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SEAFOOD CONSUMPTION FLOURISHES IN MEAT LOVING COUNTRY
By Shirlene Maria Anthonysamy

As one of the top meat consuming nations in the world, Pakistan has a seafood per capita consumption of 2kg, which is comparatively lower than other countries within Asia. However, this figure is likely to increase due to ongoing developments in terms of the variety and format of fishery products available in the domestic market. With close to 620,000 tonnes of fisheries production in 2019 (marine and inland), fisheries is an important sub-sector of agriculture and plays a significant role in the national economy as well as contributes towards the food security of the country. Furthermore, some 20% of the production enters international trade with the main markets being China, Taiwan, UAE, South Korea and Malaysia.

PROTECTING AND MONITORING SMALL-SCALE FISHERIES: THE NEED FOR A NEW APPROACH
By Michel Dejean

Small-scale fisheries are a key part of the global Blue Economy, accounting for an estimated 50% of the global catch. There are increasing calls to monitor their activity, as today they are not regulated and do not benefit from the technology that has proved successful for industrial fishing. But simply applying the same methods used for industrial fishing will not work. We need a completely different approach, one that empowers these fishers, involves them from the beginning, and gives them the right tools to fish better and more safely.

WEALTH FROM WASTES: CASE STUDIES FROM AUSTRALIA
By Janet Howieson and Catherine Norwood

Emerging commercial and social imperatives have facilitated an Australian research effort into the development of new products from seafood byproducts and low-value species. A number of approaches and technologies have been trialled, including improved post-harvest handling, enzyme hydrolysis, automated processing technologies such as high pressure processing, injection and drying, as well as new work in reforming and extrusion. However, commercial feasibility and particularly the need for consistent, quality supply in economical volumes, will rely on the development of measures to overcome the large distances, broad species variety and low volume characteristics of the Australian seafood sector.

ANTIMICROBIAL RESISTANCE (AMR) IN AQUACULTURE: THE WAY FORWARD
By Sujit Krishna Das

The indiscriminate and unregulated use of antibiotics as additives in feeds and to treat diseases in aquaculture systems has created strains of resistant bacteria, thus making the drugs no longer effective. Predictably, these resistant microbes have a negative effect on not only cultured stocks, but also on human health and the environment, as well as reduce the production potential from the sector. At the global level, the issue of microbial resistance is being tackled mainly by the tripartite FAO/OIE/WHU collaboration, but farmers and other national stakeholders also have a role to play.

DEMOGRAPHIC CHANGE IN FISHING COMMUNITIES IN ASIA: WHY IT MATTERS
Susana V. Siar and Kyoko Kusakabe

The out-migration of young people in search of better incomes and declining fishery resources are some main reasons for the changes in age and gender representation as well as livelihood diversification that are taking place in fishing communities in Asia. Recent studies have sought to document these trends in order to better understand the challenges as well as to serve as a guide in the formulation of policy and programme support for sustainable and resilient small scale fisheries, as well as to ensure the social wellbeing of ageing fisher populations and women.

MARKETING

SEAFOOD CONSUMPTION FLOURISHES IN MEAT LOVING COUNTRY
By Shirlene Maria Anthonysamy

Market Barometer
Commodity Market Update (Cephalopods)

EVENT

WEBINAR ON GLOBAL SEAFOOD MARKET TRENDS

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For more information contact Jennie Fu at jennie8888@seafare.com
As highlighted in our previous issue, the Covid-19 pandemic has been the worst in recent history, and to date, it continues to wreak the lives and livelihoods of the global community. As early as the end of January, the impact of the virus on the global seafood trade and market began to be seen, and in the time since then, there have been severe disruptions in production and supply, abrupt changes in trade flow, as well as the forced emergence of new trends. We will continue to monitor the situation and provide you with updates on the developments across the globe through our network of correspondents. To this end, we include in the pages of this May/June issue of the INFOFISH International, a special Covid-19 Situation Report Update which readers will not want to miss. The Update contains a global view of the impact of the pandemic on our industry, including: an opinion piece on the Latin American tuna industry; suggestions on preventative sanitary measures; as well as a Policy Brief by FAO on how Covid-19 is affecting fisheries and aquaculture.

Moving on to other topics, this issue of the magazine carries an interesting article from Australia on the development of new products from seafood processing “wastes”, with collaboration from the industry. There are also two write-ups which centre around small scale fisheries that is a key part of the global Blue Economy. One article talks about applying an alternative approach that seeks to empower fishers starting from having the right tools to fishing better and safely. The other article discusses why and how demographic changes affect fishing communities in Asia. Documented by colleagues from FAO, this article is part of the larger picture to better understand the challenges as well as to serve as a guide in the formulation of policy and programme support for sustainable and resilient small scale fisheries, whilst ensuring the social wellbeing of ageing fisher populations and women.

Also covered in this issue is an article on antimicrobial resistance (AMR) in aquaculture, its purpose and effects. Another article is a brief on the seafood sector in Pakistan, where approximately 30% of the population are middle income, a group which is among the fastest growing in the world. What is interesting is that in spite of Pakistan being one of the top meat consuming nations in the world, there has been significant development in consumption of fish and fishery products in the domestic market.

Not to be missed also is the Industry Profile, this time that of Dr Meryl Williams, Chair of the Gender in Aquaculture and Fisheries Section of the Asian Fisheries Society and former Director-General of the WorldFish Centre, Malaysia. INFOFISH speaks with her about her extensive involvement over the decades in advocating for food security, marginalised groups and women in fisheries and aquaculture.

Meanwhile, INFOFISH in consultation with the Thai Tuna Industry Association and Mr Phil Roberts, Chairman of the 16th INFOFISH World Tuna Trade Conference & Exhibition (TUNA 2020), has decided to reschedule the conference. The decision to reschedule was a most difficult one, driven by our collective sense of responsibility to ensure the best interests of all parties concerned. We are monitoring the situation closely and an announcement will be made sometime in late May or early June, subject to the prevailing world health situation at that time.

We wish you, your friends and family well during this difficult time; please remember to take extra precautions to keep yourselves safe and healthy.

Happy reading.
Resúmenes de los principales artículos

EL CONSUMO DE PESCADO CRECE EN UN PAÍS AMANTE DE LA CARNE
Por Shirlene Maria Anthonysamy

Una de las principales naciones consumidoras de carne del mundo, Pakistán, tiene un consumo per cápita de pescado de 2 kg, cifra comparativamente más baja que otros países de Asia. Sin embargo, este número probablemente crezca debido a los continuos desarrollos en términos de variedad y formato de los productos pesqueros disponibles en el mercado interno. Con cerca de 620 000 toneladas de producción pesquera en 2019 (marina y continental), la pesca es un subsector importante de la agricultura y desempeña un papel significativo en la economía nacional, además de contribuir a la seguridad alimentaria del país. Alrededor del 20% de la producción se destina al comercio internacional y los principales mercados son China, Taiwán, Emiratos Árabes Unidos, Corea del Sur y Malasia. Este artículo discutirá los desarrollos del sector pesquero paquistani en el mercado interno y el sector de exportación.

PROTECCIÓN Y MONITOREO DE LA PESCA EN PEQUEÑA ESCALA: LA NECESIDAD DE UN NUEVO ENFOQUE
Por Michel Dejean

La pesca en pequeña escala es una parte clave de la economía azul global, ya que representa aproximadamente el 50% de la captura mundial. Cada vez hay una mayor demanda para monitorear su actividad, ya que hoy no están reguladas y no se benefician de la tecnología que ha resultado exitosa para la pesca industrial. Pero la simple aplicación de los mismos métodos utilizados para la pesca industrial no funcionará. Necesitamos un enfoque completamente diferente, uno que capazite a estos pescadores, los involucre desde el principio y les brinde las herramientas adecuadas para pescar mejor y de manera más segura.

MEJOR APROVECHAMIENTO DE LOS DESPERDICIOS: ESTUDIOS DE CASO EN AUSTRALIA
Por Janet Howieson y Catherine Norwood.

Los imperativos comerciales y sociales emergentes facilitaron esfuerzos australianos para investigar el desarrollo de nuevos productos a partir del procesamiento de subproductos de pescado y especies de bajo valor. Se han probado varios enfoques y tecnologías, que incluyen el mejoramiento del manejo poscosecha, hidrólisis enzimática, tecnologías de procesamiento automatizado como pasteurización a alta presión, inyección y secado, entre otros. Sin embargo, la viabilidad comercial, y particularmente la necesidad de un suministro consistente y de calidad en volúmenes económicos, dependerán del desarrollo de medidas para superar las grandes distancias, la amplia variedad de especies y el bajo volumen del sector pesquero australiano.

RESISTENCIA ANTIMICROBIANA EN LA ACUICULTURA: EL CAMINO A SEGUIR
Por Sujit Krishna Das

El uso indiscriminado y no regulado de antibióticos, como aditivos en las raciones y para tratar enfermedades en los sistemas acuícolas, ha creado cepas de bacterias resistentes, lo que hace que los medicamentos ya no sean efectivos. Como era de esperar, estos microbios resistentes tienen un efecto negativo no solo en lo producido, sino también en la salud humana y el medio ambiente, además de reducir el potencial de producción del sector. A nivel mundial, la cuestión de la resistencia microbiana se está abordando principalmente mediante la colaboración tripartita FAO/OIE/OMS, pero los acuícolores y otras partes interesadas nacionales también tienen un rol que ocupar.

CAMBIO DEMOGRÁFICO EN LAS COMUNIDADES PESQUERAS EN ASIA: POR QUÉ ES IMPORTANTE
Por Susana V. Siar y Kyoko Kusakabe

La emigración de jóvenes en busca de mejores ingresos y la disminución de los recursos pesqueros son algunas de las principales razones de los cambios en la representación por edad y género, así como la diversificación de los medios de vida que se está produciendo en las comunidades pesqueras de Asia. Estudios recientes han tratado de documentar estas tendencias para comprender mejor los desafíos, y así tener una guía para la formulación de políticas y programas de apoyo para pesquerías en pequeña escala, sostenibles y resilientes, como también para garantizar el bienestar social de las poblaciones envejecidas de pescadores y mujeres.

Para obtener mayor información sobre este material, puede ponerse en contacto con la sede de INFOPESCA:
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Rodrigo Misa
Résumés des articles de fond

LA CONSOMMATION DES FRUITS DE MER DEVENUE POPULAIRE DANS LES PAYS APPRÉCIANT LA VIANDE
Par Shirlene Maria Anthonysamy
En tant que l’un des principaux pays consommateurs de viande au monde, le Pakistan a une consommation de fruits de mer par habitant de 2 kg, ce qui est relativement inférieur à celui des autres pays d’Asie. Cependant, ce chiffre est susceptible d’augmenter en raison de l’évolution continue de la variété et du format des produits de la pêche disponibles sur le marché domestique. Avec près de 620.000 tonnes de production halieutique en 2019 (marine et continentale), la pêche est un sous-secteur agricole important et joue un rôle essentiel dans l’économie nationale et contribue à la sécurité alimentaire du pays. En outre, quelque 20 % de la production entre dans le commerce international, les principaux marchés étant la Chine, Taiwan, les Émirats Arabes Unis, la Corée du Sud et la Malaisie. Cet article traitera de l’évolution du marché domestique et du secteur des exportations de fruits de mer du pays.

PROTECTION ET SURVEILLANCE DE LA PÊCHE ARTISANALE : NÉCESSITÉ D’UNE NOUVELLE APPROCHE
Par Michel Dejean
La pêche artisanale est un élément clé de l’économie bleue mondiale, représentant environ 50 % des captures mondiales. De plus en plus d’appels sont formulés en ce qui concerne la surveillance de cette activité, car aujourd’hui elle n’est pas réglementée et ne bénéficie pas de la technologie qui a fait ses preuves dans la pêche industrielle. Cependant appliquer simplement les mêmes méthodes que celles utilisées pour la pêche industrielle ne fonctionnera pas. Nous avons besoin d’une approche complètement différente, qui responsabilise ces pêcheurs artisans, les implique dès le début et leur donne les bons outils pour pêcher mieux et en toute sécurité.

RICHESSE A PARTIR DES DÉCHETS : LE CAS ÉTUDE EN AUSTRALIE
Par Janet Howieson et Catherine Norwood
Les impératifs commerciaux et sociaux émergents ont facilité un effort de recherche en Australie sur le développement de nouveaux produits à partir de sous-produits issus de la transformation des fruits de mer et d’espèces à faible valeur marchande. Plusieurs approches et technologies ont été testées, notamment une meilleure manipulation après capture, l’hydrolyse enzymatique, des technologies de traitement automatisées telles que la pasteurisation à haute pression, l’injection et le séchage, ainsi que de nouveaux travaux au niveau du reformage et de l’extrusion. Cependant, la faisabilité commerciale et en particulier, la nécessité d’un approvisionnement régulier et de qualité en volumes économiques, dépendra de l’élaboration de mesures pour surmonter les grandes distances, la grande variété d’espèces et les caractéristiques de faible volume du secteur australien des fruits de mer.

LA RÉSISTANCE D’ANTIBIOTIQUE (AMR/RAB) EN AQUACULTURE : LA VOIE A SUIVRE
Par Sujit Krishna Das
L’utilisation aveugle et non réglementée d’antibiotiques comme additifs dans les aliments pour animaux et pour traiter les maladies dans les systèmes de l’aquaculture a créé des souches de bactéries résistantes, rendant ainsi les médicaments inefficaces. Comme on pouvait s’y attendre, ces microbes résistants ont un effet négatif, non seulement, sur les stocks en culture, mais aussi sur la santé humaine et l’environnement, et réduisent le potentiel de production du secteur. Au niveau mondial, la question de la résistance microbienne est principalement traitée par la collaboration tripartite FAO/OIE/OMS, mais les éleveurs et les autres parties prenantes au niveau national ont également un rôle à jouer.

CHANGEMENT DÉMOGRAPHIQUE DES COMMUNAUTÉS DE PÊCHEURS EN ASIE : POURQUOI CE CHANGEMENT ?
Par Susano V. Siar et Kyoko Kusakabe
L’émigration des jeunes à la recherche de meilleurs revenus et la diminution des ressources halieutiques sont quelques-unes des principales raisons des changements dans la représentation par âge et par sexe ainsi que de la diversification des moyens de subsistance qui se produisent dans les communautés de pêcheurs en Asie. Des études récentes ont cherché à documenter ces tendances afin de mieux comprendre les défis ainsi que de servir de directive dans la formulation de l’appui aux politiques et aux programmes pour une pêche artisanale durable et résiliente, ainsi que pour assurer le bien-être social des populations de pêcheurs et des femmes en vieillissement.

Pour plus amples informations et pour la traduction des articles contenus dans cette revue, veuillez vous addresses à INFOPÊCHE, BP 1747 Abidjan 01, Côte d’Ivoire, Tél (225) 20 21 31 98 / 20 21 57 75 Fax (+225) 20 21 80 54 Email: infopeche@aviso.ci infopech@gmail.com Website : www.infopeche.ci
热爱肉食的国家海鲜消费量大增
Shirlene Maria Anthonysamy
作为世界上最大的肉食消费国之一，巴基斯坦的人均海鲜消费量为2公斤，相对低于亚洲其他国家。但是，由于国内市场上渔业产品种类和形式的不断发展，这一数字可能会增加。2019年渔业产量(海洋和内陆)接近62万吨，是农业的重要组成部分，在国民经济中发挥重要作用，并为该国的粮食安全做出贡献。此外，巴基斯坦约20％的产品进入国际贸易，主要市场是中国，台湾，阿联酋，韩国和马来西亚。本文将讨论该国海鲜国内市场和出口方面的发展。

保护和监控小规模渔业：需新措施
Michel Dejean
小型渔业是全球蓝色经济的关键部分，估计占全球捕捞量的50％。要求监控小型渔业活动的呼声越来越高，因为目前小型渔业活动尚未受到监管，也未从已证明对工业捕捞有效的技术中受益。但简单地采取与工业捕捞相同的方法是行不通的。我们需要一种完全不同的方法，这种方法可以赋予这些渔民权力，从一开始就让他们参与进来，并为他们提供正确的工具，从而更好，更安全地捕鱼。

变废为宝：澳大利亚的做法
Janet Howieson and Catherine Norwood
新兴的商业和社会需求促使澳大利亚着手研究如何利用海产品加工中产生的副产品和廉价种类为原料加工新产品。澳大利亚已试验了许多方法和技术，包括改进捕获后的处理技术、酶水解、自动化处理技术（例如高压巴氏杀菌、注射和干燥）以及重整和挤压。但是，要满足商业可行性，特别是对优质产品稳定持续供应的需求，有待于澳大利亚海产品行业制定措施，克服澳大利亚海产品行业长距离运输、种类繁多和数量少的特点。

水产养殖中的抗菌力（AMR）：前进的道路
Sujit Krishna Das
抗生素在饲料添加剂中的滥用和在治疗水产养殖疾病过程中的无监管使用致使耐药菌产生，因而药物不再有效，可以预见，这些耐药菌不仅会对养殖种群产生负面影响，而且还会对人类健康和环境产生负面影响，降低未来养殖的产量。在全球范围，主要由粮农组织/世界动物卫生组织/世卫组织三方合作解决微生物耐药性问题，但农民和其他国家利益相关者也可以发挥各自的作用。

亚洲渔业从业人口的变化：为何如此重要
By Susana V. Star and Kyoko Kusakabe
年轻人外出谋求更高的收入和渔业资源减少是亚洲渔业从业人员年龄和性别组成发生变化以及谋生手段多样化的主要原因。最近的研究尝试记录这些趋势，以便更好地认识这一挑战，并为制定有利于小型渔业可持续、蓬勃发展的政策和计划提供指导，并确保为老龄化和女性化的渔业人口提供福利保障。
خلاصة لأهم المقالات

ابتكار أساليب البحريات البحرية في بلد يفضل الخضوع
Shirlene Maria Anthousamy

حمية و مراقبة مصايد الأسماك الصغيرة الناطقة: الحاجة إلى نهج جديد
Michel Dejean

المحادثة الحيوية للميكروبات (RAM) في تربية التابع (RAM)
Sujit Krishna Das

النضج في المجتمعات للميكروبات
Susana V. Silar و Kyoko Kasukabe

النضج في المجتمعات للميكروبات
Azara E. Amghani
SEAFOOD CONSUMPTION FLOURISHES IN MEAT LOVING COUNTRY

By Shirlene Maria Anthonysamy

As one of the top meat consuming nations in the world, Pakistan has a seafood per capita consumption of 2kg, which is comparatively lower than other countries within Asia. However, this figure is likely to increase due to ongoing developments in terms of the variety and format of fishery products available in the domestic market. With close to 620 000 tonnes of fisheries production in 2019 (marine and inland), fisheries is an important sub-sector of agriculture and plays a significant role in the national economy as well as contributes towards the food security of the country. Furthermore, some 20% of the production enters international trade with the main markets being China, Taiwan, UAE, South Korea and Malaysia.

Introduction

According to reports by FAO, the growth of global fishery production in 2019 is expected to remain flat primarily as a result of trade tensions, while uncertainties loom for 2020. At the time of the preparing this article, this prediction is increasingly likely to materialise not only due to trade restrictions, but also because the whole world and industries across the globe (including fisheries) are grappling with the impact of Covid-19. Nevertheless, it is safe to say that fisheries and seafood will remain an integral part of food security and a valuable protein source in consumers’ diets, including in countries where seafood does not constitute the primary source of protein.

With close to 620 000 tonnes of fisheries production in 2019 (marine and inland), fisheries is an important sub-sector of agriculture in Pakistan and plays a significant role in the national economy as well as contributes towards the food security of the country (Table 1). The major fishing areas are concentrated along the coasts of Sindh and Balochistan. Marine capture fisheries constitute the major share, with close to 65% share of total fishery production. Some 46 102 tonnes of aquaculture production were recorded in 2019.

Table 1: Total fishery production for the year 2019 (tonnes & Rps)

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<th>2019</th>
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<tr>
<td></td>
<td>tonnes</td>
</tr>
<tr>
<td>Marine</td>
<td>383 768</td>
</tr>
<tr>
<td>Inland</td>
<td>234 921</td>
</tr>
<tr>
<td>Total</td>
<td>618 689</td>
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</tbody>
</table>
The major fishery species caught in national waters comprise shrimp, crab, lobsters and fish such as sardine, hilsa, mackerel, tuna, seabream and eel, among others. Shellfish such as shrimp, lobster, and crab are important export species. Exports of fishery products increased by 40% during the 2018-2019 fiscal year from the 2012-2013 fiscal, indicating progress in the export sector. According to the Ministry of Maritime Affairs, the fisheries export target for the 2019-2020 fiscal is approximately 200,000 tonnes. In 2019, these exports totaled 1,246,960 tonnes valued at US$ 165 million, and consisting of 56% fresh frozen fish, 30% dried/salted fish and 10% shrimp.

In total, some 20% of Pakistan’s fish production enters international trade, with the main markets being China, Taiwan, UAE, South Korea and Malaysia (Table 2). About half of the total fishery exports in volume comprises fresh/frozen fish, followed by dried/salted fish, and shrimp.

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<tr>
<td>China</td>
<td>35 196</td>
<td>61.81</td>
<td>36 865</td>
<td>65.32</td>
<td>35 123</td>
</tr>
<tr>
<td>Taiwan</td>
<td>28 122</td>
<td>28.50</td>
<td>28 455</td>
<td>29.44</td>
<td>28 936</td>
</tr>
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<td>13 097</td>
<td>39.07</td>
<td>14 334</td>
<td>41.66</td>
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<td>Korea</td>
<td>6 144</td>
<td>21.45</td>
<td>9 135</td>
<td>23.22</td>
<td>10 324</td>
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<td>Malaysia</td>
<td>7 829</td>
<td>11.13</td>
<td>8 917</td>
<td>12.22</td>
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<td>25.11</td>
<td>7</td>
<td>26.36</td>
<td>7 652</td>
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<td>Sri Lanka</td>
<td>5 423</td>
<td>22.13</td>
<td>5 653</td>
<td>23.58</td>
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<tr>
<td>Vietnam</td>
<td>4 458</td>
<td>19.48</td>
<td>4 763</td>
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Shifts in consumer purchase patterns

There is no doubt that modern seafood retailing will be driven by both middle income groups and the Gen Y millennials whose numbers continue to rise, across the globe. In Pakistan, approximately 30% of the population comprises the middle income category, a percentage which is known to be among the fastest growing in the world. In addition, Pakistan, as the fifth largest populous country in the world, has been included among the Velocity 12 group of economies, according to a report by Ogilvy and Mather.

It is the expansion of the urbanised middle income population segment that will be one of, if not the main, determinants for a shift in consumer purchase options and decisions on where to source foods. According to data on the current population of Pakistan delivered by Worldometer’s RTS algorithm, which processes data collected from the United Nations Population Division, some 35% of Pakistan’s 220 million population are in the urban areas, and this figure is forecasted to reach nearly
48% by 2050. These areas are where the preference for a modern shopping experience with its wider assortment of products is highest, which in turn explains why, according to Euromonitor International, modern grocery retailers are led by supermarkets, predominantly due to their wider presence in urban and semi-urban areas.

While traditional shops sell fresh fish too, an attractive array of both fresh and frozen fishery products is on display in supermarkets and hypermarkets, with the well-iced fresh fish section and frozen fish section presenting a variety of locally caught and imported species. While the fresh fish section primarily offers whole fish, the frozen fish section gives consumers choices from ready-to-cook options such as fillets, cuts, steaks, portions, and breaded, as well as peeled shrimp and imported species like Norwegian smoked salmon and New Zealand mussels. etc.

However, not all seafood purchases are made at outlets, whether traditional or modern. The lifestyles of the middle income segment, coupled with urbanisation, will be increasingly characterised by the use of technology. It comes as no surprise therefore that internet shopping is in vogue, with online retailing sites being widely accessed, particularly in the major cities in Pakistan.

Imported seafood

Packaged and prepared products are part of the modern supermarket experience in Pakistan.
Summary

As one of the top meat consuming nations in the world, Pakistan has a seafood per capita consumption of 2kg, which is comparatively lower than other countries within Asia. Nevertheless, the development in the domestic market in terms of the types of seafood available, the product assortment and the success of modern retailing illustrates the growing demand for fish and seafood. At the same time, rapid urbanisation, an increasing desire for health consciousness, as well as rising disposable incomes and spending are among the key drivers in this development.

On their own, these factors would have been enough to come to predictions on the expansion of the domestic market for seafood. Now, with the current Covid-19 pandemic, there is even more reason to expect an acceleration of seafood purchases in modern retail outlets as well as online, in tandem with the same trend which is apparent in other countries across the globe. Accordingly, imports are expected to rise in order to fulfill the strengthened domestic demand.

Who can participate?

- Shrimp hatchery/farm owners
- Technicians
- Consultants
- Hatchery/farm production managers
- Purchase managers
- Others related to the shrimp industry

Target Countries:

- Bangladesh
- China
- India
- Indonesia
- Thailand
- Vietnam

INFOFISH Online Shrimp Survey 2020 questionnaires are available in:

- Bengali
- Chinese
- Hindi
- Vietnamese
- Bahasa Indonesia
- English
- Thai

http://infofish.org/onlineshrimpssurvey2020/
Market Barometer//

**Market Trends**

The global seafood trade continues to be affected by the COVID-19 pandemic through reduced food service demand and disruption of food chains. China is recovering slowly, while the US, Europe, and much of Asia are in varying stages of battling the onslaught of the virus, which continues to take an unprecedented toll on millions of lives and livelihoods. *(A special INFOFISH Situation Report on Covid-19 and its effect on the global fisheries industry can be read on pages 22-37 in this issue of the INFOFISH International)*.

**SHRIMP**

Supply

Lockdowns in main producing countries, particularly India, Indonesia and Thailand due to the Covid-19 pandemic have severely complicated the supply chains. Farm harvesting took place in March for those who had stocked their ponds earlier; however, the raw materials are being kept in cold storages. With farms and processing facilities located in different areas, movements of products have become difficult particularly in India and Southeast Asia. In any case, most processing plants are closed due to the implementation of lockdowns. Farmers are reluctant to start another cropping; hence they have decided to stop seeding because of lack of demand from the markets. Most exporters are typically thinking months ahead in terms of sourcing products due to the transit times most goods take.

**Japan:** The pandemic has affected the Japanese seafood market adversely. A significant downward trend in the consumption of ‘luxury’ seafood including shrimp (head-on shrimp particularly) is seen in sushi shops and restaurant chains (fast food, hotels etc) following limited outdoor activities and advisories for people to stay at home. Public gatherings, Spring festival celebrations and Tokyo 2020 have been cancelled. However, with the majority of consumers now staying at home or eating at their respective offices, supermarket and online (lunch box) sales have gone up remarkably. Ready-to-eat shrimp products that have recorded good sales include nobashibi-based value-added products, boiled PD shrimp, frozen seafood pilaf and bread-battered shrimp packages, which has benefitted exporters (Vietnam, Thailand and Indonesia) of value added shrimp to Japan.

**USA:** The consumption pattern for seafood, including shrimp, has shifted from food service to retail and direct-to-consumer channels (online) following the implementation of control measures due to the pandemic. Restaurants are closed or limited to take out deliveries and this has resulted in a significant decrease in demand for high value seafood. Overall consumer demand for shrimp is on a downward trend as consumption is limited to seafood products available in the supermarkets and grocery shops. More customers are adopting grocery pick-up and delivery services to practice effective social distancing as recommended by their government authorities. Retail sales of seafood with longer shelf-lives such as frozen and canned/pouched products, have significantly increased. Demand for online retail sales have soared as well, resulting in some products running out of stock.

**Europe and others:** With the on-going negotiations on a trade deal between Vietnam and EU27, Vietnamese shrimp exporters hope that sales to Europe will continue to expand. Under the EU-Vietnam Free Trade Agreement (EVFTA), the duty for shrimp (all types) will be down to zero from the current 12-20% rates.

With the coronavirus outbreak, some Ecuadorian companies are no longer exporting to China, instead they are targeting new markets in the EU.

Due to the weak seafood demand as a result of the pandemic, Argentinian shrimp imports, particularly from Europe and China, have been greatly affected. The main importers, Spain and China, recorded declines of 19.42% and 33.68% respectively. The limited demand from China in early 2020 resulted in high inventory of shrimp in Argentinian cold storages.

**TUNA**

Fishing in the Western and Central Pacific (WCP) remains poor. Carrier arrivals in Thailand are limited but Thai canneries are reporting sufficient raw material inventories. Transhipment operations in the WCP have been greatly affected by the Covid-19 outbreak, with several ports now closed to carriers and fishing vessels. Catches in the Indian Ocean are reportedly moderate and raw material inventories at local canneries are healthy. Local canneries are operating at reduced capacity due to Covid-19 measures.

**Thailand:** *FoodNews* reports that Bangkok’s skipjack tuna raw material prices are stable in the range of US$ 1 450 – 1 500/MT. Canneries in Thailand are processing at full capacity with local sources saying that canned tuna is selling very well. The raw material supply seems adequate to fulfil the needs of an industry, with a smaller workforce. Due to panic buying, buyers are asking canneries to ship canned tuna as soon as possible but at the same time, they are not placing new orders against future shipments.

**Europe:** Canned tuna sales are booming in EU lockdown countries particularly in Italy, the most affected EU country with the highest number of Covid-19 infections and deaths. Production plants owned by the Italian tuna giant Bolton...
Group remain fully operational both for the reception and for shipment of goods. The transport of goods within Italy is allowed despite the quarantine measures introduced by the government.

Japan: Due to the rise of Covid-19 infection cases, the government has heightened control measures in the country. Following limited outdoor activities and advisories for people to stay at home, outside eating places like sushi shops, restaurants, etc are seeing poor business. The consumption demand for high value seafood has plunged as public gatherings and celebrations are not allowed. Fish market trading continues to weaken, with less landings and sales.

FROZEN FISH

USA: According to US NMFS, prices for double-frozen Atlantic cod in early 2020 were at all-time highs in the pre-Lenten season, averaging US$ 4.00/lb for boneless/skinless fillets. While demand is adequate, current supply is reported to be limited as processors had cut back on their efforts during the Chinese New Year period. Although there will be a quota increase for 2020 in the Barents Sea, the North Sea cod quota has been cut in half to allow low stocks to recover. Analysts expect prices to remain stable during the first quarter, although the coronavirus situation keeps the market uncertain.

Vietnam/USA: The US overtook China to become the largest importer of Vietnamese pangasius in February 2020, according to data released by the Vietnam Association of Seafood Exporters and Producers (VASEP). Although exports to most markets sharply fell in March from the same period of last year, exports to the US market reached US$18.1 million (17.8% of the total). VASEP has predicted further growth in exports to the North American market despite the impact of the pandemic on trade of fishery products. However, analysts and experts recommend that fish farmers actively reduce this year’s production by 10%.

CUTTLEFISH/SQUID

India: Total exports of squid and cuttlefish increased by 2.71% at 171 592 MT in 2019 compared to 2018, with main markets Spain, Thailand and China importing more. However, due to the pandemic that has impacted most of the markets in Europe, Middle East and China, stocks in India began to pile up in early 2020 as countries cancelled shipments. Seafood consignments to China have dropped by 10-15%. Europe is a large consumer of Indian cephalopods, besides shrimp.
PRICE TRENDS • COLD STORAGE HOLDINGS • IMPORT TRENDS

FROZEN WHITEFISH

FISHMEAL/FISHOIL (US$/MT)

JAPAN COLD STORAGE HOLDING: SELECTED PRODUCTS (MT)

JAPAN COLD STORAGE HOLDINGS TUNAS (MT)

JAPAN: MONTHLY IMPORTS OF SHRIMP & TUNA (MT)

USA: MONTHLY SHRIMP IMPORTS
Commodity & Market Update

SHRIMP

Farmed shrimp supply remains stable in Asia; increased production in Latin America

Strong imports in China cushioned the demand shortfalls of traditional large markets where imports were rather stagnant throughout 2019. However, even with lacklustre imports, the US emerged as a price setter in the global market for shrimp trade. In the early months of 2020 due to the coronavirus outbreak in China, less shrimp than normal was consumed during the New Year celebrations, and the forecast is for a depressed global market in coming months.

Supply

Preliminary industry reports for 2019 indicated slightly lower supply in Asia and increased production in Latin America compared with 2018. In general, farmers in Asia have been adversely affected by the weak price trends and occurrence of diseases in certain areas.

In China, the world’s largest producer of farmed shrimp, vannamei production fell below 2018 levels. In India, production in the major farming regions of Andhra and Tamil Nadu was below 2018 levels due to the general price weakening. However, overall output in India stayed slightly above 2018 levels due to increased production in the central and eastern regions of the country. Domestic production in Vietnam improved in 2019, but imports of frozen raw material declined significantly compared with 2018.

In 2019, Thai shrimp farmers struggled against environmental and economic factors such as disease in their breeding programmes and low market prices, resulting in less production when compared to the previous year.

Elsewhere, in Latin America, the two-digit export growth in Ecuador, Peru, and Mexico during January-September 2019 suggested increased supplies of farmed shrimp in these countries compared with 2018. The largest producer in that region, Ecuador, harvested over 550 000 tonnes of shrimp in 2019. For sea-caught shrimp, the Southern Shrimp Alliance (SSA) reported lower shrimp landings from the American Gulf of Mexico during the first ten months of 2019, totalling 31 388 tonnes, the lowest level recorded since 2002. In Argentina, shrimp catches in 2019 were estimated to be at 210 000 tonnes, or about 15% lower than in 2018.

Exports

During the third quarter of 2019, the seasonal surge of farmed shrimp and strong imports into China helped maintain positive export curves in many shrimp producing countries.

Ecuador remained the top shrimp exporter with strong growth (+28.8%), followed by India where the growth rate was marginal. In contrast, Vietnamese shrimp exports (of which 30-40% consisted of processed shrimp) increased significantly during the first nine months of the year. In Indonesia, processed shrimp exports, including breaded shrimp, increased to Japan and the US markets, in comparison with raw frozen products.

Mexico’s export growth was significantly higher (+41%) during the review period as compared to the previous year, supported by strong demand from China and the Republic of Korea. Peruvian shrimp exports also increased, albeit at a more moderate level (+11.2%).

Imports

China’s strong presence in the global shrimp market continued in 2019. Official imports of shrimp into the country increased by almost 170% during January-September 2019 compared with the same period in 2018. On the other hand, illegal and unreported imports through border trade with Vietnam decreased significantly following stringent border control by the Chinese authorities. Total imports of shrimp in China during this period (including unreported border trade) is estimated to have exceeded 500 000 tonnes in the first nine months of 2019.

Consumer demand for shrimp in the US domestic market was good during the 2019 summer, supported by stable supplies and cheaper prices. Compared with 2018, imports increased marginally (+1.1%) at 496 287 tonnes from January-September 2019, suggesting more than sufficient local stocks. Among the top suppliers to the market, imports increased from India, Ecuador and Vietnam but declined from Indonesia, Thailand and China. There were higher imports from Mexico and Argentina.

Under the raw shrimp category, imports of shell-on shrimp in the US were 169 000 tonnes (+12% over 2018). Demand was good for large sized shrimp, and peeled shrimp imports also increased to 223 750 tonnes, an increase of 3.2% when compared to the same period in 2018. For the popular breaded shrimp, imports increased by 2.4% at 36 440 tonnes. The supply shortfall of breaded shrimp from China was more than compensated by increased imports from Vietnam, Thailand, and Indonesia.

In the Japanese shrimp market, consumer demand improved in 2019 due to the national celebrations on the coronation of the Emperor. In general, there was greater demand for processed shrimp, while demand for raw shell-on shrimp weakened.

Overall, imports during the first nine months of 2019 remained the same as 2018 at 154 280 tonnes, of which 31% or 46 645 tonnes were value-added products such as tempura shrimp, sushi and cooked shrimp. With a 43% share in imports, Vietnam was the top exporter of value-added shrimp, followed by Thailand, Indonesia and China.

During the review period, imports of raw shell-on and raw peeled shrimp declined to 106 260 tonnes, in comparison with 108 070 tonnes imported during the corresponding period in 2018.
Stable supplies of tropical shrimp and low import prices had little positive impact on shrimp demand in the EU particularly in the larger markets (Spain, France, Denmark, Italy, and the Netherlands). In fact, import trends were negative in these five largest markets during the review period. There were higher imports registered in the Eastern European markets (Poland, Bulgaria, Czech Republic), but not enough to offset the overall decline. Accordingly, total shrimp imports in the EU registered a decline by 2.5% to 579,400 tonnes during the first nine months of 2019 compared with the same period in 2018.

During the review period, supplies from extra-EU sources were 73.2% of total EU imports, at 423,880 tonnes (-1%). Of these imports, nearly 20% (81,165 tonnes) were processed shrimp, a product for which imports increased by 9% during the review period.

In 2019, China remained Asia’s top shrimp importer with an estimated 520,000 tonnes of shrimp purchases from January-September 2019, or three times more than Japanese imports in the same period. Following stringent border control by the Chinese, illegal imports from Vietnam declined by almost 75% to 47,835 tonnes, while direct imports from all other countries increased by 169% to 478,365 tonnes. The top five exporters to the Chinese market were Ecuador, India, Thailand, Saudi Arabia and Vietnam. During the review period, there were significant increases in China’s farmed shrimp imports, but imports of capture cold-water shrimp from Argentina and Canada declined.

Frozen shrimp imports in Vietnam fell by almost 70% to an estimated volume of 103,000 tonnes during the review period as re-exports of these shrimp to China through unreported border trade were being curbed by the Chinese authorities. Shrimp imports increased moderately in the Republic of Korea (60,000 tonnes; +6.7%) and in Taiwan (35,000 tonnes; +7.5%) but declined by 7% in Hong Kong due to prolonged political unrest. In Australia, the market remained weak and imports declined by 13% to 20,300 tonnes during the review period.

Prices
In 2019, US importers remained the dominant market price-setters in international shrimp trade. Average import prices of shrimp in the US during the first nine months of 2019 were US$8.45/kg compared with US$8.95/kg in the same period of 2018. In the US domestic trade, wholesalers and distributors were able to maintain lower prices, which helped to improve sales volumes locally.

In Asia, ex-farm prices of vannamei shrimp remained soft during the peak farming season (July-October 2019) but started to firm up from late October.

Outlook
The global shrimp outlook for 2020 has been overshadowed by the outbreak of 2019-nCoV in China during late December 2019, and which subsequently was declared a pandemic. In preparation for the Lunar New Year celebrations in January 2020, shrimp imports in China were high during the last three months of 2019, while annual imports surpassed 700,000 tonnes.

However, because of the disease outbreak and subsequent precautionary measures throughout China, the authorities cancelled Lunar New Year celebrations. In order to control the disease, families were instructed to reduce outdoor activities. This resulted in drastic sales declines in restaurants and hotels following numerous cancellations of trips and dinners, as cities across China became ‘ghost towns’ during that period. Reportedly, current inventories of unsold shrimp are high in the market and there is no sign of these levels declining in the near future.

As China is one of the largest markets for farmed shrimp in Asia, production planning for 2020 has become extremely difficult for Asian shrimp farmers, where the farming season begins in March-April. The situation is similar for Latin American producers, where supplies are large at the seasonal end in February and the next harvesting season will begin in May-June. Considering these factors, global aquaculture production, particularly during the first half of 2020, is likely to be lower than last year.

In international trade, there will be heavy leaning on the American and European markets by shrimp exporters until consumption in China returns to normal. Shrimp prices will certainly be under pressure from these markets and are likely to weaken.

In general, shrimp demand in Japan usually weakens after the New Year. However, the demand pattern for peeled shrimp (widely used in noodle shops) looks good during the winter months in 2020. Demand for all types of processed or value added shrimp is expected to improve during the Spring festival season in April-May 2020.

Source: FAO-Globefish
Dr Williams, over the decades, you have been in the thick of state, national, regional and global dialogue relating to so many issues in aquaculture and fisheries!

Through the years, would it be accurate to say that food security and inclusivity (of women and marginalised groups) are the two main themes that you are most passionate about?

That is where I have come to, although, as a zoologist and biometrician, I started out with a different set of interests in aquaculture and fisheries. At first, scientists of my age were mainly using our research to help fishers, fisheries officials and the public understand the fished stocks. This phase coincided with the big expansion occurring in fishing and so very shortly we were having to answer difficult questions on whether or not stocks were over-fished. Many were. As ministers and officials took heed of our advice, they started using various ways of reducing fishing effort and catches, and this started to have serious effects on the fishers, their families and their communities. In more economically developed countries, the people affected were expected to accept the bail-outs and find other occupations. Only more recently have the social and psychological costs been recognised.

When I went to work in organisations serving less economically developed countries, I realised that the social and economic costs were front and center. However, the solutions as well as the problems were much more complex. Industrialisation of fisheries, fish trade and environmental degradation were all working against the smaller scale fishers and their value chains, but this was not getting much attention until, eventually, the small scale fishers advocates, FAO and the countries negotiated the Small Scale Fisheries Voluntary Guidelines.

All well and good, but throughout all the big changes in aquaculture and fisheries, not only small scale operators but women in all parts of the value chains, including in marketing and in the industrial and export factories, were overlooked. Either they were removed by modernisation or recruited into low-paying, often exploitative, work. And they continue to support the sector, often for free through unpaid productive work or care work from home.

During your tenure as Director-General of WorldFish (previously known as ICLARM), you pushed for aquaculture to be increasingly used as a tool to help the poor, rather than being dominated by companies looking for profits. Nearly 20 years later, it seems that much of the world still talks more about things like catch per unit effort and blockchains rather than producing nutrient-rich foods for communities. How can we make aquaculture more inclusive of social needs, and how can we garner support from big businesses to reach this goal?

These are huge challenges. Yes, profitability is important, but the social and human benefits such as nutrition will not be delivered as well until governments start working to enable this. At present, they are more focused on the economic rather than social benefits. Seafood products are viewed as important domestic income and foreign exchange earners due to the high percentage exported – at least before the Covid-19 pandemic. Governments devote their resources to keeping trade flowing. They need to develop more well-rounded fish industry policies.

Big business can be influenced by public opinion and advocacy that threaten its “freedom to operate,” e.g., poor worker conditions can give companies a bad reputation. Medium size businesses may not be so amenable to such public pressure, but evidence from other sectors is that leading companies that do the right thing may positively

1 The Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and PovertyEradication. Published by FAO (2015).
influence other companies to improve their work conditions. Large, leading companies can be particularly helpful.

The most critical action, however, is one that is resisted strongly. This is for governments and businesses to enable true collective action, such as workers’ unions, fishers’ and women’s collectives. These are not the same as company-run staff committees with limited independence. Unfortunately, the union movement has been demonized and heavily suppressed in recent decades, to the detriment of social equity.

The UN estimates that by 2050, the global population will exceed 9 billion, increasing the pressure on food sectors to maximise production and reduce waste. In your opinion, can fisheries and aquaculture keep pace with the growth in population, and at the same time, be increasingly accessible and affordable to all?

Yes, if the right species are grown and harvested and aquaculture becomes more efficient. This means much less emphasis in aquaculture on growing carnivores and luxury species like shrimp; and more in fisheries of small pelagics for direct human consumption. I am reasonably confident that sustainable replacements for fishmeal are going to be developed, judging by the promising options under development.

And now, moving on to issues concerning women in fisheries. At the 7th Global Conference on Gender in Aquaculture and Fisheries (GAF7) in 2018, you presented an article “From Catch to Consumer: Why Gender Equality Matters in Aquaculture and Fisheries” in which you highlighted the key actions that would lead to real progress towards gender equality. Could you summarise the points in that article? What do you hope to see happen by the time GAF8 rolls around next year?

At GAF7, I urged gender in aquaculture and fisheries researchers to raise their sights and look at the bigger picture – the larger intertwined economic and political forces that govern the sector. We are too focused on looking at women’s small scale problems and solutions, mainly from a social perspective. We need to learn from feminist economic research in other sectors; learn from previous political economy work on women and fisheries, e.g., during the Canadian cod crisis and transitions in Kerala fisheries; and we need to present, in leading fisheries forums, the case for protecting women’s livelihoods and creating more opportunities for them. These are not easy steps. Most fisheries and aquaculture forums resist putting gender on their agendas and some of my colleagues have even experienced a backlash.

To deliver on this political economy agenda, we need to reorient our research agendas to be more outward looking, translate more of the research results into actionable policy options, and speak out, putting the options in front of decision makers.

For GAF8, I hope for more studies on gender and the political economy of fisheries, and more action on putting gender equality perspectives into fisheries and aquaculture forums. I know already that several colleagues are working in this direction, and so I am sure we will see the results at GAF8.

Women are still over-represented in lowly paid positions throughout the world. What are some extra challenges specific to the Asia Pacific, perhaps cultural and religious, which are holding back the equitable recognition of women? Presumably advocacy efforts in say, Australia, would need to be adapted to achieve the same impact in Malaysia or Thailand?

Yes, cultural and religious differences certainly matter, but the economy often trumps these and some basic and universal factors are more important.

Some problems with “equitable recognition” are basic and universal in fisheries. A universal problem is that women are not seen and considered. On International Women’s Day, the SEAFDEC-USAID Oceans and Fisheries Partnership referred to the “Hidden Half,” and the International Association for Women in the Seafood Industry (WSI) coined the term “IIU” – Ignored, Invisible and Unrecognised.

Women’s work is not counted in many industry statistics, e.g., in post harvest or even production; not considered a real part of the industry, e.g., gleaning; not included in fisheries and aquaculture policies, e.g., the Code of Conduct for Responsible Fisheries; often is unpaid; and the workers are
not represented when decisions are made. All of these factors are huge barriers to the equitable recognition of women.

Yes, cultural factors often support these factors, more so as men feel insecure when their work has become more tenuous due to overfishing, environmental degradation, and intense competition. Advocacy efforts do need to be culturally fine tuned, and hence are best run by the people affected. However, we have also seen the power of external ideas to change the world for the better, and worse, and the flexibility of culture as circumstances change.

One of the points you have mentioned several times in your opinion pieces is how important it is that women come together to help other women to find their voices and to push the gender agenda front and centre. One of the ways is through websites such as Genderaquafish.org, which you established, and highlighting shortfalls such as the fact that more global emphasis tends to be placed on putting gender targets into work under SDG 14 (Life Below Water) and less on thinking that the gender-specific SDG5 will do much for fisheries. For readers who may be interested, could you list some of the leading organisations and websites which actively advocate for women in fisheries? Has there been much progress in getting a critical mass of men to be involved in advocacy for women?

On our website we have a wealth of information, including under the Discover GAF menu (https://www.genderaquafish.org/discover-gaf/). This menu provides an overview (https://www.genderequality.genderaquafish.org/), specific topic pages, e.g., on women in aquaculture, gleaning and diving, a page that gives links to Networks and Resources. On the Events pages (https://www.genderaquafish.org/events-2/), we also have all the presentations, published papers and reports from our nine conferences going back to 1998.


Is a critical mass of men yet involved in advocacy for women? The numbers are growing, but more are welcome. I often sense a caution among senior men (and women) in speaking out when they are not sure of their knowledge on gender equality. This is one reason we need simple, clearer messages. But we should not be naïve about a general reluctance by leaders to rock the boat or challenge the current power structures. Ridicule, or worse, backlash is always possible and difficult to handle. With the sector’s strong emphasis on economic growth, leaders want a cast iron economic case for gender equality, and often discount the more important social justice and social benefits arguments.

And on a final note, congratulations on yet another recognition of your contributions to agriculture and gender equality - the Meryl Williams Fellowship programme, funded by the Australian Centre for International Agricultural Research (ACIAR). According to reports, the Fellowship is to “support women in agricultural research for development to enhance their leadership skills and increase their impact through a combination of immersive learning, mentoring, networking and professional development”. Could you elaborate a little on this programme and what thematic areas do you hope to see will be the focus, specific to fisheries and aquaculture?

The programme is for developing women leaders in agricultural research, as part of ACIAR’s Gender Equity in Agricultural Research for Development (GEARed) initiative. The programme involves training, mentoring, targeted professional development activities and networking. It is a highly competitive programme.

In the first round, ACIAR selected 20 women from six countries (Cambodia, Fiji, Indonesia, Lao PDR, Papua New Guinea and Vietnam). Earlier this year, I had the immense pleasure to meet them and their mentors. They were awe-inspiring. Most have already jumped personal and professional hurdles to achieve what they have, and all are enthusiastic and realistic about the future they want to help create. Aquaculture and fisheries leaders are eligible, but they have to meet the criteria and compete with the wider field of agriculture and forestry research. I would love to see more from our sector in the next round and our networks will encourage women to apply.
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GLOBAL COVID-19 SITUATION REPORT: UPDATE

By: INFOFISH

The global seafood industry is going through its toughest time in living history as the coronavirus slams almost every country in the world. China is recovering slowly, while the US, Europe, and much of Asia are in varying stages of battling the onslaught of the virus, which continues to take an unprecedented toll on millions of lives and livelihoods. This Situation Update was prepared using information from a range of sources.

Overview

As was mentioned in an earlier Situation Report published in the INFOFISH International (March/April 2020 issue), China had implemented lockdowns in Hubei and other provinces. Most businesses, including manufacturers, were ordered to suspend operations; international airlines cancelled flights to and from China, restaurants and retail outlets were mostly closed, and major cities were eerily quiet. Not only did the coronavirus bring much of the seafood trade in China to a screeching halt, it also had a domino effect on the global seafood trade, not least because it had happened during the peak Lunar New Year season.

The dire situation faced by exporters of crab, salmon, lobster, shrimp, and fish from Russia, Canada, Ecuador, Chile, Australia, New Zealand, India, and Vietnam, was outlined in that Report. At a time when peak sales to China had been expected, these exporters scrambled to find alternative markets, or made the decision to stop harvesting, or (in the case of live product such as lobster) return catches to the sea. If nothing else, it pointed to the danger of over-dependence on the Chinese market. It also highlighted the steep rise of e-commerce in China, a trend which is likely to continue for some time yet.

In this May/June 2020 issue of the INFOFISH International, we present an update on the continuing impact of Covid-19 on the world seafood market, again using information gathered from a wide range of sources. When the final toll is counted, perhaps by the end of this year at the earliest, the Covid-19 pandemic may well turn out to be the biggest global challenge in living history in terms of lives and livelihoods lost. At the same time, it may also bring about unintended consequences in the way that seafood is sourced, marketed and consumed. Only time will tell.

By 18th April, the number of infected persons in 201 countries had exceeded 2.3 million, with 160 448 deaths and 595 519 recoveries.

As China began to recover (the lockdown in Wuhan was lifted on 8th April), the virus had spread worldwide with the most affected five nations in terms of number of deaths being USA, followed by Italy, Spain, France, and the UK. Restrictions on movements of people with varying degrees of severity were imposed in these, and many other countries, with obvious and predictable effects on retail trade, including seafood.

In global financial terms, The Fish Site’s report on its talk with Dr Beyhan de Jong, food and agribusiness specialist at Rabobank, is interesting. Dr de Jong predicts that the impact of the virus looks likely to be closer to that of the 2008 global financial crisis of 2008-2009, rather than to SARS due to the fact that the Chinese and global economies are much more closely linked since the outbreak of the latter, back in 2003. If the forecast for the Chinese economy to grow 2% slower than anticipated in 2020 is correct, then global growth rates will drop by 1%. Meanwhile the United Nations has estimated that the coronavirus outbreak could cost the global economy up to US$2 trillion this year. Also, according to S & P Global Ratings, the economic growth across the Asia-Pacific will slow down to 4% while the overall economic damage through this year is likely to reach US$221 billion.

As at the end of March, the majority of the governments in Europe, North America, and Asia had announced fiscal recovery packages and aid programmes.

China: Early indications of recovery

By the beginning of April, China was reported to be slowly opening to trade, receiving limited imports of food, including seafood, although still not yet in fresh or live forms.

Russian king crab exporters, who had lost their golden opportunity to supply China with live crab during the Lunar New Year, are keeping a close watch on the situation. In Bangladesh, it was reported that almost 500 000 mud crab farmers are struggling to repay high interest loans from banks and money lenders, as well as having to think of what to do with the unsold crab that never made it to China. A similar situation exists in Kerala, where the small-scale fishermen
involved in collecting live red crab for shipment to China have had to cease operations for the time being due to restrictions on live trade.

Rock lobster exports from Australia, New Zealand, South Africa, and North America were another casualty of the closed Chinese market. Wholesalers in Australia have asked for government assistance to tide them over their huge losses due to the unsold lobster and scallop, and they have launched a social media campaign to increase domestic seafood consumption.

As at the end of March, Chile had not resumed salmon exports to China, preferring instead to focus on other countries (Brazil, US, SE Asia) for the time being in the hope that exports can be redirected back to China in due course. Unfortunately in the meantime, Covid-19 had begun to pose serious threats to these alternate markets, particularly the USA where the number of infections was the highest in the world by the end of March.

Major shrimp producers and exporters Ecuador, Vietnam, Indonesia, and India remain in the same situation as the salmon exporters mentioned above. According to the Vietnam Association of Seafood Exporters and Producers (VASEP), the volume of shrimp and other seafood exports from Vietnam to China is expected to fall by about 40% in the first quarter of this year as compared to 36 711 tonnes in the same period in 2019. Ecuador, which was optimistic about the resilience of the Chinese market (re: 11th February press release from the National Chamber of Aquaculture), is keenly keeping watch on the situation to ascertain when shrimp exports can resume. China, before the outbreak of Covid-19, was the top market for their product, and so the closure had a huge impact on sales from Ecuador. Indonesian and Indian shrimp exporters, who were badly hit by the loss of business in China, and who had started to diversify their markets to other destinations, were unfortunately then hit by the spread of the virus to main markets in Europe and North America.

In late March, Chinese buyers of pangasius from Vietnam had just started to reactivate imports, although prices remain low to date. In 2019, China was the main destination for Vietnamese pangasius, which was valued at US$28.6 million, up 37% from 2018. Overall though, VASEP said in a statement dated 24th March that “Due to impacts from the Covid-19, the production and trading activities of seafood companies have been seriously affected, especially in the first two weeks of March”.

Unprecedented disruptions in global supply and sales

As at 18th April, the countries with the highest number of (reported) infections were the US with over 737 000 cases, followed far behind by Spain, Italy, France, Germany, UK, and China.

That the epicentre had moved from China to the US and Europe, the two biggest markets for seafood in the world, meant devastating losses for everyone in the retail trade and food service sector. With these losses came another huge problem: a steep rise in the numbers of people who suddenly became unemployed and therefore unable to provide for their families.

Productivity has also been affected throughout the world as social distancing rules and other emergency regulations keep people at home, and non-essential business premises closed. In some instances, flexibility has been suggested; for example, the World Tuna Purse Seine Organization has asked the Parties to the Nauru Agreement countries to temporarily relax vessel observer requirements so they can continue harvesting. Similarly in Europe, the EU fish processors and traders association (AIPCE-CEP) has recommended some relaxations in the import procedures for seafood.

Asia and the Pacific

On 24th March, India came under a lockdown period until 3rd May as the official number of infected persons reached 15 722, with fears that up to 1.3 million cases could result if stringent measures were not taken immediately. Grocery shops, banks, hospitals and other essential services remained open, but all forms of transport including air and rail, were suspended, except for those dealing with essential goods. According to the Economic Times, the lockdown will cost India about US$120 billion (EUR 111 billion), or 4% of its GDP this year.

By March, squid and cuttlefish exporters were particularly worried as Chinese demand had dropped significantly during the first two months of the year, and hopes of increasing volumes to the main European markets – Spain and Italy - were dashed as these two countries were the hardest hit by the virus in that continent. In 2018-19, India had exported US$6.7 billion worth of seafood, of which squids and cuttlefish together accounted for about 10%.

Nevertheless, up till recently, the Marine Products Export Development Authority (MPEDA) maintained that in general, seafood exports from India had not been impacted in a major way, except for slowdowns in cargo transport, particularly to China. The situation however became less clear after the Indian government implemented the lockdown period. Fishing activities in some States came to a halt and shrimp exporters said that because of the lockdown, they had started to face difficulty in exporting to other countries.

In the Republic of the Maldives, non-canned tuna exporters are struggling with the fact that exports dropped by 30% in January 2020 as compared to the same month last year, reported the Maldives Seafood Processors and Exporters...
Association (MSPEA). Tuna is the only seafood product of international value from the country. The Association said that the exports have been affected by the widespread closures of restaurants and food courts in Europe.

The Philippines, subject to a lockdown from 17th March to 30th April, usually exports the bulk of their tuna by air through Manila, but this came to a halt with the cancellation of domestic and international flights. Worst affected has been General Santos city in Mindanao, which is used to exporting about five tonnes of fresh tuna every day to various countries in Asia, particularly Japan.

Vietnamese seafood exporters are resigned to the fact that their revenue will plunge for the first half of this year. They had hoped that once China recovered, exports could resume, but due to the spread of the virus worldwide, orders began to be cancelled in Europe, the Americas, the rest of Asia, and the Middle East as buyers in those countries could not move their stocks to domestic consumers.

The Vietnam Association of Seafood Exporters and Producers (VASEP) reported that pangasius exports plunged in the first two months of 2020, valued at US$210.3 million (EUR 197 million), which was 32.1% lower year-on-year. The volume exported to China dropped by 52% to US$28.4 million (EUR 26.3 million). Likewise, exports to the EU were down by 40% (US$26 million (EUR 24 million) and to the US by -27% at US$38.6 million (EUR 35.7 million) in the period under review. Due to the significantly lower global demand, farm gate prices for pangasius had dropped to around US$0.7/kg at the end of March as compared to US$1.3/kg in March 2019.

With regard to shrimp, VASEP said that 35-50% of shrimp orders from the U.S. and EU were cancelled or postponed, and Chinese imports dropped by some 37%. However (and perhaps surprisingly) the overall decline in shrimp exports was counterbalanced by increased demand (+16%) from Japan. Cold storages in Vietnam were reported to be full at the end of March and processors in Vietnam said that not only were their contracts being cancelled, they could not obtain enough raw material for the processing to continue.

Nevertheless, VASEP sounded a positive note, predicting that global demand for seafood should recover by July and that shrimp farmers could begin stocking soon.

Customs trade statistics provide a useful overall view of Vietnamese seafood exports in the January-February period. According to the data, seafood exports earned US$988.8 million (EUR 915 million), down by nearly 11% compared to the same period in 2019. The leading destinations were Japan with US$184.7 million (+2.5% year-on-year), the US at US$179.5 million (+1%), and the EU at US$143.7 million (-11%) down 10.9% from January-February 2019. Those in the sector welcomed news in early March that the government had directed the State Bank of Vietnam and relevant agencies to provide a credit package of VND 250 trillion (US$10.7 billion) and a tax exemption scheme worth VND 30 trillion (US$1.3 billion) to support businesses affected by the pandemic.

VASEP has also requested for a 50% cut in corporate income taxes for seafood companies, lower electricity rates for seafood processing plants and cold storage units, as well as support from banks.

According to the Myanmar Times, fisheries exports from Myanmar to China (its main market) have continued despite the coronavirus outbreak. About 4 000 tonnes of fisheries products, including pike, flounder, white pomfret, yellow pike conger, carp, pufferfish, prawns, and squid, were reported to have entered China through the Muse border gate between 1 to 8 March. These exports were worth US$3.12 million (EUR 2.8 million). In the same period, the Chin Shwe Haw border route saw 28.23 tonnes of fisheries products, comprising eel and pike conger shipped into China, valued at US$72 075. Reportedly, export activities via Chin Shwe Haw were suspended in February at the height of the Covid-19 outbreak in China.

Ministry of Commerce data states that between 1 October, 2019 - 28 February, 2020, Myanmar exported fisheries products worth US$415.3 million, an increase of nearly 15% from US$361.5 million in the same corresponding period.

Australian seafood prices are falling and fishers are pleading for help as major international markets have been affected due to the outbreak. Prices paid to fishermen for prawns, scallops and lobsters have dropped by a third and could slide further as Asian markets continue to hold off buying seafood. The lobster sector in particular remains badly affected by the closure of the Chinese market as producers and exporters had specifically targeted that market during its peak Lunar New Year sales period. In the meantime, seafood wholesalers in...
Australia have launched a social media campaign in a bid to increase domestic seafood consumption.

The New Zealand lobster industry was particularly impacted as China is its only market of significance, absorbing some 98% of the supply in normal circumstances. Fisheries New Zealand has proposed that the annual catch entitlement (ACE) for lobster be carried forward by up to 10% of an individual’s total ACE holdings that may not have been acquired by the end of the fishing year; in other words, uncaught quota for 2020 could possibly be used in the following fishing season.

**Europe (EU & non-EU)**

In Europe, there is strong demand for frozen and shelf-stable seafood rather than fresh. In general, most of the countries have enough stocks in storage for a couple of months but after that, there may be a problem with declining supplies of raw materials.

In its week 12 & 13 Bulletin covering the Covid-19 crisis, the EU Market Observatory for Fisheries and Aquaculture Products (EUMOFA) said that for EU fisheries, the closure of HORECA channels, and in some places the closure of open markets, led to significant impacts on their activities, especially for small scale fisheries selling fresh fish (sharp drops in terms of volumes and prices). The result was that many vessels stayed at ports and some auctions had to close. In some Member States (MS) such as France, the sector put in place temporary solutions (distance selling, vessel rotation, stopping targeting species for which the demand collapsed, etc.) to minimise impacts on the market, especially to maintain reasonable prices. Many French vessels went out fishing only after having guaranteed contracts with wholesalers or retailers.

After a first chaotic week on the market (week 12) the situation in week 13 showed some positive signs in some MS at first sales level. However, volumes were still significantly low. In week 13, import volumes of fishery products into the EU were down by 32% compared to the previous week and 39% year on year, particularly for Norwegian Atlantic salmon (-65%), Norwegian cod (-14%), Gilthead seabream and European seabass from Turkey (-8% and -6% respectively) and haddock from Norway (-5%). Species which are traditionally imported in small volumes for restaurants showed the sharpest decreases from week 11 compared to week 13: Atlantic halibut from Norway (from 33.6 tonnes to five tonnes), Norwegian turbot (3.8 tonnes vs 15 kg), and yellowfin tuna from the Maldives (16.2 tonnes vs 0.2 tonnes).

EUMOFA predicted that in general, the processing industry relying on frozen imports from third countries could experience a shortage in supply in the coming months as processing activities are reduced, there are limitations in freight capacity and some major supplying countries have closed their ports.

At the end of March in Norway, the Norwegian Seafood Council (NSC) observed that many markets were reporting increased demand for processed and prepacked seafood, as well as products with longer sell-by dates, such as clipfish and frozen fish. Furthermore, the transport bans and disruptions which were starting to bite in the US and Europe made it difficult to ship fresh salmon to the traditional destinations, even though prices had softened considerably by then. The industry accordingly quickly adapted to these shifts in buyers’ preferences and started producing more processed products. Said Paul Aandahl, seafood analyst at the NSC, “whilst the export of fresh whole salmon to the EU has fallen by 6% in week 12, we see growth of 16 and 63% respectively to Poland and Lithuania. These are markets where Norwegian salmon are processed and smoked before being sold to European markets.”

Aandahl continued “Despite a sharp decline in the sales of Norwegian salmon to the restaurant segment in Asia, the total volumes of fresh whole salmon to Asia were almost the same as last year. This is primarily because of strong growth in the take-away segment and increased sales in retail. China had a decline of 17% compared with last year, however in South Korea exports have grown by 53%. To the US market, where transport capacity for fresh salmon was severely affected in week 12, fresh Norwegian salmon exports fell by 89%, whilst fresh fillet exports remained at the same level.”

In an early April update on fresh Norwegian salmon exports, the NSC reported that Easter sales had begun to pick up, and in fact had exceeded expectations to European markets such as the UK, Sweden and Finland.

**Fresh salmon exports from Norway are down, particularly to the US, Europe and China, but overall, volumes were not as badly affected as had been feared.**

The demand for Scottish shellfish (crab, langoustine) has been badly affected with the closures of hotels and restaurants, as well as social distancing rules, in the UK and elsewhere. Many small businesses have simply had to cease operations for now.
North America

On 25th March, the United States Senate voted to approve a US$1.2 trillion economic stimulus package that included some US$300 million to assist tribal nations, fishermen, fishing communities, other fishery-related business and certain aquaculture businesses until 30 September 2021. This is part of the US$2 trillion relief package approved for American businesses and individuals affected by the pandemic.

Undercurrent News reported that the US will remove 25% tariffs on imports of tilapia and red swimming crab from China. Meanwhile, to boost sales of pangasius, the US Department of Agriculture said it would temporarily relax a labeling requirement to allow fish that was originally packaged in large blocks for foodservice to be repackaged for retail sale.

In Canada, seafood groups such as the Canadian Aquaculture Industry Alliance have requested an aid package of CAD 82 billion (US$58.2bn). One positive bit of news is that live lobster exports (67 tonnes) from Nova Scotia to China (the primary market for the product) resumed in the first week of March, with the industry in Canada staying in a wait-and-watch mode to see if the distribution system in China had sufficiently recovered.

South America

According to the Committee on Fisheries and Aquaculture of the National Society of Industries (SNI), Peruvian shipments of seafood products to China and other destinations that make stopovers in Chinese ports have been put on hold (as at end-March) until the situation in China normalises. These products include canned anchovies, canned tuna, frozen cuttlefish, frozen shrimp tails and horse mackerel.

Fresh seafood exports (snapper, yellowtail, grouper) from Brazil to the US remain suspended due to the sudden lack of demand from that market.

Chilean fresh salmon exports to its major markets US, Brazil, and SE Asia have continued; sales to China, its fifth largest market for the product, were suspended at the beginning of March, but SalmonChile said that shipments had begun to resume slowly by the end of that month.

Ecuador, as mentioned earlier, is keeping watch on the situation to ascertain when shrimp exports can resume China, before the outbreak of Covid-19, was the top market for their product, and so the closure had a huge impact on sales from Ecuador. However by the end of March, signs of recovery in China were noted. With regard to Europe, José Antonio Camposano, Executive President of the National Aquaculture Chamber (CNA), said that Italy normally takes about 30% of Ecuadorian shrimp supplies; unfortunately demand has dropped as it is one of the European countries most badly affected by the virus. In 2019, Ecuadorian shrimp exports to Italy were worth US$176 million, according to figures from the Central Bank.

Other countries

Of the countries which do not fit neatly into the regions mentioned above, arguably the most important is Russia, which spans both the European and Asian continents. The Federation of Seafood Businesses (Sjømatbedriftene) called upon the government to negotiate with Moscow on lifting the current ban on salmon flights over Russia during the pandemic so that salmon exports to markets such as Japan, South Korea, and also increasingly to China, can resume.

Sales of products such as king crab, which are exported both by air to world markets as well as (in the case of China, by land), have also been affected. According to the Russian Association of the Far Eastern Crab Catchers (AFecc), live king crab exports to China dropped to almost nothing in March, and exporters diverted more supplies to South Korea, which usually accounts for more than 60% of total Russian crab exports. At the end of March, German Zverev, President of the All-Russian Association of Fisheries Enterprises, Entrepreneurs and Exporters (Warpe), said that the export price of crab had dropped from US$15-18 dollars to seven dollars per kg. Warpe estimates that exports for the first quarter of 2020 may drop to 7-8 thousand tonnes, and revenue will be around US$60–70 million dollars (about half the anticipated amount).

Canned seafood sales deserve a special mention

Global manufacturers of canned seafood, particularly tuna, have seen their sales shoot up as consumers from the Americas through Europe and Asia bought food in bulk in anticipation of lockdowns and possible shortages. In hard-hit Italy, various news wires reported that canned tuna was the second most widely-purchased product in February, next only to canned meat.

In the US, CNBC reported that in the week ending 21st March, sales of fresh meat increased by 100%, canned tuna by 200%, and dried beans by 400% as compared to the same period in 2019. In Asia, according to Bloomberg, Thai Union is now one of the best performers among consumer stocks in Asia (excluding Japan) with a market value of at least US$1 billion. The company is the maker of (among others), ‘Chicken of the Sea’ in the US, and ‘John West’ in Europe. Other major canned tuna and sardine manufacturers such as the Bolton Group (Italy) also reported increased sales.
LATIN AMERICA: THE RESHAPING OF THE TUNA LANDSCAPE AFTER COVID-19

By late March 2020, the Covid-19 virus had arrived in full strength across Latin America. In economic terms, the region was already growing very slowly, at less than 1% a year on average; thus the impact of the virus will be profound, affecting many areas such as commodity exports, which will be met with lower prices. It will also affect the tourism industry, reduce remittances by foreign workers, cause shutdowns of service businesses and cut down exports due to the contraction of their biggest export market, China. The UN estimates that the number of poor in Latin America, out of a total of 650m, will soon rise from 185m to 220m. Adding say, another 35 million poor people to the already impoverished region will put huge pressure on many populist governments that were elected claiming the usual mantra of “we care for the poor”.

In political and social terms, Latin America has been suffering major discontent and despair, and has seen many protests especially in Chile, Ecuador and Venezuela. Moreover, the election of two very different populist governments in Brazil and Mexico, right and left-oriented respectively, together with the return of the Peronists in Argentina, have shaken the foundations of the strong middle classes in those countries, which are the three biggest economies in Latin America. Despite having chosen these leaders democratically, there is a fear now that there are fewer opportunities for progress and no clear horizons ahead. It is obvious that Covid-19 will significantly alter the paths of global economies including Latin America, unless governments act with responsibility, common sense and transparency to avoid a major disaster.

This brings us to the subject of this paper: Will the virus reshape the tuna landscape in Latin America? And if so, how?

In order to find the answers to this, we will first look at “The day after”. In other words, assuming one day the virus will eventually disappear, or a vaccine is developed, we must list all potential changes that may affect the region, especially those related to food production and consumption. After we have identified all this, we will be in a position to narrow our search and analysis down to our favourite fish: tuna.

What will happen “the “day after””?

Perhaps one of the few certainties we have in these turbulent times is that one day this crisis will be over. To understand the implications of how Covid-19 will affect us, we can divide them into two groups: global ones, and those specific for Latin America, as follows:
Global implications

- **Globalisation**: pulling back, lessons learnt from protectionism applied by some countries

- **US-China**: quest for global dominance to continue, fueled by President Trump’s re-election campaign

- **Protectionism**: tariff wars are expected to revive economies. Closing of borders as a tool.

- **Dependence on China**: risks with China as main business partner and top foreign investor

- **Supply Chains**: integration vs disintegration: diversification as solution?

- **Regionalism and globalism**: turning inward, readapting supply chains to deal with potential disruptions

- **Global value chains**: “Just-in-time” is no longer an advantage, financial and operation costs will mostly increase.

- **Resilience** as the “New Normal”
  1. Diversifying suppliers may become the norm in multinationals to reduce dependency; and to avoid “the unexpected” (wars, epidemics, earthquakes, tsunamis, etc)
  2. Diversifying origins as protection against changes in the rules of the game
  3. Zero stocks: no longer a good policy in some industries

- **Factories abroad vs local manufacturing**: robotisation (they don’t catch virus!) as a solution to reduce costs and dependency on the human factor

- **Commercial integration**: “unheard of” countries may become interesting for business.

Opinion: The potential effects of the coronavirus will not destroy the process of globalisation but they will probably reshape it in untested ways.

Implications for Latin America

- **Recession** for a long period inevitably will change consumption patterns and habits

- **Lockdowns** will accelerate changes
  1. Home office: homes become more efficient for remote work
  2. Eating habits at home will change: family meals, health, convenience

  iii. On-the-go eating: HORECA business will have to adapt to the new reality

  iv. On-line shopping vs decrease in scale and frequency of purchases by retailers

- **Movement**: less travel, less use of cars, less use of public transport, less traffic jams. In other words, lower global oil consumption

- **Foreign workers**: more controls at borders, less regional circulation

- **Poverty**: purchasing power eroded leading to the rise of cheaper brands and private labels

- **Taxes**: helping the lower income groups by increased taxing of the middle and higher income groups

- **Traceability**: consumers will demand information which they feel is trustworthy in their brands and favourite foods

- **Organic foods**: as the synonym of safety and commitment to good practices by companies

- **Stocking up**: canned foods with a longer shelf life to prepare for future crises

- **Sustainability** can be the new flag that Latinos have neglected for years

- **Rejection of populism**: parties that have succeeded in controlling the spread/duration of the Covid 19 virus will be remembered in future elections as being successful and caring

Opinion: This is an opportunity for the region to form a more socially responsible society, caring for the needy, and giving equal access to health and education, both for rich and poor.

Supply and demand trends

How can we now predict the factors, countries and trends that will reshape the tuna landscape in Latin America? To do this, we have to assume that the coronavirus effects will last during most of 2020 (i.e. it will continue to impact significantly on our lives), and also that no country in Latin America will be immune.

For that purpose, Economics 101 teaches us that we must first understand that there are two sides of the equation: supply and demand. It is useful then to separate Latin America into two categories: tuna producing/exporting countries from the non-producing/importing ones (Table 1). Then, we will be able to study and better grasp the demand side, i.e. the consumers.
Although there is a common language (Spanish) uniting all 33 countries (except for Brazil, where they speak Portuguese), there are significant differences in their eating and purchasing habits. Tuna is no exception, as Latin American consumers have various ways of consuming it at different occasions, and even according to the time of the year (Lent and Easter). However, for the purpose of our study, we can separate them into heavy and light users (Table 2). A common way of doing this is using 1kg a year per capita as the benchmark, which is approximately six cans per person per year, as follows:

Table 1: Producing countries in the region

<table>
<thead>
<tr>
<th>Tuna in Latin America</th>
<th>Producers</th>
<th>Non-producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>South America</td>
<td>Equador, Colombia, Peru, Brazil, Argentina, Venezuela</td>
<td>Chile, Bolivia, Uruguay, Guyana, Suriname, Paraguay</td>
</tr>
<tr>
<td>Central America &amp; Caribbean</td>
<td>Mexico, Costa Rica, El Salvador, Guatemala</td>
<td>Nicaragua, Panama, Honduras, Belize, Cuba, Rest of the Caribbean</td>
</tr>
</tbody>
</table>

Now that we have divided the Latin American countries into clusters of producers vis-à-vis consumers as in Tables 1 and 2, by looking at the predicted impact of Covid-19, we can infer which of these countries may eventually “benefit” from the unfolding situation. On the supply side, we can select among the effects mentioned, the upsides and downsides for the tuna producing countries in a post-virus situation. The next task is identifying the countries that are likely to be most affected (Table 3a).

From the demand side (i.e. the consumers), by thinking about the upside effects, we can predict the factors which can bring out an increase in tuna intake through time, and those causing consumers to acquire new habits and uses. On the downside, a possible move to cheaper, lower quality tuna may occur. We then identify the countries that have more to “gain” from the virus crisis (Table 3b).

Table 2: Main consuming countries

<table>
<thead>
<tr>
<th>Tuna in Latin America</th>
<th>Heavy users (more than 1kg/year/person)</th>
<th>Light users (less than 1kg/year/person)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South America</td>
<td>Equador, Chile, Venezuela (pre-crisis)</td>
<td>Brazil, Uruguay, Bolivia, Uruguay, Guyana, Suriname, Paraguay, Colombia</td>
</tr>
<tr>
<td>Central America &amp; Caribbean</td>
<td>Mexico, Costa Rica, Panama</td>
<td>Nicaragua, Guatemala, Honduras, Belize, Cuba, Rest of Caribbean</td>
</tr>
</tbody>
</table>

Opinion: Ecuador is facing a “perfect storm” - among all the tuna producers, it will be the hardest hit country by Covid-19 in the Latin American region.
Conclusions and recommendations

a. The coronavirus will severely impact Latin American society, economy and politics (relatively more than Europe and Asia) throughout 2020, and probably into 2021.

b. The virus will oblige the region to revise and implement deep changes in the health system, in order to minimise risks to the population, at least until a vaccine is developed.

c. Commerce, manufacturing, and especially regional trade will suffer too, as consumption, investments and exports are projected to decrease significantly.

d. The impact of the virus will be seen across the whole value chain, forcing companies to review their financial projections, supply contracts, just-in-time methods, business models, distribution policies, production practices etc.

e. At-home food and beverage consumption as a result of lockdowns and quarantines implemented will rise. E-commerce in general and online retail ordering will also grow, but in turn this will cause a big decline in foodservice/HORECA/tourism sales.

f. Tuna has been the star in many countries in Europe during the tough months of lockdowns and closures. The fact that it’s reliable, safe, tasty, has a long shelf life and traceable make it a unique item.

g. Stocking up on canned tuna has surprised many factories which were not prepared to keep up with the sudden demand. This change in habit may be temporary, but it clearly means that deeper category penetration is inevitable, even in countries with already high consumption per capita.

h. In Latin America, similar trends (as listed in e, f, and g above) have been observed. The demand was so big that wherever canned tuna was not available or sold out, sardines and mackerel were purchased as alternatives.

i. Paradoxically, many of the negative effects of Covid-19 on the tuna industry will be offset by positive ones.

j. Unfortunately a “perfect storm” is brewing for tuna giant Ecuador: oil prices are down, health system is unprepared, and the low popularity of the government means a severe recession is expected. Tuna production and exports will suffer as a consequence.

k. Countries with low per capita tuna consumption (2-4 cans per person a year) that will be positively impacted in the future: Brazil, Colombia, Peru (all in the medium term) and Argentina (long term).

We can conclude that the tuna landscape in Latin America has already been reshaped due to the coronavirus, and that its effects on production and consumption will last for many years to come.

As a recommendation for Latin American governments, it is highly advisable to provide a safety net for the lower/middle income classes to avoid collapse in the economy. Opening up economies, eliminating intra-bloc barriers, and reducing import tariffs on food (including tuna) is a way to help these classes by maintaining a lower inflation level.

As a recommendation for Latin America tuna companies and the tuna industry in general, be prepared to meet the new post-virus trends. Grab the opportunity to make your tuna range more appealing and help increase consumption per capita in those countries that have neglected tuna protein vs beef/chicken/pork.

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Ensuring food safety in the seafood sector

According to the U.S. Food and Drug Administration (USFDA), there is no evidence suggesting that food products and food packaging are associated with transmission and spread of Covid-19. The European Food Safety Authority (EFSA) also confirms that there is no evidence that food is the source or transmission route of the coronavirus. Nevertheless, seafood processors should develop infectious disease preparedness and response plans that will enable them to take preventive measures against diseases like Covid-19.

This should be done throughout the seafood supply chain, which stretches from harvesting (fishing vessels/farms), through landing, processing, distribution, retail and food services, and consumers. Personal hygiene and handwashing is mandatory under HACCP guidelines at every stage, more so during a pandemic. Meanwhile, HACCP, cGMP and ISO 22000 certifications generally ensure the basic fitness of workers and food safety protocols in factories, while re-evaluation of ongoing food safety programmes that address personal hygiene and respiratory etiquette is necessary to prevent Covid-19 transmission which can cause increased rate of workers’ absenteeism; change in business patterns; and interrupted supply/delivery.

Preventive measures to ensure safe workplaces

Seafood processors should develop the following:

i. **A Preparedness and Response Plan** to prevent infectious diseases like Covid-19 if one does not already exist. The Plan should consider and address the level of risk linked with the workplaces. It may include where, how, and to what sources they might be exposed, the home and community situation, individual health risks and controls necessary to address the risk;

ii. **Implement basic infection preventive measures.** As appropriate, all seafood processors should implement good hygiene and infection control practices. It includes frequent and thorough hand washing, encourage employees to stay at home if they are sick, be aware about respiratory etiquette, provide customers and the public with tissues and trash receptacles, flexible worksites and workhours, discourage use of shared work tools and equipment and maintain regular housekeeping practices strictly;

iii. **Identify and isolate sick people promptly.** Identification and isolation of potentially infected individuals is a critical step, after which they should be encouraged to self-monitor for symptoms of the disease;

iv. **Implement and communicate about factory protection protocols.** This includes actively encouraging sick employees (including temporary staff) to stay at home, and provide adequate, usable and appropriate training on workers’ health and safety including proper hygiene practices including PPE;

v. **Implement engineering and administrative factory controls.** Engineering controls involve isolating employees from work-related hazards. Administrative controls are changes in work policy or procedures to reduce or minimise exposure to hazard;

vi. **Safe work practices.** This involves providing resources and a work environment that promotes personal hygiene, requiring regular handwashing or using alcohol-based hand sanitisers, and post hand washing signs in restrooms.

Maintaining a high level of personal hygiene includes keeping the hands and nails clean, nails short and free of nail varnish and not using excessive perfume. Handwashing is important in the following cases:

- After handling raw product
- After coughing, sneezing or using a handkerchief
- If you were in contact with someone who has a fever or respiratory symptoms (cough, shortness of breath, difficulty breathing)
- After using tobacco, vaping, eating or drinking
- After touching face or hair
- After handling waste
- After using the toilet facilities
- After handling soiled equipments and utensils
- Before and after preparing food
- When changing from one task to another

These next two pages of the Situation Report contain an overview of the recommended infectious diseases preventive measures for food providers and processors.
Situation Report

Respiratory etiquette:

• Maintain 1 metre distance between yourself and anyone who is coughing or sneezing

• Avoid touching mouth, nose and eyes

• Cover nose and mouth with a tissue when sneezing or coughing

• Put used tissue in a covered bin

• If no tissue is available use flexed elbow instead of hands while sneezing or coughing

vii. Ensure Personal Protection Equipments (PPE). All types of PPE must be available and selected to suit the potential hazard, be properly fitted and periodically refitted as applicable (e.g. respirators). Also to be consistently and properly worn when required, regularly inspected, maintained and replaced as necessary and properly removed, cleaned, and stored or disposed of to avoid contamination.

viii. Restrict employees going abroad or on international tours. During the infectious disease outbreak, travel into or out of a country may not be medically advisable.

Some takeaway points

• Fishing vessel and farm owners should follow the quarantine and biosecurity measures respectively during an infectious disease outbreak, to continue their production;

• Processors network with a lot of people, and are thus in the position to ensure that they practise handwashing and personal hygiene by themselves and encourage others;

• There should be strong coordination between the production and distribution stages in order to manage the inventory/SKU successfully without shortfalls or excessive supply;

• Retailers and wholesalers should be aware about the guidelines provided by the regulatory authorities during an infectious disease outbreak so that they can inform the consumers accordingly;

• Seafood processors, distributors, retailers, and food service and allied industries can carry on their business while maintaining social distance, and taking necessary precautions for community continuity and community resilience;

• At every step of seafood handling, cooking and preparation, consumers should follow the guidelines to keep food safe and prevent foodborne illness: Clean - Wash hands and surfaces often, Separate - Separate raw meat from other foods; Cook - Cook to the right temperature, Chill - Refrigerate food promptly;

• Restaurants and supermarkets can offer special discounts for online orders and home deliveries;

• It is safe to eat fish & shellfish cooked at a minimum internal temperature of 145°F (62.8°C);

• For packet or canned seafood use a “sterile technique” before stocking in your house;

• There should be global and regional monitoring of fake news in social media propagated against seafood in other media.

Conclusion

Handwashing, personal hygiene, social distancing, identifying persons who may be affected, and testing can prevent human-to-human transmission of infectious diseases like Covid-19. Nevertheless, these measures are actually short term remedies. Greater emphasis should be given to increasing supplier diversity, formulating a contingency plan for production, having an expanded emergency plan; and long-term risk assessments and awareness programmes. Moreover, a comprehensive ICT-based platform can be set up for the exchange of marketing and distribution information, as well as implementation of an Electronic Catch Documentation Scheme (eCDS) to minimise the huge losses in the seafood sector and to ensure food safety as well.

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How is COVID-19 affecting the fisheries and aquaculture food systems

A SECTOR AT RISK, YET FISH IS SAFE TO EAT

The COVID-19 pandemic has triggered a public health crisis followed by an on-going economic crisis due to the measures taken by countries to contain the rate of infection, such as home confinement, travel bans and business closures, among others. Even though food retail businesses, like supermarkets, grocery and convenience stores and take-away restaurants are deemed essential and remain operational, the measures taken to contain the COVID-19 outbreak have created an environment in which food could become more difficult to obtain.

Although COVID-19 does not affect fish, the fish sector is still subject to indirect impacts of the pandemic through changing consumer demands, market access or logistical problems related to transportation and border restrictions. This will in turn have a damaging effect on fishers and fish farmers’ livelihoods, as well as on food security and nutrition for populations that rely heavily on fish for animal protein and essential micronutrients.

At the same time, misleading perceptions in some countries have also led to a decreased consumption of seafood, resulting in a fall in prices of fish products. This emphasizes the need for clear communications regarding how the virus is transmitted and that it is not related to seafood.

PROTECTING EACH STAGE OF THE FISHERIES AND AQUACULTURE SUPPLY CHAIN

The full range of activities required to deliver fish and fishery products from production to the final consumer are complex. Globally, technologies employed vary from artisanal to highly industrial. Value chains include local, regional and global markets. Key activities in a fisheries or aquaculture supply chain are fishing, aquaculture production, processing, transport, and wholesale and retail marketing. Each link in the chain is susceptible to being disrupted or stopped by impacts arising from COVID-19. If one of these producer–buyer–seller links is broken by the disease or containment measures, the outcome will be a cascading chain of disruptions that will affect the sector’s economy. The desired result, human consumption of fish and fishery products, can only be achieved by protecting the producer–buyer–seller links and each stage of the supply chain. Therefore, it is essential that each stage of the fisheries and aquaculture food chain be given all possible protection.

1. Fishing activity reduced or brought to a halt because of drop in demand and/or prices

There is already evidence of a reduction in fishing effort in parts of Africa, Asia and Europe for a number of reasons. For example, fleets that rely extensively on export markets (e.g. the United Kingdom of Great Britain and Northern Ireland and Ireland) and on higher value species (e.g.
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lobsters) are likely to be particularly impacted.\(^1\) Sanitary measures (physical distancing between crew members at sea, facial masks, etc.) can also make fishing difficult and can cause a cessation or reduction of activity. Limited supplies (e.g. ice, gear, bait) due to suppliers being closed or unable to provide inputs on credit, also constrain fishing activities. Labour shortage is another problem as some crews consist of migrant workers who may not be able to cross country borders at present.\(^2\) In addition, the uneven availability of equipment to ensure health security for crews, the responsibilities of shipowners in the event activity resumes, the crew’s eligibility for aid such as partial unemployment, temporary closures, the availability of support systems to maintain the primary activity, and compatibility between the various (economic and other) support mechanisms can all affect the current level of fishing.\(^3\)

**Measures to protect production and income include:**

- designating, where this is not already the case, fishers and crew members as “essential workers” as they provide food to the nation;
- expediting visas for temporary, seasonal and foreign labour to harvest seafood;
- linking fishing centres or villages to such services as the local community kitchen in the area, where smaller varieties of fish (sardines, mackerels, anchovies) can easily be fried and be supplied there for a fixed price, where possible;
- expanding governments’ purchase of seafood for institutional use (prisons, hospitals, school feeding programmes, etc.) as well as for distribution as food assistance;
- extending the fishing season to compensate for economic losses;
- providing compensation to the owners and crew of vessels prevented from fishing;
- restricting the level of fishing currently undertaken (by setting up a collective and transparent quota or lottery system, for example) to match current demand, while ensuring that local food security is not negatively affected; and
- having government departments set a minimum floor price for each of the important species of fish, where possible.

2. Varied impacts in aquaculture production with uncertainties for the future

Effects on aquaculture production will vary. Due to market disruptions, fish farmers cannot sell their harvest and they must keep large quantities of live fish that need to be fed for an indeterminate period. This increases costs, expenditures and risks. Some farmed species for export (e.g. pangasius) have been reportedly affected by the closure of international markets (China, European Union).\(^4\) Shellfish aquaculture (e.g. oysters) are affected mainly because of the closure of foodservices (e.g. tourism, hotels and restaurants) and retailers (e.g. European Union). In addition, due to a wide range of restrictions by different countries on cargo movements and airport clearing, etc., hatchery operators and brood stock traders may find it difficult to trade brood stock for seed production, which could cause a sharp decline in production. Small-scale aquaculture, on the other hand, may benefit from reduced competition with fish imports. Aquaculture production capacity may also be affected by the difficulty in sourcing inputs (seed and feed) and finding labour due to lockdowns.

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\(^{1}\) [http://www.rfi.fr/es/europa/20200330-el-mercado-de-pescado-fresco-se-derrumba-en-europa-por-el-coronavirus](http://www.rfi.fr/es/europa/20200330-el-mercado-de-pescado-fresco-se-derrumba-en-europa-por-el-coronavirus)


\(^{3}\) Information from the Comité national des pêches maritimes et des élevages marins (CNPMEM) as at 28 March 2020 (https://www.comite-peches.fr/la-peche-francaise-dans-le-brouillard/).

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Measures to maintain operations include:

- declaring aquaculture to be at par with agriculture for the purpose of priority sector lending, crop insurance, power tariff and other levies;
- increasing access for fish farmers to credit and micro-finance programmes with reduced interest rates, flexible loan repayment, and options for restructuring loans and related payment schedules;
- granting programmes to cover production and income losses to maintain domestic seafood supply chains and to ensure continued operations;
- forgiving loans used to maintain payroll, and low-interest loans to refinance existing debt;
- relieving payments, i.e. suspending certain financial obligations such as utilities, real estate tax and mortgages; and
- slowing down production where there is a drop in demand or reduced market access, especially if exports remain slow and farm labour has been lost.

3. Processors, markets and trades are adapting to shift in demand

The fish and fishery products sector is particularly reliant on the food service sectors, and thus is highly affected by changes in food services. As countries implement lockdown measures, restaurants, hotels, schools, universities and associated canteens close down, causing a drop in activity for many fish wholesalers and an absence of outlets for some high value fresh fish species. Panic buying of food has reportedly benefited the sale of prepacked, frozen or canned fish and fish products, but these may not be able to continue supplying the market if the raw material is not available, and because of other logistical problems. In particular, as countries are closing down their borders, there may be delays at border crossing and air flights may be cancelled, which may affect the trade of goods, and the cost of transport can increase significantly. Restrictions on market access and a drop in demand will mean fish and fish products may be held in storage for longer. This has implications for food loss and waste due to quality changes as well as additional costs for processors, exporters, importers and traders. At the same time, this unprecedented situation is generating promising innovative practices that could influence the way the sector works in the future.

Measures to support the supply chain include:

- in the area of international trade, in a joint effort to ensure that trade flows continue to be as free as possible, a call by the heads of FAO, the World Trade Organization (WTO) and the World Health Organization (WHO) for the prevention of border restrictions on trade in food to avoid food shortages, emphasizing that the dissemination of information on food-related trade measures is fundamental;5
- ensuring supply chain access, and, for those fishing operations that sell their products overseas, ensuring continued access to and cooperation from officials at ports, rail and border crossings so they can maintain their sales;
- ensuring the stability of fisheries access by reducing unnecessary regulatory burdens that are preventing access to and sustainable harvest from fishing grounds;

5 The full report is available at https://www.wto.org/english/news_e/news20_e/igo_26mar20_e.htm
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• continuing support for the supply chain (e.g. using temporary storage of fish, diverting fish to the home market, working with processors to adjust supply to the home market and replacing product previously prepared for the export market);
• processing fish that remains unsold (e.g. salted or stored in ice as appropriate, which requires a supply of medium-sized insulated fish boxes to be provided by the relevant government departments;
• exploring the possibility of freezing fish productions with fish processing, refrigerating and distribution companies;
• marketing directly to end consumers as a potential important new approach for some businesses; and
• using alternative marketing strategies to help alleviate the need for prolonged storage.

4. Problems of working conditions along the value chain

The working conditions and safety of fishers at sea will be affected should the number of fishers available to crew vessels be reduced. Crew on large-scale industrial vessels (pelagic trawlers, purse seiners) that are working on/off for several weeks and are then replaced while they have a break, are unable to travel home due to flight restrictions and quarantine periods. Consequently, they may have to work longer periods on board, which increases fatigue, stress (also about the health of family members at home), and potentially the chances of on-board accidents. Large-scale fishing vessels of distant water fishing fleets can also be confronted with COVID-19 cases among their crew members while far out at sea. The virus may spread rapidly among all crew of a vessel and medical assistance is unlikely to be readily available. When trying to enter a port, crew that are not from the port State may not be allowed to enter the country. In addition, many crew members, just like small-scale fish farmers, are considered self-employed and do not currently qualify for unemployment or paid leave.

Given the migratory behaviour of many fishers, plus the frequent international visitors to fishing communities (e.g. cross-border movements), there is potential for fishing communities to become “hotspots” for the rapid spread of the virus. Restrictions on mobility may impact the harvesting sector by preventing the fishers from conducting their activities, and also the post-harvesting sector, where women are mostly in charge of the processing activities and trade. In case the restriction measures are not yet applied to markets, women fish vendors can be exposed to a greater risk for infection since markets see large numbers of people and physical distancing is difficult to implement consistently. This is even more likely if there is a lack of sanitation and hygiene facilities. The wide informality in the sector constitutes an added barrier for fishers and fish farmers to access protection from labour market policies and contributory social protection mechanisms. These might exacerbate the secondary effects of COVID-19, including poverty and hunger.

Measures to protect the most vulnerable include:

• ensuring safety by permitting only vessels with a full complement of crew to leave harbour to conduct fishing operations;
• improving hygiene and sanitation in the fish market during the relief/recovery period;
• providing payroll and unemployment assistance for crew members and self-employed small-scale fish farmers;

1 The number of available crew could be reduced owing to inter alio contracting the virus, restrictions on movements or lockdowns.
• supporting the most vulnerable with cash and in-kind transfers by local institutions (where no national social protection schemes exist);
• adapting the programme design (delivery schedule, level of benefits) and relaxing conditionalities (e.g. waivers on contributions) to ensure wider and adequate coverage of the fisheries and aquaculture sector, including informal workers, where social assistance (cash and in-kind transfers) or social insurance programmes exist; and
• supporting inter-institutional coordination, through data information exchanges between authorities responsible for fisheries development and governance to ensure the coverage of fishers by social development and repatriation.

5. Management and policy implications

While closing fishing operations will offer respite to some overexploited fish populations, similar constraints apply to the science and management of support operations. For example, fish assessment surveys may be reduced or postponed, obligatory fisheries observing programmes may be temporarily suspended, and postponing science and management meetings will delay both the implementation of some necessary measures and the monitoring of management measures. The collapse of exports markets has increased the possibility of re-sourcing fish from local producers. However, the national market of some nations is small or non-existent, and the national fishing fleet may exceed the capacity for the national market, with several management implications. Lockdowns could lead to a reduced capacity in Fisheries Monitoring Centres (FMC) as was the case in West Africa during the 2013–2016 Ebola outbreak, where staff were not only unavailable, but limited national resources were directed to funding emergency activities which left FMCs unable to function effectively. Fishers who are “safely out at sea” in their microcosm know this and may keep operating or adapt their operations to benefit from the Monitoring, Control and Surveillance’s shortcomings to engage in illicit activities. A lack of monitoring and enforcement of shared stocks may encourage some States fishing on these stocks to revert to a less responsible level of managing, monitoring and controlling fishing operations.

Measures Include:

• enhancing, where possible, remote surveillance and non-observer monitoring programmes (cameras, log-books, electronic reporting systems);
• maintaining levels of monitoring, control and surveillance of fishing activities to ensure that control measures are enforced and that the risk on board fishing vessels, particularly illegal, unreported and unregulated fishing activities, does not increase; and
• having governments carry out assessments and identify specific solutions in partnership with the actors from the sector.

Supply chain disruptions due to COVID-19

A short article entitled “The Impacts of COVID-19 on Loss and Waste in Fish Value Chains” can be viewed on the Food Loss and Waste in Fish Value Chains website (http://www.fao.org/flw-in-fish-value-chains/en/) which was launched in mid-2019 by the Fish Products, Trade, and Marketing Branch (FIAM) of the FAO. The website was developed in response to a decision taken at the 32nd session of the Committee on Fisheries (COFI). It also publishes a bimonthly newsletter which highlights a different fish loss and waste topic each time. Anyone interested can register online to receive the newsletter. FAO also invites readers to take part in a short survey (https://www.surveymonkey.com/r/BTD2KH9) to ensure that the website is still offering an informative experience.
A webinar entitled “COVID-19: GLOBAL SEAFOOD MARKET TRENDS” was organised by INFOFISH on 23rd April to address the unprecedented challenges currently faced by every segment of the global fisheries and aquaculture industry, from production through processing, transportation, marketing, and consumption, as a result of the novel coronavirus pandemic. A total of 75 participants from 22 countries attended the webinar, posing many interesting questions and contributing their views on the effect of the pandemic with regard to their own regions.

The Guest Panelist was Mr Marcio Castro de Souza, Senior Fishery Officer (International Trade) from FAO, whose presentation was on a preliminary assessment carried out by FAO on the impact of Covid-19 on fisheries and aquaculture. He said that some effects are already evident in Processing (reduction of inputs, movement of people, human biosecurity, distribution issues); Marketing (HORECA demand, long-life shelf products, timely transportation, border restrictions); and Fisheries Governance (science and management of stocks, IUU fishing). Mr de Souza invited participants to read the FAO Policy Brief on Fisheries which is accessible on the organisation’s website (www.fao.org), and which is also presented in the INFOFISH Situation Report on pages 33-37 in this issue of the INFOFISH International. In addition, he referred participants to the FAO GLOBEFISH website (www.globefish.org) for information on world fish trade.

The other panelists were from INFOFISH: Ms Joelyn Sentina, Trade Promotion Officer, who briefed listeners on the Global Fishery Market Trends; Mr Api Cokanasiga, Trade Promotion Officer, on the effects of COVID-19 on the markets in Asia; and Mr Sujit Das, Technical Officer, on ensuring safety in the seafood sector. The webinar was moderated by Shirlene Anthonysamy, INFOFISH Director.

The video and all the presentations are accessible on the INFOFISH website (www.infofish.org).

Please check the website regularly for announcements on forthcoming webinars and podcasts.
PROTECTING AND MONITORING SMALL-SCALE FISHERIES: THE NEED FOR A NEW APPROACH

By Michel Dejean

Small-scale fisheries are a key part of the global Blue Economy, accounting for an estimated 50% of the global catch. There are increasing calls to monitor their activity, as today they are not regulated and do not benefit from the technology that has proved successful for industrial fishing. But simply applying the same methods used for industrial fishing will not work. We need a completely different approach, one that empowers these fishers, involves them from the beginning, and gives them the right tools to fish better and more safely.

As the small-scale sector contributes half of the global catches, it is vital to include them in the planning and implementation of sustainability policies.

Introduction

Around the world, it is increasingly recognised that ocean resources are finite, and fisheries need to adopt sustainable practices if they are to have any long-term future at all.

Regulation of large industrial fisheries started some 30 years ago; for the vast majority of the fleet, their practices, locations and catches are all monitored and recorded. This has helped the authorities to tackle illegal fishing, allowing them to halt or restrict activities in areas where fish stocks are threatened.

However, it is estimated that small-scale fisheries (SSF) account for 50% of the global catch and 95% of the world’s fishers. As a result, there is a growing push to include small scale fishing in fisheries management—to understand how much is caught, which species and where, and to put in place systems that empower these traditional communities.

Added to which, the FAO (Food and Agriculture Organization of the United Nations) has stated its intention to work with regulatory authorities to end illegal, unregulated and unreported (IUU) fishing by 2030. Small-scale fisheries account for most of the unregulated catch, but for many reasons, the approaches currently used to regulate large-scale industrial fisheries are simply not going to work for SSF. We must take into account the unique specificities of traditional fishing.

Some inherent challenges

The monitoring and regulation of industrial fishing has been possible because the sector is partly funded through fines levied on rule-breakers and through permits and licenses sold. The big players are easily identified, and enforcement can be targeted accordingly. By comparison, few traditional fishers can afford the same type of equipment that industrial fisheries are required to install. Identifying all the small-scale fishers and then trying to impose fisheries management practices upon them in the same way is going to be virtually impossible as available resources simply do not exist to apply this kind of enforcement model to 50 million people.
Traditional fishers need to be consulted right from the start in order to ensure effective collaboration.

A different economic model

First, equipment and services for traditional fishers must be inexpensive and easy to use in order to be a viable solution. But in addition, we need to think of new ways to finance SSF monitoring. Recent technology advances have enabled new transmitters that are more affordable and better suited to SSF needs, but who will pay for them? In some cases, an NGO or international development agency may step in and pay for the devices. This is good news for the fishermen, but raises questions about the long-term: will the system work when the project is finished and the agencies (and their funding) leave?

In some areas, we have seen the fishermen’s association play a large role, paying for the monitoring technology for their members, or in other cases, governments are choosing to set up public-private partnerships.

Data collection

The first issue we need to address is the considerable data gap in these fisheries, to gain better knowledge about where, when, and how much they fish. Accurate information is the first step to taking decisions to protect fishers, food security, and fish stocks. The FAO’s Guidelines for Securing SSF (www.fao.org/voluntary-guidelines-small-scale-fisheries/en/) calls for “the establishment of monitoring, control and surveillance (MCS) systems applicable to and suitable for small-scale fisheries” and “systems of collecting fisheries data with a view to ensuring sustainability of ecosystems, including fish stocks, in a transparent manner.”

To achieve this goal, we need tracking devices adapted for these vessels, meaning that they be affordable, of course, and at the same time they also collect data automatically, requiring no action on the fisherman’s side: just install and then fish. The devices for tracking SSF must also provide a secure data chain, be tamper-proof and theft-proof, and able to collect data wherever they fish. For this, a simple GPS or smartphone is not enough, because these fishers are often forced to go far from shore, outside of mobile phone range.

A whole new approach is needed

There are clear benefits to better SSF monitoring, but the approach must be collaborative. Traditional fishers need to be involved in developing these systems, getting their feedback from the beginning. Not only does this ensure it meets their needs, but they can also see the benefits. This encourages them to adopt new practices and fosters greater stakeholder engagement. In other words, we will need to demonstrate these benefits to secure local fishers’ involvement, but in doing so, those clear benefits will then support collaboration moving forward. In formulating a possible new approach, there are several factors that need to be considered.
In addition, we need more than just location data; we need to know when and where they are fishing if we want to manage marine resources. Some have suggested AIS devices for fishermen. While they would help avoid collisions, once outside of coastal coverage, the delivery of AIS position reports by satellite often has saturation problems, meaning the data they provide would not be complete. A vessel monitoring terminal (VMS) is the only system recognised by the FAO for sustainable fisheries management, because the data chain is entirely secure and it collects data on fishing activity, not just locations.

**Data management**

In addition to choosing the right equipment, we have to think about how to manage all the data generated. Software for fisheries monitoring centres (FMCs) will have to scale up to handling tens of thousands of vessels. Relying on paper logbooks or even spreadsheets is out of the question—we need user-friendly electronic catch reporting apps in order to handle these numbers of fishermen. From the IT infrastructure point of view, the last decade has seen great progress in Big Data analytics. This enables us to face the challenge posed by the huge amount of information generated by SSF that must be processed, stored and the relevant indicators extracted.

The fisheries monitoring centres should also be perceived differently, not simply as centres to track vessel movements. In fact, the data they receive can help identify trends, indicators, and a whole level of information whose benefits can then cycle back to fishers, such as identifying the best areas to fish and new market opportunities. By working together, FMCs and SSFs can ensure that their region and community does indeed have a sustainable future.

**Benefits for small-scale fishers**

**Connecting fishers: enhanced safety**

The support of a SSF community would be secured by helping make fishing activities operationally safer. Most traditional fishing communities have experienced loss of life at sea when the vessel’s motor dies and they cannot call for help, or a violent storm comes, or they are attacked by pirates. So, technology that enhances their safety is well received, especially as many now fish further and further from the coast.

For example, at Collecte Localisation Satellites (CLS), a device has been developed for these fishers to enhance their safety at sea. It has an assistance button and when activated, a message is sent to the fisher’s family or friends, fellow fishermen, or the authorities, depending on the configuration. The device also provides weather forecasts and sends typhoon alerts, so fishermen can head home in time.

There is another app where families can ‘follow’ fishermen on their trips, giving them a sense of reassurance. This benefits not only fishers and their families but also the viability of their communities and the local economy.

**Protecting fishers: Exclusive Fishing Zones**

Another key issue facing SSF communities is conflict with industrial fishing vessels, in terms of competition for fish resources as well as collisions. A solution to this issue is the creation of zones reserved for small fishers. This approach follows the FAO’s SSF Guidelines that, “Small-scale fishing communities need to have secure tenure rights to the resources that form the basis for their…sustainable development” and “The creation and enforcement of exclusive zones for small-scale fisheries should be considered.”

But in order to establish a protected SSF zone, we first need data about where they fish, as mentioned above. Tracking them will provide the actual location where small-scale fishers are operating, enabling us to better define and enforce zones where industrial fishing vessels would be forbidden, and thereby preserving resources as well as avoiding collisions.

For example, in Peru, the government has reserved the first five nautical miles from the coast for traditional fishers. However the fishermen CLS representatives spoke with, want that zone extended to 40 nautical miles because that is where higher-value species such as tuna are found. For the moment, they have no tracking data to prove to the government that they fish in those zones, but once they have a vessel monitoring system, they will have such data to support their claims.

**Empowering fishers: traceability and improving market access**

Increasingly, market considerations are a compelling reason for small-scale fishers to adopt monitoring systems. Gaining access to export markets would improve their incomes and help develop their local economies - for instance, there is growing international demand for one-by-one caught tuna.

Consumers in Europe and the West, two of the highest value export markets, are demanding to know more about the supply chain, traceability and sustainability of the food they consume. Exporting to the EU requires proof that the fish was caught legally, which is not yet possible for small-scale fishers. To be part of this wider supply chain, they need a vessel monitoring system (VMS) and a set of catch reporting and traceability applications.

In our work, we have seen that small fishers are starting to get involved with marketing and international markets. For example, large distribution groups such as Walmart are...
Knowing more about fishing areas, catches and species would benefit SSF communities and regulators

Collaboration is key

In sum, we will need to prove the benefits of monitoring to secure local fishers’ engagement, but those clear benefits will then support collaboration moving forward.

The European project STARFISH 4.0 that is being led by CLS is an example of this approach working in practice. The project trials new VMS technology for small-scale fishers that will be developed with the local fishers’ feedback. In this way, small-scale fishers are involved and empowered in designing the systems that best suit their needs. Europe chose the STARFISH 4.0 project precisely because it adopts a participatory approach, building a culture of compliance among traditional fishers before the regulation comes into force. CLS, local partners, fishermen’s associations, and local communities are all working together to develop a device and mobile apps that have value for fishermen. In effect it secures engagement, building positive productive relationships long before any regulation comes into effect.

All around the world, governments, regulators and NGOs are trying to work out how to manage SSFs effectively. SSFs are small, extremely diverse and numerous, so the approach taken with industrial large-scale fisheries simply will not work. A new participatory, collaborative mindset is needed, along with the necessary new technology, and with SSF and regulators working together to build a safe and sustainable fishing future for everyone.

Empowering fishers: adapting to climate change

Another issue of concern for small-scale fishing communities is the impact of climate change, as in some areas, fish stocks seem to be shifting. This is definitely an issue for continued research and management efforts.

More data is needed on coastal fisheries, their catches, and species, but we already know how to make predictions about where certain fish stocks will shift in relation to changing ocean conditions. At CLS, there is a Marine Ecosystem Modeling team of experts who study precisely this question. (Editor’s note: See “Pacific Tuna & Climate: Trends & Forecasts” which was published in the INFOFISH International, Issue 3/2018, p 44-47). They have assessed the impacts on, for example, tuna stocks in the Pacific, and can predict where they will shift over the next 20 years. They can also test different scenarios depending on fishing efforts and various climate change indicators, to help determine sustainable fishing levels or where to locate processing plants.

These kinds of studies need to be further developed for the zones and species specific to small-scale fishers. The results can then be used to send them information on favourable fishing grounds, helping them to spend less time looking for their catch and enabling them to avoid areas of juvenile fish, for example, which would help protect stocks and resources for the future.

increasingly contracting directly with local fishers’ associations to supply their stores. Here, it is important to differentiate small-scale fishers from poverty-stricken fishers. In Bali, for example, and many other places, very small boats (pole and line) are catching 1-2 fish per trip, but these fish are sold for good prices and are exported directly to the US or Japan.

In another case, a fishermen’s association we worked with in Peru wants to set up a Quality Label for its members. Their line fishing method has no bycatch, so is more environmentally friendly, and the fish are of exceptional quality. With this traceability label, they can sell directly to upscale restaurants in Lima, and with the improved income they can develop their communities. By providing them with tracking and traceability technology, we can empower them with the tools they need for community development.

Michel Dejean (mdejean@groupcls.com) joined Collecte Localisation Satellites (CLS) in 1997. Over his career, he has worked in almost every aspect of fisheries monitoring with governments, NGOs and fishermen around the world. From 2012 to 2018 he was head of the CLS Indonesia office and was named Director of CLS Group’s Fisheries Division in 2018, a position he holds till today. Over the last 22 years, the main change he has seen has been in the attitude of fishers and regulators, from confrontational opposition in the past to increasing convergence as they acknowledge that sustainability has to be the end goal for all—a change he welcomes.

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WEALTH FROM WASTES: CASE STUDIES FROM AUSTRALIA
By Janet Howieson and Catherine Norwood

Emerging commercial and social imperatives have facilitated an Australian research effort into the development of new products from seafood processing byproducts and low value species. A number of approaches and technologies have been trialled, including improved post-harvest handling, enzyme hydrolysis, automated processing technologies such as high pressure processing, injection and drying, as well as new work in reforming and extrusion. However, commercial feasibility and particularly the need for consistent, quality supply in economical volumes, will rely on the development of measures to overcome the large distances, broad species variety and low volume characteristics of the Australian seafood sector.

Introduction

The past decade has seen a rising level of interest in, and concern about, the sustainability of the world’s wild harvest fisheries and aquaculture, including the generation of waste in the seafood sector which amounts to some 35 percent globally according to the FAO. This concern is underpinning efforts to reduce waste and driving industry participants to investigate ways to extract new value from byproducts. There is a new will, both politically and economically, to address the waste issue as part of broader social objectives and consumer demands. Further, at an individual company level there is often a focus on the commercial impetus or incentives to extract more value from waste and to offset the financial costs — and also the reputational costs — that might otherwise be associated with disposal.

Putting it into a global context is the UN’s Sustainable Development Goal 12, which states: ‘Ensure sustainable consumption and production patterns’. Goal 12.3 specifically focuses on halving per capita global food waste at the retail and consumer levels and reducing food losses along production and supply chains, including post-harvest losses by 2030.

In Australia, the political and scientific momentum supporting this Goal is indicated by the creation of the 10 year federal research initiative, the Fight Food Waste Cooperative Research Centre. This initiative was launched in 2018 and incorporates the seafood sector.

Meanwhile, the Fisheries Research and Development Corporation has been investing in work to develop options for under-valued species and waste products for more than a decade. Much of this research has been undertaken at Curtin University in Western Australia, including a 2016 audit of the nation’s seafood waste1. The results were in line with those of the FAO; from 170 000 tonnes of seafood harvested annually, 59 000 tonnes, or 35 percent, ended up as waste. However, this survey did not take into account bycatch, which is included in the FAO figures.

Viable waste streams for value adding that have been identified included 35 000 tonnes from white fish; 12 000 tonnes from redfish, 2 288 tonnes from shark and 1 520 tonnes from tuna. The audit prompted, and was accompanied by, a series of case studies investigating the application of technologies from other food sectors to the seafood industry, or changes to existing processes to create new or improved value.

1 (Editor’s note: Readers will find the following report interesting: Howieson J; Curtin University, 2019. Final Report: Options for Utilisation of Seafood Processing Waste (FRDC 2013/711.40).)
Research results in improved products and processes

The waste transformation research team tapped into the expertise and specialised equipment of the broader food-processing sector around Australia, including private operators and other research groups such as the Commonwealth Scientific Industry Research Organisation (CSIRO). The aim was to develop ‘investment-ready’ opportunities for the seafood industry by adapting existing processes. The team also drew on previous work it had undertaken to identify new products, as well as trialling technologies new to the seafood industry in Australia.

**Fish handling processes**

According to the work carried out by the team, harvest and handling protocols that preserve the quality of seafood demonstrated their potential to take a product that would otherwise be rejected or treated as seconds, and raise its value, even into the ‘preferred’ or ‘premium’ buying list.

Fish dispatch techniques, the use of sanitisers to control spoilage bacteria following harvest, and consistent, best-practice cold-chain logistics, were found to improve flesh quality and shelf life. Improved protocols to lift quality have also been developed for Australian salmon, Australian sardine, pearl oyster meat and a variety of finfish from Western Australia’s Pilbara region. In particular, pearling companies implemented improved handling protocols to ensure that pearl meat is handled to meet best practice food safety standards to assure this premium value-added product.

**Injection technology**

Injection technology is widely used in other food industries, often for applications such as infusing meats with marinades. In the case of seafood, researchers worked with seafood suppliers and processors to adapt injection technology specifically for some finfish species.

The aim has been to stabilise flesh quality and address a texture issue that plagues the fish, and which only becomes evident when the fish is cooked. The new injection process appears to provide a consistent eating quality in all fish, potentially improving marketability of the species.

**Hydrolysis**

Acids and hydrolysis enzymes have both been used in seafood trials to break down larger protein molecules into smaller components, generally to turn a ‘waste’ product into something more useful, or enable it to be disposed of more effectively.

This process offers the broadest opportunities to break down seafood byproducts into functional components, depending on the specificity of the enzymes used and the molecules they target.

In the Curtin University research, commercial proteolytic enzymes were selected as the preferred catalyst for hydrolysis because they provide more consistent end products. In a food-related project, a dual enzyme extraction process produced a marketable mussel stock from second-grade mussels.

Another project investigating options for processing waste from ranched Southern Bluefin Tuna in South Australia identified a faster hydrolysis process that also produced more versatile end products.

Using a commercial enzyme rather than naturally occurring enzymes in the fish gut, the fish processor SAMPI was able to reduce the time taken for hydrolysis from eight hours to two hours. The higher quality, homogenised liquid product has improved protein levels and about 10 percent oil. Bone and other matter separated out is used to make recreational fishing burley. There has been further research undertaken into higher value uses for the bone extracted from the process, potentially even for human consumption.

The fish hydrolysate that SAMPI produces is organically certified and is sold as a biological soil conditioner and aquafeed ingredient, with growing demand in both markets. It currently supplies international and Australian aquafeed markets. Further research is being conducted at the University on the immunostimulatory effects of hydrolysis product...
from various fish raw material sources as a supplement in aquafeeds.

Mussel stock produced following enzymatic hydrolysis of second grade mussels.

The enzyme hydrolysis process may also allow specific chemical components to be extracted for further testing of functional properties. This has been the case for cold-tolerant enzymes extracted from hydrolysed Patagonian Toothfish heads, provided by Austral Fisheries. Of interest to note is that a multinational detergent manufacturer (unsuccessfully) investigated the functionality of the extracted enzymes for use in cold-water washing detergents. As well, extracts of toothfish and sardine waste subjected to enzyme hydrolysis, have been tested for food functionality parameters such as anti-oxidant activity, water and oil holding capacity, emulsifying ability and foaming ability.

**Drying techniques**

The swim bladders of some fish are normally removed and may be discarded when fish are gutted. However there is a growing Chinese demand for dried swim bladders for use in traditional medicine; a similar product is already being supplied from Iceland.

Machine-dried air bladders from various finfish species have been tested against traditional Asian sun-dried products. Enzymes are also being trialled to ‘clean up’ the bladders before drying, rather than requiring fishers to remove the blood and membrane as the fish are harvested.

**Pasteurisation**

High-pressure processing (HPP) operates at temperatures of 15°C to 20°C, using pressure at increasing levels to achieve different end results. For the seafood sector, three different applications have been identified: the easy shucking of shellfish, meat extraction and extended shelf life.

In trials with a commercial HPP operator in Western Australia, packaged seafood – both raw and cooked – was processed under high pressures in cycles of two to 10 minutes. High pressure proved to be a viable option for the easy shucking of seafood, particularly oysters and abalone. Pressure at 250 to 350 MPa breaks the muscle that holds the animals to their shells. When the oysters or abalone are unpacked, the meat simply slides out of the shell – no knives required.

A preliminary trial provided reasonable extraction of intact portions of raw meat from the claws of Champagne Crab. This could improve the meat recovery and marketability of the species, which can be difficult to handle because of its small spines and hairs.

Higher pressures of up to 650 MPa effectively kill most organisms present in the meat, and this process was able to extend the shelf life of cooked crabmeat and cooked finfish from five days to up to three weeks. As a result a pilot, chilled, packaged, cooked crabmeat product with an extended shelf life was developed using this process, performing well in state food awards.

However, the trials did show that high-pressure processing may affect texture, colour and other sensory properties, so individual and detailed product development is needed to optimise opportunities from this technology.

**Protein separation**

Fillet recovery rates for finfish vary from 30 to 50 percent. Over 20 percent protein can be recovered through mechanical meat separation technologies applied to filleted fish frames and other seafood ‘waste’.

Trials used a drum separator with sieves ranging from two to 10 millimetres to produce mince of varying grades and ‘chunkiness’ from a variety of finfish, which could then be used to create new products such as fish cakes or croquettes, or potentially for use in high-temperature extruded products.
Cold-set binding is commonly used in meat processing for ‘restructuring’ of raw meat proteins into portions that can be cooked and used in similar ways to fresh cuts of meat. Preliminary trials with CSIRO, later modified into pilot trials at commercial food processing facilities, identified alginates to be effective ‘glue’ to bind seafood mince recovered from fish waste into useable portions that could be ‘sliced and diced’. Crumbing these restructured portions was found to protect the flavour and texture of the final product when thawed from frozen.

Low moisture extrusion technology is widely used in the food sector to create products that range from breakfast cereals to pet foods. Raw ingredients are shaped as they are cooked at temperatures of above 100°C.

In trials with CSIRO, finfish and crabmeat mince were processed at up to 120°C. The major challenge was the high moisture content of seafood – initially about 80%, which is higher than the usual 30% moisture of ingredients for low moisture extrusion. High moisture extrusion requires extension of the length of the cooling dye (and hence longer cooling times). The best result was achieved from a trial using a mix of ‘waste’ fish protein that had been recovered through improved separation processes, which was then pureed and pre-mixed with other dry proteins to produce a seafood cake. The final moisture content was 75% and the end product achieved both a good texture and flavour.

Reforming technologies

Once seafood protein has been extracted from processed frames, a variety of technologies can be used to reform it into useable portions.
Insect production

A more recent research project is also investigating the use of seafood waste - and possibly the biomass of invasive carp species being culled from inland waterways - to feed Black Soldier Fly larvae, which will then be dried and used as an aquafeed supplement. Insects fed on fish waste and then incorporated into barramundi and marron feed diets have shown some positive results.

Challenges which need to be addressed

Despite good outcomes from the product development phase of the trials, the research identified practical and cultural barriers that limit the commercialisation of new products and markets from Australian seafood raw material.

Maintaining a consistent, commercially viable supply of quality raw material is one of the greatest barriers to commercial success. Australia’s fisheries are rich in diversity, with more than 300 wild species caught commercially, but the volumes of most species are small, and catches are landed at many different ports, along the country’s 35 000 kilometre coastline. Aquaculture production, while more concentrated, is also quite low in volume when compared to that of other countries. Fluctuating prices and seasonal conditions may also lead fishers to chase the highest price available in the moment, instead of uncertain and potentially lower longer-term returns from new products.

Distances between harvesting, processing and markets as well as species diversity are among other major issues to overcome in making more of undervalued species and processing waste. Volatility within the fishing sector itself also plays a role, with short seasons for harvesting and limited regional infrastructure for processing and storage.

There are additional hurdles for any product targeting human consumption, including the need to ensure the “waste” is treated as a food product with appropriate handling from the point of harvest. The process is easier in vertically integrated companies that deal with their product from harvest to market in fragmented supply chains. Once “waste” moves beyond the first point of processing, it becomes more difficult to ensure that appropriate handling, food safety and cold chain management have been applied.

Additionally, it can be difficult for smaller fishers or seafood processors to initiate the changes needed to secure finance and to develop feasible marketing and distribution requirements.

In summary, even when new processes are successfully developed or adapted for a specific species, and proof-of-concept is provided, success depends on industry commitment to harvest the species, and a whole-of-supply-chain commitment, including logistics, distribution and marketing channels. However, it seems likely that emerging commercial and social imperatives to reduce waste as part of sustainable production processes and consumption processes, and development of circular economies, will continue to drive both government policy and industry investment to draw more value from every part of the seafood harvested.

Second grade mussels prior to enzyme hydrolysis to produce mussel stock.

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MOU with China to develop aquaculture

Mexico/China — Mexico’s National Fisheries Institute (INAPESCA) reported that the governments of Mexico and China signed a Memorandum of Understanding on aquaculture research. The plan is for Mexico to have an aquaculture industrial park that generates options for companies dedicated to the production of farmed seafood. Meanwhile, INAPESCA highlighted that the Gulf of Mexico and the Caribbean have an extensive and relatively shallow continental shelf which is conducive to farming activity in cages and pens.

Super-intensive shrimp farm

Qatar — The first super-intensive indoor shrimp farm in Qatar was launched by Blue Aqua International (Singapore) and Doha-based ITQAN Technologies. The facility, which includes a hatchery, grow-out modules and a microbiology lab, has a production capacity of about 1 000 tonnes. While ITQAN will provide the operational structure, Blue Aqua will contribute its technical knowledge on mixotrophic systems, green-to-clean recirculation aquaculture systems (RAS), and AgroDome housing technology.

TiLV resistance breakthrough announced

General — In a study published in the journal Aquaculture using GIFT tilapia, researchers from University of Edinburgh’s Roslin Institute and WorldFish discovered that selective breeding to produce Tilapia Lake Virus (TiLV) resistant strains is likely to be effective without affecting the growth of the fish. According to CGIAR (led by WorldFish), since its detection in 2014, TiLV has ravaged tilapia populations in 16 countries across three continents. Clinical signs of the virus observed in representative tilapia include behavioral changes, skin damage such as skin erosion, discoloration, skin hemorrhages and loss of scales, eyeball protrusion and abdominal swelling. There are currently no treatments or vaccines for TiLV. GIFT tilapia is produced in at least 14 countries, helping to reduce poverty and hunger.

IFAD support for agriculture and fisheries

Mozambique — The Bank of Mozambique and the International Fund for Agricultural Development (IFAD) have signed two agreements worth US$115.5 million for agriculture and fisheries. The US$43 million agreement for the development of Small-Scale Aquaculture (PRO-DAPE), aims to contribute to the improvement of living conditions, food security and resilience to climate change. The Value Chain Development in the agriculture sector agreement, worth US$72.5 million, is intended to contribute to food security in critical regions of the country. There are an estimated 902 500 rural producers in Mozambique, one of the African countries most affected by climate changes.

All-in-one website for Aquaculture Improvement Projects

General — Sustainable Fisheries Partnership (SFP) has just launched its Aquaculture Improvement Project (AIP) Directory which is an open platform for information sharing for anyone active or interested in aquaculture improvement projects.

SFP says that the directory currently lists five active AIPs in three countries (China, Indonesia and Thailand) for two species (shrimp and tilapia). Other active AIPs are invited to register on the website for free. The website also includes a range of resources and tools to support new projects. The organisation believes that AIPs are increasingly important for the development of better sustainability practices in the aquaculture industry. The AIP Directory will be a one-stop shop for all stakeholders in the supply chain. It also aims to utilise the power of the private sector to promote positive changes towards sustainability through necessary policy changes and making improvement at farm and zonal level.

New MOU signed with IPNLF

The Maldives — A new memorandum of understanding (MoU) has been signed between the International Pole & Line Foundation (IPNLF) and NGO Dhivehi Masverin (Maldives Fishermen). In
signing the MoU, both parties agreed to promote each other’s work through their respective social media platforms, collaborate on conducting skipper training workshops to promote best-practice fishing, support the collection of catch-and-effort and other fishery data, support and assist in promoting the reduction of plastic use in tuna fisheries, as well as support activities that ensure an improved understanding of social and economic conditions.

Another of the agreement’s key priorities, according to the IPNLF press release, will be attracting new talent and young jobseekers to the Maldives’ tuna fishing sector. Using carefully selected imagery and videos – shared through highly popular social media platforms – Dhivehi Masverin has already been successfully building up the engagement of younger generations with one-by-one fishing.

**Import ban to protect endangered porpoises**

**Mexico/US** - The US National Marine Fisheries Service (NMFS) has announced that it will ban imports of Mexican shrimp and other seafood caught in the habitat of the critically endangered vaquita porpoise. The import ban places pressure on the Mexican government to stop the use of gillnets that are entangling vaquitas. The action is being taken under the Marine Mammal Protection Act (MMPA), which requires the US government to prohibit the import of seafood caught using fishing gear that kills marine mammals in excess of United States’ standards. The US imported approximately 85,000 tonnes of fish and fishery products from Mexico in 2019 (+1.62% from 2018).

**New Fisheries Minister brings changes**

**Indonesia** – The Indonesian Fisheries Minister Mr Edhy Prabowo is reported to...
be reviewing and possibly rescinding some of the initiatives undertaken by his predecessor Susi Pudjiastuti. The previous Minister was known, among other things, for a ban on the use of trawl and seine nets known locally as *cantrang*, and the sinking of foreign fishing vessels seized in Indonesian waters.

The ban on *cantrang*, which sweep down to the seabed in coastal areas, was enforced in 2015 to protect fish spawning sites. As it was met with resistance from many local fishers, a grace period was given till February 2020. The new Minister has said that he will have a dialogue with them before making any further decision on these nets, but some local NGOs feel that a better way would be to strengthen the Ministry’s monitoring of the use of unsustainable gear and boost ongoing efforts to help fishers still using *cantrang* to switch to more sustainable equipment.

With regard to the seizure and destruction of foreign vessels fishing illegally in Indonesian waters, Mr Prabowo has said he will consider using them, such as redistributing them to local fishers. Critics such as the advocacy group Destructive Fishing Watch (DFW) Indonesia say that the softer approach to foreign vessels will ultimately favour large-scale fishing companies over small fishers, with the former being better able to buy the auctioned vessels.

**Jack mackerel fishery now MSC certified**

As of 26th March, after an assessment period of 15 months, the European South Pacific midwater otter trawl jack mackerel fishery joined 395 other fisheries in 36 countries that are certified to the Marine Stewardship Council’s fishery standard. The certification is up for review in March 2025.

The fishery includes three trawlers from Germany, Lithuania, and Poland which operate in the Southeast Pacific under South Pacific Regional Fisheries Management Organisation (SPRFMO) management. The annual quota is 41,538 tonnes in 2020, which is 6 percent of the total allowable catch (TAC). The fish is mainly sent to Nigeria and Angola where it is sold in smoked form.

**Reciprocal exemptions from tariffs**

**China/USA** - Nine seafood items have received special exclusions from tariffs placed by the US on goods imported from China. The items which are mainly in frozen form include Alaskan sole, Alaskan plaice, flounder, sole, slipper lobster, king crab, snow crab, Dungeness crab, and meat from crabs other than king, snow, Dungeness, and swimming crab. Originally, the goods were subject to 10% tariffs but the rate increased to 25% in May 2019 and now have been exempted. The exemptions were granted on 31st January while other imported seafood products remain subject to tariff rates between 10% and 25%.

Meanwhile, China will offer tax exemption on US$300 million worth of US seafood imports, which includes live crab and lobsters. Chinese companies can apply for exemptions from tariffs that would let them buy US seafood and aquatic products at a lower price beginning in March.

**Temporary Guidance Document for food outlets**

USA - In April 2020, the USFDA issued a Guidance Document entitled “Temporary Policy Regarding Nutrition Labeling of Standard Menu Items in Chain Restaurants and Similar Retail Food Establishments During the COVID-19 Public Health Emergency”. The Document is meant for chain restaurants and similar retail food establishments that sell standard menu items covered under the menu labeling provisions of section 403(q)(5)(H) of the Federal Food, Drug, and Cosmetic Act (FD&C Act) to provide flexibility regarding these menu labeling requirements during the COVID-19 pandemic.

This regulation, under normal times, requires restaurants and similar retail food establishments that are part of a chain with 20 or more locations, doing business under the same name, and offering for sale substantially the same menu items to provide nutrition information (including calorie declarations) for standard menu items on menus and menu boards so that the information is available to customers when they make their order selections.

The Document however recognises that as a result of the pandemic, there are some temporary changes in business practices, such as dine-ins switching to a takeout or “to-go” only format in response to the COVID-19 restrictions which involves creating new or modified online ordering portals and printed takeout or to-go menus for their stores. Additionally, some chain restaurants and similar retail food establishments may be experiencing temporary disruptions in the food supply chain which may impact availability of their standard menu items.
Initial strong start for seafood sector

Norway - According to the Norwegian Seafood Council, the Norwegian seafood year started 2020 with a historically high level of January exports in terms of value (NOK 9.8 billion/US$1.05 billion, +15% from January 2019). The growth in value was seen in all regions, especially in Asia. In January 2020, Norway exported 84,965 tonnes of salmon to Asian markets valued at US$141 million, an increase of 10.72% in volume and 20% in value as compared to the same month last year. For whitefish, increased volumes and prices of fresh products contributed to growth in value. There was also an increase in value for trout, herring and mackerel.

Seafood exports grow for third year in a row

Peru - In 2019, seafood exports had risen for the third consecutive year, amounting to 1.81 tonnes and valued at US$3.5 billion. This was an increase of 9.9% in volume and 7% in value compared to 2018. The increase was due to higher shipments of fishmeal to the Chinese market (which accounted for 70% of the total share) and frozen products (jack mackerel and giant squid) to Spain and South Korea, among others. Notably, South Korea took 1,506 tonnes of frozen mackerel in 2019 as compared to zero in 2018.

Export drops balanced by increase to the EU

Papua New Guinea - Exports of fish and fishery products from PNG decreased to 177,808 tonnes (-9.48%) between January to November of 2019 as compared to the same review period in 2018. Shipments to the two main markets, Philippines and Thailand, make up 72% of the total fish exports from PNG. Philippines and Thailand are mostly supplied with whole frozen tuna that are further processed into canned tuna. In contrast, PNG’s fish exports to the EU markets increased to about 41,000 tonnes (+10.8%) in January to November 2019 as compared to the same period in 2018. This was largely due to the PNG-EU Economic Partnership Agreement that allows PNG to access duty and quota free admission to the EU.

New trade agreement for duty-free exports

EU/Solomon Islands - On 17th February 2020, the EU Council confirmed that the Solomon Islands would be part of the interim Economic Partnership Agreement (EPA) between the EU and the African, Caribbean and Pacific (ACP) group of states. Under this EPA membership, the Solomon Islands will join Fiji and Papua New Guinea in being able to enjoy duty-free exports to the EU. In the case of the Solomon Islands, this could include tuna loins and canned products produced in approved shoreline plants. The EPA will start applying provisionally between the EU and Solomon Islands after they have completed their notification procedures, likely by the end of March 2020.

Increase in tuna exports in 2019

Vietnam - Tuna exports to the US rose to 38,417 tonnes (+38%) in 2019 as compared to 2018, with that country remaining by far the biggest buyer of tuna. The huge increase was due to the US-China trade war, which caused American importers to look for sources other than China. Vietnam was the second largest tuna exporter to the US after Thailand. Vietnam’s tuna exports to ASEAN member countries rose by 7% to US$54 million, with Thailand and the Philippines being the two top buyers. In the Middle East, Israel remained the top buyer of Vietnamese tuna, although its purchases fell by 42% to US$37 million. The Vietnam Association of Seafood Exporters and Producers (VASEP) predicted that Vietnamese tuna exports are forecasted to grow by 15% in 2020 (subsequently, this estimate had to be sharply downgraded due to the Covid-19 pandemic).

Share in global seafood trade set to rise by 2030

India - In 2019, India exported approximately 1.6 million tonnes of fish and fishery products, a decrease of 19.54% as compared to 2018. The government has called for efforts to increase its share in global seafood trade from the present 4.1% to 6.7% by 2030 by increasing production, value addition and diversification. A vision document has been made which involves a three-pronged strategy to promote the sector, increase productivity, expand area under cultivation and diversification of species. Improvement in infrastructure, focus on value addition, brand promotion and increase in the number of trade promotion offices would also go a long way in achieving the trade target.

Export performance 2019

Sri Lanka - The fishery export figure for 2019 increased to about 29,000 tonnes (+3.13%) compared to 28,160 tonnes in 2018, with the US dominating 12.85% of the market share followed by Italy and Taiwan at 8.5% and 6.7%, respectively. Exports to the EU markets such as Italy, France, the United Kingdom, Germany and Spain have improved tremendously over the years. Sri Lanka is one of the main tuna producing island nations in the Indian Ocean. Skipjack tuna, the main tuna commodity, is exported mainly frozen, while yellowfin tuna is exported in fresh/chilled form.

New export destinations

Iran - Iran exported about 43,000 tonnes of fish and fishery products during January-April 2019, a slight increase of 3% from the same review period in 2018.
Industry Notes

Hong Kong, Iraq and Thailand are the main markets for Iran’s fishery products, with shrimp as the main export.

However according to the Head of Iran’s Fisheries Organization (IFO), new markets for the country include China, South Korea and some EU nations, following the signing of various agreements.

Import ban lifted on Fukushima seafood

Singapore - In January 2020, the government lifted import restrictions on seafood from the area around Japan’s Fukushima nuclear power plant. This marked the end of a series of import controls over nine years on produce from across Japan, including Tokyo, Kanagawa and Shizuoka over the past decade. The decision to end the ban came after the Singapore Food Agency (SFA) reported that it has not detected any radioactive contaminant in food imports from Japan in the past five years. Previously, seafood products from the affected areas had to be accompanied by a test certificate for radioactive contaminants to show that it meets safety standards, and a certificate of origin to identify the prefecture of origin of the product. In 2019, Singapore imported about 2,946 tonnes of fish and fishery products from Japan, an increase of 18.91% from 2018.

Global aquaculture feed estimates for 2019

According to the 2020 Alltech Global Feed Survey, global aquaculture feed sales rose by 4% to reach 41 million tonnes in 2019. However, in terms of volume, production was down by 1.07% to 1.126 billion tonnes, the first global decrease for nine years. One reason for the lower output was because demand had declined due to the African swine fever (ASF) outbreak in the Asia-Pacific region, particularly China.

The Survey notes that the top nine feed-producing countries are the US, China, Brazil, Russia, India, Mexico, Spain, Japan and Germany. Together, these countries produce 58% of the world’s feed production and contain 57% of the world’s feed mills.

GEF-FAO programme shows progress

A five-year, US$50 million programme rolled out by the Food and Agriculture Organisation of the UN (FAO) and partners has made remarkable progress in protecting international waters’ biodiversity by rendering fishing in these waters less harmful to several marine species, including sea turtles and tuna.

The Common Oceans ABNJ Program, funded by the Global Environment Facility (GEF) focused on areas beyond national jurisdiction (ABNJ) - also called international waters - that cover 40% of the earth and comprise nearly 95% of the oceans’ volume.

“The Program has brought together a broad and unique partnership to tackle this challenge by promoting the sustainable management of fishery resources and ecosystem-based practices, with some outstanding results. We hope to expand this initiative to continue safeguarding our marine biodiversity and contributing to the global goals and aspirations of the 2030 Agenda for Sustainable Development and the post-2020 Global Biodiversity Framework,” said Maria Helena Semedo, FAO’s deputy director-general, climate and natural resources.

The GEF-FAO programme has made a number of gains including ensuring that eight out of 13 major commercial tuna stocks no longer experience fishing, reducing bycatch and marine pollution, establishing 18 new vulnerable marine ecosystems and raising awareness on ocean issues to strengthen decision-making. Discussions have taken place at the ABNJ Global Steering Committee Meeting to extend the programme with the aim of continuing to strengthen governance in international waters and reinforce measures to combat illegal, unregulated and unreported fishing.

IOTC & ICCAT: New FAD measures in 2020

By the end of 2019, two of the world’s biggest regional fishing management organisations (RFMOs) - the Indian Ocean Tuna Commission (IOTC) and the International Commission for the Conservation of Atlantic Tunas (ICCAT) - had agreed on measures to reduce the impact of Fish Aggregating Devices (FADs) on marine ecosystems.

In 2020, IOTC called for purse-seiners to utilise non-entangling FADs (to reduce accidental bycatches of species such as sharks and turtles), and that by 2022, all FADs should be made of biodegradable materials. IOTC also requires the number of active FADs per vessel in IOTC waters to be reduced from 350 to 300, and scaled down each vessel’s total, active and inactive, FAD count from 700 to 500. Further, IOTC clarified its reporting rules for data on FADs, and will be working towards standardised FAD marking, tracking, and retrieval procedures.

The ICCAT requires that in 2020, FADs fishing will pause during January and
February throughout the Atlantic Ocean and areas under its monitoring. In 2021 and thereafter, this will be lengthened to three months. Previously, the pause period applied for two months, and only in a limited part of the ICCAT’s convention area. Further, by 2021, no vessels will be allowed to operate more than 300 active electronic buoys in ICCAT waters compared to the current limit of 500. Another significant development is that the ICCAT finally agreed to full onboard observer coverage: all purse seine vessels targeting tropical tuna will have to carry observers throughout the year. Further, in 2022, 10% of all longline vessels over 20 meters will also be required to carry observers.

Launch of Blue Manifesto
According to a Seas At Risk press release dated 27 January 2020, 102 environmental organisations, led by Seas At Risk, BirdLife Europe, ClientEarth, Oceana, Surfrider Foundation Europe and WWF are launching what they call the “Blue Manifesto”. Saying that heeding the recommendations presented in the Manifesto will put Europe on the right track to protect and restore the ocean, the NGOs are calling for:

- At least 30% of the ocean to be highly or fully protected by 2030
- Shift to low-impact fishing
- Securing a pollution-free ocean
- Planning of human activities that support the restoration of thriving marine ecosystems

Monica Verbeek, Executive Director at Seas At Risk said: “The ocean covers 70% of the Earth’s surface, mitigates climate change and provides oxygen - it is the planet’s support system. To perform its vital functions the ocean needs to be healthy and populated with life. We call..."
on the political leaders of the EU to bring the ocean at the core of the political agenda and make a healthy ocean a reality. The joint Blue Manifesto launched today is the Blue answer to the European Green Deal.”

IFFO RS now known as MarinTrust

IFFO RS, the IFFO Global Standard for Responsible Supply, has just announced its new name: MarinTrust. IFFO RS was originally founded by IFFO, The Marine Ingredients Organisation, in 2009. The rebranding campaign acknowledges the certification programme’s journey, undertaken in 2014, to a separate entity with its own governance structure, articles, purposes and budget. As a business-to-business independent third-party audited certification programme, MarinTrust aims to champion best practices within the marine ingredients industry. It allows producers of marine ingredients to demonstrate that their raw materials are responsibly sourced and marine ingredients are responsibly produced.

Since the first fishmeal plant was IFFO RS certified in 2010, the standard has grown significantly, with more than half of the fishmeal and fish oil produced worldwide now IFFO RS certified.

World Fish Migration Day, 16 May 2020

The World Fish Migration Foundation is organising World Fish Migration Day on 16th May, with the theme Connecting, Rivers and People and intention to create awareness regarding open rivers and migratory fish.

Many migratory fish species are critically endangered or threatened. They are a crucial link in the food chain and play an important role in creating healthy and productive river systems.

A more detailed look at migratory fish and river restoration initiatives can be obtained from the ‘From Sea to Source’ guide which is available for viewing on the Foundation’s website (www.fromseatosource.com).
The 22nd Japan International Seafood & Technology Expo

2020.9.30 [Wed] → 10.2 [Fri]

Tokyo Big Sight
Aomi Exhibition B Hall

同時開催 Co-Event

「すしEXPO 2020」コーナー Sushi EXPO 2020
「国際水産養殖技術展 2020」コーナー International Aquaculture Technology Expo 2020
「鮮度流通技術展 2020」コーナー Freshness Keeping and Distributing Technology Expo 2020
「フィッシュネクスト技術展 2020」コーナー Fish Next EXPO 2020

主 催 一般社団法人 大日本水産会 Endorsed by Japan Fisheries Association
ANTIMICROBIAL RESISTANCE (AMR) IN AQUACULTURE: THE WAY FORWARD

By Sujit Krishna Das

The indiscriminate and unregulated use of antibiotics as additives in feeds and to treat diseases in aquaculture systems has created strains of resistant bacteria, thus making the drugs no longer effective. Predictably, these resistant microbes have a negative effect on not only cultured stocks, but also on human health and the environment, as well as reduce the production potential from the sector. At the global level, the issue of microbial resistance is being tackled mainly by the tripartite FAO/OIE/WHO collaboration, but farmers and other national stakeholders also have a role to play.

Introduction

Global fish production peaked at about 171 million tonnes in 2016, with aquaculture representing 47 percent of the total. Between 1961 and 2016 the average annual increase in global fish consumption (3.2 percent) outpaced population growth (1.6 percent). The aquaculture figure indicates a substantial increase in the relative contribution of the farming sector to total fish production from 5 percent in 1962 to 47 percent in 2016 (SOFIA 2018)\(^1\). The global increase in production has also resulted in a wide diversity of species being cultivated – currently over 580 species in total (consisting of 362 finfishes, 62 crustaceans and 37 aquatic plants) with a wide range of growth and maximum production conditions.

The contribution of the aquaculture sector to meet the goal of a world without hunger and malnutrition and to achieve Agenda 2030, is significant. Global per capita fish consumption has been growing at a rate twice as fast as population growth, reaching a record high per capita consumption of 20.5 kg in 2017 and expected to exceed 25 kg per capita by 2025, i.e. 20 percent higher than today.\(^2\) Meanwhile, the world population will reach 9.5 billion by 2050, at which time the contribution from aquaculture will be 63 percent. The sector therefore needs to develop a new vision in the context of Agenda 2030 for sustainable development, which includes increasing production and conserving biodiversity.

A major challenge in this endeavour is antibiotic resistance, defined by the World Health Organization as occurring when bacteria change in response to the use of antibiotics used to treat bacterial infections, thus making them no longer effective. Together with antifungals and other drugs which treat infections caused by microorganisms, antibiotics are antimicrobials: agents (natural, synthetic or semisynthetic) that kill microorganisms or inhibit their growth but cause
little or no damage to the host. Hence, all antibiotics are antimicrobials but not all antimicrobials are antibiotics.

Some of the important bacterial diseases for fishery species and most frequently used antibiotics in aquaculture are outlined in Tables 1 and 2 (Reantaso 2018⁴).

Table 1: Main bacterial diseases in aquaculture

<table>
<thead>
<tr>
<th>Gram-negative bacteria</th>
<th>Gram-positive bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibriosis (V. anguillarum, V. harveyi clade, V. parahaemolyticus, Aliivibrio salmonicida (V. salmonicida), V. vulnificus, Photobacterium damselae)</td>
<td>Mycobacteriosis (Mycobacterium fortuitum, M. marinum, Nocardia asteroidis, N. crassostreae (ostreae), N. seriolae)</td>
</tr>
<tr>
<td>Aeromonas (Aeromonas caviae, A. hydrophila, A. sobria, A. veronii, A. jaonedi, A. salmonicida)</td>
<td>Streptococciosis (Streptococcus agalactiae, S. iniae, Lactococcus garvieae, Aerococcus viridans)</td>
</tr>
<tr>
<td>Edwardsiella (Edwardsiella anguillarum, E. ictaluri, E. piscicida, E. tarda, Yersinia ruckeri)</td>
<td>Renibacteriosis (Renibacterium salmoninarum)</td>
</tr>
<tr>
<td>Pseudomonas: Pseudomonas anguilliseptica, P. fluorescens)</td>
<td>Flavobacteriosis (Flavobacterium branchiophilum, F. columnare, F. psychrophilum, Tenacibaculum maritinum)</td>
</tr>
<tr>
<td>Infection with Intracellular Bacteria (Piscirickettsia salmonis, Hepatobacter penaei, Francisella noatunensis, Chlamydia plicatilis)</td>
<td>Infection with Anaerobic Bacteria (Clostridium botulinum, Enterobacterium catenabacterium)</td>
</tr>
</tbody>
</table>

Table 2: Frequently used antibiotics in aquaculture

<table>
<thead>
<tr>
<th>Type</th>
<th>Generic Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetracyclines</td>
<td>Oxytetracycline, Doxycycline</td>
</tr>
<tr>
<td>Quinolones</td>
<td>Oxolinic acid, flumequine, enrofloxacin (and other fluoroquinolone)</td>
</tr>
<tr>
<td>Phenicol</td>
<td>Florfenicol, Chloramphenicol and Thiampenicil</td>
</tr>
<tr>
<td>Anti-folates</td>
<td>Trimethoprim/Sulfamethoxazole, trimethoprim, sulfonamides</td>
</tr>
<tr>
<td>β-lactams</td>
<td>Amoxicillin</td>
</tr>
<tr>
<td>Macrolides</td>
<td>Erythromycin, Josamycin, Neomycin (for Gram+Ve Bacteria)</td>
</tr>
<tr>
<td>Nitrofurans</td>
<td>Nitrofurantin</td>
</tr>
</tbody>
</table>

Antimicrobial resistance (AMR) occurs when bacteria and other microbes such as parasites, viruses and fungi develop resistance to drugs used to treat the infections they cause.⁴ AMR, together with antimicrobial use (AMU) were identified in the first Joint FAO/OIE/WHO Expert Meeting on Antimicrobial Use (AMU) and Antimicrobial Resistance (AMR) in Aquaculture as being major hazards.

AMR occurs naturally through microbial adaptation to the environment, exacerbated by the inappropriate and excessive use of antimicrobials. It may exist in combination with present and past use of antibiotics, probiotics, prebiotics and other treatment, singly or combined. These systems have been designated as “hotspots for AMR genes” where significant genetic exchange and recombination can occur. Various factors are involved in this process such as lack of regulation and oversight of use, poor therapy adherence, non-therapeutic use, over the counter (OTC) or online sales and availability of counterfeit or poor-quality antimicrobials. AMR may also happen through horizontal gene transfer (HGT) and mutation events that allow genetic exchange within microbial populations, a process which has been ongoing since ancient times.

The consequences of AMR include the failure to successfully treat infections leading to increased mortality, more severe or prolonged illness, production losses and reduced livelihood and food security. Microorganisms that develop AMR are sometimes referred to as ‘superbugs’. It has been estimated that 90 percent of bacteria originating in seawater are resistant to one or more antibiotics and up to 20 percent of the bacteria are resistant to at least five.

Sources of antimicrobials in aquaculture

Antibiotics enter aquatic environments through various means. The application of organic manure e.g. cow dung, poultry litter and piggery wastes in integrated farms is common in many Asian countries, where the inorganic nutrients support the growth of photosynthetic organisms eaten by aquatic animals. This practice in turn often leads to higher occurrence of antimicrobial resistant bacteria which might later have an impact on fish quality and shelf life as well as consumers’ health. Another source is through animal feed, which often contains antimicrobials which had been added to promote growth or prevent and treat diseases. Meanwhile, the direct medication of fish in aquaculture also leads to an increase in the level of antimicrobial resistance among bacteria in the fish intestine.

Once bacteria have acquired AMR genes, they may exist in the environment for a long time. Bacterial strains carrying resistance determinants in commercial seafood products include disease-causing pathogenic bacteria in humans, thereby increasing the risk of spreading AMR from aquaculture to consumer. Some studies have found that 70-80 percent of the antibiotics given to fish are excreted into the water and can further alter the microbial communities present.
Pathways of antimicrobial resistance (AMR) genes from closed and open aquaculture systems into the water and sediment environmental resistome. (Source: Watts and Lanska et al. 2017)

There is also the problem of residues in seafood, caused by the injudicious use of antimicrobials. This presents a hazard to public health either through the consumption of seafood containing residues or by handling of products containing residues. The consequences of antimicrobial resistance in bacteria may include an increased number of infections in humans, frequency of treatment failures, severity of infection, as well as higher cost of living.

**FAO global coordinated action**

As AMR is not a stand-alone issue and it is not restricted to a single country, nation or sector, actions in isolation will not produce any good results for the long run. Recognising this, the Food and Agriculture Organisation (FAO) is playing a leading role in coordinating global activities together with the World Organisation for Animal Health (OIE) and World Health Organisation (WHO) to address the global threat of AMR.

The Global Action Plan on AMR with contributions from the FAO and OIE, was adopted during the 68th World Health Assembly (the decision-making body of the WHO) in May 2015. The World Assembly of the OIE adopted the strategy in May 2015 and the 39th FAO Conference adopted the Resolution 4/2015 in June 2016. To support implementation of this Resolution, the FAO has developed an Action Plan on AMR focused on the following areas: building awareness in national/regional/international fora; surveillance and monitoring on AMU and AMR; preparing Best Practice Guides for Shrimp, Tilapia and Carp; and to assist state governments to develop National Action Plans on AMR. A political declaration was also made during a high level meeting on AMR at the 71st UN General Assembly in September 2016.8

Working together to achieve the “One Health Program” in a tripartite arrangement the FAO, OIE, and WHO agreed to step up joint action to combat health threats associated with interactions between humans, animals and the environment.

Experts hope that this tripartite partnership will add tremendous value in strengthening and tackling the AMR issue.

**Specific recommendations: the way forward**

- Establish an independent regulatory authority for aquatic animal health and maintain strong coordination with human health, animal health, plant production, environment and food and feed safety organisations;
- Registration of aquatic animal health professionals to increase extension services and create awareness on the unauthorised prescription of antimicrobials in aquaculture;
- State fisheries departments to publish a List of Bacterial Diseases with respect to economic and zoonotic importance;
- State fisheries departments to publish a List of Approved Aquatic Animal Drugs;
- Publish a List of appropriate dosages for aquatic animal health drugs against specific pathogens to stop abuse and overuse of antimicrobials;
- Establish national aquatic animal disease diagnostic laboratories for the detection of pathogens and quick response during disease outbreaks;
Stop the usage of banned veterinary drugs in aquaculture, including the practice of mislabeling/ misleading declaration of these drugs, and ensure prudent and responsible use of antibiotics;

Stop the application of antibiotics as growth promoters in aquaculture and regulate the import of banned antimicrobials in aquaculture;

Labels of approved aquatic animal drugs should contain some specific information like “Aquatic Animal Use Only”, to be used only after proper consultation with registered aquatic animal health professionals, etc;

Build awareness on antibiotic-free farming methods, biofloc-farming and alternatives to antibiotics (prebiotics, probiotics, phyto-biotics, immunostimulants, bacteriophage therapy, quorum sensing and vaccine etc);

Strengthen surveillance on AMR in humans and food animals;

Stop the application of all kinds of organic manure in aquaculture and ensure Best Management Practices at every step of the aquatic food production chain;

Coordinated multi-sectoral research is required to assess the impact of AMR in aquaculture and to develop alternative products to antibiotics;

Follow WHO/OIE/FAO recommendations regarding responsible and prudent use of antimicrobial agents to reduce the misuse of antimicrobials in animals and to protect public health.

Some take-away points

The true cost of AMR is hard to predict, but an antimicrobial resistance review published in London stated that 10 million lives a year by 2050, and a cumulative US$100 trillion of economic output are at risk, and a 2-3.5% decrease in global Gross Domestic Product (GDP), may be expected due to the rise of drug resistant infections.7

Basically, the higher the content of antibiotic resistant bacteria in farm environments, the greater the threat to fish farms as they serve as a source of antibiotic resistant genes for fish pathogens. This resistant bacteria can eventually be transferred to humans through opportunistic pathogens. Thus any kind of farm intensification which ignores best management protocols increases the spread of bacterial diseases in aquaculture, which in turn invites the use of antimicrobials.

Considering the public health concerns about the consequences of abuse and over-use of antimicrobials, widespread awareness and stringent drug regulations are necessary to limit their application. The implementation of efficient strategies to contain and manage gene resistance emergence and spread is also critical, requiring innovative research, state of the art diagnostic tools and trained staff.

Ultimately, perhaps one of the best ways to tackle the issue of AMR is to encourage the implementation of farming protocols that reduce stress on the fish, which then decreases the chances of pathogen outbreaks, and thus reduces the necessity for antibiotics.

References


TIL Biosciences
(The Animal Health Division of Tablets (India) Limited)
72, Marshalls Road, Chennai - 600 008

Tablets (India) Limited is a leading research based Nutraceutical and Probiotic formulations manufacturing and marketing company. Drawing on more than 125 years' experience in the human and animal healthcare market, Tablets (India) Limited offers a wide range of solutions. Originally a British company which was sold to be promoters of Mr. Sri Krishna Jhaver by the year 1894, over the years Tablets (India) Limited has grown, thanks to its involvement in research and development. Today, the firm employs 6500 staff and offers a wide range of solutions and products. Tablets (India) Limited has received many prestigious International & National awards for its commitment to high standards of Research and Quality. Tablets (India) Limited was awarded with “GIL 2011-India” by Frost & Sullivan for New product innovation in Probiotics & Nutraceuticals.

“In 2004, TIL Biosciences (The Animal Health Division of M/s Tablets (India) Limited) was born. We developed good range of products for aquaculture (shrimp and fish) and companion animal health care. All the products are eco- friendly and as such are devoid of steroids and hormones. We in principle do not manufacture or promote any antibiotics for animal health. Instead, our key focus is to expand our animal health care product market globally and improve the status of livestock farming. The world is in need of animal protein and the requirement will drastically increase in the upcoming future. In order to supply the global need, livestock production must increase. Thus, we ensure that our product serves the purpose.

Today there are team of experts to support about 3000 users of TIL Biosciences products. We feel that we are responsible for the safe and sustainable future for Animal Health and working hard to conserve animal life. As such, we work with consultants, farmers, pet breeders, dealers, agents and distributors all across India and in several countries. This overseas network is expanding each day and we are proud to be working with so many experts to make the world a better place for animals of every species.”

“As a company, we are highly concerned about the safety of animals and we emphasize on sustainable farming practices. Hence, we supply products to the animals that are free from steroids and antibiotics. We have registered our products in the appropriate bodies. Our staffs are provided with safety gears while processing the products and were also provided with proper health insurance to the staff and their family members.”

“Looking ahead, we are developing a selection of unique products for livestock, and a number of these are already in the development stage and a selected few are at the trial stage. We expected to launch these innovative new products in future and this will benefit the market as there are many reports on emerging and re-emerging diseases. As such, we foresee even greater success for our company over the years to come.”
Introduction

Asia is home to millions of people dependent on fishing and related activities for food, nutrition, livelihoods and trade. Whether marine or inland, these fishing communities are changing because of environmental, economic and social factors from within as well as outside. Many of these fishing communities are vulnerable because of their geographical location, social and economic situation, demographic characteristics, and the condition of the fishery and natural resources on which they depend.

The topic relating to demographic change in fishing communities and how these factors influence livelihoods diversification, climate change adaptation, and resource sustainability, among others, has so far received little attention. The 2016 State of World Fisheries and Aquaculture noted that there was a decrease of 1.5 million fishers globally between 2012 (39.4 million) and 2014 (37.9 million). The following year, the number of fishers increased and reached its peak of 40.7 million, an increase of 2.9 million. The reasons for the decrease and increase in the number of fishers are varied and worth exploring. These reasons, among others, may include the state of the infrastructure and human resources for data collection in the countries, population change in fishing communities, the attractiveness/unattractiveness of the fishing industry to potential new entrants such as the youth, migration into and outside the fishing communities, and ageing among fishers and fish workers.

Interest in demographic change in fishing communities dates back to the macro-level studies conducted between 1994 and 1997 under the leadership of the Food and Agriculture Organization of the United Nations (FAO). The studies revealed the following, among others: (i) the trend of decreasing number of coastal fishers in the Philippines and Malaysia and the increasing number of fishers in Bangladesh and India; (ii) inter-generational occupational mobility out of fishing, indicating that fishing was no longer a “last resort employment”; (iii) fishing households were not always the poorest and in some cases may be better off than farmers; and (iv) acknowledgement by fishers from the Philippines, India and Bangladesh about declining resources and the environment due to the increasing number of fishers and fishing boats and domestic and industrial water pollution.

A presentation by Miki et al. (2018) during the 7th Global Conference on Gender in Aquaculture and Fisheries, regarding changes in fishing communities and fisher women in Japan, generated renewed interest on the topic. The authors showed a declining trend in the number of fishers and fishery workers, both women and men, between 1993 and 2013, as well as a declining trend in the number of women in fisheries cooperative associations between 1990 and 2013. The presentation also revealed that the ageing rate of the population in fishing communities (38 percent) was higher compared with the total population in Japan (29 percent).

Table 1 shows that a decline in the number of fishers is also happening in China, Indonesia, Malaysia, Thailand, and the Republic of Korea.
In ASEAN Member States, it is projected that by 2035, the percentage of the population over 60 years old will be 21 percent in Brunei Darussalam; 12 percent in Cambodia; 15 percent in Indonesia; 9 percent in Lao PDR; 16 percent in Malaysia; 15 percent in Myanmar; 11 percent in the Philippines; 34 percent in Singapore; 30 percent in Thailand; and 20 percent in Vietnam. In addition to the change in the population structure, there is increasing urbanisation in many of these countries, and it is projected that by 2030, 2.5 billion people in Asia and the Pacific will be living in urban areas.

**FAO/NACA Regional Consultative Workshop on Demographic Changes in Fishing Communities in Asia: Some interesting findings**

In fishing communities, the impact of changes such as increase or decrease in population, out-migration, and ageing or a young population, on fisheries resources, the economy, labour availability, and gender division of labour, as well as on fishing as a way of life, among others, is not well known. For this reason, the FAO Regional Office for Asia and the Pacific and the Network of Aquaculture Centres in Asia-Pacific (NACA) co-organised a Regional Consultative Workshop on Demographic Changes in Fishing Communities in Asia on 6-7 November 2019 in Bangkok, Thailand.

The Regional Consultation explored the following questions: (i) What are the changes in demography (ageing, migration) in the fishing communities? (ii) How are fishers adjusting their livelihoods with the changes in fishery resources as well as labour availability? Are they diversifying to other livelihoods? (iii) What are the consequences from these adaptation strategies? Are there any gender differences in the impact of such adaptation strategies? and (iv) What are the challenges faced and policy and programme support needed for fishing communities for sustainable small-scale fisheries? The Regional Consultation was attended by participants from Cambodia, China, India, Indonesia, Iran, Lao PDR, Malaysia, Maldives, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam.

A desk study (Punyaratabandhu, 2019) prepared for the Regional Workshop showed a general demographic trend in Asia of decreasing fertility rate (births per woman); increase in the population aged 60 and over, with the majority of them being women; increase in migration from rural areas to cities; and greater inequalities faced by the rural poor in terms of access to education. The desk study also found out that there is limited long-term research on demographic transition and fishing communities, making it difficult to understand adaptive strategies and resilience. Knowledge gaps identified by the desk study included: (i) Lack of linkage between demographics and socio-economic indicators; (ii) Limited linkages between demographics, economic change and ecosystem; (iii) Studies were people-blind and gender-blind; (iv) Information was dated with large amount of reports on transition and change dating back to late 1990s and early 2000s; (i) Studies on drivers of demographic transition largely

### Table 1: Number of fishers in selected Asian countries, 1995–2017

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<td>8 389</td>
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<td>9 115</td>
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<td>34 213</td>
<td>36 304</td>
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<td>37 879</td>
<td>40 781</td>
<td>40 399</td>
<td>40 422</td>
</tr>
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</table>

focused on the agricultural sector; and (vi) Limited availability of long-term research to enable the understanding of the impact of demographic change in the fishing sector.

In India (Parappurathu, 2019), there were 16 million people involved in fishing and allied activities in 2017, of whom 65 percent were male and 35 percent were female. There was an increasing trend in the number of marine fisherfolk population between 1980 and 2010, but a decreasing trend between 2010 and 2016. Family size was decreasing and the sex ratio was skewed in favour of males. Literacy rate rose over the years and there was improvement in the level of educational attainment among fisherfolk. The study further indicated that although the literacy rate was slightly higher for males than females, both were lower than the national average, and that the marine fisherfolk population living below the poverty line was higher (61 percent) than the national average (29.5 percent). There was a trend of male migration between States to work as fishing labourers and for women to work in shrimp processing factories. Furthermore, smallscale fishers previously engaged in traditional non-motorised fishing were moving to mechanised trawl/purse seine as labourers, attracted by the timely payment of remuneration. Between 1980 and 2016, the number of non-motorised fishing vessels declined from 134 741 to 25 689.

In Indonesia (Koeshendrajana, 2019), there was a 51 percent decrease in the number of fisher households between 2003 (1.6 million) and 2013 (780 037). Data for 2013 showed that many of the fishers belonged to the 40–49 age group, with more than half of them in the 30–49 age group. Furthermore, more than 30 percent of fishers with non-motorised fishing vessels belonged to the age group 50 and above; one-fourth of the fishers using inboard motorised vessels and 30 percent using outboard motors belonged to the same age group. The data showed fluctuations in the number of fishers between 2012 and 2016, but there was an overall decrease between the two periods, from 2.7 million in 2012 to 2.6 million in 2016.

In the Maldives (Shakeel, 2019), the youth represented 68 percent of the working age population and 47 percent of the total population in 2014. Available data showed that people directly involved in fishing represented 3.6 percent of the working age population in 2014. Furthermore, the number of fishers has been decreasing since 2014 from 8 596 to 7 045 presently. The predominance of young people in the working age population has led to changes in the fishing industry, among these being: (i) operation of larger tuna fishing boats; (ii) use of modern devices on tuna fishing boats, such as fish finding devices, bird radars, GPS and vessel locating devices; (iii) operation of multi-day fishing trips by tuna fishing boats; (iv) increased participation of the youth in fishing, particularly in pole and line tuna fishing and handline large yellowfin tuna fishing. The overall increase in population, however, could put additional pressure on reef resources.

In Myanmar (Than and Naing, 2019), roughly 25 percent of the population are below 15 years old, but the proportion of young people in the population has been decreasing steadily owing to declining birth rates and increasing life expectancy, with most men and women living into their 60s. Between 1973 and 2014, the number of people aged 60 and over increased from a little over 1.5 million to 4.5 million, with more females than males. In terms of migration, males in the 40 to 54 age range have higher migration rates than women. The authors did not present data specific to fishing communities. However, the implications of an ageing population, for example, the need for a supportive environment for older persons such as social protection, affordable access to basic primary health care services, sufficient universal pension schemes, work opportunities for older persons, and infrastructure that will ensure their well-being, were a common concern.

Case study: Cambodia and Thailand

In a study entitled “Demographic changes in fishing communities in Cambodia and Thailand”, in-depth interviews, focus group discussions and key informant interviews were conducted at Khlong Yai district (Trat province, Thailand), Kampong Savy district (Kampong Chhnang province, Cambodia), Srae Ambel district (Koh Kong province, Cambodia), and Tuek Chhou district (Kampot province, Cambodia). In Thailand, the study area was on marine fisheries, while for Cambodia, both inland and marine areas were covered.

In Thailand, the number of fishers is decreasing while the young generation are going to urban areas to work. Fishing communities are ageing, and they are getting increasingly dependent on cross-border migrant workers to sustain fishing. The sector is further challenged by the strict regulations that were introduced by the Thai government to combat illegal, unreported and unregulated (IUU) fishing, such as the need for extra paperwork that they are not used to doing, and the difficulty in managing crew since only those who are registered with a particular boat can go fishing. Any mistake they make is followed by a ban on fishing for several months, which makes it extremely difficult for them to resume fishing after that.

On the other hand, in Cambodia, fish catches are decreasing especially in the inland area, making it more and more difficult to sustain a livelihood dependent on fishing. Many youths migrate to urban and cross-border areas, leading to labour shortage in fishing and fish processing.
In the study areas, the ageing population is increasing, but to a different degree and for different reasons. The study found that the nature of demographic change in fishing communities is shaped by drivers such as (i) decrease in fish resources (which hit the inland fisheries in Cambodia the most); (ii) labour shortage (which hit Thailand the most, but also inland fisheries in Cambodia because of out-migration); (iii) changes in laws and regulations (in Thailand owing to the efforts to combat IUU fishing, whereas in Cambodia the struggle to protect fishing areas is becoming more difficult); (iv) group building initiatives that can improve the fishers’ sense of being fishers; as well as (v) their strong identity as fishers; and (vi) drivers outside fishing that pull youths out from fishing communities to migrate to urban areas and across the border for career development (a common finding in all the study areas). In other words, the fishers are getting older, but the reasons for this as well as the speed at which the process is happening differs under different contexts.

The decrease in fishers, especially young people, has led to (i) difficulty in maintaining middle-sized boats, especially in Thailand; (ii) reliance on remittances and non-fishing income; (iii) difficulty to diversify in areas such as fish processing because of the lack of fish as well as labour; (iv) less collective power; and (v) crisis in elderly care. In both Thailand and Cambodia, the demographic changes are happening fast and since it is a new phenomenon for them, fishing communities are still struggling to adapt.

More research and community support needed

The sustainability of the fishing industry depends, among others, on the state of fishery resources and the women and men in fishing communities who catch, process, and market the fish. An ageing or decrease in the young population of fishers has consequences on how fishing and related activities are conducted, the adoption of new technologies, and the availability of labour, to name a few. Unlike what is often expected, i.e. that the low number of fishers can lead to improved conservation of fishery resources (Tietze et al. 2000) and the restoration of the fishing professions, the implication of the demographic change can be more complicated and can negatively or positively affect the fishing profession as well as the vibrancy of fishing communities.

From the case studies in Cambodia and Thailand, fishing communities tend to have a higher percentage of ageing fishers compared to the national average. The relative attractiveness of fishing as a livelihood is lower when there is better opportunity for non-fish occupations, especially accelerated by a decrease in fishing resources as well as by laws and regulations surrounding fisheries. At the same time, fishers have strong identity as fishers, and they may continue to fish even when it is not economically viable.

Therefore while fishing communities will continue to exist, the vibrancy of the community may be threatened, affecting the older fishers. In order to cope with the demographic changes in fishing communities, the study recommended the need for support to these fishing communities, including strengthening their local organisations to voice their concerns and participate in the governance of the fishing industry and the management of fishing grounds. It also recommended the promotion of safe migration and non-fishing occupations in order to diversify livelihoods in the fishing communities.

Elderly care provision is also an urgent measure that is needed for these communities where the ageing population is increasing rapidly. Without state provisions, the existing gender norms would expect women and daughters to take up the care work, affecting the ability of these households to earn, contribute to fishing, as well as for women to explore career possibilities outside the community.

Overall, there is a need to better understand the specific contexts of fishing communities and the demographic change that is happening, as well as the drivers (within and outside the fisheries) and the impacts of such change on the fishing industry, livelihoods diversification, climate change adaptation, and gender roles and relations.

References


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INFOFISH ASSOCIATE MEMBERSHIP
Forging close links with the global seafood industry

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- Seafood processors
- Certification agencies
- Academia
- Equipment and supplies companies
- Fishing technology companies
- Packaging and printing companies
- Investors
- Innovators
- Business forums and professional associations
- Others

For further details, please visit www.infofish.org or contact info@infofish.org
Precise and quick fish injections

The FishGuide is an accessory which can be fitted on to an injection device to provide for correct needle positioning while injecting fishes. It is said to reduce fish wounds and protect users from possible injuries.

Recommended for injecting small to mid-size fish species, three FishGuide sizes may be installed and removed easily by hand. It fits self-refilling syringes ranging up to 0.5 ml (the Socorex original 187 or Socorex ultra 1810 models) which are marketed as being robust and reliable. Made with stainless steel and copper threads, the FishGuide can be positioned over 360° on the syringe to select the best working position, and their shape can be modified to adapt any fish size.

*Manufacturer: Socorex, Switzerland (www.socorex.com)*

Automated fish counters

The Channel Counter is particularly useful during splitting, grading operations or lice treatment, as it provides critical data on the number of fish in each size group.

VAKI has an extensive range of counters for use in aquaculture systems like pens and cages. Using a scanning camera and computer vision, all images of fish moving through the scanning area are recorded. Custom software is used to analyse and count each image with an almost 100% accuracy rate.

*Manufacturer: VAKI Aquaculture Systems Ltd, Iceland (https://vakiiceland.is)*

Stunning device for humane slaughter

An electric stunning device is on the market for fish farmers to use in the slaughter of fish in a more humane manner. The Humane Stunner Universal (HSU) is a water-filled pipe lined with electrodes, where fish pumped through the pipe are immediately rendered unconscious by the electricity in the water.

Each HSU is designed for different locations: beside cages, on boats or barges, or on land, the size varying according to the location.

*Manufacturer: Aceaquatec (aceaquatec.com)*

Ultrasound for control of sea lice

The company that has come up with an ultrasound device to control Chilean sea lice (*Caligus rogercresseyi*) infestations in salmon farming was one of the finalists in the Global Aquaculture Alliance’s annual Global Aquaculture Innovation Award for 2014. It announced that in trials, the application of ultrasound underwater, directly in fish pens, has a lethal effect on juvenile stages of the sea lice, but not on the salmon or other animals due to the low power and frequency of 20 KHz per transmitter.

It is estimated that losses due to sea lice infestations in the Chilean salmon farming industry have been around US$300 million (EUR 235 million) per year since 2009. According to the company, there have been reductions in the sea lice population of 30—50% per fish after using the ultrasound equipment.

*Manufacturer: USONIC Ltda, Chile*
Startups showcase some interesting ideas

At its fourth and final biennial Global Innovators Forum which was held in November 2019, Fish 2.0 announced its top innovators, according to six categories:

- **Aquai (Top Innovator in Aquaculture):** the Fish as a Service (FaaS) B2B platform which uses a biomimetic fishlike drone to provide monitoring services in offshore fish farms

- **Montana Microbial Products (Top Innovator in US Seafood):** high-quality barley protein concentrates for fish feed, a new fish-free alternative to traditional feeds

- **Australian Crayfish Hatchery (Top Innovator in Australian Seafood):** state-of-the-art facility supplies antibiotic-free, pathogen-free hatchlings to farmers of the lobster-like crayfish in Australia and internationally

- **Fortuna Fish (Top Innovator in Global Seafood):** the Fortuna Cooler, the first fish transport box made of natural, locally sourced materials

- **Moscow-based Yorso (Top Innovator in Ocean and Seafood Technology):** offers an online B2B wholesale seafood marketplace that operates internationally, integrates with buyers’ and sellers’ customer relationship management (CRM) systems and automates commercial transactions and marketing tasks through a variety of platforms.

- **Wholechain (Top Innovator in Supply Chain Change):** a user-friendly, blockchain-based traceability solution that provides transparency throughout the seafood supply chain. Wholechain is also working on making it easy to integrate with other platforms such as warehouse management systems.

Since 2013, Fish 2.0 has worked with 588 entrepreneurs and built a network of over 700 investors worldwide in line with its vision of helping investors and entrepreneurs build the knowledge and connections they need to bring innovative ideas to life and move capital into the sector. (*Editor’s note: Fish 2.0 founder and executive director Monica Jain was featured in an interview in the March/April 2018 issue of the INFOFISH International.*

### Silica from diatoms

Aqua-Spark, the first investment fund focused on sustainable aquaculture, has announced that it is investing in a Swedish company that uses algae to convert effluent water from recirculating aquaculture systems (RAS) into valuable products for the solar and personal care sectors.

Swedish Algae Factory has come up with a procedure to extract a mesoporous silica material from diatoms. Named as Algica, the extract is said to have exceptional light-altering properties which makes it useful as a replacement for harmful and/or less efficient chemical substances, for example to improve the efficiency of solar panels, as well as moisturisation, cleansing and ultraviolet light protection in personal care products. When used in RAS, it cleans wastewater, absorbs carbon dioxide, and also creates a nutrient-rich organic biomass that can be used for fish feed or fertiliser.

According to Aqua-Spark: “By upcycling wastewater into high-value products for the solar and cosmetic industries, the brand is solving a major issue for land-based aquaculture and sustaining a separate, diversified business model”.

Manila-based Fortuna Fish has produced portable expandable coolers for small-scale tuna fishers. The coolers are insulated with coconut fibre, a widely-available, locally-sourced natural material that is a waste product of the coconut meat *industry.*

Supplementary bulletins...

- **European Price Report (EPR)** is a monthly bulletin with comprehensive coverage on European markets. Produced by FAO-Globefish, EPR reports on market trends and prices for coldwater as well as tropical species namely cod, hake, Alaska pollack, herring, farmed salmon/trout, European sea bass/sea bream, tuna, tropical shrimp and cephalopods and more.

- **INFOFISH International**, the longstanding bimonthly magazine distributed globally since 1981, is also included as a complimentary copy (by surface mail) to subscribers of the fortnightly INFOFISH Trade News.

- **Globefish Highlights** is the commodity report which outlines quarterly market trends and outlook on tuna groundfish, shrimp, lobster, cephalopods, small pelagics, fish meal and fish oil.

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This case study focuses on a fast-growing niche market product: pre-packed in MAP (Modified Atmosphere Packaging) portioned fillets of organic salmon. Price formation is analysed in detail in four key markets:

- Ireland, the main producing country for organic salmon, with a high per capita consumption (4.7 kg/capita/year);
- France, one of the two biggest markets for salmon products within the EU (along with Germany) and main importing country for Irish salmon;
- Germany, one of the two biggest markets for salmon products within the EU (with France) and the biggest market for organic food and the second for organic fish;
- The United Kingdom, second largest producer of organic salmon in the EU and the biggest market for organic fish.

Price transmission analyses are developed for:

- Different supply chains: domestic production – domestic market and imported products – domestic market;
- Different origins of salmon (Ireland, Scotland and Norway), taking into consideration differences in production costs and margins of salmon farming and their impact on ex-farm prices;
- Different types of retailers: supermarkets, discount stores, specialized retailers.

This study was carried out in the first semester of 2019, when the UK was a Member State of the EU.

This publication can be viewed at no cost from the EUMOFA website (www.eumofa.eu).

INNOVATIVE TECHNOLOGIES IN SEAFOOD PROCESSING

Edited by Yesim Ozogul and published by Taylor & Francis Inc, September, 2019, USA. 376 pages.

This publication gives information on advances in chilling, freezing, thawing, and packaging of seafood and also updates knowledge of novel process technologies (high-pressure processing, irradiation, ultrasound, pulsed electric field, microwave and radio frequency, sous vide technology, novel thermal sterilisation technologies, ozone and nanotechnological applications, and other innovative technologies such as cold plasma, ohmic heating, infrared heating supercritical carbon dioxide, and high-intensity pulsed light) for the seafood industry.

Further, it highlights aspects related to quality of seafood treated with these innovative technologies, effect on food constituents, possible risk, security/safety both of seafood and consumers, the environmental impact, and the legislative aspects. The book also addresses the growing international environmental concern for fish discards and fish waste generated in the seafood processing industries.

Innovative Technologies in Seafood Processing is available for online purchase through various channels including www.amazon.com or www.bookdepository.com.

STRENGTHENING, EMPOWERING AND SUSTAINING SMALL-SCALE AQUACULTURE FARMERS’ ASSOCIATIONS


This technical paper presents three major sets of information resource: (i) five case studies from five Asian countries, (ii) the synthesis of the case studies and (iii) the report of the regional workshop that reviewed the case studies and the draft synthesis of the case study reports. These provided additional science-based, professional, and experiential information, and developed recommendations to strengthen, empower and sustain organizations of small-scale fish farmers and related aquaculture-based enterprises.

This publication can be viewed at no cost from the FAO website (www.fao.org).
The FISH INFONetwork (FIN) consists of seven independent partners who cover all aspects of post-harvest fisheries and aquaculture. Fifty national governments have signed international agreements with the different FIN services and are using the expertise of these services to develop the fishery sector worldwide.

The FIN pages are a regular feature in the four network magazines:
- INFOFISH International
- INFOPESCA Internacional
- EUROFISH Magazine
- INFOSAMAK Magazine

They present the FIN-wide spectrum of activities, showing actions and results.

The FIN has more than 70 full-time staff and works with more than one hundred international experts in all fields of fisheries. Through its link from FAO GLOBEFISH to the FAO Fisheries Department, it also has access to the latest information and knowledge on fisheries policy and management issues worldwide.

The execution of multilateral and bilateral projects is one of the main activities of the network. It is also widely known for its range of publications and periodicals as well as for the organisation of international conferences, workshops and training seminars. All eight services offer different possibilities for co-operation with the private sector, institutions, government offices and donors.

For more information on the FISH INFONetwork visit the website www.fishinfonet.org.

EVENTS

Making fish a regular part of school meals in Latin America

An FAO TCP project to promote the inclusion of fish in school meals in three Latin American countries, Honduras, Peru, and Angola, concluded at the end of last year with the formulation of national strategies to ensure school meals include more fish. The final workshop to discuss the results of the project was organized by FAO in collaboration with INFOPESCA in Punta del Este, Uruguay. Twenty-five people from nine Latin American countries, Argentina, Brazil, Colombia, Guatemala, Honduras, Panama, Paraguay, Peru and Uruguay, participated in this meeting, while Angola, which is part of the project, could not attend. The meeting was opened by the Andrés Domingo, Director of DINARA, Graciela Pereira, Executive Director of INFOPESCA and Jorge Toppe, Reporting Officer, FAO.

Honduras reported that all the activities stipulated in the project had been completed and that a clear strategy on the inclusion of fish in school meals had been drawn up. Two pilot studies were carried out, one at a school in the interior, and the other at a school on the coast. Peru has a well-organized school meals programme (Qaliwarma), but fish is not frequently included in the school menu in some areas of the country. In the project, Peru developed its strategy to make sure every school in the country could include fish on its menu. Two low cost fish products based on Peruvian anchovy were tested among school children, a salted/dried product and a canned product based on shredded whole gutted anchovy. Both products had a high level of acceptability. More than 90% indicated they liked the whole shredded anchovy very much.

The remaining participating countries presented their school feeding programmes and proposed ideas as to how fish could become an essential part of these diets. The importance of convincing parents was highlighted as part of the strategy. Buying locally and supporting small scale fishermen was also suggested as a means to support local economies and ensure long term solutions.

FAO brief: How COVID-19’s impact on fisheries and aquaculture can be mitigated

As with other sectors of the global economy, fisheries and aquaculture are also affected by the spread of COVID-19. Producers, processors, traders, and consumers both directly and indirectly feel the impact of the virus, the consequences of which, particularly for populations that depend heavily on seafood for food security and nutrition, can be severe. FAO has therefore released a brief on how COVID-19 is affecting the fisheries and aquaculture sector and suggested measures to support the different players in the supply chain.

Production, for instance, may suffer from the imposition of sanitary measures on board that make fishing difficult, crews may not be able to join their vessels due to travel restrictions, and the necessary supplies of bait or ice may not be available. In addition, demand in some countries has fallen as a result of unfounded perceptions about links between COVID-19 and seafood.

Aqaculture production is affected by the closure of markets, the shutdown of the HORECA sector, and restrictions on flights and cargo movements. In the processing sector issues with cross border transport, uncertain supply of raw materials, and market restriction are among the challenges companies must face. COVID-19 is also likely to have an impact on fisheries management and policy as stock assessments, fisheries observer programmes, and science and management meetings may be postponed or cancelled.

Measures to support the different elements in the supply chain extend from expanding government purchases of seafood to maintain demand and prevent a slump in prices, through extending credit and microfinance facilities to fish farmers to ensuring smooth passage of goods at ports, rail terminals, and at border crossings. The complete brief is available at http://www.fao.org/documents/card/en/c/ca8637en
2020

MAY

19-21
Aquaculture UK
Aviemore, Scotland
https://aquacultureuk.com/

27-29 (POSTPONED)
INFOFISH WORLD TUNA TRADE CONFERENCE & EXHIBITION (TUNA 2020)
Bangkok, Thailand
http://tuna.infofish.org/

JULY

8-10
Indo Fisheries
Jakarta, Indonesia
https://www.indofisheries.id/

AUGUST

21-23
China International (Guangzhou) Fishery and Seafood Expo
Guangzhou, China
http://www.chinafishex.com/index.asp

SEPTMBER

1-3
Seafood Expo Asia
Hong Kong, China
https://www.seafoodexpo.com/asia/

21-23
Seafood Expo Russia
Saint Petersburg, Russia
https://seafoodexporussia.com/en/

23-25
International Indonesia Seafood & Meat Expo
Jakarta, Indonesia
https://ism-expo.com/

30 Sept - 2 Oct
Japan International Seafood & Technology Expo
Tokyo, Japan
https://seafood-show.com/japan/

OCTOBER

15-17
Aqua Fisheries Myanmar (Aqua MY)
Yangon, Myanmar
aquafisheries-expo.com

15-17
Future Fish Eurasia
Fuar Izmir, Izmir, Turkey
eurasiafaire.com

28 - 30
China Fisheries & Seafood Expo (CFSE)
Qingdao, China
chinaseafoodexpo.com

NOVEMBER

3-5
SEAFEX
Dubai, UAE
www.seafexme.com

4-6
Busan International Seafood & Fisheries Expo (BISFE)
Busan, South Korea
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DECEMBER

14-18
World Aquaculture 2020
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# Editorial Plan 2020

## Issue: Fish as Food
(Aquaculture; food security for small-scale communities; food safety; value addition; new food products from fishery species)

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## Regular Features

- **Industry Profiles** (confirmed as at 31 December 2019):
  - Jose Camposano (1/2020)
  - Jim Gulkin (1/2020)
  - Meryl Williams (3/2020)
  - Dr Lahsen Ababouch (3/2020)

- **Other Sections**:
  - Market Barometer
  - Market Trends
  - Commodity Updates (seaweed, tuna, fishmeal, shrimp, pangasius, milkfish, cephalopods)
  - Industry Notes
  - Innovations
  - Equipment & supplies
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Conference postponed due to on-going Covid-19 concerns. New dates to be announced in due course.