishery technologist.

In 2014, the PCIC also launched a special programme named "Agricultural Insurance for Farmers and Fisher-folk under the Registry System for Basic Sectors in Agriculture (RSBSA)". The RSBSA is a nationwide database of baseline information concerning farmers, farm labourers and fisherfolk in the 75 provinces of the Philippines. The programme fully subsidizes insurance premiums for all subsistence farmers and fisherfolk who are registered under the RSBSA; it includes all product lines offered by the PCIC (including the fisheries programme). According to the RSBSA, 1.36 million small-scale fishers have access to the insurance products offered by PCIC for their fishing and aquaculture activities. The PCIC 2021 RSBSA guidelines describe the following:

For aquaculture projects, fish stocks can be insured in the following systems:

i) Inland fish ponds: maximum of 2 500 m^2
ii) Mariculture/offshore aquaculture:
    a. fish cages of up to a maximum of 400 m^3
    b. fish pens of up to a maximum of 1 000 m^2
    c. seaweed farm culture of up to maximum 1 000 m^2.

For non-crop agricultural and fisheries assets:

The programme can insure up to a maximum of three units of fishing boats and equipment used within municipal waters; the maximum gross tonnage for fishing boats is 3 tons. The fishing boat registration issued by the Bureau of Fisheries and Aquatic Resources (BFAR) is the basis for the fishing boat's eligibility for insurance cover.

The PCIC and BFAR also regularly support fishers and fish farmers to recover from the impact of natural disasters like Typhoon Yolanda (budget allocation of PHP 88 million).[3] According to BFAR (2019) the most affected aquaculture industry was tilapia farming due to oxygen depletion, followed by seaweed farming caused by ice-ice disease. There are about 2 000 fisherfolk insured in Central Visayas, with a total insured value of PHP 600 million (USD 11 million).

5. UNDERWRITING

In Indonesia, Japan, the Philippines and Viet Nam, the governments provide support to increase the underwriting of capture fisheries, aquaculture, life and health insurance. This support takes the form of premium subsidies ranging from 20 percent to 100 percent, which are implemented through public insurance companies or government agencies. In Indonesia, subsidy insurance programmes are run by the government in partnership with insurance companies. National policy and regulations promoting coverage for small-scale fishers/fish farmers have been one of the main drivers for the development of insurance services in all the countries under review. The only exception is Bangladesh, where there are no aquaculture/capture fisheries insurance schemes in operation.

Especially in Asia, where small-scale operations dominate the fisheries sector, the distribution model adopted for an insurance product plays a key role in its success. In the insurance programme promoted in five Vietnamese provinces between 2011 and 2013, each participating commune appointed a single representative to interact with insurance companies on their behalf. This representative acted in a similar manner

[3] According to the central bank of the Republic of the Philippines (Bangko Sentral ng Pilipinas; 2021), the average annual exchange rate of the Philippine peso (PHP) to USD was PHP 52.66 to 1 USD in 2018.

to an insurance agent, recording and providing insurance-relevant information such as the aquaculture area and volumes produced. The insurance policies were provided to the farmers through these representatives, whose responsibilities also included collecting the premium from the farmers and distributing payment claims. Without such support from the local authorities and a well-constructed institutional network, insurance companies would have struggled to access small-scale farmers. Although the insurance programme in Viet Nam failed due to losses made by insurance companies in the past, the underwriting criteria have recently been amended, which has allowed a wider group of beneficiaries to subscribe. Aquaculture insurers are now extending their services in two provinces, Bac Lieu and Soc Trang.

The most successful insurance programme in Asia is the subsidized programme used in Japan. The condition to obtaining the subsidy is that fishers who operate vessels with a gross tonnage of 1–100 tons must be members of a fishing cooperative and enter into a contract with the insurance association. This arrangement provides an incentive to maximize insurance coverage, share risks and reduce costs. The government reinsures the fishing vessel insurance association through a stop -loss approach. This reinsurance activates when the insurance association pays out claims that exceed 109 percent of the net premium income for one financial year. The government reimburses 85 percent of the pay-outs that exceed this 109 percent threshold. Besides providing reinsurance and subsidizing premiums, the government provides tax exemptions, approves the articles of association and the insurance stipulations, including the insurance premium rates. It also oversees the association and the central society or apex body. The underwriting rules generally applied to all insurance policies handled by the Fishing Vessel Insurance Association (FVIA) and the Fisheries Mutual Insurance Association (FMIA) have largely remained unchanged in the last decade.

Traditional indemnity-based insurance models dominate the market for all the countries under review. In these types of insurance models payments are linked to individual farmer yields and losses. The Philippines is the only country among those covered that has recently begun to provide index-based insurance and reinsurance policies for fishery and aquaculture (House Bill, HB 6923 – DOA, 2018). This type of scheme links payments to independently established data such as local rainfall, wind speed, temperature, typhoons, cyclones and historical yield data as trigger events to release payments and compensation to the farmers and fisherfolk affected.

One critical aspect that is relevant to underwriting within Asia is the gradually evolving demand for, and distribution of, microinsurance policies among fishers and fish farmers. In Bangladesh for instance, MFIs and NGOs can provide microinsurance services. In Indonesia, the government has introduced microinsurance policies for small-scale aquaculture, which are then implemented through the main insurance company and a consortium of others. The government thus supports the development of the aquaculture insurance programme by determining the criteria for prospective insurance premium assistance. Recipients are registered, issued with an Aqua Card and certified as practising fish farmers; small-scale farmers must operate with a fish farming area of five hectares or less.

In the Philippines, the Mutual Benefits Associations (MBA) had about 7.3 million members and a premium income of PHP 11 billion in 2018 (USD 208 million). Indeed, the Philippines is fast becoming a model for microinsurance in Asia, with 28.5 percent of the population covered by micro policies (segregated data for SSF insurance policies was not available).

There are a few issues worth mentioning that prevent the implementation of sustainable fisheries and/or aquaculture insurance programmes in the region:

i) Lack of critical data – i.e. prices, causes of mortality, harvests, yields, losses etc. This remains a challenge, as a sizable number of fishers/fish farmers do not maintain proper records for stocking or harvested yields that may be assessed

by insurers for risk profiling or claim settlements.

ii) Limited experience and skills. The expertise is lacking within insurance companies to implement and administer insurance programmes that are specifically aimed at covering fishing and aquaculture risks.

iii) Low interest from reinsurers within these countries (except for Japan). Reinsurers are reluctant to cover perils in aquaculture and fisheries, as small-scale producers cannot meet the minimum standards established.

In the prevailingly traditional (extensive) production systems, disease prevention and control is rudimentary, which often limits access to existing insurance schemes.

6. PERILS COVERED

Bangladesh

There are currently no insurance programmes for capture fisheries or aquaculture. However, it is believed that the shrimp insurance programme the government plans to introduce will include both "named perils" and "all risks" policies (World Bank, 2018b). The "named perils" policies would provide coverage for stock mortality to protect commercial shrimp against tropical cyclones, storm surges, floods, and disease, excluding the white spot syndrome virus (WSSV). The "all risks" policy would provide protection for shrimp farms against natural and climatic disasters and disease outbreaks. A pre-condition for "all risks" coverage against viral diseases is that PCR (polymerase chain reaction) virus detection technology is in place to ensure that none of the brood stock entering the farms is infected.

Japan

There have been no major changes or inclusion of new perils in the capture fisheries or aquaculture insurance policies since the 2006 aquaculture review and the 2009 capture fisheries review. Capture fisheries insurance in Japan includes "all risks" cover, which provides for the damage or losses of fishing vessels in the event of an accident or natural disaster: these include sinking, stranding or fire, as well as unforeseen costs and liabilities incurred in the operation of fishing vessels. Aquaculture insurance policies are provided as the "named peril" type. They are divided in two categories: one addresses the partial and total loss of the stock due to mortality or escape during the culture cycle; the other addresses "insurable damages", losses and sinking of aquaculture facilities while in operation. Damages excluded from cover under the above categories are: war or similar disturbances; theft; contamination of water due to the discharge or leakage of sewage; waste fluids and other substances that are harmful for the cultured products; negligence by the policyholder or third parties; and excessive red tides (this excludes those under a special contract for red tides). An aqua farmer can purchase a "named peril" policy as part of cover that includes damages caused by red tides, though only in waters designated by the insurer.

The Japanese P&I club is the only organization within the country that underwrites P&I insurance for fishing vessels as well as cargo ships. The main risks covered by P&I insurance are:

i) loss of, or damage to, a fishing vessel or net caused by touching another fishing vessel;

ii) compensation for costs related to personal injury, illness or death of crew;

iii) compensation for personal injury, illness, or death of crew on board while under contract; and

iv) compensation of medical expenses and crew repatriation costs.

Viet Nam

Fishing vessel insurance is available as an "all risks" policy to cover inshore and offshore activities. It covers fishing vessels (hull), fishing gear and equipment. Additionally, the policies provide "all risks" cover for crew members working on board.

Aquaculture insurance is only available for "named perils" and covers stock mortality caused by a range of natural phenomena. These include hurricanes, tropical depressions, whirlwinds, thunder and lightning; heavy rain, floods, landslides or land subsidence caused by floods or runoffs; rising sea levels, saltwater intrusion, extreme heat, drought, hail, earthquakes and tsunamis. However, such disaster events must be announced or confirmed by competent authorities. No premium subsidies are granted for insurance against epidemics affecting giant tiger prawns and white-leg shrimps (Decision No: 22/2019/QD-TTg), (Viet Nam Plus, 2019).

Philippines (the)

Insurance provided by the PCIC to fish farmers and fisherfolk is of the "all risks" type and covers natural calamities such as typhoons, floods, droughts, earthquakes and volcanic eruptions, as well as force majeure events.

Certain perils are excluded from cover, notably those losses arising from:

i) insects, mites, birds and disease;
ii) international destruction/killing, whether by order of an official body or otherwise;
iii) any measures resorted to by government in the larger interest of the public;
iv) avoidable risks emanating from or due to neglect by the assured;
v) non-compliance with accepted farm management practices by the assured or person authorized by him/her;
vi) malicious or wilful act by the assured or any hired worker of the assured;
vii) theft and robbery, pillage, sequestration;
viii) strike or any other commotion, war or related act of any foreign enemies, hostilities (with or without declaration of war), civil war, rebellion, revolution, insurrection and military and usurped power;
ix) ionizing radiations or contamination by radioactivity from any nuclear waste, or from the combustion of nuclear fuel; and
x) oil spills and any cause or risk not specified under the covered risk section.

Indonesia

The capture fisheries policy covers "all risks" damage to fishing vessels, equipment, gears and related occupational accidents.

The aquaculture insurance programme covers perils such as damage arising from diseases leading to fish mortality, business interruptions as a result of natural disasters, fish disease outbreaks, and the impact of climate change and/or pollution under the microinsurance scheme (APPIK).

7. POLICIES IN FORCE

Bangladesh

At present no insurance programme is available for either the capture fisheries or aquaculture sectors. The government-supported life insurance programme for fishers in Bangladesh issued a total of 1.4 million ID cards from 2012 to 2017. Of these cards, 47 235 were issued to women during that period. According to the Department of Fisheries (DOF), there were 1.6 million fishers registered in Bangladesh in June 2021, including 41 492 fisherwomen.

A policy to provide financial assistance to a fisher's family as a result of death or permanent disability was approved in 2019. The compensation is paid to the families of fishers lost at sea because of natural disasters (storms, cyclones, tidal bores), or fatalities from piracy or fishing accidents.

A total of 587 fishing households were paid compensation for the death of a fisher in their family; the payout per person was BDT 50 000 (approximately USD 595).[4] The total compensation paid out by the programme was BDT 2.1 million (USD 25 000) to 30 fisher families in 2019–20. In addition, BDT 2.5 million (USD 29 500) was allocated to two permanently disabled fishers and 49 families on the death of fishermen in 2020–21 (DOF, Bangladesh).

Japan

Capture fisheries

Vessels insured

In 2017, insurance schemes in Japan covered 112 891 fishers and 164 795 vessels. The gross tonnage insured in 2017 reached 763 267 tons of fishing vessels insured. By 2019, the total number of vessels covered by insurance had fallen to 112 767. Considering the latter, about 82 percent of all registered, powered fishing vessels of more than 1 ton are insured with the Japan FVIA (FAO 2019). This decline follows the trend observed in recent decades. The number of fishing vessels insured has steadily decreased, mainly due to the decline of the size of the commercial fishing fleet.

Equipment and gear insured

Information on insurance of equipment and gears is not available.

Aquaculture

Species insured

The Japanese aquaculture insurance system remains largely as it was in the 2006 aquaculture review. The main species covered for stock mortality or escape are: seaweeds, oyster, pearl oyster, mother of pearl shells, scallops, yellowtail tuna, seabream, coho salmon, seabass, flatfish, kanpachi, horse mackerel and puffer fish. Coverage starts only from a certain stage/age of production, which means the fry or fingerlings in certain species may not be covered.

Growing systems insured

The information remains the same as described in the 2006 aquaculture review. Around 3 000 aquaculture insurance policies were estimated to be in force in 2020 in Japan.

Viet Nam

Capture fisheries

There are an estimated 940 000 fishers in Viet Nam (FAO, 2020c). In 2016, the total number of powered fishing vessels in the country was 109 762, of which 33 173 vessels had engine capacities of 90 HP or more, and 76 568 vessels had an engine capacity of less than 90 HP (Uyen, 2017). During 2018, a total of 7 500 households participated in the insurance programme provided by the government to support offshore fishing vessel owners.

Vessels insured

No data could be obtained on the number of fishing vessels insured. However, considering that most common fishing gears used are gillnets (36 percent), followed by trawls (19 percent) and hook and lines (16 percent), it is expected that these are covered by insurance. The insurance programme run by the government covers fishing vessels that have a total main engine capacity of 90 HP or more. Premium subsidies are paid as follows: i) 70 percent of the insurance premium for ships with a total main engine

[4] The average exchange rate of the Bangladesh taka (BDT) to USD was BDT 84.7 = 1 USD in 2019 (OECD, 2021).

capacity of between 90 HP and 400 HP; and ii) 90 percent of the insurance premium for ships with a total main engine capacity of 400 HP or over. That aside, 100 percent premium support is available for fishing crew working on board. Given that insurance cover is highly subsidized, it is estimated that some 30 000 fishing vessels are covered by insurance.

Equipment and gear insured
Information on equipment and gear insurance cover was unavailable.

Aquaculture
An estimated 1.6 million aquaculture farmers have been active in Viet Nam in recent years (FAO, 2020c). The government, through Boa Viet Insurance, provides insurance premium support to all levels of fish farmers and fishers: poor households are granted 100 percent; near poor households 80 percent; ordinary fisher/fish farmers are granted 60 percent; and producer organization/ cooperatives are granted 20 percent. However, it is not known how many fish farmers are insured.

Species insured
The species covered are giant tiger prawns and white-leg shrimps in Soc Trang and Bac Lieu regions.

Growing systems insured
The growing systems covered by insurance are ponds and cage-culture systems. Information on the number of policies in force was not available.

Indonesia

Capture fisheries
Recent estimates suggest that around 2.6 million fishers have been active in Indonesia in the last few years (FAO, 2020c). The number of those formally registered is much lower, while information on the number of fishers insured is not available. However, in 2016 MMAF paid the premium for 409 497 people, which granted them an insurance policy card. These premiums were paid to the PT Asuransi Jasa Indonesia insurance company to provide personal accident insurance plus cover (a risk guarantee covers losses during fishing and life insurance for fishermen). This insurance was specifically for artisanal and small fishermen with fishing boats of between 3 tons (minimum) and 10 tons (maximum).

Vessels insured
According to MMAF, there were a total of 683 246 small artisanal fishing boats and large commercial vessels in operation in 2016. FAO estimates that some 460 000 of these vessels are engine-powered (FAO, 2020c). Elsewhere, MAFF reported that there were 3 677 commercial fishing vessels of 30 tons or more in operation in 2017. A 2018/2019 techno-economic fleet performance review showed that few of these large fishing vessels were insured (Van Anrooy *et al*., 2020). Recent information on the total number of fishing vessels insured was not available.

Equipment and gear insured
Information on equipment and gear insurance was not available.

Aquaculture
In 2017 microinsurance coverage was provided by the APPIK to 2 004 small-scale aquaculture producers over a total area of 3 300 hectares in 37 districts of 14 provinces.

By 2019 the APPIK programme, supported by MMAF, reported that the policies in force covered 15 026 fish farmers over a combined farming area of 20 836 hectares across 25 provinces in the country. For 2020 the programme's target was to cover an additional 5 000 hectares of farming area. Total compensation would vary from Rp 3 million to Rp 7.5 million (USD 206 to USD 515) per hectare, depending upon the premium paid and the species insured.

Species insured
The APPIK programme covers shrimp, milkfish, tilapia (both freshwater and brackish water) catfish and polyculture species.

Growing systems insured
The grow-out production systems covered are freshwater ponds, brackish water shrimp and fish ponds and pens, and marine cages.

Philippines (the)

Capture fisheries
Vessels insured
There are an estimated 184 000 powered fishing vessels in the Philippines (FAO, 2020c). The PCIC (2020–21) data reveals 45 715 insurance policies in force for fishing boats, with a total coverage of PHP 5.82 billion (USD 111 million), while the total premiums paid were around PHP 204.96 million (USD 4 million) (PCIC, 2021). The number of fishing vessels insured is on the rise: in 2018 there were 40 467 fishing vessel insurance policies in force by PICC.

Equipment and gear insured
Information on equipment insured was not available. Gear insurance policies for fishing nets are available and the PICC reported that in the 2019–21 period a total of 88 gear insurance policies were issued for an insured value of USD 200 000. The premium income was around USD 5 900.

Aquaculture
Species insured
The culture species insured are milkfish (bangus), pangasius, native catfish, crab, grouper (Lapu-Lapu), lobster, malaga (Rabbit fish), mussel, oyster, prawn, sea cucumber, sea grapes, seaweeds, shrimp (Penaeus monodon) and tilapia. Based on PCIC data from the last decade (2011–21), there were 15 349 policies in force that insured these species in the production phase, involving 59 237 practising fish farmers. The cumulative amount of cover for aquaculture insurance policies was USD 54 million; the premium income was USD 3.3 million.

Growing systems insured
The grow-out insurable systems are fish/shrimp ponds, fish pens and fish cages. Information reported by PCIC from the 2015–21 period showed that there were 431 fish cages insured. The latest information available on the policies in force in 2021 showed 328 fish cages covered by insurance, for a total value of USD 800 000 and a premium income of USD 58 000.

8. RISK MANAGEMENT

Bangladesh

At present no insurance programme is available for the fisheries or aquaculture sector. The DOF in Bangladesh promotes the following measures to mitigate aquaculture risks:

i) dissemination of modern technology
ii) enforcement of biosecurity measures and traceability
iii) introduce good aquaculture practices
iv) compliance with codes of conduct
v) coverage of social safety net programmes, and
vi) establish robust surveillance system, close monitoring, supervision and guidance.

Japan

The most effective and efficient practices observed for capture and aquaculture risk management in Asia can be found in Japan, implemented by the FVI and the FMI in coordination with the government and fisheries cooperatives. The terms and conditions have remained the same since the 2006 aquaculture review (VanAnrooy *et al*., 2006) and the 2009 capture fisheries review (VanAnrooy *et al*., 2009). The main aspect of strong risk management in Japan is the financial support provided by the government for fishing vessels of less than 100 tons. All fishing vessels of this size registered in Japan are insured by FVI and FMIS; vessels of over 1000 tons are insured by national commercial insurers. The reason behind this effective implementation is that the FCA is in close contact with its members and meet the following requirements: i) more than two-thirds of FCA members own fishing vessels ranging from 1 to 100 tons; ii) vessels may be in operation for more than 60 days a year; iii) members reside within the operational area of the FCA; and iv) members agree to register their vessels under basic damage insurance.

Viet Nam

In Viet Nam insurance companies like Boa Viet have taken risk management to the commune level. Potential subscribers are asked to fill out an insurance form detailing information on their practices. This applies to both capture fishers and aquaculturists. Any produce that is eligible for insurance subsidies must be issued with food quality and safety certificates by the appropriate national regulatory authority. These terms and conditions contribute to better farm management activities and risk management practices. The beneficiaries of the insurance premium support schemes should generally be members of fishing cooperatives or associations.

Indonesia

In Indonesia fishers interested in governmental insurance premium subsidies must own vessels of less than 10 tons, be no more than 65 years old and have a valid fisherman card. Under the APPIK insurance programme, fish farmers can apply for an insurance premium subsidy if they have a farming area of at least 2 hectares (freshwater and/or seawater) or a brackish water aquaculture area of 5 hectares.

Philippines (the)

Fishers or fish farmers interested in the regular fisheries insurance programme must have a license, as per PCIC Board Resolution 2018-090:

> Duly licensed and/or legitimate owners/operators of fish ponds, fish cages, fish pens and fisheries farms, which culture/produce selected fish species, such as milkfish, shrimps, groupers, snappers, tilapia, mudcrab and seaweeds, may qualify for coverage under this program; Provided, that if not duly licensed, the individual fish farmer/fisherfolk/grower shall be registered under Fish R of BFAR and following BFAR's Code of Practice. (PCIC Board Resolution 2018-090).

Prior to applying for insurance coverage, potential policyholders must agree to technical supervision from an accredited fishery technician. Fish farms should be evaluated by an aquaculture technician and approved as suitable for operations; they should also be accessible by regular means of transportation. These conditions contribute to risk management and better farm management activities.

9 HANDLINGS OF CLAIMS

Bangladesh

No capture fisheries or aquaculture insurance programme was in operation in Bangladesh in 2020.

Japan

At the prefecture level the FVIA and FMIA are the points of reference for the claim handling process. The Fisheries Agency of Japan is often asked to assist in loss adjustment, particularly when larger disasters occur. The claim handling process is largely the same for fishing vessel and aquaculture-related insurance claims. The documentation requirement and submission process has remained largely the same since the 2006 aquaculture review (VanAnrooy *et al*., 2006). The policyholder must immediately notify the underwriter of an accident and submit the following documents to them: i) a document describing the cause and consequences of the accident; ii) a document indicating the amount of loss, together with documentary evidence issued by public agencies; and iii) any other relevant information.

Viet Nam

In Viet Nam, policyholders should immediately notify the insurance company of serious damage to stocks and provide backup information such as photos and certificates. Insurance company staff inspect the losses and damage incurred, and calculate the compensation due. Every insurance company has its own procedures in place for cases where there may be some disagreement between the loss adjuster and the policyholder in terms of damage and compensation.

Indonesia

The claim handling process in Indonesia is the same for the BPAN and APPIK programmes: the fishers and fish farmers are registered with MMAF and have ID cards that link them to the insurance programmes.

The process to obtain a Fishermen's Insurance card in Indonesia is the following:

i) the fisher takes the membership document to register at a local Maritime and Fishery office in the regency/city, which sends the fisher's registration data to the MMAF;
ii) the data is then sent by MMAF to PT Asuransi Jasa Indonesia (the insurer) for validation;
iii) the insurer subsequently validates the data and sends it back to MMAF to agree on the amount insured; and
iv) the insurer prints the insurance card and issues the policy to the fisher.

In the event of an accident arising from an occupational hazard, or loss of life during or outside daily occupational activity, the Fishermen's Insurance cardholder or heir submits the insurance claim to the closest local fisheries office and the insurance company. At the time of submitting the claim, the following documentation needs to be provided: completed claim application form, photocopy of insurance card, the time the accident occurred or death certificate, fisher identification card, police filing report, and a hospital report (as required). No information was obtained from the insurer regarding the turnaround time for the claim settlement processes.

Philippines (the)

The claim process established for the aquaculture insurance programme includes the following steps:

i) Notice of loss (NL). The assured fish farmer shall send a NL to the PCIC Regional Offices (RO) or PCIC Extension Offices (PCIC-EO) within two calendar days of the loss and/or before the aquaculture stock is harvested. The NL shall contain the following information: name and address of assured, location of the insured stock, policy number, date and time of occurrence of loss, nature/cause of loss and extent of loss.

ii) Claim for Indemnity. The claim for indemnity needs to be filed by the insured fish farmer on a prescribed indemnity form within seven days from the occurrence of loss to the PCIC RO or PCIC EO.

iii) Adjustment and settlement of claims. The verification and loss of assets is assessed by a team of at least two loss adjusters: one from PCIC, and one from the fishery department. Loss adjusters verify claims and submit the findings to the PCIC office. The category of losses are: i) total loss – loss of 90 percent or more; ii) partial loss – loss of between 10 percent and 90 percent iii) no loss – where the loss is less than 10 percent. Claims are to be settled within 60 days of the submission of complete documentation to the PCIC by the insured fish farmer (PCIC, 2021).

10. UNDERWRITING EXPERIENCE

The countries under review are prone to catastrophic risks and vulnerable to disease in their fisheries and aquaculture production systems. Bangladesh, Viet Nam, and the Philippines are among the countries most vulnerable to climate change in the world. The impacts of catastrophic events in coastal fishing communities and in aquaculture production systems have undoubtedly had a wholesale impact on insurance underwriting experiences.

Bangladesh

There is currently no insurance programme available either for aquaculture or capture fisheries. The aquaculture insurance policies introduced by SBC and JBC in the 1990s were taken off the market owing to poor underwriting results. Although no information is available on the loss ratio of these policies, the main reasons for the programme's failure were: i) the policy was marketed on a voluntary basis with a fixed premium of 0.99 percent of the sum insured (far below the actuarially correct premium rate); ii) the policy carried no deductible, but instead applied a coinsurance of 20 percent of the value of the claim. In the absence of a conventional deductible the product was thus extremely vulnerable to initial loss.

Japan

In 2020, the net premium collected was JPY 16.6 billion (USD 150 million). A total of 30 267 claims were received, with an average overall loss ratio of 19 percent across all classes of fishing vessel (Table 1). Based on the class of fishing vessel (in terms of tonnage), the smallest vessels (less than 5 tons) had the lowest loss ratio. Their claim settlement was 16 percent. Medium to semi-large fishing vessels (5–20 tons and 20–100 tons) had higher loss ratios, of 39 percent and 42 percent respectively (Table 2).

By comparison, in 2017 the total number of vessels insured was 164 796 and the number of claims received was 33 601. The total loss ratio in 2017 was 20 percent (FAO, 2019).

Table 3 provides information on the type of accidents and number of insurance claims submitted to the Japan Fishing Vessel Insurance. Damage to engines and

TABLE 1
Claims received and paid by Japan FVIA (2020)

1	No. of member fishermen	105 862
2.	No. of insurance contracts	155 937
3.	Total gross tonnage of insured vessels	733 357
4.	Net premium collected (million JPY)	16 605 (USD 150 million)
5.	No. of claims received	30 267
6.	Claims paid (million JPY)	11 619 (USD 106 million)
7.	Incurred claims ratio (percent)	19.4
8.	Gain/Loss ratio (percent)	70.0

Source: FVIA.

TABLE 2
Claims paid by class of fishing vessel by Japan FVIA (2020)

Tonnage	No. of insured vessels	No. of claims received	Loss ratio (%)
Less than 5 tons	133 350	21 547	16
5–20 tons	21 516	8 398	39
20–100 tons	348	147	42
More than 100 tons	723	175	24
Total	**155 937**	**30 267**	**19**

Source: FVIA.

TABLE 3
Type of accidents and number of claims by FVIA (2020)

Ranking	Type of accident	No. of claims submitted	Percentage
1.	Damage to engine	10 866	36
2.	Collusion with drifting objects	8 426	28
3.	Damage to hulls	3 109	10
4.	Grounding	2 376	8
5.	Damage to facilities	2 072	7
6.	Incursion of seawater leaking	814	3
7.	Collusion with other vessels	592	2
8.	Sinking	525	2
9.	Stormy weather	159	0.5
10	Fire	243	0.8
11	Stranding	167	0.6
Total claims		**30 267**	

Source: FVIA.

collision with drifting objects stand out as the most frequent accidents, accounting for 36 percent and 28 percent of claims respectively. Claims related to stormy weather accounted only for 0.5 percent of all claims.

Based on the replies provided by the Japan FVIA in the FAO survey, the underwriting experiences in the 2014–2019 period were considered good. Outside of these, only two years (2011 and 2012) were deemed bad in terms of economic results. In 2019, 510 fishing vessels were involved in marine accidents, while the number of dead and missing reported in those accidents was 36. In order to improve the safety of small fishing vessels and further reduce loss ratios, MAFF is promoting demonstration tests to avoid collisions and grounding accidents through the use of smartphones (MAFF, 2020).

Viet Nam

There is no information on the underwriting experiences of the agricultural insurance programme currently promoted by the government. In the 2011–2013 agriculture insurance programme the total claims for rice, livestock and aquaculture cumulatively amounted to VND 702 billion (USD 30 million); almost all of this (95 percent) went to the aquaculture insured. The aquaculture line accounted for the highest loss ratio (306 percent). The poor underwriting experience that was registered highlighted inadequate evidence and data to support claim processes, with many claims denied compensation. The limited provision of proper technical guidelines to both parties – insured and the insurer – related to monitoring procedures for farm production, farm management practices and farm improvements also hindered the experience.

Indonesia

A total of 409 497 fishermen participated in the Fishermen Insurance Premium Assistance programme (BPAN) in 2016. There had been 338 claims by March 2017. The highest number of claims were for natural deaths (224 fishers), followed by 43 claims for the cost of treatment due to fishing accidents, and 13 claims for death due to fishing accidents at sea. The lowest number of claims was for permanent disability, with 3 claims (Safitri, 2018).

By 2018, the APPIK programme had paid out on the claims of 133 fish farmers affected by disease and floods. The total value was Rp 346 million (USD 24 300), which covered a farming area of 69.2 hectares across nine municipalities.

Philippines (the)

The PCIC data from 2015–21 reflect the cumulative insurance coverage and claims for around 238 651 fisherfolk. The total number of policies issued in this period was 61 480, with an insurance amount of PHP 8.61 billion (USD 164 million); total premiums paid amounted to PHP 378 million (USD 7 million). The number of claims during this period reached 5 198 with an indemnity protection of PHP 50.11 million (USD 952 000). Information was not available on the type of damages claimed. According to the PCIC report covering 2015–21, the damage rate has consistently been lower than 1 percent.

11. CONCLUSIONS

Government support in the form of premium subsidies has been key to the promotion of capture fisheries and aquaculture insurance in Asia. Over the last decade Viet Nam, the Philippines and Indonesia have promoted fisheries and aquaculture insurance through the development of legal and regulatory frameworks, as well as premium

TABLE 4
Results of regular and special programmes for PCIC fisheries insurance

Year	Claimants	Indemnity	No. of insured (fishers and fish farmers)	Damage rate %	Loss ratio %
2015	78	18 532	12 861	0.36	0.08
2016	149	21 029	7 267	0.50	0.12
2017	452	84 577	26 192	0.60	0.13
2018	409	70 892	40 489	0.24	0.04
2019	1 043	199 852	55 129	0.49	0.10
2020	1 649	319 810	47 333	0.87	0.21
2021	1 121	199 517	39 999	0.65	0.21

Source: PCIC Automated Business System (PABS) Statistical Reports 2015–2021.
Note: Damage Rate is computed as: (Indemnity/Total AC x 100). Loss Ratio is computed as: (Indemnity/Total premiums).

subsidies for insurance programmes for fishers and fish farmers. Only in Indonesia was a strong public–private partnership established to roll out insurance programmes for the fisheries sector. In the other countries covered, public insurance agencies implement these programmes. Several challenges have hindered the uptake of insurance in the fisheries sector, such as: i) most fishers and fish farmers are still not aware of the existence of the government programmes; ii) government staff lack the experience to support the programmes; iii) there is limited coordination between local and central governments; and iv) in some cases there is an overdependence on government insurance programmes that provide support after natural disasters and other emergencies.

Capture fisheries

Status of the programmes: Currently four of the five countries (all except Bangladesh) have capture fisheries insurance programmes in place. The Indonesian government has established a Personal Accident Insurance programme for registered fishermen, and the premium is paid by MMAF. The Philippines' insurance programme includes broad coverage against losses, from damage to fishing vessels, equipment and machinery, in addition to covering on-board crew and even extending coverage to members of their respective households. Japan's three-tiered insurance system offers a successful mechanism in terms of coverage, efficiency and organization. The mutual fisheries insurance model, whereby fishers and fish farmers need to be members of fisher associations to get access to subsidized insurance coverage, has proved a success. This model could be usefully replicated in other countries in the region.

Limitations: The limited distribution network of insurers in some Asian countries means that capture fisheries insurance services do not always reach rural and coastal fishing communities. Moreover, collaboration with agencies that could support the distribution of these services – such as cooperatives, associations, MFIs and fisher groups – is not streamlined. The high costs involved in selling insurance to fishers, conducting damage assessments, inspection and claim compensation processes, also remain a challenge for insurers in Asia.

Opportunities: The world fishing fleet comprised 4.56 million vessels in 2018. The five Asian countries in this chapter reported having 1.54 million fishing vessels, including 963 000 engine-powered fishing vessels (FAO, 2020c). This large number shows that there is an untapped market for capture fisheries insurance services.

Aquaculture

Status of the programmes: Four out of the five Asian countries reviewed currently have aquaculture insurance programmes. The aquaculture insurance programmes in Japan and the Philippines are successful. In the other countries, past failures have demanded new approaches, which are being tested in Viet Nam and Indonesia. Aquaculture insurance has still not been launched in Bangladesh after many years of discussions.

In Japan, the Philippines and Viet Nam, aquaculture insurance is highly subsidized by the government and largely implemented by national insurers. In Indonesia the government has initiated a partnership with 12 private insurance companies, and pays the full premium for fish farmers.

The species covered under stock mortality insurance vary from country to country, while the grow-out systems (fish ponds, pens and cage culture) covered are similar across all the countries. There is no stock mortality insurance product available for fish/shrimp hatcheries in the countries in this study. Philippines is the only country that has begun to offer index-based insurance policies for the aquaculture sector.

Insurance losses within the four countries have primarily been caused by outbreaks of disease (both in shrimp and fish species), followed by natural disasters like floods, typhoons, cyclones, and red tides. It is very difficult to estimate the percentage of total production insured owing to the limited data available, as insurance companies often regard the number of policies and the area insured as confidential information.

Limitations: Private insurance companies generally do not show much interest in the aquaculture business in the four countries, although there are many fish and shrimp farmers interested in insuring their aquaculture stock, farm infrastructure and other assets. Stock mortality insurance covers the period from the time of stocking until harvest, though in Viet Nam the insurer will not pay compensation for stock mortality within ten days of the date of stocking. This limits the interest of fish farmers in acquiring this type of insurance. Another limiting factor is that insurance companies generally do not compensate damages that are less than total losses. Partial stock mortality is often not compensated. Since many of the losses are partial, the current insurance policies are less attractive to aquaculture farmers.

Opportunities: The aquaculture insurance portfolio is an expanding line of business for insurers. While the Philippines has recently begun to provide index-based insurance directly to fishers and fish farmers, similar measures may be adopted by countries like Viet Nam, Indonesia and Bangladesh.

12. RECOMMENDATIONS

Linkages between credit and insurance: Better collaboration between insurance and credit service providers is required so that insurance cover can form part of collateral for a loan, and insurance premiums can be included in the loans. Appropriately linked credit and insurance arrangements will enhance the sector's sustainable development and increase insurance business opportunities. Promoting microinsurance services among fisher communities by bundling microcredit with asset/disaster insurance programmes is another option. Involving fisher and fish farmer groups, such as self-help groups and MFIs, in insurance distribution could also be promising.

Application of new technologies and services: Weather-index-based insurance schemes have been in force in the agriculture sector for some time, allowing satellite data and weather stations inputs to trigger insurance payments in the event of specific, weather-related events. These could be extended to capture fisheries and aquaculture as well (as piloted in some countries) in order to increase insurance efficiency.

Awareness raising, training and promotion: A risk-financing culture is lacking in most SSF communities. Awareness raising and training on the risks involved in fisheries and the promotion of insurance as part of the solution are both needed. By working with local fisherfolk organizations and through coordination with fisheries training and development organizations in Asia, insurance services can be promoted and risk management options brought to fishers' attention.

Increase the involvement of fisheries organizations in insurance services: The increased participation of fishers and fish farmer cooperatives, federations, NGOs and boat owner associations as intermediaries/agencies will contribute to the promotion and administration of insurance services within the sector. Lessons learnt from Japan on how each member of a fisheries cooperative obtains insurance cover can be useful.

Flexibility in insurance premium payment processes: Catch and income are seasonal in capture fisheries; flexibility should therefore be offered in the payment of premiums.

Efficient and simple damage assessment and claim dispute settlement processes: A mechanism to address customer grievances with regard to damage assessment methods and outcomes, as well as claim handling processes, is often not available or does not function well. These processes should be put in place and include efficiency indicators, as used in other insurance business processes.

Special insurance products for women workers/entrepreneurs: Globally women constitute 14 percent of the 59 million people engaged in capture fisheries and aquaculture (FAO, 2020b). The number of women working in the sector in Asia is substantial. Women are engaged in the whole value chain: aquaculture/mariculture/fisheries production, fish marketing, processing, distribution and retail. The provision of microfinance through self-help groups has increased women's participation in the sector, but gender-specific insurance products must be developed as well.

Life, accident and health insurance policies: Insurance of fishing assets should preferably be complimented by life, accident and health insurance. In Japan such services are mandatory for fishers, while rapid improvements are under way for these types of insurance for those working in the sector in Indonesia. Governments recognize the benefits of such insurance programmes for the sustainable development of the fisheries sector but require partnerships with insurance suppliers to establish these programmes.

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Regional report of Europe

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1. INTRODUCTION

Marine insurance is widely believed to be the oldest form of insurance, with origins dating back to Greek and Roman marine trade in the Mediterranean Sea (Morris, 2018). Marine insurance contracts were developed in Genoa and other Italian cities in the fourteenth century, eventually spreading to northern Europe. Demand for marine insurance increased dramatically by the end of the seventeenth century as London emerged as a global centre for international trade. In the late 1680s, Edward Lloyd opened a coffee house in Tower Street in London which soon became the meeting place for shipowners and merchants wishing to insure cargo and ships, and those willing to underwrite such ventures. Lloyd's Coffee House emerged as the first marine insurance market in the world, leading to the establishment of insurance companies and associated specialists such as surveyors and loss adjusters. Rather than an insurance company, Lloyd's is a corporate body operating as a partially mutualized marketplace within which multiple financial backers, grouped together in "syndicates", came together to pool and spread risk. Building on the success of marine insurance, non-marine insurance and reinsurance subsequently developed as fields of their own.

Marine insurance traditionally formed the majority of business underwritten at Lloyd's, with fishing vessels and aquaculture among the many specialty policies available on the market. Policies for capture fisheries and aquaculture are also available from mutual underwriting organizations known as Protection and Indemnity Clubs (P&I). These clubs emerged in the eighteenth century as small-hull insurance clubs formed by British shipowners who were dissatisfied with the scope and cost of the hull insurance provided by commercial insurers (including Lloyd's). They have become the model for other specialized marine and non-marine mutual underwriting organizations in areas such as oil pollution and nuclear risks. Today, the International Group of P&I Clubs, is made up by 13 of the largest P&I clubs and provides marine liability cover for approximately 90 percent of the world's ocean-going tonnage. Of the 13 clubs in the group, 8 have their headquarters in the United Kingdom of Great Britain and Northern Ireland, with 2 of the remaining 5 clubs based in Norway.

The majority of insurance programmes for capture fisheries in Europe consist of individual policies for vessel/gear protection and crew safety. Excluding the Russian Federation, landings from capture fisheries in Europe peaked in the late 1980s and have progressively declined since. Approximately 10.2 million tonnes of fish were harvested in 2018, a 30-percent decline relative to 1988 (FAO, 2020). This long-term decline has defined the insurance market for this sector in Europe.

Within the agricultural sector, aquaculture insurance is a highly specialized domain; it is widely regarded as the most challenging segment to insure owing to the fragmented nature of the industry, the large number of species and production methods, the difficulty of tracking inventories, and the wide variety of perils impacting production. The European experience with aquaculture insurance is probably the most detailed anywhere in the world and ressembles the development of commercial salmon farming in Norway. The insurance industry went through a very steep learning curve in the 1970s and 1980s, marred by frequent outbreaks of disease, while in recent years

extreme climatic events and harmful algal blooms (HAB) have emerged as major challenges. Outside Norway, a large portion of the aquaculture insurance/reinsurance market is located in London, with large reinsurance markets also found in France, Germany and Switzerland.

Intended as an update to the insurance reviews conducted by FAO in 2006 and 2009 (van Anrooy *et al.*, 2006; van Anrooy *et al.*, 2009), this chapter presents an assessment of the European insurance industry for capture fisheries and aquaculture. The assessment was primarily based on the results of an online survey conducted by FAO involving the key stakeholders from the insurance sector (insurers, reinsurers, brokers) who provide services to the capture fisheries and aquaculture sectors in Europe. This information was complemented with interviews with industry experts and a comprehensive desk study of the academic and gray literature.

2. STATUS OF CAPTURE FISHERIES AND AQUACULTURE PRODUCTION

Landings from capture fisheries for the European continent (excluding the Russian Federation, as its most important fisheries are based in the Pacific Ocean) fell by nearly 19 percent between 2000 and 2018, from 12.5 million tonnes to 10.2 million tonnes (FAO, 2020). Diminishing harvests are the result of declining stocks and more restrictive fishery regulations, which have been introduced in recent years to address overfishing and promote the sustainable exploitation of stocks (Froese *et al.*, 2018). The most abundant species are small pelagic fish such as Atlantic herring, blue whiting, Atlantic mackerel, Atlantic cod and capelin. The most important fishing nations are Norway, Iceland and Spain, which respectively accounted for 26 percent, 13 percent and 9 percent of landings in 2018. In contrast, aquaculture production (excluding the Russian Federation) increased from 2 million tonnes to 2.9 million tonnes during the same time period (a 45 percent increase). Atlantic salmon is by far the most important species farmed on the continent (54 percent of total harvest in 2018), with most production coming from Norway. Other important aquaculture species are rainbow trout, common carp, gilthead seabream, European seabass, blue mussels and the Pacific cupped oyster. In addition to Norway (47 percent of continental production in 2018), major farming nations in Europe include Spain (12 percent), the United Kingdom of Great Britain and Northern Ireland (7 percent), France (6 percent), Italy (5 percent), and Greece (5 percent).

Norway

Endowed with 21 000 km of coastline and ideal climatic factors, Norway is extremely well suited to industrial-scale production in both fisheries and aquaculture. In 2018, Norway operated the ninth-largest capture fishery and was the ninth-largest aquaculture producer in the world. Norwegian fisheries management is mostly based on access and quota regulations, coupled with capacity adjustment schemes. The total catch amounted to nearly 2.7 million tonnes in 2018. The most important species for human consumption are cod, haddock and saithe, while herring, capelin and mackerel are used both for consumption and as raw materials in fish oil and fishmeal production. Blue whiting is another important species but is mostly destined for processing oil and meal. Herring provided the largest catch in 2018 at 498 000 tonnes.

Norway is also one of the leading nations in the field of aquaculture in terms of operations, technology and research and development (R&D). It is making one of the leading seafood exporters in the world. In 2018, total aquaculture production was 1.36 million tonnes, valued at more than USD 8.3 billion, with Atlantic salmon accounting for 95 percent of the output (FAO, 2020). While salmon aquaculture emerged in a few locations in the 1970s, both Atlantic salmon and rainbow trout are

cultivated up and down the coast at present. Cod, halibut, scallop, European lobster and blue mussels are also produced in the country. In 2017, the total number of employees in the aquaculture sector was estimated at 7 376 (Eurofish, 2020a)

United Kingdom of Great Britain and Northern Ireland

Landings from capture fisheries in the United Kingdom of Great Britain and Northern Ireland declined from 754 000 tonnes to 700 000 tonnes between 2000 and 2018 (FAO, 2020). Mackerel, herring and blue whiting are the most abundant species, while cod landings have shown some recovery in recent years. Scottish vessels account for approximately 65 percent of the harvest, while English vessels capture 30 percent (MMO, 2020). Aquaculture forms an increasingly important part of the British seafood industry but faces strong competition from imports. Most of the aquaculture industry is based in Scotland, where it is considered an important source of employment given the remote locations of some sites. Production increased from 152 000 to 198 000 tonnes between 2000 and 2018 (up 29.6 percent) and consisted primarily of Atlantic salmon (around 80 percent of total harvest). Limited quantities of other species such as mussels, oysters, trout, carp and halibut are also produced. The total value of aquaculture production was estimated at USD 1.3 billion in 2018 (FAO, 2020).

Spain

Boasting a coastline of almost 8 000 km on both the Atlantic Ocean and the Mediterranean Sea, Spain is home to the largest fishing industry and the largest consumer market for fisheries and aquaculture products within the European Union. Landings from capture fisheries nevertheless fell by 13 percent between 2000 and 2018, from 1.1 million to 929 000 tonnes (FAO, 2020). In value terms, the most important species are skipjack, yellowfin and bigeye tuna, followed by whitefish (mainly cod and hake) and small pelagic fish (herring, sardine and anchovy). Almost 50 percent of vessels are registered in the northwestern Galicia region. The industry provides employment to approximately 37 000 people across the nation (Eurofish, 2020b). Spain also offers great conditions for marine and freshwater aquaculture. The aquaculture sector is widely diversified in terms of species and farming technologies. Production increased from 309 000 to 348 000 tonnes between 2000 and 2018 (up 13 percent). Leading species in terms of volume include blue mussel, gilthead seabream, European seabass and rainbow trout. Mussel farming is by far the biggest sector in terms of production volume (around 80 percent of total aquaculture output), with most farms operating in Galicia. Nevertheless, European seabass and gilthead seabream generate a higher return (USD 243 million compared to USD 160 million in 2018). In recent years, the industry has diversified into new species such as meagre, bluefin tuna and yellowtail (*Seriola* spp.) while turbot has already gained a sizable market share (8 000 tonnes in 2018).

France

The French fishing industry has lost over half of its vessels and over two-thirds of its workforce since 1945. Landings in 2000 reached 694 000 tonnes but had declined to 612 000 tonnes by 2018 (FAO, 2020). An estimated 40 percent of the vessels operate in the Atlantic area, 20 percent in the Mediterranean Sea and approximately 40 percent in overseas territories (EMFF, 2016a). The most important species targeted are tuna (skipjack and yellowfin), scallop, hake, and small pelagics (herring, pilchard). The aquaculture sector is dominated by shellfish farming (Pacific cupped oyster and blue mussels, primarily) but production has declined in recent years. Output from shellfish aquaculture exceeded 200 000 tonnes in 2000 but fell to 150 000 tonnes in 2018 due to the higher incidence of diseases in grow-out areas, which may have been triggered by

the increasing temperatures associated with climate change (Vaissiere, 2019). Rainbow trout and common carp are also produced, along with small volumes of seabream and seabass. Total aquaculture production was valued at USD 847 million in 2018 (FAO, 2020).

Italy

Fishing in Italy takes place along the entire coastline, but is more significant in certain regions, particularly the south. The size of the Italian fleet has steadily decreased over time: landings fell by 32 percent from 304 000 to 207 000 tonnes between 2000 and 2018 (FAO, 2020). A majority of the fleet (70 percent) consists of small-scale vessels of less than 12 m in length (Eurofish, 2020c). Approximately one-third of landings are small pelagics (anchovies and sardines), though crustaceans such as the deepwater rose shrimp and squillids, as well as cephalopods (cuttlefish, squid and octopus) are also represented in the catch. Aquaculture in Italy is dominated by Mediterranean mussel, Japanese carpet shell and rainbow trout. European seabass and gilthead sea bream are the major farmed marine finfish species. Production nevertheless declined during the 2000–2018 period, from 217 000 to 143 000 tonnes (down 33.8 percent). Traditional extensive aquaculture is still carried out in the brackish lagoons known as *valli*, especially in the northeastern regions. More modern aquaculture operations have developed along the Italian coasts, with a higher concentration along the Adriatic Sea. Freshwater finfish farming takes place in the north and central regions of Italy; European eel is produced in addition to rainbow trout. The total value of Italian aquaculture production was estimated at USD 530 million in 2018 (FAO, 2020).

Greece

The Greek fisheries sector has contracted over the last few decades: landings declined 22 percent between 2000 and 2018, from 99 000 to 77 000 tonnes (FAO, 2020). The mix of species is similar to that of Italian fisheries: small pelagics (anchovies and sardines), crustaceans (deepwater rose shrimp and shore crab), and cephalopods (octopus). Around 95 percent of the fishing fleet consists of small-scale coastal fishing vessels (EMFF, 2016b). By contrast, aquaculture production increased by 39 percent in the same period (2000–2018), from 95 000 to 132 000 tonnes, exceeding fisheries production by 55 000 tonnes in 2018. Marine finfish farming (seabream and seabass, primarily) is the largest aquaculture sector, both in terms of production (over 105 000 tonnes in 2018) and value (over USD 610 million). Mussel aquaculture is the second most important segment of marine aquaculture (22 000 tonnes in 2018) while freshwater aquaculture consists mainly of small family enterprises raising rainbow trout in tanks (EMFF, 2016b).

3. THE INSURANCE MARKET

Insurance is a global business, with some of the largest European insurance companies operating in multiple countries and offering numerous insurance solutions. Gross written premiums (GWP) collected by European firms were estimated at USD 1.6 trillion in 2018: this amounts to one-third of global insurance premiums, slightly less than the Asia-Pacific region and slightly more than North America (Staib *et al.*, 2019). At a compound annual growth rate (CAGR) of 0.3 percent over the 2009–2018 period, the European market is nevertheless growing at a much slower rate than Asia (5.4 percent) and North America (2.7 percent).

The European life insurance premiums (Life and Health) amounted to USD 1.14 trillion (69 percent of GWP) in 2018 while non-life premiums (Property and Casualty, P&C) accounted for USD 506 billion (31 percent of GWP). Non-life premiums include a wide range of insurance products such as Motor, Accident & Health, Property, Liability, Marine, Agriculture, and Credit. Capture fishery and aquaculture insurance

are both specialty lines within the marine and agricultural insurance markets. Due to the fragmented and relatively minor nature of these markets, precise estimates on the marine and agriculture insurance premiums in Europe are not easily accessible. Marine insurance is often grouped with Aviation and Transit (cargo) in official reports, and referred to with the acronym 'MAT' in this context. According to Insurance Europe (2020), GWP for MAT reached USD 17.1 billion in 2018. On a global level, both marine and agriculture premiums are estimated to account for 1.5 percent of non-life premiums (Staib *et al.*, 2019). If the same ratio is applied to the European market, premiums for marine and agriculture insurance would have amounted to approximately USD 7.5 billion in 2018.

A large number of firms and syndicates provide insurance/reinsurance services to the capture fisheries and aquaculture industries throughout Europe. All insurance companies, including Lloyd's of London, are controlled by the insurance laws and regulations applicable in their country of incorporation, as well those of the countries in which they do business. As revealed by survey respondents, many countries set local restrictions on the scope and scale of policies offered by foreign-based insurers, which significantly constrains these companies' operational ability to cover a wider variety of risks.

4. SUPPLY AND DEMAND

Capture fisheries

There are many specialized insurers providing coverage to the fishing industry throughout Europe, including Thomas Miller Specialty (United Kingdom of Great Britain and Northern Ireland), Hanseatic Underwriters (Germany), Generali Seguros (Spain), Hydor (Norway), and the Southern Finland Fisheries Insurance Association. Some of these insurers are members of the European Fishing Vessel Insurance Companies Association (EFICA), an umbrella organization founded in 1992 with the principal aim of exchanging information on markets, trends, claims and loss prevention across the insurance industry. Members include companies from Belgium (DSV Belgium), France (SAMAP, SAMBO), the Netherlands (Van Olst de Graaff), Norway (Skuld, Møretrygd, Tromstrygd), Portugal (Mútua dos Pescadores), Spain (Sociedad de Seguros Marítimos de Vigo, Nacional de Reaseguros, ARTAI), Switzerland (Helvetia Insurance) and the United Kingdom of Great Britain and Northern Ireland (Shipowners', Sunderland, MS Amlin).

In addition to commercial insurers such as Lloyd's, the Protection and Indemnity (P&I) clubs are important provider of liability insurance for fishing vessels in Europe. The P&I clubs are shipowner-led mutual insurance organizations offering coverage for a wide range of third-party liabilities (e.g. collisions, personal injury and illness, pollution, wreck removal, and even fines) connected with the operation of the member vessels, and these are usually provided at a lower cost than the commercial competitors. Central to the operation of P&I clubs is the concept of mutuality, whereby members insure each other, making them simultaneously an insurer and an insured party (Soyer *et al*., 2018). In contrast to commercial insurers, the clubs are non-profit organizations. The International Group of P&I Clubs (IG), formed by 13 of the largest P&I clubs in the world, jointly operates a pooling agreement and obtains reinsurance cover at a relatively low rate. It is estimated that the IG provides marine liability cover for approximately 90 percent of the world's ocean-going tonnage. Given that 8 of the 13 clubs in the IG are based in the United Kingdom of Great Britain and Northern Ireland, English insurance law – as set forth in the 1906 Marine Insurance Act, with key sections amended by the Insurance Act 2015 to conform more closely with modern practices – has achieved global influence and has significant implications for P&I operating in others regions.

The Shipowners' Club – an IG club with headquarters in London – is normally associated with the insurance of fishing vessels. In 2019 the insured fishing fleet amounted to around 3 875 vessels: 12 percent of the total number of insured vessels operating worldwide (The Shipowners' Club, 2020). Another leading insurer of fishing vessels (along with aquaculture) is Sunderland Marine Mutual Insurance Company (Newcastle, United Kingdom of Great Britain and Northern Ireland). Sunderland Marine has operated as a guaranteed subsidiary of the North of England P&I Association – a member of IG – since 2014.

Supply and demand for capture fisheries insurance is expected to be related to the extent of the region's fisheries, and specifically its fishing fleet. Recent years have seen a gradual reduction in the fishing fleet in Europe, mainly as a result of the Common Fisheries Policy's stated goal of improving the wellbeing of fishery resources by reducing overfishing. The Common Fisheries Policy (CFP) was originally integrated with the Common Agricultural Policy, but from 1970 onwards it gradually emerged as a separate regulatory body, notably as Member States adopted exclusive economic zones (EEZs) and new Member States with substantial fishing fleets gained access to the European Community. The Community was therefore compelled to tackle specific fisheries problems, including structural measures for fishing fleets. What is more, the 2013 CFP reform obliged Member States to adjust their fishing capacities through national plans (Breuer, 2020).

As a result, the number of active vessels registered in the European Union in 2018 fell to 81 860 – a decrease of 4 percent when compared to 2008 (Eurostat, 2020). The overall gross tonnage was 1.5 million tonnes (down 17 percent) while total engine power amounted to 6.2 million kilowatts (down 10 percent) during the same period. While a number of European Union Directives (e.g. 2009/20/EC and 2017/159/EC) require ships with a gross tonnage of 300 tons or more to acquire insurance, the commercial reality is that the European Union fishing fleet continues to shrink. However, even though there are fewer vessels to insure, the supply of coverage in Europe is still considered plentiful and competitive. Nonetheless, the contraction of the fishing vessel insurance market has made it less attractive to the insurance industry as aging vessels and machinery will inevitably increase claims.

Government support for the payment of insurance premiums may be available through the European Maritime and Fisheries Fund (EMFF), a European Union funding scheme for the fisheries, aquaculture and maritime sectors. The EMFF contributes to programmes of Member States, which provide financial compensation to fishermen for economic losses caused by adverse climatic events, environmental incidents, or rescue costs for fishermen and/or fishing vessels in the case of accidents at sea (EU, 2014).

Another issue is the increased politicization of fishery management within the European Union (EU). The management of fish stocks, quotas, gear and vessel regulations are all negotiated between Member States within the European Council, and the European Council with non-member States. Any European Union vessel is given access to fish in the combined EEZ if they are properly licensed and have sufficient quota for the target species (Forse *et al*., 2019). These negotiations have been further complicated by the Brexit Agreement, which was ratified in January 2020. Under Brexit, the British government argues that any new agreement on fisheries must be based on the understanding that "British fishing grounds are first and foremost for British boats". However, the European Union is requesting access for its vessels, arguing that a "fair deal" on fisheries is a pre-condition for a free trade agreement between the United Kingdom of Great Britain and Northern Ireland and the European Union (Morris, 2020). The United Kingdom of Great Britain and Northern Ireland

formally left the European Union on 31 January 2020, but is still bound by the European Union's CFP until the end of 2020. The implications for marine insurance companies are still unclear given the uncertainty surrounding the negotiations.

Aquaculture

When salmon farming began in Norway in the early 1970s, a group of domestic insurance companies decided to specialize in aquaculture. Over the years, these companies developed as much knowledge and experience on specialist risks associated with aquaculture as can be found anywhere in the world (Secretan, 2006). Outside Norway, a number of insurance companies are based in London, while a multitude of domestic insurers also provide aquaculture insurance coverage throughout Europe. Large reinsurance markets are found in Switzerland (e.g. Swiss Re, Scor), Germany (e.g. Munich Re, Hannover Re), and France (Axa XL, a subsidiary of the French multinational insurance firm Axa S.A.). The latter developed a strong presence in the salmon farming industry through a series of acquisitions and mergers and is also active in insuring seabass and sea bream farms in the Mediterranean. Other prominent companies are Sunderland Marine (a subsidiary of the North of England P&I Club, based in Newcastle, United Kingdom of Great Britain and Northern Ireland) and the Global Aquaculture Insurance Consortium (Lloyd's Register marketplace). In Spain, aquaculture stock insurance is provided by Agroseguro, a consortium of approximately 21 private and public insurance companies authorized to extend government-supported policies.

Although aquaculture insurance has grown considerably in Europe in recent years, most of this growth has been driven by the increasing sophistication of the salmon industry led by Norway, its main producer in the region and second in the world. With a premium amount of USD 45 million in 2017, Norway is the largest market in the industrialized aquaculture segment, while China is the largest single market in the small-scale segment (USD 46 million in 2016). According to top executives at Axa XL, salmon industry insurance has reached nearly 100 percent coverage in Norway (and 80 percent in Chile), with the seabass and sea bream industries in the Mediterranean following salmon in coverage. Insurance penetration is much lower for other species in the European region: this is due to the fragmentation of the industry and/or the high-risk levels involved in production. The high coverage reached in salmon and seabass/sea bream aquaculture is a product of the farming methods used in these industries, which keep losses related to mortality within an insurable range.

From the perspective of producers (particularly of species other than salmon and seabass/sea bream), insurance penetration remains low because of the limited – and expensive – market options and the reduced availability of government premium supports. Farmers have complained that insurance coverage for certain biological events (e.g. harmful algal blooms) and fish diseases is not available or is only available at premiums and/or deductibles considered too high. Another issue is that coverage may be dependent on the insurance value of the fish, which may be positively or negatively related to book values (Marine Harvest ASA, 2013). Because profit margins in aquaculture tend to be narrow (with the exception of high-value species such as salmon), producers often consider insurance unaffordable and struggle to comply with frequently updating inventories (Hohl, 2019).

Government support schemes for insurance premiums are only available in a few countries – Spain and Turkey, for example (Martínez and van Anrooy, 2020). These schemes often impose conditions such as defined ranges for stock valuation, deductibles and other factors, which increases the appeal for insurers with limited expertise in aquaculture underwriting. However, some insurers may avoid these schemes for their lack of underwriting flexibility, which is crucial when the producer is interested in

mitigating specific financial and operational risks. Support schemes might address this shortcoming by promoting underwriting flexibility, while providing direct support based on the terms agreed between farmers and insurers (Jiménez, 2014).

The reduced availability of premium supports from national governments is partially mitigated by the EMFF. Regulation No. 508/2014, Article 57 ("Aquaculture Stock Insurance") established that the EMFF may provide stock insurance support to cover the economic losses faced by aquaculture producers in Europe in at least one of the following: i) natural disasters; b) adverse climatic events; c) sudden water quality and quantity changes not caused by the operator; and d) diseases in aquaculture, failure or destruction of production facilities (EU, 2014). In some countries, such as Greece, the EMFF is better suited to the insurance needs of shellfish farmers, which tend to be underserved by private insurance companies (J. Theodorou, personal communication, 2020). Coverage provided by EMFF was expanded in April 2020 to mitigate the impact of the COVID-19 outbreak in the European fishery and aquaculture sectors (European Union, 2020).

European aquaculture production increased 30 percent between 2008 and 2018, while the number of licensed salmon and rainbow trout farms increased from 922 to 1 160 (up 26 percent) during the same time period (Statistics Norway, 2020). In the European Union, the number of aquaculture enterprises has remained relatively stable during the last decade, at around 12 000 operations (STECF, 2018). The Norwegian government is very supportive of further technological progress in the salmon farming sector, which in recent years has led to investment in land-based recirculating aquaculture systems (RAS) and offshore salmon "mega-farms". Although these systems represent an emerging field for the insurance market, they are still considered risky propositions by insurers. According to industry executives, "RAS projects need to be underwritten project by project" (Mereghetti, 2018). Insurers also remain skeptical with respect to offshore salmon "mega-farms", suggesting that a multi-year track record of results will be needed for these systems to gain wider acceptance among the insurance industry.

Biological factors such as diseases, sea lice and harmful algal blooms, have caused significant financial losses to aquaculture in Europe and across the globe. Climate change is already driving new challenges for the aquaculture insurance industry, as revealed by the persistent HAB experienced in Norway in 2019, which caused losses estimated at USD 250 million for the salmon farming industry (Magra, 2019). Warming waters tend to increase the frequency and intensity of these blooms.

5. UNDERWRITING

Capture fisheries

The survey revealed that many policies are provided through the intermediation of insurance brokers, given the growing sophistication of policies and contracts. Insurance services can also be provided directly through the insurance company's staff, as well as through formal cooperation with fishery associations and cooperatives, even though the latter is less common. Some underwriters only support their own terms and conditions while others are able to 'follow' the terms of other specialist underwriters. London-based respondents explained that, as a subscription market, there is a 'lead' in London, but virtually all underwriters can shape their terms and conditions for what is a specialist insurance class.

Companies reported a net underwriting capacity on any single risk (without reinsurance) ranging from USD 500 000 to USD 500 million and a gross underwriting capacity (including reinsurance) ranging from USD 4 million to USD 500 million. Several of the companies with the largest underwriting capacity are based in the United Kingdom of Great Britain and Northern Ireland; these tend to be global insurers with a large number of offices in Europe and other continents (e.g. Sunderland Marine, The

Shipowners' Club, Ascot Underwriting). Companies based in Spain (e.g. Sociedad de Seguros Mutuos Marítimos de Vigo, Generali Seguros) also insure a large number of vessels in Latin America and Africa.

Aquaculture

Insurance can be provided directly through the insurance company's staff, but it is more commonly done through specialized brokers. In a few cases, insurance may be facilitated through a formal cooperation with aquaculture associations/cooperatives or by external agents (such as an NGO) with representation in aquaculture communities. As a general rule, insurers require extensive information on every operation to be insured; applicants are therefore required to complete specialist application forms and are usually assisted in this process by brokers. Many insurance companies have developed their own application forms and policy terms and conditions; terms can vary among producers of the same species and area, based on the companies' loss experiences and the perils selected by the policyholder. Nevertheless, some survey respondents stated that they are able to follow the terms of other specialist underwriters. Companies reported a gross underwriting capacity (including reinsurance) of up to USD 25 million on any single risk (USD 45 million on aggregated locations).

Insurance companies usually calculate the compensation they will pay based on the value agreed with the policyholder, which is usually based on the production costs and not on the selling price of the crop. In other words, compensation covers only those costs that would be necessary to replace the losses suffered with an equal or similar stock. This is referred to as biomass loss (stock mortality) coverage.

Although traditional arrangements dominate the aquaculture insurance market, the survey revealed that a few companies also provide index insurance. Aquaculture index (or parametric) insurance is a relatively new but innovative approach to insurance provision that pays out benefits on the basis of a predetermined index (e.g. rainfall level) for losses resulting from weather and catastrophic events, i.e. "quantifiable forces of nature". Current index products in European aquaculture are based on weather indices, particularly wind speed and temperature (rainfall is less frequent), that closely relate to expected stock mortalities. Index insurance is provided by companies and brokers such as Axa XL and Gallagher. While weather index products have significant potential for aquaculture risks, limited data on inventories, basis risks and the farmers' understanding of the insurance product are likely to limit their growth (Hohl, 2019).

6. PERILS COVERED

Capture fisheries

Like most marine insurers around the world, insurance companies providing services to the capture fisheries sector in Europe frame their basic policy forms around the London market's Institute Fishing Vessel Clauses. These clauses are the result of the 1987 merger of the Institute Time Clauses (Hulls) – developed by Lloyd's and the Institute of London Underwriters in the nineteenth century – and the Trawler All Risks Clauses, which were aimed at British fishing fleets.

Marine insurers adapt the Institute Fishing Vessel Clauses to reflect their own requirements. Participants in the survey reported that their insurance terms may be defined to cover "all risks" or "only named perils". Covered risks include: vessel/hull damage, crew illness, injury or death, natural disasters (storms, lightning, tsunamis, etc.), war risks (hostile actions, attack, piracy), as well as accidents due to technical/mechanical failure, human error (collisions), collision with marine debris, and those caused by a third party. Policies may also include coverage for risks such as theft and damage by vandalism, striking third-party nets, and fines imposed for certain incidents (e.g. fish escapes). Parametric (index-based) insurance is very rarely offered.

Mutual (P&I) companies have developed their own "club rules", which often extend the scope of coverage or provide bespoke protection to a particular fishery or a particular class of vessel. For example, they might cover fines for breaches of pollution, smuggling or immigration laws (provided these breaches are accidental). They might also cover costs and expenses arising from stowaways, refugees and the saving of life at sea, in addition to the costs associated with towing other vessels. Details on policy conditions and rules – including perils covered – can be found on the P&I club websites.

Aquaculture

Both all-risk and named-peril insurance are available throughout Europe. All-risk insurance covers all possible perils that result in stock mortality, subject to the specific exclusions stated in the policy. As reported by participants in the survey conducted for this review, these perils include natural disasters (e.g. typhoons, floods, harmful algal blooms), extreme weather events (e.g. low temperature and frost), changes to the normal chemical composition of the water (including deterioration of water quality from increased microbiological activity), technical failure, theft, collision, predation (from sealions, sharks, jellyfish or birds), and disease. All-risk policies are subject to deductibles, which are clearly specified in the wording of policies and tend to be considerably higher than in other agricultural enterprises, amounting to 10, 20, or even 30 percent of the agreed amount at risk. In a few markets, such as Norway, all-risk insurance provides cover for losses incurred as a result of government slaughter orders for notifiable diseases (e.g. infectious salmon anemia) and indemnifies the policyholder with a preestablished percentage (e.g. 50 percent) of the lost value of the stock after the deductibles (Hohl, 2019).

In contrast to all-risk insurance, named-peril insurance covers only specifically defined perils. Insured perils for offshore production systems such as cages normally differ from those defined for onshore systems such as ponds and RAS. The duration and features of most natural perils are clearly defined in the policies – e.g. a storm is commonly defined as an event occurring within 72 hours, and a flood within 168 hours. Disease events can range from 30 to 90 days, depending on the disease and the market (Hohl, 2019).

7. POLICIES IN FORCE

Capture fisheries

Given the fragmented nature of capture fisheries insurance, it is difficult to determine exactly how many policies are in force in the region. Hart (2009) estimated that there were 50 000 fishing vessels covered by insurance services in the European Union in 2009 . This estimate was based on the assumption that 60 percent of "passive gear" vessels (and potentially less) carry insurance, while a much greater proportion (up to 90 percent) of "towed gear" vessels are insured. Given that the number of active vessels registered in 2018 was 82 000 (down 4 percent relative to 2008) (Eurostat, 2020) and that Hart's assumption on coverage rates across vessel types is still valid, we can reasonably assume that the number of fishing vessels currently covered by insurance in the European Union is under 50 000. Considering that Norway and Turkey respectively reported 6 000 and 15 600 active vessels in 2018, the total number of European fishing vessels carrying insurance is not likely to exceed 60 000 (55–60 percent of the entire fleet).

Policies normally provide protection for vessels (hull, machinery and fishing gear) against a wide range of perils and incidents, including those caused by crew negligence. Policies will also pay damages or compensation for personal injury, illness and the death of crew and passengers. P&I policies cover an even wider range of risks, including:

i) loss or damage to piers, wharves, jetties, pontoons or any property belonging to other parties, including their fishing nets;

ii) claims from other parties for personal injury or death arising out of a collision;
iii) contractual liabilities and indemnities for illness, personal injury, death or property damage, including indemnities to port authorities, boatyards and suppliers of goods and services;
iv) fines for accidental escape or discharge of oil and other substances;
v) breaches of immigration regulations;
vi) costs of defending criminal proceedings;
vii) the extra costs and expenses of fuel, wages, provisions, and port changes incurred in diverting to bring sick or injured crew or others ashore for urgent medical treatment, or the repatriation of dead bodies;
viii) damage to coral reefs and other sensitive marine environments;
ix) costs and expenses arising from stowaways, refugees, and the saving of life at sea;
x) damage to towed fishing vessels; and
xi) wreck removal after the loss of a fishing vessel.

Respondents explained that coverage for specific risks has evolved over time in response to members' insurance needs.

Vessels insured

Fishing vessels are a large insurance class ranging from small, inshore craft with a two- or three-sailor crew, to ocean-going factory vessels with crews in excess of 40 people and valued at more than USD 50 million.

According to the FAO survey respondents, insurance is more commonly available for both offshore and inshore (coastal) fisheries, but some inland fisheries are covered as well. It is possible to obtain insurance for a wide variety of vessels and fishing methods: trawlers, purse seiners, longliners, gillnetters, vessels engaged in tuna pole-and-line fishing, and multipurpose fishing vessels. Some companies also provide insurance for trap/pot fishing, scallop dredging, lobster/crab diving, and recreational fishing. One respondent stated that coverage for deep-sea fishing is being considered by their firm. Coverage is equally available for small (up to 12 m in vessel length), medium (12–45 m), and large vessels (over 45 m). The maximum age limit on vessel insurance coverage was reported to be 45 years.

When asked which activities companies were not prepared to insure, respondents cited artisanal fishing, whaling/sealing/shark fishing, squid jigger vessels (in view of their increased collision risks), large Russian and Chinese factory-type vessels (increased crew and fire risks owing to poor maintenance), contracts involving American jurisdiction (considered unprofitable by some), certain fines and penalties, kidnap and ransom. Non-ICCAT-certified tuna fisheries were also rejected by some respondents, as well as forbidden fishing methods such as drift nets and IUU fishing.

Policies generally include coverage for engine and propulsion systems, outboard engines, on-deck installations (cranes, beams), below-deck installations (freezers, cold-storage), fishing gear, electronic equipment for navigation and communication, lifeboats, hydraulic systems, and daughter vessels. In some policies, compensation for fishing gear is paid when loss is caused by events such as fire lightning or violent theft by persons from outside the vessel, or where it results from the total loss of the vessel by insured perils, not as a result of normal operation of the gear.

Aquaculture

It is difficult to determine with any accuracy either the total number of policies in effect in Europe, or any individual country, or the number of commercial aquaculture enterprises that are currently insured. As previously mentioned, industry experts estimate that salmon aquaculture has reached nearly 100 percent coverage in Norway,

while the seabass and sea bream industries in the Mediterranean follow salmon in terms of insurance penetration. However, in the latter sector large operators are much more likely to be covered by insurance than small-scale producers; this means that the rate of coverage by biomass is substantially larger than coverage by number of enterprises. Given the number of aquaculture firms in the European Union, Norway and Turkey (16 300 units – STECF, 2018; Eurofish, 2020a; Eurofish, 2020d) and an assumed coverage rate of 100, 20 and 10 percent for salmon, seabass/seabream and shellfish/freshwater aquaculture, respectively, it is estimated that approximately 2 500 enterprises are covered by insurance in Europe (around 15 percent of the total number).

Most insurance companies participating in the survey indicated that coverage is provided for stock mortality *in situ* and mortality resulting from live transit. P&I coverage for aquaculture operations is available and provided by P&I clubs.

Species insured

Atlantic salmon is the most insured species, followed by rainbow trout, seabass, seabream and tuna. Other finfish species covered are meagre, carp, halibut, turbot, arctic char, amberjack, cobia and sturgeon (freshwater aquaculture). Some firms also reported coverage for shellfish (mussels, hard clams, oysters, abalone, lobster) and seaweeds (kelp).

European-based firms have established business elsewhere in the world; as such, they report coverage for tilapia, pangasius and shrimp. A few respondents suggested that cod, octopus and algae could be among the new species potentially insured in the near future. Unsurprisingly, a few respondents made strong statements against shrimp and extensive aquaculture insurance owing to the lack of stock control and the lower level of management, which make these operations very difficult to insure (disease coverage is never offered for shrimp aquaculture, which makes policies unattractive to most producers).

Growing systems insured

Most survey respondents reported coverage for both offshore and onshore systems.

The following culture systems are listed in decreasing order of importance, as revealed by the survey: cages, RAS, hatcheries and on-growing units, ponds, raceways and gravity tanks, offshore systems, oyster and mussel farming systems, barges, longline culture, aquarium systems, and greenwater tanks. Both RAS and Very Large Offshore Production Units (VLOPUs) were cited by some respondents as potential systems to be covered in the future, and as systems that are not insurable at the moment. The case of RAS systems is particularly interesting, as many respondents recognize there is great potential – hence the current coverage being provided – but also exercise caution, with the first year of operation the greatest source of concern (respondents reported losses caused by high levels of hydrogen sulfide [H_2S]). These responses align with recent press reports highlighting RAS as a "very risky, but an emerging field for the insurance market" (Mereghetti, 2018). Insurers are eager for a multi-year track record of results to emerge prior to embracing both RAS and VLOPUs.

Other aquaculture-related insurance

Some companies and brokers provide comprehensive coverage for buildings and onshore equipment, public / product / employee / transport liability, as well as business interruption. In fact, some of the respondents that did not provide coverage for the latter indicated that loss of profit due to slow growth and business interruption are risks that could be included in their portfolio, along with other balance sheet

protection products. Nevertheless, the performance of these products could be affected by moral hazard, which remains high in aquaculture. Currently, third party liability is not available for aquaculture insurance.

8. RISK MANAGEMENT

Capture fisheries

Risk management is essential to marine insurers as their attitudes towards risk and their practical knowledge of the field shape their individual insurance criteria. Insurers rely on both their own and independent surveyors. Prior to issuing any policy, vessels must be appropriately classed and maintained with a classification society (e.g. the International Association of Classification Societies); compliance with flag state conditions must also be ensured. In addition, the past record of incidents, age, trade, management and ownership history is reviewed and a pre-entry, onsite ship inspection is conducted. Desktop risk reviews, periodic inspections and/or management audits can be imposed at any time. Regular interactions with loss prevention teams from insurance companies ensures awareness of issues such as fatigue or undermanning, as well as the importance of regular maintenance of fishing gear and equipment. Concerns about IUU fishing are addressed by reviewing fishing licenses and IUU blacklists released by regional fisheries management organizations. Nearly half of the respondents from the survey reported that they are familiar with the PSI initiative and reported the existence of procedures to deny insurance to vessels in IUU blacklists.

Because fewer accidents result in lower claims costs, which in turn allows insurers to produce more competitive premiums, training programmes and publications are frequently released by insurance companies to increase the awareness of risk and to prevent accidents occurring. For example, the British P&I Club suffered a number of high-value casualty cases in 2016, including four collisions involving fishing vessels. These incidents eventually led the club to produce a Guide for Masters and their Bridge Teams on how to reduce the risk of collisions with fishing vessels (UK P&I Club, 2017).

The continuous training of underwriters on the complex nature of risks in marine insurance is an essential aspect of risk management. A number of insurance companies run training programmes duly certified by the Chartered Insurance Institute (CII) in London, which also delivers examinations.

Aquaculture

Risk management surveys are regularly carried out by surveyors who must certify that the stock is free of diseases, the equipment is functional and regularly serviced, and farming structures are frequently maintained and repaired. While insurers rely primarily on independent contractors, larger companies may hire their own surveyors.

As part of the risk survey process, books, balance sheets and accurate documentation of fish stocks (i.e. stocking rates, stock biomass, mortalities, and feed quantities) must be disclosed. Detailed records are beneficial for both sides: on one hand the policyholder is more reliably covered in the event of a claim, while on the other the insurance company can calculate the premium more precisely. Furthermore, the insured business must agree to take immediate action in the presence of a disease and immediately report any material changes in the stock to the insurer.

In recent years, the globalization of the salmon industry – coupled with the ongoing consolidation into highly sophisticated, efficient and scientifically driven operations – has altered the traditional role of aquaculture risk managers. From being farm management experts for individual sites the risk managers have become global researchers examining issues and developments on a regional, national, and international scale with the assistance of mathematical models. Recent examples of risk management assistance provided to policyholders include: i) investigations into feed composition following the suspicion that variable feed quality caused developmental

problems; ii) analysis of containment net integrity; iii) promotion of integrated pest management strategies; and iv) development of bloom monitoring and mitigation techniques (Agroinsurance, 2014). The experience gained in risk management with the salmon farming industry has been used to manage risk for other species such as seabass, sea bream, tuna, trout and abalone.

9. HANDLING OF CLAIMS

Capture fisheries

As soon as a potential claim is filed, a loss adjuster (who may be independent or work for the insurance company) is instructed to assess the nature and extent of the damage and report directly to the insurer. Depending upon the nature of the damage (e.g. fire on board), an expert may be appointed to help determine the exact cause of the loss. This process is normally conducted in an expedited manner to arrive at a prompt determination of liability.

A number of industry analysts have recently suggested that clearer and more specific wording is required from the Institute Fishing Vessel Clauses in order to avoid some inequitable outcomes during the claim handling process (The Maritime Executive, 2018). For example, Clause 9 states that underwriters should defray the cost of wages and maintenance of members of the crew retained while a vessel is undergoing repairs for which the underwriters are liable. Nevertheless, because the wage bills on some vessels can be close to USD 100 000 a week, the wages element rapidly dominates a claim for a relatively inexpensive repair. In this case, a more precise definition of the terms crew, wages and maintenance is warranted. An additional example is related to the concept of *general average* (the apportioning of liability for loss after marine casualties). Analysts have pointed out that the voyage profile of a fishing vessel leaving a port for a specific fishing location and then returning to the port they started from does not fit well with the laws and regulations around general average which are predicated on the voyage from Port A to Port B commonly observed in the shipping industry. The implication is that an inequitable result may emerge whereby the vessel owner either gets all expenses associated with the return to his home base considered as general average or none of them, depending on the stage of the fishing campaign at the time of the casualty. According to Willum Richards, 2017–2019 chairman of the London-based Association of Average Adjusters, it should be possible to generate a wording for the Institute Fishing Vessel Clauses that achieves equitable results for all parties involved (The Maritime Executive, 2018).

Aquaculture

The procedure to deal with claims in Europe is the same as that adopted in other regions of the world. Policyholders are required to report any event that might lead to a claim in order to respond to incidents as fast as possible, before problems get beyond remediation. In the event of damages or loss, and following the receipt of a claim notification, insurance companies usually appoint independent (or their own) loss adjusters to review and evaluate the claims on the basis of the policy. Loss adjusters carefully examine whether the problems occurred suddenly, were really beyond the policyholder's control, and whether the farmer took reasonable measures to avoid the damage. Whenever requested by the insurance company, policyholders must produce all documents and logbooks related to the claim and allow insurance company agents to interview any person who may have direct or indirect knowledge of the matter under evaluation.

10. UNDERWRITING EXPERIENCES

Capture fisheries

The slow, protracted decline of capture fishery landings and the decommissioning of vessels in Europe have both affected the underwriting experience: fewer vessels to insure translates into a lower potential for profits related to other areas of marine insurance. Profits are also impacted by the increasing frequency of claims stemming from ageing vessels and machinery.

According to respondents, a major issue affecting the global performance of the capture fisheries insurance business is the relatively poor level of risk management still observed in some of the insured fisheries. These concerns seem to be more prevalent in large fisheries from developing countries, some of which receive coverage from European insurers. Poor oversight and deficient certification of risks such as fire hazards and vessel maintenance are not uncommon.

The substandard classification of vessels is another issue that could influence the risk management and overall underwriting experience of insurance companies. One telling example is the ongoing legal dispute between Generali Italia SpA and the owner of a sunken fishing vessel lost off the coast of West Africa, as reported by the legal news service Law360 (Faulkner, 2020). According to the fishing company, Generali Italia and 15 other underwriters wrongly refused to indemnify it after a freezer trawler tilted following an "error of judgement" by its crew. However, Generali Italia and the other underwriters claim that they were misled about the true value of the ship and are seeking to block the fishing company from collecting on a USD 50 million policy. According to Generali, the defendants pegged the value of the vessel at USD 50 million even though the vessel was a scrap candidate and had been bought less than a month earlier for no more than USD 700 000. This case emphasizes the need for insurance companies to enforce minimum technical criteria prior to issuing insurance policies.

The 2009 capture fisheries review revealed that the underwriting results for the European insurance industry were mediocre in the 2000–2009 period. The responses collected in this year's survey do not suggest that performance has improved markedly, as many respondents interspersed "Good" and "Very Good" years with "Neutral", "Bad" and "Very Bad" years during the 2009–2019 period. For any given year, some respondents may report an acceptable performance while others report poor results. Aggregated responses for most years indicated "Neutral" results, with no apparent trend over time.

Aquaculture

A major issue pointed out by survey respondents is that a gap remains between what farmers are willing to pay for insurance and what insurers are charging. Aquaculture insurance remains a very complex, technical business with a relatively poor loss record compared to other areas of insurance. Therefore, a somewhat paradoxical situation emerges: companies offering the service feel that the aquaculture industry does not pay sufficient premiums, while many farmers are convinced that insurance is simply too expensive. A negative feedback loop ensues in a limited market penetration and leads to higher premiums for those participating in the market.

Respondents also noted that deductibles are too low and insured limits are too high compared to the low premium volume generated by the sector. In addition, aquaculture facilities are too frequently exposed to catastrophic events – such as the recent Storm Gloria in eastern Spain – and current premium rates do not price the impact of these extreme events adequately. A respondent from the survey reported historically poor results for shellfish (oysters, mussels) because of frequent catastrophic losses.

Adverse selection remains a problem: the majority of farming companies with significant risk exposures purchase insurance, which skews the insurance portfolio's results. Another issue is that premiums are disproportionately generated from

established, high-value aquaculture regions such as Norway; a poor spread across species and geographical regions in turn leads to volatile insurance portfolios, which are difficult to manage and profit from, thus curtailing growth of the overall market. The market's expansion is further limited by local restrictions on foreign insurance companies.

A common perception among insurance and reinsurance companies is that their sector operates on very thin profit margins, while large salmon farming companies have managed to reap substantial profits in recent years due to high salmon prices. Large producers increasingly see aquaculture insurance as an "investment", i.e. they expect to obtain frequent payouts from insurance companies. A related issue is the missing long-term relationship between policyholder and insurance company: after experiencing a loss, policyholders simply switch to a different insurance company in order to keep a low premium rate.

Respondents also reported that micro-insurance solutions put forward for small-scale farming systems need the involvement of many stakeholders, and have not been successfully implemented yet due to the large transaction costs associated with the management of these programmes.

In the early years of the industry, aquaculture insurance was hampered by a lack of reliable data on natural hazards. Currently, a number of spatial technologies and tools are available to insurance companies to manage this type of risk more effectively (Aguilar-Manjarrez *et al.*, 2018). For example, Munich Re's NATHAN (Natural Hazards Assessment Network) risk suite is designed to assess the risks of natural hazards around the world (Munich Re, 2020). Moreover, the EU-funded Applied Simulations and Integrated Modelling for the Understanding of Toxic and Harmful Algal Blooms project (ASIMUTH) used a collection of satellite and modelling data to construct a HAB forecasting tool, which combines oceanographic, biological and toxicity data into a near real-time warning system (Maguire *et al.*, 2016). The importance of these tools will increase over time, as climate change is expected to have an impact on the frequency and intensity of hazardous events, e.g. higher incidence of algal blooms in Norway.

Using a simple scale from "Very Bad" to "Very Good" to rank the underwriting results from insurance companies over the previous 10 years, the 2006 aquaculture review concluded that European aquaculture insurance is marginally profitable (Van Anrooy *et al.*, 2006). Based on the responses collected in the present 2020 FAO survey, this assessment remains unchanged for the period from 2009 to 2019.

11. CONCLUSIONS

Capture fisheries

Many of the conclusions presented in the 2009 capture fisheries review remain relevant for the current assessment.

Insurance companies continue to offer well-designed policies, generally framed under the Institute Fishing Vessel Clauses; they make use of a well-connected network of insurance brokers and carry out standard claim-handling procedures. Commercial insurance companies provide protection to vessels against a wide variety of perils, while mutual underwriting organizations (P&I clubs) offer policies to cover an even broader range of risks.

The market for commercial fishing vessel insurance in Europe is likely to continue to shrink over time as fishery management shifts towards the conservation and preservation of stocks, and aquaculture continues to grow as a major source of the world's total fish supply. The number of active vessels in the region fell by 4 percent between 2008 and 2018, as countries strove to meet the obligations arising from the 2013 reform to the Common Fisheries Policy. As profit margins continue to tighten,

with little expectations for growth, fishing vessel insurance will struggle to attract new corporate capital, which will be redirected by insurance companies and P&I clubs to more profitable business lines.

Other factors can influence the capture fishing insurance industry. The decline in landings (down 2.5 percent in the 2008–2018 period) may translate into reduced risks, as fewer days at sea reduce the frequency and opportunities for accidents. On the other hand, exploitation of diminished fish stocks may cause the remaining boats to travel further and stay longer at sea, thereby increasing risk. Moreover, as the European fishing industry continues to age, older vessels will produce a higher number of claims. These considerations may influence capture fisheries' underwriting experiences. As the European marine insurance market serves other countries, risk management will remain a major challenge for the industry, especially for vessels participating in the distant fisheries of developing countries.

The challenge of illegal, unreported and unregulated (IUU) fishing will continue to gain prominence in the near and mid-term future. Reducing exposure to the legal and reputational liabilities associated with IUU fishing is a major goal for insurance companies. As a result, most companies have implemented a number of protocols to detect and deny coverage to rogue vessels engaged in IUU fishing, in compliance with the obligations acquired under the UN environment's PSI initiative.

Fisheries management has become increasingly political, given that fish stocks, gear and vessel regulations, as well as quota allocations, are negotiated between all Member States within the European Council, and the European Council with non-member States. Although insurers have been preparing for Brexit since 2016, the impact on the marine insurance sector is still uncertain now Brexit has become a reality.

Aquaculture

Several of the conclusions reached in the 2006 aquaculture review in Europe are still valid today. With sophisticated insurance markets and an appropriate support network of brokers, loss adjusters and technical experts in aquaculture, Europe continues to be the best served region in the world. Insurance companies offer well-designed policies and have developed appropriate claim-handling procedures. Their comprehensive approach to risk management is supported by survey and inspection systems, as well as reinsurance available from specialist companies in a number of countries.

Insurance in European aquaculture continues to be purchased primarily by large, well-managed and well-financed producers. Most of the growth in the insurance market has been driven by the growing technological sophistication and industrial consistency of the salmon industry in Norway. High salmon prices and wider profit margins in recent years have helped consolidate this growth, to the point that coverage of the industry in Norway has reached 100 percent. Coverage has also increased for other species such as seabass and sea bream in the Mediterranean, as well as a large number of species and production systems throughout the continent. However, cover is not easily accessible for many small-scale, family-run businesses in sectors such as mussel/oyster farming. For these enterprises, coverage through the European Maritime and Fisheries Fund of the European Union might represent a better option.

It appears that the European aquaculture insurance market is marginally profitable, even when many aquaculturists feel that the current premium structure is rather expensive. Several reasons are behind the relatively poor performance of the sector compared to other areas of agricultural insurance, namely: i) exposure to both high-frequency losses (e.g. sea lice) and low-frequency–high-severity damage (e.g. natural disasters, algal blooms, epidemics); ii) high mortality in culture systems, which vary according to species and environmental conditions; iii) the concentration of high risk in specific locations in a very fragmented industry, which limits efficient risk pooling; and iv) high moral hazard and adverse selection.

In recent years aquaculture in Europe has been affected by biological incidents such as diseases, sea lice and harmful algal blooms, which have caused significant financial losses. One risk management strategy pursued by the industry is the development of RAS and offshore operations, which are now regarded as emerging fields in the insurance market. A track record of results built over a number of years will be needed before insurance companies fully embrace these solutions. Availability of parametric (index-based) insurance as well as balance sheet/revenue protection products may also increase in the future.

In general, aquaculture insurance coverage in Europe has improved over the years as it has increased its capacity to underwrite larger risks and new culture technologies. This trend is expected to continue in the future. Nevertheless, a major conclusion of the 2006 aquaculture review is worth repeating here: in order to expand the aquaculture stock market and widen availability, insurers must be able to make profits from underwriting the risks of the industry. This must be achieved by increasing the industry's ability to hedge against factors such as diseases and natural disaster exposures; in other words, by spreading risk further in terms of geography and species.

12. RECOMMENDATIONS

The following recommendations emerged from the research conducted by the author and from suggestions offered by the survey respondents.

Capture fisheries

i) Increase the education of shipowners and crew on basic concepts such as vessel safety and fishing personnel safety, as well as maintenance and insurance literacy. Several insurance companies have released publications promoting safety guidelines; this practice should be encouraged as safer vessels reduce fatality rates and lead to improved outcomes for underwriters.

ii) Given that risk management practices were reported as inadequate in some of the insured fisheries, the development of standard sets of rules that fishing firms would adhere to (akin to an ISO/class equivalent for fishing vessels) is strongly recommended, in addition to a regulatory framework ensuring the enforcement of these rules. In this scheme, participating firms would be vetted and could then be classified into higher insurance tiers, in the same way government bonds are graded by credit rating agencies. This system could be applied to areas such as fire risk management, as fire incidents are common in the industry, providing fishing firms with an incentive to improve their practices.

iii) The IMO International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F) should continue to play a pivotal role among international instruments on fishing vessel safety.[1] Although Chapter III of STCW-F only provides an outline of the basic safety training required of all personnel aboard fishing vessels flying the flags of signatory countries, an ongoing revision of the Convention (to be completed in 2022) is expected to provide further guidance on the content of the safety training.

iv) Regulations should also be promoted to ensure fishing vessels are properly classed under a marine classification society so as to minimize the chances of legal disputes; even if disputes are resolved in favour of insurance companies, litigation does little to improve their image.

[1] The STCW-F is an international convention established by the International Maritime Organization (IMO) which aims to increase safety on fishing vessels by setting a minimum standard for training, certification and watchkeeping of fishers.

v) In order to minimize the occurrence of inequitable insurance outcomes, attention should be given to improving the wording of the Institute Fishing Vessel Clauses (recommendation made by the Association of Average Adjusters).

i) As the frequency and intensity of storms increases as a result of climate change, consideration should be given to index insurance schemes that provide protection against extreme weather events.

Aquaculture

The primary recommendation emerging from the study is to find ways to enlarge the risk pool of participants in the insurance market through the greater participation of producers across species, culture systems and geographical locations. It is essential to identify and provide incentives for lower-risk producers to become part of the risk pool. Increasing the number of participants in the market would allow insurers to issue policies at a premium price that most farmers could afford. Insurance portfolios with a healthy spread in terms of geography and species are also less vulnerable to volatility. This would benefit local, small-scale producers in particular as aquaculture insurance is already accessible to most of the large, corporate farms.

The enlargement or aggregation of the risk pool could be achieved by several means:

i) Extension programmes to further educate farmers on the benefits of comprehensive risk management, including risk-mitigating Best Management Practices and early warning systems for aquaculture (e.g. the European-Union-funded ASIMUTH project). Farmers typically address risks directly related to the running of their operations but frequently fail to recognize the probability of risks that are beyond their control such as natural disasters, boat collisions and algal blooms. The proposed educational programmes could address this important aspect. An additional goal would be to create familiarity and trust towards private insurance providers.

ii) The establishment of producer organizations made up of small-scale aquaculture producers should be encouraged, in addition to cooperative arrangements along the value chain, as these groups would be easier to insure than individual operations.

iii) Targeted government programmes that aim to reduce the cost of insurance premiums for small-scale producers. To this end, the experiences of the private–public partnership led by Agroseguro in Spain constitute a very useful precedent.

Finally, survey respondents also emphasized the need to train specialists with a specific knowledge of aquaculture insurance, given that the class is highly specialized and requires a great deal of expertise on species, production systems and local conditions. Embracing state-of-the-art techniques such as mathematical modeling and remote sensing in order to promote adequate risk profiling will also contribute to the uptake of aquaculture insurance.

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Regional report of Latin America

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1. INTRODUCTION

The Latin American region remains one of the most productive in the world, with the fisheries and aquaculture sectors considered a major source of export earnings and livelihoods for hundreds of thousands of people. Peru and Chile are respectively ranked second and tenth in the list of major capture fishery nations, with 8 percent and 3 percent of total global production (FAO, 2020a). Both countries have also experienced high aquaculture growth rates in recent years.

As in other regions of the world, capture fisheries and aquaculture operations in Latin America involve risks. The increased intensity and frequency of extreme weather-related events such as El Niño[1] have aggravated these risks, as they directly affect the coasts of Peru and Chile, causing damage and losses to the fisheries and aquaculture sectors. Although insurance for capture fisheries and aquaculture is considered an important risk management tool and has been available in most Latin American countries for decades, insurance penetration is generally low, particularly among small producers.

This chapter presents an updated overview of Latin America's insurance industry for capture fisheries and aquaculture, outlining the changes that have taken place since the 2006 aquaculture review (Van Anrooy *et al.*, 2006) and the 2009 capture fisheries review (Van Anrooy *et al.*, 2009). Considering their contribution to capture fisheries production in the region, information on capture fisheries insurance is provided exclusively for Chile and Peru. In the case of the review of aquaculture insurance, Brazil is also included.

This chapter is based on a literature review, as well as responses to the online survey administered by FAO from insurance companies, brokers, surveyors and loss adjustors from the Latin American region. The author also benefited from informal interviews with industry experts and government officials, which were carried out in July–August 2020.

2. STATUS OF CAPTURE FISHERIES AND AQUACULTURE PRODUCTION

Although Latin American fisheries production has declined in recent decades (42 percent lower from 2000 to 2017), the region remains one of the most productive fishing regions in the world. In 2018, Latin America produced about 13.7 percent of global marine landings (FAO, 2020a; OECD/FAO, 2019). Peru and Chile continue to be the region's major fish producers, together contributing to approximately 80 percent of the region's landings. The overall downward trend observed in recent years has largely been influenced by a drop in anchovy (*Engraulis ringens*) catches in Peru and Chile. There are various factors behind this: the implementation of stricter management plans, the high level of illegal, unreported and unregulated (IUU) catches, the overexploitation of some stocks, and the impact of the El Niño and Southern Oscillation (ENSO) episodes of 2016 and 2017/2018.

[1] "El Niño" is a large-scale, reoccurring climate–oceanic phenomenon that affects the Pacific Ocean. It turns ocean water warmer and prevents cold and nutrient-rich deep water from reaching the surface. This in turn hardly changes species composition (especially anchovies) and results in stock crashes that affect fish production.

The Latin American region only contributes about 3.4 percent of the world's aquaculture production. However, the increase in recent years (> 6 percent per year in the 2000–2017 period) has given the region one of the highest aquaculture growth rates. Chile remains the region's leading aquaculture producer, with 38 percent of the region's total production, followed by Brazil (FAO, 2020b). Although diversification of aquaculture species within the region has been promoted, so far only salmonids, trout, shrimp and tilapia have achieved significant and stable production, along with molluscs in Chile and Peru. Fishery production in the region is expected to grow by 12 percent over the next decade, with Chile and Brazil displaying the highest growth, at 21 percent and 17 percent respectively. Peru, meanwhile, is expected to have a lower growth rate, of 3 percent (OECD/FAO, 2019).

Peru

Peru is the second-largest fishing nation in the world, with anchovy making up about 87 percent of its total capture fisheries production. The country continues to be the world's leading producer of fishmeal and fish oil, contributing 22 percent of the world's fishmeal production and 33 percent of world exports in 2018. Peruvian aquaculture production has increased at an average annual rate of 10.7 percent; in 2018 it produced 103 598 tonnes. Inland aquaculture production accounted for 59 percent of production, while mariculture made up 41 percent. Most aquaculture production is done by small-scale operators with an annual production of up to 150 tonnes. The main cultivated species are trout (53 percent), shrimp (29 percent), and scallops (12 percent).

Chile

Chile landed 2.1 million tonnes of capture fisheries products in 2018, with anchovies the main species in terms of landed volume. Chile has increased its aquaculture production volume by around 30 percent over the last decade, from 871 000 tonnes in 2008 to 1.3 million tonnes in 2018. Salmon continues to be the main aquaculture species by volume (63 percent of total production), and the country almost doubled its production from 2008 to 2018, from 480 000 tonnes to 809 000 tonnes. Other high-value species cultured are rainbow trout and Chilean blue mussel. In 2018, Chilean aquaculture production had an estimated off-farm value of USD 10.5 billion (FAO, 2020b).

Brazil

In 2017, Brazil's total capture fisheries output was estimated at 704 100 tonnes, with 30 percent originating from inland fisheries (Fishery and Aquaculture Country Profile, 2010). Over the last decade, the country's aquaculture production has almost doubled, reaching 606 000 tonnes in 2018. Brazil is the second-largest aquaculture producer in Latin America after Chile, contributing 20 percent to the region's total. Tilapia continues to be one of the main aquaculture species in terms of volume, putting the country among the four largest producers in the world. The value of Brazil's aquaculture production has increased by around 65 percent over the last decade, from USD 851 million in 2008 to USD 1.3 billion in 2018 (Peixe BR, 2019).

3. THE INSURANCE MARKET

Insurance penetration (premium/gross domestic product) has improved in the region over the past decade, mainly due to the development of life insurance policies. In 2018, the Latin American insurance market reported premium income of USD 151 billion (a 5.5 percent decrease compared to 2017), which represented 3 percent of global premium income (MAPFRE, 2019). The main reasons for this slowdown are the poor

economic and financial conditions, as well as the volatility of commodity prices in Latin America. The decline is especially evident in Brazil, due to its economic recession and currency depreciation. Peru and Chile, meanwhile, showed growth similar to that observed in their economies.

Agricultural insurance in the region has developed rapidly over the last decade. It accounted for about 6 percent (USD 1.6 billion) of global agricultural insurance premiums in 2016. Brazil remains the country with the most important agricultural insurance market (mainly crop and livestock insurance) in the region. With the exception of Chile, where insurance for aquaculture has been available for more than 20 years, aquaculture insurance has just begun to develop in other countries in the region. In 2017, only 28 percent of the region's aquaculture production was insured, mainly in Chile and Mexico (Giardi, 2017).

Insurance and reinsurance activities are highly supervised by each country's insurance regulators. In Peru and Chile, general insurance business is mainly carried out by insurance and reinsurance companies, which operate in the country as companies limited by shares. Individuals and/or companies can also acquire insurance from foreign insurance companies. Consequently, some large fishing and aquaculture companies acquire insurance from abroad through their parent companies. In Brazil, insurance and reinsurance companies can only operate in the country if they are registered and meet the regulator's strict requirements. Some insurance market regulations have been eased in recent years, with a view to increasing foreign investors' access to the Latin American insurance market. Nevertheless, the process of introducing new insurance products (as in the case of aquaculture) remains cumbersome, particularly in Brazil.

4. DEMAND AND SUPPLY ISSUES

Capture fisheries

Peru and Chile

The capture fisheries insurance market in Peru and Chile is still largely dominated by a few large private insurance companies. In Peru, of the 15 insurance companies that offered non-life insurance policies in 2020, 4 offered marine hull insurance.[2] In 2020, marine hull insurance accounted for about 1.6 percent of total non-life insurance premium income (SBS, 2020). Two companies represented about 94 percent of the total premium income from marine hull insurance, one of which was particularly dominant, with a 71 percent market share (SBS, 2020). In Chile, 32 insurance companies were engaged in the non-life insurance business in 2020, of which 13 provided marine hull insurance (AACH, 2020). In 2020 marine hull insurance accounted for about 0.8 percent of total non-life insurance premium income. Taken together, three insurance companies realized about 83 percent of premium income (AACH, 2020). Compared to the 2009 capture fisheries review (Van Anrooy *et al*., 2009), the number of capture fisheries insurance providers in Peru has not changed while in Chile this number has increased from 9 to 13.

The demand for capture fisheries insurance is closely related to the size of the fishing fleet and the scale of the policy subscribers (fishing companies).

In Peru, the total number of industrial fishing vessels (mainly pelagic purse seiners and coastal trawlers) increased from 790 in 2009 to 834 in 2019 (SNP, 2019). In Chile, the total number of industrial fishing vessels (mainly pelagic purse seiners and trawlers) decreased from 223 in 2008 to 142 in 2017 (SERNAPESCA, 2017). In terms of the scale of the policy superscribes, in Peru just two main fishing companies possess around 10 percent of the total fishing fleet (76 vessels) and provide the major share of fishmeal

[2] Marine hull insurance covers all loss and damage of vessels used for commercial purposes and can include third-party coverage.

and fish oil exports, with 39 percent and 38 percent of total exports in 2018 respectively (TASA, 2018). In chile, a series of mergers has resulted in four large fishing business groups controlling a large part of the country's fishing industry.

The status and the extent of the countries' fisheries management also influences the demand for insurance products in the capture fisheries sector. Over the last decade, the governments of Chile and Peru have imposed stricter fishing regulations to rationalize fishing efforts and promote the sustainable use of resources. Both governments have closed fishing seasons early for anchovies due to the high presence of juvenile populations, and this has substantially reduced total landings of the species. As a result, the production of fishmeal and fish oil suffered a historical decline in 2017, which seriously affected the fishing industry. Fluctuations in the production volumes and prices of anchovies and fishmeal/fish oil have an impact on the profitability and sustainability of the value chain, particularly the fish processing industry in both countries. The fish processing industry requires 4 million tonnes of raw fish per year to achieve market balance, yet between 2013 and 2017 Peru's anchovy production could only meet this goal in 2013 (Globefish, 2020). The periodical occurrence of El Niño events affects the supply of fish, and indirectly the demand for insurance services. Although not as extreme as those recorded in 1998, El Niño episodes in 2015/2016 and 2017 nonetheless interrupted the fish value chain, and the main ports and roads were temporarily closed because of heavy rain and floods.

The instability of capture fisheries production volumes, together with the fishing fleet capacity trends (see Kitts *et al*., 2020), have meant that demand for fishing vessel insurance has remained stable in both countries over the last decade. While in 2018 anchovy catches in Chile and Peru increased again, industry sources suggest that the demand for vessel insurance is not likely to increase in the industrial fishing fleet in the near future. According to these sources, the supply of insurance to the industrial fishing fleets in Peru and Chile is adequate and competitive.

Around 31 000 small-scale vessels (up to 32.6 m^3 capacity, up to 15 m in length) were registered in Peru in 2018; this accounts for 90 percent of the total fishing fleet (PRODUCE, 2019a). In Chile by contrast, the number of small-scale vessels was 12 546 in 2016 (SERNAPESCA, 2017). Although the small-scale fishing fleets constitute a significant part of the entire fleets of both countries, small-scale vessels remain largely uninsured. The same conclusion was reached a decade ago in the 2009 capture fisheries review (Van Anrooy *et al.*, 2009).

Generally, small-scale fishers in Peru and Chile only purchase insurance coverage if required by financial institutions as a prerequisite for obtaining loans, or for leasing contracts for vessels and machinery. In Chile, a deductible to cover accident and vessel insurance is included in the contracts that some fishing companies sign with small-scale fishers. The latter are therefore covered by insurance in this instance, though there are no official data on the total number of fishers insured in this form.

In Peru, the government issued Law 30636 in 2017 (El Peruano, 2017), which made it compulsory for fisherfolk to carry insurance for accidents. The compulsory insurance for artisanal fishers (Seguro Obligatorio del Pescador Artesanal - SOPA) provides coverage for death and injury for small-scale fishers during operations on vessels that either hold harvest rights or are legally authorized to operate. However, given the high level of informality in the sector and the insurance industry's limited interest in providing insurance to small-scale fishers, participation in the scheme is low.

Aquaculture

Chile

Chile has the most well developed aquaculture insurance market in the region, with technological developments in aquaculture providing the main driver for growth in this line of insurance. As an indication of the sector's longevity, aquaculture insurance has been provided to the salmon industry for more than 20 years.

Over the past decade, the number of companies operating in the salmon industry has fallen as a result of a series of acquisitions and mergers, while farms have increased in size. A total of 20 large companies currently operate in the sector – less than half the number recorded in the 1990s. Three companies make up about 30 percent of the market in terms of aquaculture exports. It is estimated that more than half of the salmon-producing companies are insured by the Chilean insurance industry, thus covering at least 50 percent of the total production of salmon biomass in the country. However, according to AXA executives, the coverage is even higher, with at least 80 percent of Chilean salmon biomass production insured (Craze, 2020). The rest of the salmon-producing companies are insured through their company's headquarters, which are usually located in Norway, Canada or the United Kingdom of Great Britain and Northern Ireland. The high coverage achieved in salmon is partly the result of technological innovations and improvements in risk management practices at the farm level, as promoted by the salmon industry. This has kept stock mortality rates within an insurable range.

The Chilean government has implemented tighter regulations on the salmon industry in recent years. There is more control on the management of stocking densities, pollution reduction (e.g. nutrient loading) and interactions with the wild population due to the escape of farmed fish. In 2019, the National Service for Fisheries and Aquaculture (SERNAPESCA) issued the "density directive" designed to control farm location, stock density and prevent overproduction. While the implementation of these regulations is expected to reduce production growth, it is also assumed that the outbreak and spread of disease (such as salmon anaemia-ISA) will be reduced. The measures may therefore have positive implications for the insurance industry's underwriting experiences. According to industry sources, P&I insurance, as well as coverage for farm equipment and infrastructure, have all increased among salmon producers. The increased interest is mainly driven by the above mentioned recent government initiatives, especially related to imposing fines for salmon escapes. The growing social and market pressure on the industry to take responsibility for its environmental impact may also be another motivation for salmon producers seeking insurance. Moreover, aquaculture operations are moving further south and offshore, where climate variability risks are higher (e.g. higher speed winds, more storms); this process may be another driver for growth in insurance demand in the coming years.

Insurance penetration for other aquaculture species such as rainbow trout and Chilean blue mussels remains low. Policies available on the market for these species provide limited stock mortality coverage and are relatively expensive. The fragmented nature of these markets, as well as the higher risks involved in these aquaculture operations, make premiums and/or deductibles too high. This limits the purchase of insurance cover by these producers.

Brazil

Agricultural insurance has been widely available in Brazil since the mid-1990s with government support in the form of premium subsidies. However, aquaculture insurance is still in its infancy. In 2017, after several years of striving to meet the very strict standards of the Superintendence of Private Insurance (SUSEP), a foreign-based

insurance company made aquaculture insurance available for Brazilian aquaculture producers of tilapia. So far, this company is the only authorized aquaculture insurance supplier in the country.

Aquaculture insurance in Brazil is linked to the development of tilapia farming. Historically, tilapia aquaculture was mainly conducted by small-scale enterprises using traditional farming systems such as earthen ponds and cages. In recent years the industry has innovated however, and is becoming a technology-intensive business. This has elevated the country as one of the top tilapia producers in the world. The government has supported the uptake of technologies by providing loans for the modernization of farming practices, while regulating the right. The right to use public spaces for aquaculture production has also been regulated. Despite these advancements, the cumbersome environmental licensing and permit procedures continue to hinder the development of aquaculture in the country (Barroso *et al*., 2019), and therefore aquaculture insurance.

In 2020, the Ministry of Agriculture, Livestock and Supply announced the expansion of the ongoing government's Rural Insurance Premium Subsidy Program (PSR) to provide insurance premium subsidies for the aquaculture sector.[3] Initially the distribution will focus on large and medium producers, as well as aquaculture cooperatives. Subsidies of up to 40 percent of the insurance premiums are expected to be available for biomass loss by onshore and offshore operations, and the policies to provide cover against water or environmental pollution, theft and robbery, predators, bad weather, lightning and chemical alteration of water. While the programme should contribute to the uptake of insurance among aquaculture producers and cooperatives, understanding the market conditions and implementing a data management system for risk profiling is key to develop aquaculture insurance in the country.

Peru

There are no public organizations or commercial insurance companies that offer aquaculture insurance in Peru. Large commercial aquaculture operations are covered by the international market, while medium- and small-scale enterprises, which hold rights to about 67 percent of the country's total aquaculture area (PRODUCE, 2019b) are largely uninsured. According to government sources, preliminary discussions are being held among government agencies to determine the best mechanism to promote aquaculture insurance among medium- and small-scale producers, which will most likely follow the outline of the government's Catastrophic Agricultural Insurance (SAC) scheme. The SAC scheme is a premium subsidy programme that aims to increase the uptake of insurance among small- and medium scale farmers and covers losses due to natural events (Government of Peru, 2019).

5. UNDERWRITING

Capture fisheries

The terms and conditions of capture fisheries insurance policies in Peru and Chile are largely shaped around the London market. They are provided through intermediation by both insurance brokers and the insurance company's own staff. While it is possible to provide insurance through fishing associations and/or cooperatives, such arrangements are not common. In both countries the insurance of fishing vessels is mainly supplied by private companies, and there is no state-supported capture fisheries insurance programme. Similarly, public agencies are limited to regulating insurance practices. A Chilean insurance company that participated in the global survey

[3] The PSR, created in 2003 by Law No. 10 823, is a government premium subsidy programme which aims to enhance farmers' protection against production risks. At the same time, it facilitates the private industry's participation in the rural insurance market.

presented a net underwriting capacity on individual risks ranging from USD 370 000 to USD 1.5 million; their gross capacity (i.e. including reinsurance) ranged from USD 400 000 to USD 5 million. Reinsurance coverage for marine lines of business (hull and machinery cover) is typically provided by foreign-owned reinsurance companies, primarily from the London market.

Aquaculture

In Chile, aquaculture underwriting is provided exclusively by private insurance companies; there are no state-supported aquaculture insurance schemes. Traditional indemnity insurance arrangements continue to dominate the market, although initiatives to promote the development of index-based insurance have been reported. According insurance industry sources, one Chilean insurer has developed an index-based insurance policy using wind speed, temperature and rainfall indexes. However, due to the occurrence of El Niño events, the product has not yet been offered. Other initiatives have intended to design parametric insurance policies to cover financial losses from delayed mussel production due to water pollution events. Mussels are more resistant to pollution and harmful algae, which is the reason that stock mortality insurance is not often purchased. Therefore, insurance to compensate financial losses suffered because of delayed harvests would be in higher demand among mussel producers than stock mortality insurance. Yet the poor weather monitoring systems in place, in addition to limited experience with parametric products, mean that the development of this type of policy has encountered delays. Underwriting capacities of USD 500 000 net per aquaculture business/farm and USD 6 million gross capacities, have been reported.

In Brazil, only one company has been authorized to provide insurance for aquaculture to date, through the government's PSR program. No information is available on the underwriting capacity of aquaculture farms in Brazil.

6. PERILS COVERED

Capture fisheries

The perils covered by capture fisheries insurance policies underwritten in Peru and Chile have not changed over the past decade. Policies are commonly of the "all risks" type, which covers risks caused by natural calamities (e.g. storms, floods, and waterlogging), accidents due to technical/mechanical failure and human error, fire and explosion. Policies may also include coverage for risks such as theft, vandalism and acts of piracy. Depending on the insurance provider, specific restrictions may be established. For instance, in Peru fire and explosion are sometimes only covered when the incident occurs at sea.

Aquaculture

Aquaculture insurance policies in Chile continue to be predominantly of the "named perils" type, although "all risks" coverage is also available. The perils covered are natural disasters (e.g. storms, floods and red tides), extreme weather events (e.g. low temperatures and frost), diseases, predation and water contamination (such as pollution caused by plankton increases), technical failures, theft and collisions.

The only aquaculture policy available in Brazil offers stock mortality coverage, physical loss and/or total loss of market value caused by water pollution and/or other contamination. Additional coverage can be purchased to protect against theft, predation and natural disasters (e.g. floods/tsunamis, droughts, storms and earthquakes).

7. POLICIES IN FORCE

Capture fisheries

Marine insurers in Peru and Chile usually follow the London market's Institute Fishing Vessel Clauses when framing their basic policies and related forms, adapting these clauses to meet their own and the policyholder's requirements. In most cases capture fisheries insurance policies provide protection to fishing vessels (hull and machinery) and equipment/gear. These policies can be extended to protect fishing companies against third-party liability and employer's liability as well as other risks, depending on the policyholder's insurance needs. Due to the fragmented nature of the sector, no information is available on the total number of capture fisheries insurance policies in force in either country.

Vessels insured

There is no official information on the number of fishing vessels covered by insurance in Peru and Chile. However, given that large-scale industrial fishing vessels are insured by fishing companies, it can be assumed that nearly 1 000 fishing vessels are covered.

All types of commercial fisheries (inland, inshore and offshore) are eligible to be insured. Insurance is available for a wide variety of fishing vessel types, such as purse seiners, trawlers, longliners, gillnetters, as well as vessels engaged in tuna pole-and-line fishing. Since the fishing fleets in Peru and Chile consist primarily of pelagic purse seiners and coastal trawlers, it is expected that these types of fishing vessels are the main types covered by insurance. Most fishing vessels insured have steel hulls, but vessels equipped with fibreglass reinforced plastic, ferrocement, aluminium and wooden hulls, can also be covered.

Equipment and gears insured

Besides providing insurance for hulls and machinery (including engine and propulsion systems), fishing vessel insurance policies in Peru and Chile can include fishing gear, electronic equipment for navigation and communication, lifeboats, launches and daughter vessels.

Aquaculture

In Chile, most insurance companies offer coverage for loss of biomass (*in situ* and in transit) though policies may also include coverage for infrastructure (e.g. raceways, basins, storage and hatchery buildings) and equipment (e.g. cages, small boats). P&I insurance for aquaculture operations is usually purchased separately from aquaculture stock mortality insurance. According to industry sources, aquaculture operators are also increasingly seeking to insure the well-boats used in offshore aquaculture operations (e.g. salmon farming),[4] though these boats are often covered by marine hull insurance policies. In Brazil, the only available aquaculture policy exclusively covers the loss of biomass caused by mortality, physical loss and/or total loss of market value.

It is very difficult to determine the total number of aquaculture policies in force, or the number of companies currently insured. Based on responses to the 2020 survey, there are at least 365 aquaculture policies currently active in Chile.[5] In Brazil, at least one aquaculture policy is in force, however this number is expected to increase in the coming years in light of the government's premium subsidies programme for aquaculture operators. It is estimated that there are no active policies in Peru, except for the policies acquired by parent aquaculture companies in the international market.

[4] A well-boat is a fishing vessel with a well or tank for the storage and transport of live fish.
[5] Number of active policies reported; however, it is likely that more than 365 farms are insured.

Species insured

In Chile, Atlantic salmon, Coho salmon and rainbow trout continue to be the main species insured, while the insurance market has increasingly provided coverage for blue mussel (*Mytius edulis*). Omber fish (*Argyrosomus regius*), croaker *(Micropogonias* spp.) and oysters (*Crassostrea* spp.*)* are also covered by insurance.

In Brazil, tilapia is the only aquaculture species insured at the moment.

Growing systems insured

In Chile, both onshore and offshore systems can be insured, including the following systems: marine cage culture systems, longline culture systems, gravity flow systems, oyster and mussel (hang culture/rope/line and bottom culture), raceways and gravity tanks, offshore submersible and semi-submersible cage systems, green water tanks, recirculation aquaculture systems, as well as hatchery and nursery operations. Insurance of offshore cage systems for the salmon aquaculture industry is expected to grow in the coming years.

In Brazil, the only aquaculture insurance available can cover both onshore and offshore farms. Earthen ponds, floating cages and longline culture systems are included. Hatcheries and ongrowing units can also be covered by insurance.

8. RISK MANAGEMENT

Capture fisheries

As in other regions, risk management surveys form an integral part of capture fisheries insurance underwriting. Insurers rely on both their own and independent adjustors, whose risk assessment reports are a key component of the decision-making process related to applications for insurance coverage. Prior to issuing any policy, some minimal pre-conditions are required. These conditions relate to the age of the vessel (maximum 20 years, based on survey responses), the previous history of accidents, as well as conditions related to the state of the hull, hull material and the state of the equipment. Among other documents, policyholders should submit details related to the construction of the vessel and certificates of its seaworthiness. When a fishing company in Peru or Chile requests above-average insurance coverage, thorough risk management studies and inspections will be carried out, which are conditioned by the reinsurance company.

None of the survey respondents reported specific procedures that exclude vessels that have been sanctioned for their involvement in IUU fishing from insurance.

Aquaculture

Risk management surveys are used to assess the physical risk inherent in production and operations. Risk assessment procedures are conducted by insurance company staff and independent surveyors. Potential policyholders must submit accurate documentation of farming operations (e.g. books, balance sheets, loading rates, stock biomass, mortalities and feed quantities). Potential policyholders must fill in application forms and are usually assisted by brokers or the insurance company's own staff. While many of the insurers have developed their own application forms and policy conditions, most of them follow international standards and conform to the European market model.

Considering that insurance for aquaculture has been available in Chile for more than 20 years, inspectors in the Chilean insurance market have extensive experience in assessing aquaculture risks. Moreover, given the global nature of the salmon industry and its continuous technological advances, the risk management processes in salmon aquaculture is well developed.

9. HANDLING OF CLAIMS

The handling of claims procedures in capture fisheries and aquaculture insurance policies does not differ much from what was reported in the 2006 aquaculture review and 2009 capture fisheries review (Van Anrooy *et al.*, 2006; Van Anrooy *et al.*, 2009). Fisheries and aquaculture insurance policies often contain standard claims procedures based on internationally accepted principles. As a general rule, policyholders should report any claim or potential claim to the insurance company immediately, either in writing or by other means (e.g. by email or telephone). In addition, policyholders must take reasonable steps to mitigate risks, which are usually prescribed in the policy.

For both capture fishery and aquaculture insurance, independent loss surveyors as well as own-company adjustors are used to evaluate claims against policies and inform both the insurer and the fishery/aquaculture company requesting the claim. These reports include suggested decisions with their justifications. The handling of claims is highly regulated and in case of litigation the outcomes often favour the policyholder.

10. UNDERWRITING EXPERIENCE

Capture fisheries

The insurance sector in Peru and Chile has more than 20 years of experience providing insurance services to the capture fisheries industry, specifically to large-scale industrial fishing vessels and their operations. In recent years fishing vessel insurance has plateaued, with slow growth, relatively stable demand and mediocre underwriting experiences. The excess capacity on the supply side contributes to competition in the insurance market and impacts profitability. In the 2009–2017 period the underwriting results of capture fisheries insurers in Chile were generally neutral or poor, in financial terms. In 2018-2019 some insurers reported neutral and good underwriting experiences. No information was obtained on the underwriting experience in the Peruvian capture fisheries insurance market.

Aquaculture

The underwriting experiences of aquaculture insurers serving the salmon industry have been influenced by outbreaks of disease, harmful toxic algae events and extreme weather conditions. In 2016, a toxic algae bloom affected 35 of the country's 415 salmon farms, generating estimated losses of USD 80–120 million for the insurance industry (Poblete *et al.*, 2019), the largest loss ever experienced by the aquaculture insurance market. Given that the aquaculture insurance industry in Chile focuses mainly on covering salmon farming operations, the risks are poorly spread. This leads to volatile insurance portfolios and increases losses in the case of disaster events. However, the fact that the insurance industry is well supported by reinsurance – and that the salmon industry continually adopts technological advances to mitigate risk – has led the insurance industry to manage these loss episodes properly, and thus achieve acceptable profits in recent years.

The underwriting experiences of Chilean insurance companies that responded to the 2020 survey vary widely between insurers in terms of financial results, and fluctuate between years. Only one insurance company reported their underwriting experience as "very good" in the last ten years, in 2018 and 2017. For the other years all insurers reported results ranging from "good" to "neutral" to "bad".

There is no information on the underwriting experiences in the Brazilian aquaculture insurance market, as the insurance provision is very recent.

11. CONCLUSIONS

Capture fisheries

Capture fisheries insurance continues to be purchased mainly by large-scale industrial fishing companies and it is assumed that more than 1 000 industrial fishing vessels in Peru and Chile are currently insured. The demand for fishing vessel insurance grew slowly and has stabilized in recent years. Profit margins in fishing vessel insurance will continue to be under pressure due to a competitive supply side and limited growth in demand. The demand for P&I insurance cover among fishing companies is growing, which provides opportunities for insurers.

The small-scale fisheries sector in Latin America continues to be largely underserved by insurance. In Peru and Chile, the vast majority of the approximately 43 500 small-scale fishing vessels registered operate without insurance. The limited awareness of the benefits of insurance among small-scale fishers and their lack of financial literacy hampers insurance provision for this sub-sector. Furthermore, insurers' lack of understanding of small-scale fishers' needs, coupled with the high risks involved in small-scale operations, mean that the policies available do not meet the fishers' insurance requirements. In Peru, the introduction of compulsory accident and life insurance for small-scale fishers took place in 2017, but it has not yet been fully implemented, thus most small-scale fishers continue to operate uninsured.

Aquaculture

Chile is the best-served country in the region in terms of aquaculture insurance. The technological progress in the salmon industry, added to its comprehensive approach to risk management – supported by the vast experience of insurers and reinsurers serving salmon aquaculture – has enabled the aquaculture insurance market to achieve acceptable profits and manage losses. Insurance coverage is now also available for other species such as mussels and rainbow trout, but insurance penetration remains low owing to the high premiums charged to insure these species and production systems. The stringent environmental management regulations on the salmon industry, as well as increased social and market pressures, has led to an increase in demand for P&I insurance among aquaculture producers.

In Brazil, the aquaculture insurance market is at a relatively early stage**.** The increasing technological advancements in tilapia aquaculture, together with the recent availability of government premium subsidies, are expected to lead to a growing demand for aquaculture stock mortality insurance.

In Peru, there is currently no aquaculture insurance offered by domestic insurance companies. The government is in the early stages of negotiations with the insurance market to establish a premium subsidy programme for medium- and small-scale aquaculture operators.

12. RECOMMENDATIONS

Capture fisheries

- Governments in the region should develop policies and regulatory frameworks for compulsory third-party liability insurance for fishing vessels. This should include personal injury and life insurance for crew members, liability towards crew members and passengers, damage and losses from collisions, wreck removal, and public liability insurance in the event of environmental pollution.
- Governments should encourage the provision of insurance in the small-scale fisheries sector. This could be done through premium subsidy programmes or the promotion of microinsurance schemes in small-scale fishing communities. These initiatives require partnerships with the private insurance market, an increased formalization of the small-scale fisheries sector (i.e. improvement

of vessel registries and fishing licencing systems), as well as financial literacy training for small-scale fishers.

- Fishing vessel owners, in cooperation with NGOs, government and development agencies, should increase awareness and build crew capacity for safety-at-sea measures on board their vessels, and promote risk management practices. This approach would reduce risks, operational costs and subsequently reduce insurance premiums.

Aquaculture

- Insurers should aim to enlarge the risk pool of the insurance market that serves the aquaculture industry. The risks should be spread across species, culture systems and geographical locations. By increasing the number and variety of aquaculture farms insured, insurers would mitigate the risk of large losses caused by single events affecting a species. This would in turn reduce the reliance on the reinsurance market and generate more stable underwriting results.
- Insurers can play a role in the innovation, modernization, and sustainable growth of aquaculture operations by advising aquaculture farmers on proven risk management practices, how to reduce production risks, and the technologies that can help them do so.
- Governments should extend agriculture insurance premium subsidy programmes to aquaculture farmers, aiming to increase insurance uptake. Partnerships with private insurance companies and fish farmers' cooperatives could support the rollout of such programmes.
- Aquaculture farmer organizations and insurers should guide farmers on the data management and record-keeping of their farming operations. The systematic collection of this information, shared with the insurance market, would contribute to the development of risk profiles. It would also lead to insurance policies that meet the needs of farmers, and improve risk management strategies.

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Regional report for Oceania

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1. INTRODUCTION

Oceania is a region with large oceanic countries, including Australia, New Zealand and Papua New Guinea. The region also contains more than 20 small island developing states (SIDS) and overseas territories, including several unincorporated territories of France, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

According to FAO, Oceania's contribution to total global capture fisheries and aquaculture production has remained constant over the past ten years, at around 1.5 percent and 0.25 percent respectively (FAO, 2020a; FAO, 2020b). Despite the region's limited contribution to global production, both sectors greatly contribute to the health, nutrition and lives of people of the region. Oceania has one of the highest average fish consumption rates per capita in the world, at 24.2 kg per person per year in 2017 (FAO, 2020b), and the fishing industry constitutes the economic backbone of many states in the region. Income from fishing and the sale of fishing rights to large multinational operators often makes up a significant proportion of GDP in the states and territories of Oceania, especially those that do not have large land space or significant tourist industries. Aquaculture production is also becoming increasingly important in the region, especially in the developing economies of the SIDS, and discussions are under way through subregional and regional organizations to increase opportunities for aquaculture development. More projects have been developed in the region in the last ten years, especially in Papua New Guinea and the Solomon Islands. Often small in scale or for the purposes community commerce, but with the potential for export, these projects include the farming of introduced species such as tilapia, sea cucumber and milkfish.

This chapter primarily analyses the capture fisheries and aquaculture insurance markets of New Zealand and Australia, focusing on sectorial changes in the last ten years. New Zealand and Australia continue to have strong domestic fisheries industries and well-developed, mature and stable insurance markets, which provide templates for broader insurance schemes in the wider Oceania region. The analysis examines the status of capture fisheries and aquaculture insurance in both New Zealand and Australia, as well as a complex insurance landscape with multiple insurance traditions, and a potentially high incidence of uninsured or underinsured operators and crews. Information from other Oceanian insurance markets is also included, where appropriate, and the chapter provides a broad picture of the prospects for fishing and aquaculture insurance in the region as whole.

The information presented here is based on a desk review of literature, direct contact with insurers and a collection of sample policies from a range of providers. There are restrictions in the availability of some data, as there is a tendency in both the insurance and fishing industries to treat data as sensitive commercial information, notably in light of Privacy Act legislation in both Australia and New Zealand. It should be noted

that the response to the FAO global survey on fisheries and aquaculture insurance was deficient in the Oceania region; the author therefore relied mainly on the sources of information mentioned above.

2. STATE OF CAPTURE FISHERIES AND AQUACULTURE PRODUCTION

Australia and New Zealand possess exclusive economic zones (EEZs) that are among the largest in the world. These EEZs border each other, forming part of an unbroken, contiguous band of EEZs stretching from Southeast and East Asia to French Polynesia and the Pitcairn Islands. This area is broadly known as the Western and Central Pacific Ocean (WCPO), and covers most of Oceania, in addition to the Pacific coasts of adjacent states in Asia. States and territories such as the Cook Islands, French Polynesia, the Marshall Islands, Micronesia (Federated States of), New Caledonia and the Solomon Islands also possess very large EEZs, enabling them to adopt a role as large ocean states or territories.

In 2018, Oceania contributed around 2 million tonnes (less than 1 percent) to total global fisheries production (FAO, 2020a). This contribution is predominantly in capture fisheries, as only 13 percent of fisheries production in Oceania comes from aquaculture. Production levels in capture fisheries in both Australia and New Zealand have continued to be closely managed over the last ten years. The value of production in both countries has increased due to value-addition for domestic and export markets, rather than as a result of significant increases in tonnage produced in either country. In terms of value, fisheries production from Oceania accounts for 5 percent of Asian seafood imports, making Asia the primary export market for Oceania capture fisheries and aquaculture products. Overall, however, Oceania is a net importer of these goods. For example, in 2018 Australia imported some 490 000 tonnes of fish and fisheries products, while only exporting 59 000 tonnes (FAO, 2020a).

New Zealand

New Zealand has the world's ninth-largest EEZ, which extends into the subantarctic islands area south of 50° S latitude, and north to subtropical Polynesia in the area of the Kermadec Islands, at 28° S latitude. With a land area of 270 000 km^2 and a total marine area of 4.3 million km^2, 97 percent of New Zealand's surface area is ocean. As indicated by the Ministry of Primary Industries (MPI, 2020), New Zealand produced or harvested 600 000 tonnes of seafood in 2018, of which 450 000 tonnes were wild capture fishery products harvested under the Quota Management System (QMS).[1] The country's total fisheries production constitutes around 25 percent of the total fisheries output in Oceania.

Marine fisheries continue to dominate the seafood industry, with its outputs harvested mainly for export markets. Wild capture accounts for 65 percent of fisheries production by value. Since 2000, the total annual catch in commercial capture fisheries has fallen from 750 000 tonnes to around 425 000–450 000 tonnes per annum. These figures have settled at the lower level over the last 15 years in light of managed reductions to QMS total allowable catch (TAC) allocations, pursuant to active MPI precautionary stock management. The closure of the orange roughy (*Hoplostethus atlanticus*) fishery in 2006, together with significant reductions in the TAC for hoki (*Macruronus novaezelandiae*) in the early 2000s, both had a significant effect on the tonnage available for capture fisheries. In 2018, 84 percent of routinely assessed stocks were believed to be fished within safe biological limits, compared to 81 percent in 2009 (Fisheries New Zealand, 2018).

[1] Introduced in 1986, the Quota Management System (QMS) is a key tool in New Zealand fisheries management. Under the QMS a yearly catch limit is set for many commercial fish and aquatic stocks (including species of fish, shellfish or seaweed); this enables and exercises precautionary management by controlling the number of fish taken from each stock.

The main capture species include hoki (*Macruronus novaezelandiae*), ling (*Gnenypterus blacodes*) and squid (*Nototodarus sloanii* and *Nototodarus gouldi*), which represent 16 percent, 6 percent and 5 percent of total capture fisheries production respectively. Other major species include southern bluefin tuna (*Thunnus maccoyii*), albacore tuna (*Tunnus alalonga*), snapper (*Pagrus auratus*), blue cod (*Parapercis pelamis*), terakihi (*Nemadactylus macropterus*), rock lobster (*Jasus edwardsii*) and abalone (*Haliotis iris*). Catch of hake (*Merluccius australis*) has declined in importance relative to other species over the last ten years (Fisheries New Zealand, 2018; Williams *et al*., 2017).

In 2018 the production of aquaculture products in New Zealand amounted to 105 000 tonnes, including a very small component for inland fisheries based on native eel farming. New Zealand aquaculture production primarily consists of green-lip mussels (*Pernacanaliculus*; 85 percent), chinook salmon (*Oncorhynchus tshawytscha*; 12 percent), and pacific cupped oysters (*Crassostrea gigas*; 2 percent). In 2018, aquaculture production enjoyed a total market revenue of NZD 600 million.[2]

The mix of species cultured in New Zealand has been constant for the last 25 years. Yearly aquaculture production tonnages have fluctuated between 102 000 and 117 000 tonnes since 2011, having grown from around 70 000 tonnes in 1995. Since 2004 the size of the aquaculture industry has remained relatively static. Overall, production has stabilized in the last 15 years at around 110 000 tonnes per annum (+/- 8 000 tonnes). From 2011 to 2018, the export value of New Zealand Aquaculture products rose from NZD 300 million to NZD 400 million; this was mainly due to changes in market prices and the value-addition of products for export (Aquaculture New Zealand, 2018).

The combined export value of the capture fisheries and aquaculture sectors in New Zealand in 2018 was valued at NZD 2.4 billion (i.e. approximately USD 2.1 billion), making it New Zealand's fifth-largest export commodity by value. Major export destinations are Australia, China, the United States of America, and China, Hong Kong SAR. The marine sector in New Zealand employs 30 000 people, including 13 500 full-time workers in the seafood industry, of which 2 500 work at sea on commercial fishing vessels and on aquaculture platforms (Fisheries New Zealand, 2018; Williams *et al*., 2017).

Australia

The Australian Fishing Zone (AFZ) occupies an area of 8.9 million km^2, making it the third-largest EEZ in the world. Parts of the AFZ share similar temperate zones and subantarctic capture fishing zones with New Zealand, as well as some stock similarities, but Australia has a wider range of climate types, including full tropical fisheries within the AFZ. However, production and harvest levels of seafood and aquaculture products in Australia are less intensive than in New Zealand, both as a percentage of fishing effort and in relation to the economy. Fisheries production in Australia is predominantly for the domestic market.

As indicated by the Australian Department of Agriculture, in the last ten years farmed salmon (*Salmo salar*) has overtaken wild capture rock lobster (*Jasus edwardsii*) as the dominant fisheries production species in Australia. Australian prawn production has remained constant in terms of value in the same period. The three most valuable species in 2018 were salmon (*Salmo salar*; AUD 855 million),[3] rock lobsters (*Jasus edwardsii* and *Panulirus cygnus*; AUD 713 million), and prawns (various types, farmed

[2] Approximately USD 538 million. As per the Bank of Canada (2021), the average NZD–USD exchange rate in 2018 was NZD 1 = USD 0.8973.

[3] Approximately USD 828 million. As per the Bank of Canada (2021), the average AUD–USD exchange rate in 2018 was AUD 1 = USD 0.9687.

and wild-caught; AUD 361 million). Taken as a whole, these made up 60 percent of the value of the wild capture fisheries and aquaculture sectors. Abalone and tuna species together account for a further 27 percent of the value of fisheries production. In terms of volume, Australia exports 21 percent of all fisheries production.

The concentration of Australian industry on domestic markets and on low-volume, high-value species for export means that an annual harvest of 281 000 tonnes equates to a market value of AUD 3 billion. Aquaculture is responsible for 40 percent of the total value generated by Australia's capture fisheries and aquaculture sector. In Australia 17 000 people were employed in fishing, hunting, trapping and aquaculture, of which 11 000 were in wild catch capture fisheries and 6 000 in aquaculture. (Department of Agriculture, 2019a, 2019b, 2019c; Fisheries Research and Development Corporation, 2019).

3. THE INSURANCE MARKET

The insurance market in Australia and New Zealand is developed, mature and adequately regulated. Since 1983, the two countries have effectively operated as a common market, with close economic relations and few restrictions on the trade of commodity products between them. This relationship means that goods and services can be provided in the same manner in both markets. The insurance products sold in either country are therefore broadly similar and interchangeable, with only minor modifications necessary to account for regulatory differences in each country. As a result, there is a trans-Tasman trade in fisheries capture and aquaculture insurance products, which in turn extends to services provided to other countries in Oceania, especially those nations that are, or were, members of the Commonwealth of Nations.[4] These countries broadly follow the insurance law of the United Kingdom of Great Britain and Northern Ireland, which is based on the London market.

In 2020 there were 88 licensed insurers registered in New Zealand (Reserve Bank of New Zealand, 2020), while in Australia there were 100 licensed insurers and 11 reinsurers (Australian Prudential Regulation Authority, 2020). The total net premium value in Australia in 2019 was AUD 130 billion, of which the general insurance market (which includes capture fisheries and aquaculture insurance) accounted for AUD 64 billion in the same year, i.e. 49 percent of the total value (Insurance Council of Australia, 2020). New Zealand's insurance market is a fraction of the Australian market, with a net premium market value of NZD 8.5 billion, with the value of general insurance premiums adding up to NZD 6 billion. To illustrate the difference between the two countries, the general insurance value per capita in New Zealand is less than 40 percent of the level of insurance sold in Australia (Insurance Council of New Zealand, 2020).

The core principles of insurance law in both Australia and New Zealand are founded in English common law and the general law of contract (Rogan, 2020), and supplemented by statute laws and professional codes in both countries. The marine insurance rules for both countries are based on the United Kingdom of Great Britain and Northern Ireland Marine Insurance Act (1906), which led to consequential enactments in New Zealand (Marine Insurance Act 1908) and Australia (Marine Insurance Act 1909). This effectively provided a harmonized set of terms and conditions for insurance access to the London market. These laws are still in force at the time of writing. All persons who conduct insurance business (insurers and reinsurers) in either country must be licensed as an insurer.

As a region Oceania is well served by the international insurance market, with strong linkages between major international firms, a small number of nationally

[4] The Commonwealth of Nations is a voluntary association of 54 independent and equal countries, home to 2.4 billion people living in advanced economies, developing countries, small states and island nations. The legal values and principles date back to the British Empire and are expressed in the Commonwealth Charter. Any country can join the Commonwealth of Nations. The last country to join was Rwanda in 2009. thecommonwealth.org/

owned firms, and large networks of brokers. In addition to regional products marketed by multinational London market firms with offices in New Zealand and Australia, there are insurance and reinsurance services available from insurers originating from China, France, Germany, India, South Korea, Switzerland and the United States of America. All British companies operating in Oceania are able to underwrite policies internationally, while companies from India, New Zealand, Norway and Spain are also able to underwrite in more than one country. Some insurance providers in New Zealand (capture fisheries), Fiji (capture fisheries) and Kiribati (treaty reinsurance) provide national services only. Similarly, there are some Australia-only insurers and insurance brokers who work only in the country and cater for the aquaculture market.

New Zealand

The Reserve Bank of New Zealand licenses and supervises insurers operating in New Zealand, subject to the Insurance (Prudential Supervision) Act 2010. New Zealand's private insurance sector is small by international standards, which is largely due to the active role played by government in the provision of social insurance services in the country. Moreover, life insurance products are a relatively minor component of New Zealand's retirement savings infrastructure. Overseas insurers may be exempt from parts of the licensing requirements providing they meet certain standards and are regulated in their own market by a recognized regulator. Under New Zealand rules, Lloyd's of London are permitted to obtain a license in New Zealand for all of their underwriters and brokers. Government-owned insurance providers are exempt from licensing.

In 2019 the New Zealand government conducted an insurance contract law review through the Ministry of Business, Innovation & Employment (MBIE) to ensure that the current regulatory framework in the country facilitated well-functioning insurance markets (Ministry of Business, Innovation & Employment, 2019). Among its other functions the MBIE administers the Marine Insurance Act 1908, which defines marine insurance and carries a generalized standard definition of marine perils.

The Insurance Council of New Zealand (ICNZ) is a professional association of licensed insurers which was formed in 1895 to represent insurance companies through advocacy and communication to stakeholders. The Council promotes ethical insurance best practices through its *Fair Insurance Code* and acts as a lobby group to government on insurance issues (Hunt and Eastwick-Field, 2020; Insurance Council of New Zealand, 2020; Scragg and Laing, 2020). Most fisheries and aquaculture insurance providers are member of the ICNZ.

Australia

The Australian Prudential Regulation Authority (APRA) is the prudential regulator of the financial services industry in Australia. It is also responsible for administering the Financial Claims Scheme outlined in the Insurance Act 1973. The Australian Securities and Investments Commission (ASIC) is the corporate regulator and issues licenses to insurance sellers and brokers. As part of its duties, it monitors and promotes market integrity in the financial system, and also administers the Australian Securities and Investments Commission Act 2001, the Insurance Contracts Act 1984 and the Marine Insurance Act 1909. Brokers are regulated under Chapter 7 of the Corporations Act (2001) as they provide financial services which deal in financial products (and include a contract of insurance). Moreover, as brokers provide advice on financial products they must hold an Australian financial services license, unless they fall within a relevant exemption (Fan, 2018; Gerber and Hine, 2020; Vrisakis *et al.*, 2018).

The Insurance Council of Australia (ICA) is the professional body for the insurance industry in Australia and was established in 1975 to represent licensed Australian insurance companies. The Council's main objectives include promoting private-sector

insurance companies, improving service standards across the insurance industry through self-regulation, and representing the insurance sector to the government and the public. Most, if not all, fisheries and aquaculture insurance service providers are members of the ICA.

4. SUPPLY AND DEMAND

Both in Australia and New Zealand, and by extension across much of Oceania, the capture fisheries and aquaculture insurance market is dominated by a small number of insurance suppliers, a large number of agents and brokers, and a very small number of reinsurance providers.

Capture fisheries

Capture fisheries insurance products have a long history in both countries, having been available as an adjunct of marine insurance for more than 100 years. A specific set of policy clauses for fishing vessels dates back to 1987. New Zealand and Australia both have only a few major companies involved in the provision of commercial marine insurance and this has remained stable over the last ten years, with five major companies dominating both markets. In New Zealand, five major companies provide capture fisheries insurance and together account for 80 percent of the capture fisheries insurance market. In Australia the top five companies account for 50 percent of the market. Four of the market leaders in each country are the same companies, which means that there are six major London market companies operating in Oceania providing capture fisheries insurance. The majority of companies operating are British-owned, but there is at least one major Australian firm offering these products that operates in both Australia and New Zealand. At least three of these major companies offer capture fisheries insurance through markets in other Oceania states such as Fiji, Papua New Guinea and Vanuatu.

The number of fisheries capture vessels in New Zealand in 2018 was 1 164 powered vessels (FAO, 2020b). Australia had approximately 7 000 active fishing vessel in the same year, although no publicly available information indicated the total number of vessels covered by active capture fisheries insurance policies. It can be assumed that the demand for capture fisheries insurance in both countries has remained constant and relatively static over the past ten years, despite the fact that the profiles of their fisheries industries differ considerably: New Zealand exports 90 percent of its fish and aquatic products, whereas Australian production is predominantly for the domestic market.

In New Zealand, capture fisheries production and the number of fishing vessels has decreased continuously in the wake of industry consolidation, following the implementation of the QMS in 1986. The number of fishing vessels in New Zealand decreased significantly between 1987 and 1995, with 1 766 licensed capture fisheries vessels recorded in 1995. The trend of industry consolidation has continued, as New Zealand vessels have become fewer and larger over the years: 50 percent of the vessels are larger than 10 m LOA.

The number of fishing vessels licensed in Australia is difficult to estimate owing to the fragmentation of licensing regimes to the state level, combined with reporting matrices that focus on fishery outputs rather than inputs. In the 1995–2018 period there may have been a decline from 9 000 licensed vessels in 1995 to less than 6 500 in 2018, but this is difficult to verify.[5] The basic structure of the Australian capture fisheries industry has remained fundamentally unchanged over time, partly due to

[5] Australia does not publish aggregated statistics enumerating the number of fishing vessels. Statistics are aggregated only partially in vessel numbers, as well as in number of licenses or shareholdings.

the decentralization of jurisdictions in Australian fisheries management. Almost all the vessels registered in Australia are 10 m LOA or less – a collective model similar to the profile of New Zealand capture fisheries before the New Zealand industry consolidated for industrial export capacity.

No foreign fleets operate in either the Australia or the New Zealand EEZ, other than the American purse seine fleet, which operates under the "U.S. Treaty"[6] (MFAT, 2020). This situation has improved health and safety protection for crews on all vessels in both EEZs over time and has enabled fishing operators to systemize compliance with their respective domestic laws into standard operating practice. This applies in all aspects of vessel operations: whether at sea, where P&I cover may be necessary, or in port, when national employment and accident compensation laws apply fully.

On the buyer side, with respect to the purchase of insurance policies, there have been no major changes in the New Zealand market. According to the Ministry of Primary Industries, eight large commercial companies still control 80 percent of fisheries production in New Zealand. By comparison, there are no dominant companies in Australian fisheries, but rather a plethora of small-to-medium operators across all sectors.

Aquaculture

Aquaculture insurance products for Australia and New Zealand are broadly similar and have been available for almost 30 years from a limited number of suppliers. One British company continues to maintain a significant share of the market in both countries, as noted in the 2006 aquaculture review (Van Anrooy *et al.*, 2006). This company previously managed its aquaculture risk from New Zealand, but in 2012 relocated to Melbourne, Australia; it continues to offer aquaculture insurance in both countries and has remained the market leader in Oceania for the last 15 years. The range of insurance products available has increased since 2006, with various insurance companies prepared to take on certain aspects of risk, rather than assuming the risk of comprehensive all-risk cover. Nevertheless, the supply of aquaculture insurance continues to be an issue in both countries. Many insurers remain highly risk-averse, particularly when it comes to new aquaculture ventures, owing to a history of failures among aquaculture start-ups.

Attempts to domesticate kingfish (*Seriola lalandi lalandi*) in New Zealand aquaculture farms are an example of an aquaculture project that was difficult or impossible to insure in the commercial market as result of uncertainties around the risks involved. These initial difficulties in kingfish farming led to the establishment of a project within the National Institute of Water and Atmospheric Research (NIWA), a government research body. Over the past ten years NIWA has developed the commercial potential of kingfish, with all risk assumed in the project's operational budgets.

In terms of demand, a few large companies dominate the aquaculture insurance market, as in capture fisheries; these include companies that also participate in wild capture fisheries insurance. In New Zealand most aquaculture is dominated by mussel farms which, according to Aquaculture New Zealand (2018), account for 15 percent of New Zealand's total capture fisheries and aquaculture production by volume. This makes New Zealand the eleventh-largest supplier of mussels in the global market. In 2020 there were approximately 1 200 marine farms in New Zealand waters, compared to 1 151 listed in 2006. Industry estimates suggest that these farms cover an area of 5 800 hectares, once freshwater farms and spat-catching areas are included. The Nelson Marlborough region is a major centre of aquaculture production in New Zealand,

[6] Multilateral Treaty on Fisheries between Certain Governments of the Pacific Island States and the Government of the United States of America", also referred to as the "U.S. Treaty".

with corporate aquaculture companies centred on mussel and salmon production. In Australia, the number of aquaculture operators has remained relatively stable over the past ten years, with 1 400 aquaculture operators active in 2018.

In New Zealand, aquaculture production has remained relatively constant in terms of volume (average annual production 110 000 tonnes) over the same period, although subject to annual variations based on market demand and growing conditions. Over the last five years the government has promoted initiatives to enable growth in the aquaculture industry, which may in turn lead to growth in the market for aquaculture insurance. In 2019 the Ministry of Primary Industries (MPI) introduced a growth policy (The New Zealand Government Aquaculture Strategy) based on three key principles: 1) maximize the value of existing farms through innovation, 2) extend into high value land-based aquaculture, and 3) extend aquaculture into the open ocean. The aim of the Aquaculture Strategy is to increase the value of New Zealand aquaculture fivefold, to NZD 3 billion, by 2035. Other than relying on an expansion of aquaculture volumes, the forecast growth of aquaculture in the country in value terms is also based on increasing the value of products, including the introduction of low-volume, high-value-added products to the market. One example of this is the attempt to domesticate yellowtail kingfish (*Seriola lalandi*). Additionally, another current focus for the expansion of New Zealand aquaculture undertaken by NIWA is in the acclimatization of salmon for aquaculture development, which is based in the Southland region of the South Island of New Zealand (National Institute of Water and Atmospheric Research, 2020). New species and operations are being added to New Zealand's aquaculture basket, even though insurers remain hesitant to insure new aquaculture projects.

In Australia, aquaculture production has almost doubled, from 58 911 tonnes in 2008 to 96 798 tonnes in 2018 (FAO, 2020b). As a sector it is deemed stable and mature, and primarily based on the production of farmed salmon. As in New Zealand, the Australian federal government has planned initiatives to promote aquaculture development in the country. In 2017 the federal government introduced a policy (The National Aquaculture Strategy) for the threefold expansion of aquaculture (to AUD 3 billion) by 2030. The policy is based on promoting: an efficient regulatory framework; research, development and extension; market access; biosecurity risk management; improving public perception; improving environmental performance; promoting investment in aquaculture; and improving training and education for the aquaculture workforce (Commonwealth of Australia, 2017; Wynn *et al*., 2017). The latter might also prompt the growth of aquaculture insurance in the country. Nevertheless, as in the case of New Zealand, the general aversion to risk among insurers is likely to influence the uptake of aquaculture insurance, notably in terms of coverage for new aquaculture ventures.

General supply and demand issues in Oceania

Oceania as a region is likely vastly under-insured (Ramachandran and Masood, 2019), despite stable market performance in states and territories, and with adequate regulatory regimes in place for both marine capture and aquaculture insurance. Apart from Australia and New Zealand, potential demand for new insurance services in capture fisheries and aquaculture may be found in the SIDS of Oceania, where infrastructure investment is increasing in oceanic fisheries, especially tropical tuna fisheries. There is also a proliferation of new aquaculture ventures in French Polynesia, Fiji, Kiribati, Papua New Guinea and the Solomon Islands.

There is also a niche for increasing P&I insurance services for Pacific Island people working as fishing crew, observers, or as officials performing coastal State and flag State activities within EEZs, under regional access or bilateral agreements. National governments in the region are working at the subregional level through the South Pacific Community (SPC) to promote aquaculture development as an essential food

security tool in the region, with investment from donors and business entrepreneurs. In the Solomon Islands and Papua New Guinea the expansion in aquaculture has led to the development of hundreds of small-scale fish farms, which often farm introduced species such as milkfish and tilapia, and provide employment for thousands of people. Aquaculture employment doubled between 2004 and 2018 in both countries, rising to 12 000 people (FAO, 2020b). The growing investment in aquaculture in these countries is expected to lead to increased demand for insurance.

4.4 Issues in the EEZs and the WCPO

The exclusive economic zones of Oceania cover much of the Western and Central Pacific Ocean (WCPO) and contain significant tropical tuna fisheries. Some 2.6 million tonnes of tropical tuna is harvested in the WCPO annually (around 54 percent of the total global quantity of wild-caught tuna), with 1.4–1.8 million tonnes directly sourced inside the EEZs of the states and territories of Oceania every year (FAO, 2020a). This brings significant international interest and involvement from Distant Water Fishing Nation (DWFN) fleets in the EEZs of Oceania and on adjacent high seas. These fleets are bound by the laws of their flag States in terms of the type of insurance they purchase as part of their operating costs. Operators from certain countries carry hull insurance primarily based on total loss of the vessel. To further reduce the cost of their insurance, these operators often reduce coverage for mechanical damages and losses, and P&I loss to the basic level of compliance. This has led to crew, government officers and observers from Oceania and neighbouring Southeast Asian countries being underinsured. Not having adequate P&I cover while working in hazardous environments, on vessels with damaged equipment that is often left unrepaired, increases the risk of accidents and fatalities.

One national fisheries authority in Oceania solved the issue of P&I underinsurance for its staff and contractors operating transnationally at sea. On both its own flagged vessels and vessels of other flags it listed specified territories, named personnel, and specified perils for comprehensive P&I cover under American law brokered in American Samoa. Using this targeted comprehensive policy underwritten by American insurers, P&I cover for staff and contractors in the field increased tenfold. The basic insurance the operator should arrange effectively provides 'double' insurance for staff and contractors working in areas beyond national jurisdiction (ABNJ) and beyond the reach of government travel insurance policies. This example shows that P&I insurance can be found in the international market – above and beyond that usually accessible to many Oceanian countries – for those operators and governments who wish to increase protection for employees and contractors. It offers a model for other fisheries agencies in the region to achieve better insurance cover rather than having to operate through Australia and New Zealand, where P&I products tend to be less suitable for transboundary fisheries.

Crew and observer safety and insurance is now a subject of regional discussion among Oceanian nations, together with the Distant Water Fishing Nations who seek access to Oceania's tuna resources. This follows several highly publicized deaths of crew and observers at sea. Over the last five years, governments, operators and subregional organizations have discussed how to promote the creation of harmonized terms and conditions for insurance requirements among the nations of Oceania, in order to meet the collective needs of operators in international and transboundary fisheries. While the Australian and New Zealand insurance markets may benefit from any potential agreement, its impact could be far-reaching, influencing the capture fisheries insurance market for Fiji, Kiribati, Papua New Guinea, Vanuatu, the French and American territories, and other freely associated states and countries. Such an influence is more likely given the international subregional access licenses issued by the Pacific Forum Fisheries Agency and the Parties to the Nauru Agreement Office.

5. UNDERWRITING

As described in section 3, the market share of capture fisheries and aquaculture insurance in the region is small, relative to the total market size of the insurance industry. Capture fisheries and aquaculture insurance account for 1 percent of the value of insurance markets in Oceania. The New Zealand fisheries and aquaculture sector is worth an estimated gross premium value of NZD 30 million, or 0.5 percent of general insurance values in the country.[6]

Capture fisheries

Capture fisheries insurance policies can be 'territory'-specific: they may be issued for a single EEZ, or include international cover across multiple EEZs and on to the high seas, as long as the vessel's operating area is specified in the policy. In the context of Oceania, most capture fisheries insurance activity is based on London market underwriting. In New Zealand, Australia and the Commonwealth of Nations countries, it therefore follows the rules, terms and conditions of the London Market, including the 1987 London Institute Fishing Vessel Clauses (Hudson, Madge and Sturges, 2012; Sunderland Marine, 2021). In the context of tropical tuna fisheries inside and across boundaries of EEZs – including 'following the fish' through multiple EEZs and on to the high seas – there is also a strong strain of American-underwritten policies in P&I, hull insurance and catch insurance. A significant amount of risk is also underwritten in Asian markets for capture fishing operators from China, Japan and the Republic of Korea. Comprehensive policies available for French and Spanish operators are also available, which link back to European insurance markets.

New Zealand vessels operating in inshore fisheries have access to the government-owned Accident Compensation Corporation 'no-fault' injury compensation scheme. Similar schemes are more fragmented in Australia, as they are spread across 19 different federal and state organizations.

The presence of state-funded accident and injury schemes does reduce the size of the P&I insurance market considerably in both countries. This is particularly true in Australia, as the predominant type of fishing operations in its fishing zone involve coastal, owner-operated small vessels of 10 m LOA or less; these vessels supply a primarily domestic market. As New Zealand operators are more industrial and export-oriented in nature than their Australian counterparts, they are more likely to purchase P&I cover for vessels operating outside the 12-nautical-mile territorial limit, where the rule of domestic law becomes almost non-existent.

Insurers rely on networks of brokers to meet overall marine insurance needs. They require extensive information including specialist application forms to complete sales, and base their underwriting approach on a risk assessment.

Aquaculture

Cross-cutting research among insurance companies indicates that aquaculture insurance is primarily sold through insurance brokers. In some cases, insurance is obtained for formal cooperation between aquaculture businesses and government agencies. In a similar manner to capture fisheries insurance, companies that provide aquaculture insurance use established networks of brokers in countries around Oceania. Companies from Australia, India, New Zealand, Norway and the United

[6] Information in this section was calculated and collated by the author from sources including the Reserve Bank of New Zealand, the Insurance Council of New Zealand, the Australian Securities and Investments Commission, the Australian Prudential Regulation Authority, the Insurance Council of Australia, the Ministry of Primary Industries (NZ) and the Department of Agriculture (Australia).

Kingdom of Great Britain and Northern Ireland offer aquaculture insurance through brokers in both Australia and New Zealand. An equivalent, albeit smaller network of insurance sales and brokerage for French-speaking territories and states in the Pacific, including Vanuatu, is also active.

In Australia, there are at least two specialist underwriting agencies/brokers handling aquaculture insurance. Reinsurance services in the sector are available from both London market and Swiss reinsurance firms. By way of example, the latter allows one major British aquaculture insurance company (which provides services to both New Zealand and Australia) to spread up to 50 percent of risk through reinsurance services.

Collective assurance

Historical insurance exclusion in certain areas of capture fisheries and aquaculture has encouraged the development of collective assurance to address those needs not covered by the commercial insurance market. Such schemes are developed through community organizations, or through the use of contingency funds in larger organizations to 'insure' operations in-house by maintaining a reserve fund. Schemes that fall into this category include self-managed indemnity as practised by Māori corporations, and an in-house indemnity fund for Fisheries Observers maintained as a separate account by the Pacific Forum Fisheries Agency. There are also emerging microinsurance schemes that bring together smallholders for mutual indemnification, and which could include the participation of fishing associations. These schemes can serve as vehicles for collective insurance management.

The fact that Māori corporations in New Zealand rarely purchase insurance on the commercial market considerably reduces the size of New Zealand's commercial insurance market, as these corporations account for some 30 percent of capture fisheries and aquaculture production in the country.

6. PERILS COVERED

Capture fisheries

Capture fisheries insurance policies are generally sold as "all-risk" policies, but there are very specific sets of rules for covering offshore fishing vessels, both inside and outside the domestic law of nations. Perils generally covered in the capture fisheries sector include: natural disasters (such as storms, tsunamis, earthquakes and floods); accidents due to technical/mechanical failure; accidents due to human error (such as stranding, sinking, collision); accidents caused by a third party; damage caused by marine debris; damage by vandalism; and theft.

Aquaculture

Aquaculture insurance policies in Australia and New Zealand are also generally of an "all-risk" type. They include natural disasters, extreme weather events, technical failure, environmental pollution (such as runoff and spray drift from land-based sources), disease, theft, predation, collision, water quality problems, stock mortality, equipment and support craft, transit risk and operational risk.

7. POLICIES

The data available from the insurance industry was not sufficient to determine the number and value of policies in force in capture fisheries or aquaculture in Oceania.

Capture fisheries

Capture fisheries policies typically cover hull insurance, engine cover, third-party liability, employers' liability and operational insurance. Optional policy extensions are available for loss of catch, mortgage repayment insurance and P&I cover. Policies

tend to offer clauses for hull, engine, employers' liability and vessel operations, and are broadly similar across both markets. Many operators carry basic insurance cover in Australia and New Zealand, with or without policy extensions, depending on their individual circumstances.

The practice of carrying capture fisheries insurance is well established, and in many countries in Oceania the purchase of insurance is a pre-requisite for the issuance of a license to fish. However, in Australia and New Zealand there does not appear to be any compulsion to purchase vessel insurance as part of the licensing process. Hull, equipment and P&I insurance is available for vessels operating in more than one EEZ, or on the high seas, from at least one insurance company operating in both Australia and New Zealand. One Australian company operating in both countries offers 'Fisherman Insurance' for commercial operators, which includes hull insurance, employers' liability, optional catch insurance, statutory liability and third-party liability.

Vessels insured

No publicly available information was found on the total number of active vessels covered by capture fisheries insurance policies. However, assuming that the total number of vessels in this category has remained static in Australia and New Zealand (with a slight decrease in the latter's fishing fleet), it is likely that the total number of fishing vessels insured in both countries is similar to that reported in the 2009 capture fisheries review (Van Anrooy *et al*., 2009). The number of insured vessels can therefore be estimated as between 2 000 and 3 500. However, this calculation does not take into account fishing vessels operating outside the EEZs of both countries.

Based on market patterns it is reasonable to assume that the uptake of commercial capture fisheries vessel insurance is much higher in Australia than in New Zealand. This is to be expected by virtue of the self-assurance and indemnity schemes operated by Māori corporations which, as previously mentioned, reduce the commercial market in New Zealand by up to 30 percent. Moreover, general insurance per capita is much lower in New Zealand than in Australia.

Equipment and gear insured

All machinery and gear on board a vessel, whether owned or operated by the owners or their employees, can be insured by capture fisheries insurance policies in both countries. This includes nets and other fishing gear such as winches, engines, electronic and mechanical equipment. Information on the number of policies is not available.

Multinational capture fisheries policies

Comprehensive, full marine and P&I insurance covering all aspects of operations is standard on the approximately 40 American-owned and flagged tuna purse seiners that operate under a regional access treaty with the independent countries and associated states of Oceania.[7] These vessels "follow the fish" into different EEZs, including seasonal ventures into the northern part of New Zealand's EEZ. Elsewhere, ten Australian and five New Zealand offshore vessels operate on the subantarctic high seas and Antarctic fisheries covered by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). The South Pacific Regional Fisheries Management Organization (SPRFMO) has also licensed eight Australian and six New Zealand offshore vessels for high-seas fishing in temperate and tropical areas (CCAMLR, 2021; SPRFMO, 2021). All of these vessels likely carry full marine cover and P&I insurance for all aspects of their operations, even though neither organization

[7] The treaty in question is the "Multilateral Treaty on Fisheries between Certain Governments of the Pacific Island States and the Government of the United States of America", also referred to as the "U.S. Treaty".

specifies requirements for insurance cover for fishing vessels. Insurance premiums can be reduced by operating safe ship management plans that identify all risks on the vessel; risks are then managed by policies that actively mitigate and eliminate hazards on board vessels and reduce operational risk.

Aquaculture

Full insurance of all aspects of aquaculture operations is only available from a few insurance companies. Generally, insurance is available to cover stock mortality, equipment, growing systems and transit risk. Data that enabled an estimate of the total number of aquaculture policies active in both countries was not found, but insurance trends indicate that levels of commercial insurance coverage are considerably higher in Australia than in the rest of Oceania. As with capture fisheries, it is difficult to estimate the number of aquaculture insurance policies active in Oceania, primarily because insurance companies are generally reluctant to disclose such information. There is also a lack of compulsory insurance requirements, along with the widespread use of in-house indemnity schemes among operators, especially in New Zealand. With this in mind, it is possible that only half of the aquaculture enterprises in Oceania are insured.

Species insured

In Australia, the species insured are predominantly finfish – especially salmonids, kingfish and southern bluefin tuna – but the insurance of farmed prawns and other crustaceans is also possible. In New Zealand, species insured are also predominantly finfish, especially salmon. Mussels and oysters can also be insured, providing the appropriate risk management protocols are embedded in the business model. Kingfish and hapuka (*Polyprion oxygeneios*) are currently supported through government research funding but could become a market for species insurance if production of these two species can be commercialized.

Growing systems

Insurance is available in both countries for onshore and offshore aquaculture systems, as well as for the following growing systems: cages, barges, oyster and mussel growing systems, raceways, ponds, hatcheries, offshore submersible systems and recirculation aquaculture systems.

8. UNDERWRITING EXPERIENCE

Insurers did not provide information on the gross and net capacity values on single risks. A single document was obtained from the New Zealand Insurance Council, which detailed significant marine losses (of over NZD 500 000) in the period from 1 January 2005 to 31 December 2017. These large fisheries and aquaculture losses in New Zealand amounted to a total value of NZD 5.3 million for that period; this accounted for 2.4 percent of the total Marine Large Losses (NZD 220.9 million) in the 13-year period covered.

Capture fisheries

Based on the results of the survey conducted among insurers in the region, the underwriting experiences in capture fisheries insurance have been mixed in terms of economic results. Insurance underwriters based in the United Kingdom of Great Britain and Northern Ireland that offer services in capture fisheries in Oceania mostly reported "Good" to "Very Good" results in the 2016–2019 period. Conversely, underwriters from European countries and India reported mixed results, with responses varying widely year on year between 2016 and 2019 – from "Very good" to "Very bad". One European company reported 2016 as "Good", 2017 as "Bad", 2018

as "Very bad", and 2019 as "Very good". The market for capture fisheries insurance appears to be the most stable among those companies operating at the London market. The outlook for capture fisheries insurance suggests that markets in both Australia and New Zealand will remain stable in the short-to-medium term.

Aquaculture

Comprehensive aquaculture insurance in both countries is primarily offered by a single British company, which offers a mature, specialist market product. London market underwriters offer competitive products through brokers to insure offshore aquaculture equipment. The results of the FAO survey conducted among insurers in the region indicate that underwriting experiences in aquaculture have also been mixed, and economic results vary between insurers. The underwriting results of one London market underwriter operating in the region were consistently "Good" over the 2010–2019 period. Other insurers reported mixed results between 2016 and 2019, with results deemed "Bad" or "Very bad" reported in two of the four years. One Indian insurance company offering services in Fiji and New Zealand rated performance as "Neutral" over the same four-year period.

9. RISK MANAGEMENT

Insurers of both aquaculture and capture fisheries operations require extensive information on the business. They use specialist application forms with specific underwriting prescriptions, as well as restrictions based on categories of risk. In-house and independent assessors are employed in both Australia and New Zealand, and some insurance companies will use both as part of normal business, depending on demand and availability. In capture fisheries insurance the use of in-house assessors appears to have increased since 2009. Meanwhile, in aquaculture insurance, respondents universally reported using independent assessors – only one respondent included in-house assessors working alongside independent contractors.

In order to increase access to insurance for established aquaculture businesses, such as the large-scale operations of New Zealand's major fishing companies, it is vital that these companies continue to take a proactive role in risk management. Companies should reduce risks by implementing standard operating practices that monitor and take action against emerging threats through systemized quality control and risk management standards.

10. HANDLING OF CLAIMS

Independent loss adjusters are used to assess the majority of aquaculture claims in both Australia and New Zealand; only a minority of companies keep in-house loss adjusters on staff, working in cooperation with independent loss adjusters. Compared to the 2009 capture fisheries review, many insurance companies in this area appear to have moved away from an almost exclusive use of independent loss adjusters, to keeping loss adjusters on staff to work in cooperation with independents.

11. CONCLUSIONS

In Australia and New Zealand, the capture fisheries and aquaculture insurance business is a small but stable segment of the insurance market, in which supply generally meets the fisheries sector's demand for insurance. Capture fisheries production is capped by quota management systems operating in both countries, and this continues to be a constraint for growth in the capture fisheries insurance business. Any growth which may occur will be related to increasing market returns on value-added innovations and specialist products, especially for export to large markets such as the United States of America, the European Union or China.

Aquaculture insurance has the potential for growth in the next 10–15 years, owing to the development of new enterprises encouraged by government policies designed to promote aquaculture in both Australia and New Zealand. The Australian aquaculture industry is stable and mature, primarily based on the production of farmed salmon. Although the technology to increase production of southern bluefin tuna or kingfish is in development, with some growth predicted, the general aversion to risk among insurers with regard to covering aquaculture start-ups is unlikely to change. This effectively discourages entrepreneurs, as no affordable insurance coverage is available for them during the riskiest phase of the business cycle.

Significant growth in aquaculture may also be predicted in other countries of Oceania over the next 10–20 years. Once enterprises become profitable, aquaculture insurance may grow and increase business in this sector. However, the refusal to provide cover in the start-up phase may result in cooperative indemnity schemes effectively replacing commercial insurance in the future. There is clear evidence for this in New Zealand, where Māori corporations have managed indemnity and loss through internal insurance systems since the 1980s.

The comprehensive, state-run no-fault accident compensation schemes in both Australia and New Zealand, together with equivalent schemes in other countries such as Fiji, have reduced the demand for P&I insurance in the capture fisheries sector. This is a point of contention among states in Oceania that are looking for P&I for nationals to work as crew, observers and enforcement officers aboard ocean-going fishing vessels. There is considerable potential for growth in the provision of P&I insurance across the region, in light of the growing number of Oceanian state nationals who work outside their country's jurisdiction and are not covered by state-run no-fault schemes because of the geographical location of fishing activities.

12. RECOMMENDATIONS

General

- For operators across Oceania, the cost of capture fisheries and aquaculture insurance can be reduced by adopting proactive risk management policies, with comprehensive risk management registers and standard operating practices. These policies should be based on existing templates in use by major fishing companies and major insurers. In order to mitigate hazards, operators should assess the level of risk management in operations and standard practices, including safe ship management plans and effective quality control testing.
- Fisheries capture and aquaculture operators in the states and territories of Oceania outside Australia and New Zealand may look to the mature insurance markets in both countries as models of effective insurance cover. By accessing the international commercial insurance market through the brokers that represent major insurance companies, gaps in insurance coverage can be addressed elsewhere in the region, in countries such as Fiji, Papua New Guinea and Vanuatu.
- There should be dialogue between subregional governance bodies such as the Pacific Forum Fisheries Agency, the South Pacific Community, and insurance sector representatives from Oceania, the United States of America, Europe or Asia. This approach would build harmonized terms and conditions for the provision of adequate insurance services to the fishing industries in the SIDS of Oceania. In doing so, it would ensure the health and safety of nationals of Oceanian states working in transboundary and high seas fisheries.
- Governments in Oceania may wish to examine state-based insurance models to provide basic levels of coverage to fishing and aquaculture sector personnel for vessel hull, equipment, aquaculture operations and P&I. For example, state-funded no-fault accident compensation schemes, state-owned insurance

companies, or state-subsidized insurance programmes could be adopted. In the context of capture fisheries for tropical tuna, such schemes could be funded by imposing levies on foreign-flagged operators operating in EEZs. Vessels owned by foreign companies but flagged to countries such as Kiribati or Vanuatu could be legally required to carry insurance cover when operating in the EEZs.

Capture fisheries

- P&I insurance is a pressing issue for SIDS in Oceania. Given the limited range of P&I services offered in Australia and New Zealand, operators in the SIDS may want to look to the mature market for P&I, which is available through American brokers, including those in American Samoa or Guam. This approach would remedy a significant gap in the protection of nationals from Oceanian countries working across boundaries and on foreign-owned or foreign-flagged vessels.
- Governments in Oceania could also consider establishing a basic insurance requirement for the issuance of fishing licenses. This could include third-party liability insurance, or extended to comprehensive hull insurance, equipment insurance and P&I cover for nationals of Oceanian countries and vessels operating in Oceania. This approach would ensure coverage for those involved in the highly profitable tropical tuna fisheries in particular.

Aquaculture

- In the face of a lack of cover for many aspects of start-up aquaculture operations, aquaculture operators across Oceania may wish to develop cooperative indemnity insurance schemes to provide mutual coverage. These schemes may be based on collectives of operators in the same industry, or on corporate, village or community structures. They may take the form of microinsurance or cooperative mutual insurance collective schemes similar to those emerging in Southeast Asia and South Asia (Watson, Armerin, Klinger and Belton, 2018).
- Insurers in Australia and New Zealand could consider expanding their client base by promoting insurance products to emerging aquaculture enterprises and national capture fisheries fleets in countries such as in Fiji or Papua New Guinea.

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5. Conclusions

The main conclusions to be drawn from this review are:

5.1 CAPTURE FISHERIES

- The number of fishing vessels covered by marine hull insurance is estimated at around 450 000 worldwide. Some 61 percent of the insured fishing vessels can be found in Asia, followed by the Americas (18 percent), Europe (14 percent) and Africa (6 percent).
- For large-scale industrial fishing fleets, the supply of marine hull and other insurance services meets demand. Insurance services for industrial fishing vessels are available in all regions, and fishing vessel owners have several insurance options to choose from, either from the national or international market. At least 90 percent of the estimated 67 800 large-scale fishing vessels (> 24 m in length) operating worldwide are covered by marine hull insurance.
- IMO conventions such as the 2001 Bunkers Convention and the 2007 Wreck Removal Convention, which have been ratified by many countries, require fishing vessels of a gross tonnage of 300 tons or more to carry third-party liability insurance. Various countries are extending similar insurance requirements to smaller fishing vessels. Fishing vessels active in areas beyond national jurisdiction (ABNJ) under the mandate of RFMOs are increasingly required to carry third-party liability insurance for marine pollution, wreck removal and to cover accidents of crew and observers.
- Globally, between 50 percent and 60 percent of the approximately 430 000 semi-industrial fishing vessels (between 12 and 24 m in length) are covered by marine hull insurance. In European countries, Japan, Oceania, the Russian Federation and the United States of America, a larger proportion of the semi-industrial fishing vessels are insured. In these countries the supply of insurance for semi-industrial fishing vessels meets demand. However, in Asia, Latin America and particularly Africa, there are still tens of thousands of semi-industrial fishing vessels operating without marine hull insurance.
- Over 95 percent of the 2.3 million motorized small-scale fishing vessels (< 12 m in length) operate uninsured. Small-scale fishing vessel owners often have limited and relatively more expensive insurance options to choose from. In Africa and South America, where commercial insurers dominate the capture fisheries insurance market, insurance coverage of small-scale fishing vessels is very low. Most small-scale fishers worldwide still do not have access to adequate insurance services that meet their specific needs and conditions, and small-scale fishers operating in inland waters even less so.
- In Asia, fisheries insurance is compulsory in Japan, and coverage of small-scale fishing vessels continues to be high. In other Asian countries, such as China, India, the Philippines and Viet Nam, public and mutual insurance schemes have been established or improved in the last decade and governments often provide premium subsidies. Small-scale fishers now have a better chance of accessing insurance services. However, most of the 2.1 million motorized fishing vessels in Asia remain uninsured.
- Most fishing vessel insurance policies continue to be of the "all risks" kind and can cover the major types of fishing vessels: bottom trawlers, pelagic trawlers, purse seiners, seiners, longliners, gillnetters and tuna pole-and-line vessels.

Insurers prefer to cover younger vessels, but vessels older than 40 years can still be insured in most countries. The hull material (steel, GRP, wood, etc.), the state of the hull and machinery, as well as the vessel's overall maintenance and seaworthiness, are all key determinants of insurability.

- The fishing vessel insurance underwriting process, risk management and claim handling practices continue to be largely framed around the London market's Institute Fishing Vessel Clauses. However, insurers worldwide generally shape their policies to meet the needs of their clients. Pre-acceptance surveys and supporting documentation (e.g. state of vessel, vessel registration, fishing authorization, loss/claim history) are commonly required in insurance application processes. Premiums are determined by the specific characteristics of the vessel and sometimes the area of operation. Independent marine surveyors and loss adjustors are respectively used to determine the condition of vessels offered for insurance and to assess claims.
- Underwriting experiences in fishing vessel insurance have been generally good over the period 2009–2019. On average, 39 percent of the insurance and reinsurance companies and brokers who responded to the FAO survey reported "Good" to "Very good" underwriting experiences, and 41 percent reported "Neutral" results. The profitability of this line of insurance has been positively affected by fishing fleet investment and modernization programmes in the European Union, and particularly China. In these cases, older vessels are removed from the fleet and replaced with new, higher value and larger vessels with higher safety standards.
- Access to accident, health and life insurance services for crew on fishing vessels and small-scale fishers in developing countries has improved in recent years, especially through programmes administered and subsidized by governments (e.g. in China, India, Japan, the Philippines and Viet Nam). In Asia, at least 4 million fishers are currently covered under these programmes.
- Yet the development and performance of the capture fisheries line of the insurance business continues to be constrained. This is the result of several factors: a limited knowledge of the demand and needs of insurance in the capture fisheries industry; a lack of enabling policies and regulatory frameworks to encourage or facilitate insurance provision; and the business risks due to the poor risk management in the industry.

5.2 AQUACULTURE

- The number of aquaculture stock mortality insurance policies in force has more than quadrupled in the last 15 years, which indicates that demand for this line of insurance has grown tremendously. The increase in aquaculture investments, supported by the steady growth rate of aquaculture production (which has doubled in the last decade) has supported this growing trend. The latter is in turn facilitated by the promotion of ambitious national production targets.
- The number of aquaculture insurance policies in force was estimated at over 40 000 worldwide in 2020. With 15 000 and 12 000 policies in force respectively, Indonesia and China were the largest markets for aquaculture insurance. This means that some 83 percent of aquaculture stock mortality insurance policies were issued in Asia in 2020. In Europe and the Americas, around 2 700 and 2 500 aquaculture farms were reported to be insured respectively.
- The provision of aquaculture insurance services is inadequate, particularly in Asia. The region's aquaculture industry employs an estimated 19.6 million people and produced nearly 73 million tonnes of fish, crustaceans and molluscs in 2018. The estimated off-farm value of aquaculture production was around

USD 145 billion in China alone in 2018. In the same year, in India, Indonesia and Viet Nam, the aquaculture production value of the aforementioned species groups amounted to USD 13 billion, USD 12 billion and USD 14 billion respectively (FAO, 2020a). Therefore, only a tiny percentage of aquaculture production value is insured in Asia. Efforts to increase the supply of insurance to aquaculture on the part of governments and insurers have not achieved the desired results.

- Individual insurance contracts are generally larger in Europe and the Americas, because of the insurance market's focus on high-value marine cage culture systems of salmon, seabass and seabream. Europe, Chile and Oceania have seen the aquaculture insurance market consolidate in recent years, driven by technological innovations in the culture systems of a few highly commercial species, as well as related improvements in risk management.
- Large-scale aquaculture producers with well-financed operations are best served by the insurance industry. Medium- and small-scale farmers continue to lack coverage, with limited insurance options and high premium rates, particularly in developing countries. The gap between the supply and demand of aquaculture insurance worldwide is far from being closed.
- In various countries in the Asian region (e.g. China, Indonesia, Japan and Viet Nam), but also in the United States of America, aquaculture insurance is encouraged by governments though premium subsidy schemes, favourable legislation, or pilot insurance programmes for small-scale producers.
- Public insurance programmes and mutual insurance associations continue to play a major role in providing insurance to small-scale producers, particularly in East Asian countries such as China, Japan and Viet Nam. In other regions, aquaculture insurance is mainly provided by private insurance companies.
- The range of species and culture systems covered by aquaculture policies worldwide is diverse and has increased in recent years. However, insurers continue to focus on insuring those aquaculture species with which they are most familiar. There are high risks involved in aquaculture operations involving "new" species and pilot culture systems. Considering the possible failure of new types of farming (e.g. recirculation aquaculture systems), limited technological solutions and poor risk management practices, insurers are reluctant to spread their portfolio over more species and locations.
- Risk management practices applied by aquaculture insurers are diverse and depend on the availability of in-house expertise, government support or assistance from farmers' associations. Specialized independent or in-house risk assessors provide risk management assistance in Europe and Oceania.
- New forms of partnership between private insurance companies, fish farmers' associations and mutual insurance associations in China have started to yield some successes. Fish farmers increasingly collaborate with insurers to identify and assess risks, adopt better risk management practices, and thus reduce risks for insurers. However, the initiatives launched in China continue to be pilot schemes.
- The underwriting experiences of aquaculture insurance companies largely differ between years, companies and countries. On average, 40 percent of the insurance and reinsurance companies and brokers who responded to the FAO survey reported "Good" to "Very good" underwriting experiences in aquaculture stock mortality insurance in the 2009–2019 period, while 36 percent reported "Neutral" results. The insurance industry seems to have consolidated the market and found ways to improve business and increase profitability.

- Extreme natural weather events and biological factors such as red tides, algal blooms and disease negatively affect underwriting experiences. The limited risk pool of participants in the aquaculture insurance market, added to the fact that high-value, export-oriented aquaculture operations are often grouped in specific locations, result in higher concentrations of risk. These factors make losses in the aquaculture insurance market higher.

5.3 COMMON ISSUES

- Private insurance companies dominate the capture fisheries and aquaculture insurance markets in Africa, Europe, Latin America, Oceania and the United States of America. In Asia, public and mutual insurance companies play a crucial role in the provision of insurance to capture fisheries and aquaculture. However, the market share of private insurance companies and public–private collaborative programmes providing these services has increased in recent years (especially in China).
- The ongoing liberalization of the insurance market has allowed insurers who operate internationally to provide capture fisheries and aquaculture insurance and reinsurance services to new markets. This has increased competition and expanded the range of insurance products offered. However, it has not led to an increase in insurance coverage for small-scale producers.
- The demand for P&I insurance, employee and public liability cover is increasing, particularly from large-scale industrial fishing and aquaculture companies. They seek to protect their business against incidents that could lead to claims under environmental protection and labour laws.

6. Recommendations

Recommendations provided in this section are drawn from the various regional and national reports presented in this review. Many of the recommendations presented in the 2006 aquaculture review and the 2009 capture fisheries review are still valid. These recommendations are directed towards different stakeholders who are involved in the promotion, design and implementation of capture fisheries and aquaculture insurance services. Specifically, they are relevant for policy- and decision-makers in governments, insurance agencies, fishers and aquaculturists, as well as development agencies and NGOs active in capture fisheries and aquaculture insurance.

6.1 GENERAL RECOMMENDATIONS

- **Awareness raising.** All stakeholders (insurers, government agencies, fisherfolk, aquaculture producers and their organizations) should join efforts to share information on the merits of capture fisheries and aquaculture insurance. The role of insurance in enhancing the sustainability and safety in fisheries and aquaculture should be emphasized (as per FAO, 2020b; FAO 2020c).
- **Capacity building on risk management**. Governments, insurers and NGOs/development agencies should increase their efforts to promote and provide extension programmes to educate aquaculture farmers and fishers on better risk management practices and safety measures.
- **Insurance for small-scale fishers and aquaculture producers.** All stakeholders should increase their efforts to increase the access of small-scale producers to insurance services, as few of the millions of small-scale producers worldwide are adequately served by the insurance industry.
- **Innovation and technology.** Governments, research institutions, insurers and NGOs/development agencies, should collaborate to enhance innovation and technology development in aquaculture operations. Improving risk management practices will reduce production risks and environmental impacts.
- **Data.** Governments, insurers and NGO/development agencies should support data collection on fisheries and aquaculture operations. This can be done by introducing record-keeping practices, maintaining fishing vessel, fisher and farm registries and records, disease outbreak records, supporting profitability analysis, facilitating vessel tracking, and keeping records on weather conditions. The systematic collection and sharing of this information would contribute to understanding the risks, monitoring them and evaluating business practices. This would support the development of risk management strategies for these industries and facilitate insurance service provision.

6.2 GOVERNMENTS

- **Insurance as an integral part of fisheries/aquaculture development.** Recognize insurance as an integral part of the development and management of the fisheries and aquaculture industry.
- **Implement policy and legislation frameworks to promote insurance as a risk management tool.** Regulatory frameworks should be developed at the national level to regulate and stimulate the provision of fisheries and aquaculture insurance, especially among small-scale producers. Efforts are needed to extend compulsory insurance requirements to medium- and small-scale fishing vessels, as laid out in international conventions such as the 2001

Bunkers Convention and the 2007 Wreck Removal Convention. Compulsory insurance requirements can often be easily integrated into existing legislative and policy frameworks (e.g. as a requirement for vessel registration or issuing an aquaculture operations license).

- **Establish insurance facilities.** Establishing fisheries and aquaculture insurance facilities will enable the insurance industry, public organizations, donors and fisher/aquaculture associations to cooperate in the provision of insurance services to small-scale producers and meet joint objectives (see Secretan *et al.*, 2007).
- **Premium subsidies.** Premium subsidy programmes are common practice in agriculture in many countries. They protect farmers against declines in crop production and/or revenue, reduce costs in the event of natural disasters, and introduce innovations and climate-smart practices. There is no reason why fishers and aquaculture farmers should not have access to similar programmes to increase the uptake of insurance services. Successful premium subsidy programmes for capture fisheries and aquaculture are easily replicated (e.g. from Japan and the United States of America) .
- **Disaster risk management practices and safety regulations.** Prioritize and adopt policies and regulations at the national level to promote and enforce better risk management practices in aquaculture, as well as safety standards for fishing vessels and fishing vessel personnel. In addition, disaster risk management should be promoted in coastal communities. This should include investment in early warning systems, disaster prevention and mitigation systems. Such policies, regulations and related measures will reduce risks, accidents, fatalities and costs.
- **Private–public partnerships.** Promote the establishment of partnerships to provide reinsurance services to public/mutual insurance schemes or deliver direct insurance services to fishing communities. These can be provided either through premium subsidy programmes, awareness raising campaigns, or with the technical support of fisheries agencies.
- **Mutual insurance.** Develop legal and regulatory frameworks that facilitate the establishment of mutual insurance associations and regulate the operation of mutual insurance schemes. This could support the availability of more affordable insurance solutions, especially for small-scale fishers and aquaculture producers.
- **Capacity building.** Conduct technical seminars and training courses on capture fisheries and aquaculture insurance targeting policy- and decision-makers, extension officers and technical and administrative staff involved in fisheries and aquaculture.

6.3 FISHERIES AND AQUACULTURE INSURERS

- **Innovative insurance schemes targeting the small-scale sector.** Test, pilot and promote innovative models and products that recognize the unique business characteristics of these sectors. These may include innovative delivery models, such as the provision of aquaculture insurance through fish feed suppliers (FAO, 2020c), parametric or weather-index-based insurance for fisheries or aquaculture (CCRIF, 2019; Tietze and Van Anrooy, 2019), or facilitating premium reduction by applying safety standards or BMPs. Innovative solutions are also needed for the payment of insurance premiums (e.g. digital finance), to simplify the wording of insurance policy documents and application forms, and for more flexible claim-handling procedures.

- **Alliances with the fishers/aquaculture organizations.** Take proactive measures to promote alliances with fishers/fish farmers' associations, cooperatives, producer organizations and the like, in order to deliver insurance services to small-scale producers collectively. Insurers can benefit from the organization's experience of risk assessment, as well as its existing social control mechanisms, standardized policies (reducing transaction costs) and overall cost-effective management of policies. Fisheries agencies, reinsurers and NGOs should support these alliances and promote the implementation of joint pilot projects.
- **Increase awareness within the industry.** Invest in building capacity for fisheries/aquaculture insurance among staff and others involved in addressing insurance needs. This could include specialist underwriters, surveyors, loss adjusters, extensionists and insurance agents/brokers.
- **Linkages with microfinance and credit.** Increase efforts to engage with financial institutions (e.g. banks, credit associations, microfinance institutions) to design products in which insurance is bundled with credit, investment or saving programmes. Given the strong presence of (micro-) finance institutions in many coastal communities, linking with these can be a cost-effective option to deliver insurance services to fishers and aquaculturists.
- **Diversify the aquaculture insurance portfolio.** Diversify aquaculture insurance across species, culture systems and geographical locations to enlarge the risk pool and spread risks. Insurers should invest in increasing their knowledge of other aquaculture species and risks in related culture systems in order to develop and pilot new insurance products.
- **Network expansion.** Improve the network of offices in the main fishing ports and coastal areas to facilitate the promotion and dissemination of fisheries and aquaculture insurance.

6.4 FISHERS, AQUACULTURISTS AND THEIR ORGANIZATIONS

- **Apply safety and risk management practices.** Fishing vessel owners should implement vessel and crew safety measures, vessel maintenance programmes, and comply with fisheries management measures and regulations. Aquaculturists should implement better management practices to reduce their economic and financial risks, and increase their environmental performance.
- **Arrange for insurance cover of employees.** Fishing vessel owners and aquaculture farmers have a duty of care towards their employees. They should provide worker contracts that include accident and health insurance for their employees. Third-party liability insurance cover for their employees and others is also recommended.
- **Organize.** Fishers and aquaculture farmers should organize themselves into associations, groups or cooperatives, to facilitate the exchange of information and the implementation of extension services, as well as increase access to finance and insurance services. Governments and insurance service providers can communicate with farmers and fishers more easily when they are organized. To this end, they should organize training and raise awareness of financial literacy, emphasize the importance of insurance and develop/implement group insurance programmes.
- **Register.** Fishers and aquaculture farmers should make sure that they operate legally and that they are registered formally as a fishing vessel owner, captain, crew, aquaculture farmer or farm worker. By doing so they will be recognized by government agencies and will have access to government support and benefits (e.g. subsidies, extension services, information). Without being registered and having vessel and/or land ownership formally recognized it will be impossible to access insurance services in most cases.

- **Keep records.** Aquaculture farmers and fishing vessel owners should keep detailed records or logbooks of their operations, including costs and income, production data and specific management practices. This historical data can thus be made available to underwriters, enabling a more effective assessment of risks when applying for insurance services.

6.5 DEVELOPMENT AGENCIES AND NGOS ACTIVE IN FISHERIES AND INSURANCE

- **Awareness and capacity building.** Advocate, promote and support the organization of national, regional and global events such as webinars, workshops and conferences where stakeholders involved in fisheries and aquaculture insurance can meet and exchange experience and practices. The focus of such events should be on increasing the participation of brokers, surveyors and loss assessors specialized in fisheries and aquaculture insurance.
- **Promote networks.** Advocate, promote and support the implementation of national, regional or global networks where stakeholders involved in fisheries and aquaculture insurance can exchange experiences, learn and support each other to increase access to insurance services. One example is the Global network for capacity building to increase access of small-scale fisheries to financial services (CAFI-SSF Network), supported by FAO, the Asia Pacific Rural and Agricultural Credit Association (APRACA) and African Rural and Agricultural Credit Association (AFRACA). Indeed, CAFI-SSF aims to act as a platform to promote, develop and facilitate capacity building, knowledge exchange, advocacy and awareness; it shares experiences, good practices and provides support and advice to stakeholders to increase access to adequate financial services for SSF (small-scale fishers and small-scale aquaculture producers).
- **Policy and regulatory support.** Encourage and provide technical assistance to governments to establish legal, policy and institutional frameworks that enable the development of capture fisheries and aquaculture insurance. The continued provision of advisory services to incorporate compulsory fishing vessel insurance and third-party liability requirements into legislation is also required. Furthermore, development agencies and NGOs can contribute to the introduction of insurance in climate change adaptation and mitigation plans, disaster risk management, as well as in sustainable fisheries and aquaculture management and development plans.
- **Support the implementation of international conventions, guidelines and initiatives.** Promote the ratification and implementation of international conventions and agreements that promote the insurance of fishing vessels, fishers and aquaculture workers (e.g. IMO's 2012 Cape Town Agreement and 2007 Wreck Removal Convention, ILO's 2007 Work in Fishing Convention). Similarly, promote the implementation of the UN Environment's Principles for Sustainable Insurance (PSI), in addition to the Guidelines to control or mitigate the risk of insuring vessels and companies associated with IUU fishing (OCEANA/PSI, 2018). Support the implementation of the FAO-APRACA Guidelines for increasing access of small-scale fisheries to insurance services in Asia. Finally, develop, update and implement other guidelines, manuals and best-practice approaches that contribute to increasing access to insurance services for small-scale producers in capture fisheries and aquaculture.

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This *World review of capture fisheries and aquaculture insurance* presents the findings of five regional and four national studies conducted in 2020. An estimated 450 000 fishing vessels worldwide are covered by marine hull insurance. Nearly all of the estimated 67 800 large-scale industrial fishing vessels are covered by marine hull insurance, as well as 50–60 percent of the estimated 430 000 semi-industrial fishing vessels. However, over 95 percent of the 2.3 million motorized small-scale fishing vessels operate uninsured. Most small-scale fishers do not have access to adequate insurance services. Between 2009 and 2019 underwriting experiences in fishing vessel insurance were generally reported as "Good". What is more, access to accident, life and health insurance services for crew on fishing vessels and small-scale fishers in developing countries has improved in recent years.

In 2020, the number of aquaculture insurance policies in force was estimated at over 40 000 worldwide, with China and Indonesia the largest markets for this type of insurance. While large-scale aquaculture producers are well served by the insurance industry, the provision of insurance is inadequate for medium-and small-scale farmers, particularly in Asia. Underwriting experiences for aquaculture stock mortality insurance were reported as "Good" to "Very good" (40 percent), or "Neutral" (36 percent) in the period 2009-2019. The insurance industry has consolidated the market and increased profitability in aquaculture insurance.

This world review also contains information on the capture fisheries and aquaculture insurance market, the prevailing underwriting practices, perils covered, policies in force, risk management and claim handling procedures. Finally, it offers a series of recommendations for increasing insurance service provision to the fisheries and aquaculture industries.

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