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A SUSTAINABLE SEAWEED CULTIVATION MODEL FOR RURAL COASTAL COMMUNITIES IN SRI LANKA

By Shawn Senarath, Dasun De Silva and Malika Sugathpala

Seaweed farming is a sunrise sector in Sri Lanka, where it is regarded as having the potential to uplift rural fishing communities while at the same time, forming a basis for restorative aquaculture in national waters. Several challenges have been identified, among them being consistency in supply and quality, particularly with regard to international markets. A local company has reported early success in its seaweed farming training model which is aimed at creating sustainable and scalable systems, including a high capacity seaweed farm community as well as a farm management integration system using IoT.

INTERNATIONAL YEAR OF ARTISANAL FISHERIES AND AQUACULTURE (IYFA 2022)

By the IYFA Task Force

The slogan of the International Year of Artisanal Fisheries and Aquaculture (IYFA 2022) – small in scale, big in value - is a recognition and appreciation of the millions of small-scale fishers, fish farmers and fish workers who provide healthy and nutritious food to billions of people globally. This article outlines the background and history of the Year, provides information and links to communication materials, and describes how you and your organisations can engage in this global initiative to give small-scale fish producers the global acknowledgment they deserve.

CAN FISH PREVENT MICRONUTRIENT DEFICIENCY IN HUMAN HEALTH?

By Marisa Mehta

Micronutrients are essential for humans and critical for healthy life. Fish can provide several essential micronutrients to humans, thus reducing deficiencies, especially during the first one thousand days of life. Omega-3 fatty acids are also important for human development in helping to maintain a healthy heart by lowering blood pressure, as well as ad healthy brain function and development of nerves and vision in infants. Fish provide an elevated level of omega-3 fatty acids in a small volume of food. Therefore eating fish regularly, even in small quantities, will improve health, which is especially important for the well-being of communities in low-income food deficit countries.

THE POST-COVID BUSINESS ECOSYSTEM IN INDIAN FISHERIES: PROSPECTS AND STRATEGIES

By A Suresh and CN Ravishankar

Fisheries is the fastest growing primary sector in India. The entire fisheries value chain is labour intensive, with strong inter-connecting linkages which exert a multiplier effect so as to enhance the income of the diverse stakeholders. This article examines the current business ecosystem for fisheries-based value chains in the country at this time, when the worst of the COVID-19 pandemic is deemed to be over. It then highlights several business development possibilities and proposes strategies for boosting entrepreneurship within this ecosystem.

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First of all, here’s to a Happy 2022 to all, and Happy IYFA! As many of you already know, the United Nations has declared 2022 the International Year of Artisanal Fisheries and Aquaculture (IYFA). FAO is the key coordinating agency in collaboration with other relevant organisations in the UN system.

Small-scale artisanal fishers and fish farmers are critical in feeding the world’s growing population and IYFA 2022 is a wonderful opportunity to highlight the immense value of fisheries and aquaculture to our food systems, livelihoods, culture and environment.

We are of course excited by the many opportunities that an officially recognised year gives us. And we are looking forward to working with all the relevant stakeholder organisations to raise awareness about the tremendous contribution of the artisanal sector to food security and livelihoods. We also want to draw attention to the interests of the millions of women and men all over the world that depend on the sector for their most basic needs. This means collaborating closely not only with national governments and regional institutions but also with private sector organisations, industry associations, academia and NGOs. An International Steering Committee including public and civil society representatives and others from the fisheries and the aquaculture sectors, is providing guidance on IYFA activities.

While FAO is ready to assist with coordination and provide information and communication material, activities are to be driven at the local, national and regional level. This is a great opportunity to showcase what small-scale fishers are doing locally. We are already encouraged by the response to IYFA 2022 from both government institutions and private sector associations and the establishment of many regional committees for undertaking such activities. We also hope to see committees established soon in Asia and encourage all of you to get involved.

As IYFA 2022 falls within the UN Decade of Family Farming (UNDFF 2019-2028), the two celebrations will reinforce each other and provide greater visibility for small-scale producers. Similarly, IYFA can promote more action for achieving the Sustainable Development Goals (SDG) by 2030, in particular SDG 14.b which addresses the small-scale sector and access for small-scale artisanal fishers to marine resources and markets.

IYFA 2022 is not only about showcasing the achievements of small-scale fisheries and aquaculture. It is about building a sustainable future for those who depend on it and the resources upon which they depend. We hope to see further progress this year on the various SDG14 indicators, including the four for which FAO is the custodian agency, such as improving the status of fish stocks (SDG 14.4), eliminating harmful subsidies that lead to illegal, unreported and unregulated (IUU) fishing (SDG 14.6) and increasing economic benefits for small island developing states (SIDS) and the world’s least developed countries through sustainable use of marine resources and sustainable management practices (SDG 14.7).

While all UN members have endorsed the UN Sustainable Development Goals Agenda 2030 and committed themselves to the individual targets, co-operation is essential. Multilateral solutions and agreements require collaboration and ongoing discussion between policymakers and there will be plenty of opportunities to promote discussion in 2022.

The FAO Committee on Fisheries (COFI) will meet on 5-9 September 2022 and the two FAO Sub-Committees on Aquaculture and Fish Trade will meet in May and June. This year FAO will also release a new edition of our flagship publication, the FAO State of World Fisheries and Aquaculture (SOFIA).

Ocean governance and the sustainable use and management of our aquatic resources will be at the top of the agenda at several major events scheduled for 2022. In February, policymakers, scientists and others will attend the One Ocean Summit in the port city of Brest in France; the Our Oceans conference will be held in Palau in April; and the UN Ocean conference will take place in Lisbon, Portugal from 27 June to 1 July.

Questions may be asked about the timing or relevance of these events and how they will guarantee progress on substantive issues affecting fisheries and aquaculture. My answer is simple: there is no alternative. Progress in meeting the specific targets of the UN Agenda 2030 has been partial or slow, and in some areas it has even taken a step backwards due to the COVID-19 pandemic and other factors. It is critically important to speed up any action that will advance international awareness and dialogue and move us closer towards achieving the UN SDG targets.

Together we have achieved impressive milestones in fisheries governance with the adoption of the FAO Code of Conduct, endorsement of the PSMA, the FAO Guidelines for Catch Documentation Schemes and the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries. All these agreements emerged from extensive international dialogue before finally being endorsed by policymakers on a global level.

My personal wish for 2022 is for all of us to work together so we can produce concrete and positive outcomes on the UN SDG14 targets - and bring an urgent end to the pandemic that has caused so much pain and suffering around the world.

Dr Audun Lem
Deputy Director, Fisheries and Aquaculture Department,
Food and Agriculture Organization of the United Nations (FAO)

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INFOFISH International 1/2022 ● www.infofish.org
Resúmenes de los principales artículos

AÑO INTERNACIONAL DE LA PESCA Y LA ACUICULTURA ARTESANALES (AIPAA 2022)

Por el Grupo de Trabajo del AIPAA

El lema del Año Internacional de la Pesca y la Acuicultura Artesanales (IYFA 2022) --pequeña en escala, grande en valor-- es un reconocimiento y aprecio a los millones de pescadores en pequeña escala, piscicultores y trabajadores del sector que proporcionan alimentos saludables y nutritivos a miles de millones de personas en todo el mundo. Este artículo describe los antecedentes y la historia de esta conmemoración, proporciona información y enlaces a materiales comunicacionales, y describe cómo los lectores y sus organizaciones pueden participar de esta iniciativa global para dar a los pequeños productores de pescado el reconocimiento mundial que merecen.

EL ECOSISTEMA EMPRESARIAL POST-COVID EN LA PESCA INDIA: PERSPECTIVAS Y ESTRATEGIAS

Por A Suresh y CN Ravishankar

La pesca es el sector primario de más rápido crecimiento en India. Toda la cadena de valor de la pesca tiene una mano de obra intensiva, con fuertes vínculos interconectados que ejercen un efecto multiplicador para mejorar los ingresos de las diversas partes interesadas. Este artículo revisa el ecosistema empresarial actual para las cadenas de valor basadas en la pesca en el país, en un momento en el que se considera que lo peor de la pandemia COVID-19 ya pasó. También destaca varias posibilidades de desarrollo empresarial y propone estrategias para impulsar el espíritu emprendedor dentro de este ecosistema.

UN MODELO DE CULTIVO DE ALGAS SOSTENIBLE PARA LAS COMUNIDADES COSTERAS RURALES EN SRI LANKA

Por Shawn Senarath, Dasun De Silva y Malika Sugathpala

El cultivo de algas es un sector emergente en Sri Lanka. Se considera que tiene el potencial de elevar a las comunidades pesqueras rurales y, al mismo tiempo, formar una base para la acuicultura restauradora en aguas nacionales. Se han identificado varios desafíos, entre ellos la coherencia en el suministro y la calidad, particularmente en lo que respecta a los mercados internacionales. Una empresa local ha reportado un caso de éxito temprano en su modelo de capacitación en cultivo de algas marinas, que tiene como objetivo crear sistemas sostenibles y escalables, incluida una comunidad de granjas de algas marinas de gran capacidad, así como un sistema de integración de gestión de granjas que utiliza IoT.

¿EL PESCADO PUEDE PREVENIR LA DEFICIENCIA DE MICRONUTRIENTES EN LA SALUD HUMANA?

Por Marisa Mehta

Los micronutrientes son esenciales para los seres humanos y fundamentales para una vida sana. El pescado puede proporcionar varios micronutrientes esenciales para reducir deficiencias, especialmente durante los primeros mil días de vida. Los ácidos grasos omega-3 también son importantes para el desarrollo humano, ya que pueden ayudar a mantener un corazón sano al reducir la presión arterial, así como contribuir a una función cerebral saludable y al desarrollo de los nervios y la visión en los bebés. El pescado proporciona un nivel elevado de ácidos grasos omega-3 en un pequeño volumen de comida. Por lo tanto, comer pescado con regularidad, incluso en pequeñas cantidades, mejorará la salud, lo que es especialmente importante para el bienestar de las comunidades de los países de bajos ingresos y con déficit de alimentos.
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Par la Task Force d’IYAFA

Le slogan de l’Année Internationale de la Pêche et de l’Aquaculture Artisanales (IYAFA 2022) - à petite échelle, grande en termes de valeur - est d’accorder une reconnaissance et une valorisation des millions de pêcheurs artisans, des pisciculteurs et des travailleurs du secteur de la pêche qui fournissent des aliments sains et nutritifs aux milliards de personne dans le monde. Cet article décrit le contexte et l’histoire de l’année, fournit des informations et des liens de supports de communication, et décrit comment vous et vos organisations pouvez-vous engager dans cette initiative mondiale pour donner aux petits producteurs de poisson la reconnaissance mondiale qu’ils méritent.

L’ÉCOSYSTÈME DES ENTREPRISES POST-COVID DANS LA PÊCHE INDIENNE : PERSPECTIVES ET STRATÉGIES..........................................................30
Par A Suresh et CN Ravishankar

La pêche est le secteur primaire qui connaît la croissance la plus rapide en Inde. L’ensemble de la chaîne de valeur de la pêche est à forte intensité de main-d’œuvre, avec de solides interconnexions qui exercent un effet multiplicateur pour améliorer les revenus des diverses parties prenantes. Cet article examine l’écosystème commercial actuel des chaînes de valeur de la pêche en vigueur dans le pays, tout en jetant un regard rétrospectif sur les effets néfastes de la pandémie de COVID-19. Il met ensuite en évidence plusieurs possibilités de développement commercial et propose des stratégies pour stimuler l’entrepreneuriat au sein de cet écosystème.

UN MODÈLE DE CULTURE DURABLE D’ALGUES POUR LES COMMUNAUTÉS RURALES CÔTIÈRES AU SRI LANKA..................................................44
Par Shawn Senarath, Dasun De Silva et Malika Sugathpala

La culture d’algues est un secteur en plein essor au Sri Lanka, où elle est considérée comme ayant le potentiel de rehausser le niveau de vie des communautés rurales des pêcheurs tout en établissant une base pour la restauration de l’aquaculture dans les eaux nationales. Plusieurs défis ont été identifiés, parmi lesquels la cohérence de l’offre et la qualité, surtout, au regard des exigences des marchés internationaux. Une entreprise locale a enregistré un succès précoce dans son modèle de formation à la culture d’algues qui vise à créer des systèmes durables et évoluifs, y compris une communauté de fermiers d’algues à grande capacité ainsi qu’un système intégré de gestion de la culture d’algues en appliquant le modèle IoT.

LE POISSON PEUT-IL PRÉVENIR LA CARENCE EN MICRONUTRIMENTS A LA SANTÉ HUMAINE ? ..................................................49
Par Marisa Mehta

Les micronutriments sont essentiels pour les humains et primordiaux pour une vie saine. Le poisson fournit plusieurs micronutriments essentiels aux humains en réduisant les carences, en particulier pendant les mille premiers jours de la vie. Les acides gras oméga-3 sont également importants pour le développement humain. Ils peuvent également aider à maintenir un cœur sain en abaissant la tension artérielle, ainsi qu’à favoriser le bon fonctionnement du cerveau et le développement des nerfs et de la vision chez les nourrissons. Le poisson fournit un niveau élevé d’acides gras oméga-3 dans une petite quantité de nourriture. Par conséquent, manger du poisson régulièrement, même en petite quantité, améliorerait la santé, ce qui est particulièrement important pour le bien-être des communautés des pays à faible revenu et à déficit alimentaire.
文 章 摘 要

国际手工渔业和水产养殖年（IYFA 2022）

By the IYFA Task Force

国际手工渔业和水产养殖年（IYFA 2022）的口号是“小规模、大价值”，这是对数百万为全球数十亿人提供健康营养食品的小规模渔民、养殖户和渔业工人的认可和赞赏。本文概述了国际手工渔业和水产养殖年的背景和历史，提供了信息和交流材料的链接，并说明了您和您的机构如何参与其中，给予小规模鱼类生产商应得的全球认可。

印度渔业的后疫情时代商业生态系统：前景和策略

A Suresh and CN Ravishankar

渔业是印度增长最快的初级产业。整个渔业价值链是劳动密集型的，具有强大的内在联系，可以发挥乘数效应，从而提高不同利益相关者的收入。本文研究了该国在新冠疫情最严重时期过去后，以渔业为基础的价值链的现有商业生态系统。它强调几种业务发展的可能性，并提出了在这个生态系统中鼓励创业的战略。

斯里兰卡农村沿海地区的可持续海藻种植模式

By Shawn Senarath, Dasun De Silva and Malika Sugathpala

海藻养殖是斯里兰卡的一个朝阳产业，被认为具有提升农村渔业区发展的潜力，同时也可为国家水域恢复性水产养殖奠定基础。海藻养殖目前遇到了一些挑战，包括供应和质量的一致性，特别是在国际市场方面。一家本地公司报告称其海藻养殖培训模式取得了初步成功，该模式旨在创建可持续和可规模化的系统，包括高产海藻养殖区以及使用物联网的养殖管理集成系统。

鱼类能否预防人类健康中的微量营养素缺乏症?

Marisa Mehta

微量营养素对人类和健康生活至关重要。鱼类可以为人类提供多种必需的微量营养素，防止营养缺乏，尤其是在生命的最初一千天。Omega-3 脂肪酸对人类发育也很重要。它们还可以通过降低血压来帮助维持健康的心脏，并有助于婴儿的健康大脑功能和神经和视力的发育。即使是少量的鱼，也可以为人类提供较高的omega-3脂肪酸。因此，定期食用鱼，即使是少量食用，也会改善健康，这对低收入缺粮国家的改善人民生活水平尤为重要。

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Gu Yuan Yuan
خلاصة لأهم المقالات

السنة الدولية لمساهمة الأسماك البحرية واستزراع الأحياء المائية (IYFA 2022)

يقدم فريق عمل IYFA بشكلا عام شعار السنة الدولية لمساهمة الأسماك البحرية واستزراع الأحياء المائية (IYFA 2022) محدود النطاق، كIMER، أكبر القيمة اعتمادًا وتقييدًا لعديد الصناع الصغير، ومزارعي الأسماك ومعظم الصيد الذين ينتمون طعامًا صحيًا ومغذيًا لليابانيين الأشخاص على مستوى العالم. وتشير هذه المقالة خلفية وتاريخ السنة، وتعرض معلومات وروابط لمواد الأسماك، ونُصّف كيف يمكننا نشركم ومنظمنكم في هذه المبادرة العالمية لمنح صغار المنتج الأسماك الاعتراف العالمي الذي يستحقه.

النظام الإيكولوجي للأعمال في فترة ما بعد كوفيد-19 بمصايد الأسماك الهندية: التوقعات والاستراتيجيات

A Suresh و CN Ravishankar

يقدم فريق عمل A Suresh و CN Ravishankar القول بالقول، من خلال الصناع الصغير، ويعتبر زمن الصيد البحرية أهم القطاعات التي أخذت في الظهور في سريلانكا. حيث نظر إليها أنه قادر على النمو في النهوض بمجتمعات الصيد البحرية بينما تشكل في نفس الوقت أساسا لترميم الأحياء المائية في المياه المحلية، وقد تم تحديد العديد من التحديات من بينها التوقف عن العمل الجودة، لا سيما فيما يتعلق بالإنتاج الدولي. وقد أبلغت إحدى الشركات المحلية عن نجاحها المبكر في نموذج التدريب على زراعة الأسماك الحرفية الذي يهدف إلى إنشاء نظام مستدام وقابلة للتطوير، بما في ذلك مجتمع زراعة الأسماك البحرية العالي السعة علاوة على النظام الكامل لإدارة المزرعة باستخدام إنترنت الأشياء.

نموذج مستدام لاستزراع الأسماك البحرية للمجتمع الساحلي الفريقي في سريلانكا

Shawn Senarath و Dasun De Silva و Malika Sugathpalu

يعتبر نموذج مستدام لاستزراع الأسماك البحرية أحد القطاعات التي أخذت في الظهور في سريلانكا، حيث نظر إليها أنه قادر على النمو في النهوض بمجتمعات الصيد البحرية بينما تشكل في نفس الوقت أساسا لترميم الأحياء المائية في المياه المحلية، وقد تم تحديد العديد من التحديات من بينها التوقف عن العمل الجودة، لا سيما فيما يتعلق بالإنتاج الدولي. وقد أبلغت إحدى الشركات المحلية عن نجاحها المبكر في نموذج التدريب على زراعة الأسماك الحرفية الذي يهدف إلى إنشاء نظام مستدام وقابلة للتطوير، بما في ذلك مجتمع زراعة الأسماك البحرية العالي السعة علاوة على النظام الكامل لإدارة المزرعة باستخدام إنترنت الأشياء.

هل يمكن للأسمك منع بعض المغذيات الدقيقة في صحة الإنسان؟

Marisa Mehta

يمر فريق عمل Marisa Mehta بالقول، من خلال الصناع الصغير، تعترف الأسماك بضرورة للإنسان ولحياته الصحية. ويمكن للأسماك أن توفر العديد من المغذيات الدقيقة الأساسية للإنسان لتمكين النقص الحاصل، خاصة خلال الأفام يوم أولى من الحياة. وتعد الأسماك الحرفية أوميغا 3 مهمه أيضا لنمو الإنسان، إذ يمكنها أيضا المساهمة في الحفاظ على صحة القلب وضغط الدم، بالإضافة إلى المساعدة في وظائف المخ الصحية وتحفيز الأعصاب والروية عند الرضع. وتوفير الأسماك من خلالها أوميغا 3 الدقيقة بكمية صغيرة من الطعام، ومن ثم فإن تناول الأسماك بانتظام، ولو بكميات محدودة، من شأنه أن يحسن الصحة، وهو أمر مهم بشكل خاص لرفاهية المجتمعات في البلدان ذات الدخل المنخفض التي تعاني من عجز غذائي.

للمزيد من المعلومات الرجاء الإتصال ب: إفوسومك

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INTERNATIONAL YEAR OF ARTISANAL FISHERIES AND AQUACULTURE (IYFA 2022)

By the IYFA Task Force

The slogan of the International Year of Artisanal Fisheries and Aquaculture (IYFA 2022) – small in scale, big in value – is a recognition and appreciation of the millions of small-scale fishers, fish farmers and fish workers who provide healthy and nutritious food to billions of people globally. This article outlines the background and history of the Year, provides information and links to communication materials, and describes how you and your organisations can engage in this global initiative to give small-scale fish producers the global acknowledgment they deserve.

The United Nations General Assembly declared 2022 the International Year of Artisanal Fisheries and Aquaculture (IYFA 2022), with FAO acting as the lead agency working closely with partners, organisations and relevant United Nations bodies. Celebrating the Year in 2022 follows a trend of highlighting that fisheries and aquaculture is about people as much as it is about fish. Its objective is to focus world attention on the role that small-scale fishers, fish farmers and fish workers play, thereby increasing global understanding and action to support them.

A key step is to enter the celebration of the Year into all national calendars and action plans across the globe to ensure that governments and relevant organisations alike start planning and getting creative on how to give small-scale fish producers the global acknowledgment they deserve.

IYFA 2022 is here!

Plans have commenced for celebrating IYFA 2022 with the establishment of a Task Force in FAO, the formation of an International Steering Committee, the development of a new website, and the launch of a visual identity. The International Steering Committee consists of members from the seven FAO regions, as well as non-state actors in small-scale fisheries and aquaculture, and representatives from the International Fund for Agricultural Development and the United Nations Permanent Forum on Indigenous Issues. The Committee provides overall guidance and assistance in the preparations and implementation of the Year and facilitates mobilisation of political and financial support, which will be channelled through a trust fund for IYFA 2022.

The Year’s visual identity – its unique “look and feel” – aspires to show artisanal fisheries and aquaculture as a unity that continuously co-evolves, fulfilling economic, environmental, social and cultural functions of the two small-scale sectors. The pictogram as seen in the illustration above is a symbolic portrait with no specific gender or ethnicity. Wavy lines depict the hair, a fish is also an eye, and the nose and mouth have a boat-like profile.

A comprehensive guide on how to use the visual identity to promote IYFA 2022 is available online for all interested governments, public institutions, intergovernmental
How to get involved in IYAF 2022

IYAF 2022 is an opportunity to highlight the potential of small-scale fisheries and aquaculture, and point to the benefits which can be gained from strengthening these sectors. To make the most of this opportunity, it is time to think creatively, join hands and start making plans now for how to make IYAF 2022 a memorable year. Let us give small-scale fishers, fish farmers and fish workers the attention they deserve!

Here is how you can get involved:

- **Contribute a human-interest story**

One concrete way to get involved is to prepare a human-interest story to be featured as part of IYAF 2022, to share with the world a special person, group or organisation that has made a meaningful contribution to small-scale fisheries and aquaculture. Human-interest stories linked to artisanal fisheries and aquaculture may be published on the IYAF and FAO websites and digital channels and/or be used in events, exhibitions and for pitching to global media. To contribute please use the template ‘Call for Human Interest Stories’ in the Communication Toolkit provided at: https://www.fao.org/artisanal-fisheries-aquaculture-2022/home/en/ and send it to the IYAF Secretariat no later than 31 January 2022.

We encourage all partners to use the visual identity and to adapt it to other languages. FAO stands ready to support you in this. For source files or more information, please visit www.fao.org/artisanal-fisheries-aquaculture-2022 or contact us at IYAF@fao.org.
• **List your events on the official IYFA events page**

   Activities and events are being organised around the world to celebrate IYFA2022. Feature your activity or event on the IYFA2022 webpage by registering at the link: https://www.fao.org/artisanal-fisheries-aquaculture-2022/events/en/

• **Utilise official IYFA campaign materials**

   Communication material available at: https://www.fao.org/artisanal-fisheries-aquaculture-2022/communication-toolkit/en/ is available in the six official languages of FAO to make it easy for all partners to join the IYFA global campaign. This includes key messages, the visual identity, an IYFA 2022 brochure and website, a promotional video, social media cards, hashtags, videos and templates for making beautiful posters, banners and outdoor promotions and much more.

   Communication products are all available in the IYFA 2022 Asset Bank: https://digital-assets.fao.org/home/action/browserItems?categoryId=135848&categoryTypeId=2

• **#IYFA2022 on social media**

   Inform, educate and engage audiences with real facts. Join the #IYFA2022 campaign by sharing through digital channels and visit the Trello Board (https://trello.com/b/8Yg9yh91/international-year-of-artisanal-fisheries-and-aquaculture) for the list of official hashtags and other promotional materials.

• **Use the IYFA2022 visual identity**

   To increase the impact of the IYFA 2022 celebrations, we ask you and all IYFA partners to use the visual identity as much as possible in all your activities and events, also on digital platforms!

   To help you get started, we have prepared two guides on how to use the IYFA 2022 visual identity:

   • The **Guidelines for the use of the IYFA 2022 visual identity and waiver of liability** give detailed instructions on how to use the IYFA logo and who may use it.

   • The **visual identity guidelines for graphic designers** give precise instructions on branding, use of the logo for different materials, and tips for inserting the logos of partners working with you on joint activities and events.

   If you need the visual identity in other languages, FAO can also work with you to create different language versions of the visual identity. You can send a request to IYFA@fao.org. Our graphic design team can advise you on any additional issues you may have when using the visual identity, from logo arrangements to different format requirements (size or layout).
Stay tuned: small-scale fishers and fish farmers photostory book

The FAO Regional Office for Asia and the Pacific, in collaboration with INFOFISH, is developing a photostory book that puts a spotlight on Asia as home to the majority of the world’s small-scale fishers and fish farmers. It will celebrate the diversity of Asian small-scale fisheries and aquaculture, making visible their faces and circumstances. The book will also honour the numerous women and men in small-scale fisheries and aquaculture value chains who are contributing to the Asian region’s food security, nutrition, livelihoods, trade, and foreign exchange reserves. The photostory book will be launched during the first quarter of 2022 in two webinars aimed at raising awareness and at celebrating IYAFA 2022, as well as to link major FAO initiatives/outcomes in small-scale fisheries and aquaculture.

By the numbers

Small-scale fisheries

- An estimated 120.4 million people were either employed along the value chain in capture fisheries in 2016 or engaged in subsistence fishing at some point in the year. Small-scale fisheries accounted for 93.9 percent of these (113 million people) (FAO, WorldFish, Duke University, forthcoming).
- More than 47 million women are fully or partially employed in capture fisheries value chains or engaged in subsistence fishing (39.6 percent of the people were employed part or full-time in capture fisheries or engaged in subsistence fishing, and 39.6 percent in part or full-time small-scale fisheries employment or subsistence fishing in 2016) (FAO, WorldFish, Duke University, forthcoming).

Aquaculture

- 20 million people are directly engaged in aquaculture worldwide (FAO, 2018). This increases to up to 50 million if indirectly engaged people are also considered (FAO and WorldFish, 2016).
- 80 percent of world aquaculture production comes from developing countries (FAO and WorldFish, 2016).

The build-up to declaring the Year

In 2014, small-scale fishers and fish workers gained considerable attention and recognition through the endorsement of the FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines) – and the subsequent efforts by FAO and others to turn words into actions. It was in fact during the discussions on the implementation of the SSF Guidelines at the 32nd Session of the FAO Committee on Fisheries (COFI) in July 2016 that a proposal for an international year on artisanal fisheries and aquaculture was put forward by the Latin American and Caribbean Group.

A commemorative year was proposed as an opportunity to further consolidate efforts to improve small-scale fisheries, and propel efforts to improve small-scale aquaculture. COFI considered that the Year would sensitise public opinion and governments on the importance of adopting specific public policies and programmes to promote activities in support of small-scale fisheries and aquaculture, especially in vulnerable rural areas constrained by poor governance and low capacity for sustainable use of aquatic resources. The United Nations General Assembly subsequently declared 2022 to be the International Year of Artisanal Fisheries and Aquaculture.

From now until the end of 2022, FAO will continue to liaise with policy-makers, development partners, other United Nations agencies, academia, NGOs, civil society organisations, the private sector, small-scale fisheries and aquaculture organisations, and the general public to raise awareness about the Year and encourage promotion and engagement ideas, activities and funding for IYAFA 2022.

Additional information on the small-scale fisheries and aquaculture sector is available from many sources, including:


The IYAFA Task Force is comprised of staff from across FAO. The primary function of the task force is to support the IYAFA International Steering Committee in the planning, development and implementation of the IYAFA 2022 action plan, including the establishment of regional committees, as well as mobilization of political and financial support.
Action Plan

Vision statement of the International Year of Artisanal Fisheries and Aquaculture 2022

A world in which small-scale artisanal fishers, fishfarmers and fishworkers of both genders are fully recognized and empowered to continue their contributions to poverty alleviation, human well-being and resilient and sustainable food systems through the responsible use of fisheries and aquaculture resources and socio-economic development.

Overall design

The IYFA 2022 Global Action Plan (IYFA GAP) aims at building global momentum to empower small-scale artisanal fisheries and aquaculture and securing a sustainable future for these important sectors. Outlined here are a series of indicative and interconnected actions that are mutually reinforcing in the pillars of work described below.

The GAP is meant to provide inspiration for small-scale artisanal fisheries and aquaculture proponents including, but not limited to, national administrations, non-governmental organizations, civil society organizations (CSOs), private enterprises, development agencies and intergovernmental bodies.

The overall expected outcomes of IYFA 2022 fall into four categories:

- **Raised awareness:** Sharing accessible information and key messages on small-scale artisanal fisheries and aquaculture with a broad range of audiences, including through the organization of and participation in relevant global, regional and national events and campaigns.

- **Strengthened science-policy interface:** Collectively gather and disseminate transdisciplinary evidence in a participatory manner to generate required information and knowledge on specific aspects of small-scale artisanal fisheries and aquaculture, that is then used to support decision-making and policy processes in support of small-scale artisanal fisheries and aquaculture.

- **Empowered stakeholders:** Enabling small-scale artisanal fishers, fishfarmers and fishworkers and their organizations to engage as equal partners in all relevant decision-making processes. This would also include working with legislators and government agencies in the formulation and adoption of laws, regulations, policies, strategies, programs and projects.

- **Partnerships:** Build new and strengthen existing partnerships, both among small-scale actors’ organizations as well as with other partners from government, research bodies, non-governmental organisations, the private sector, regional organizations and others, at all levels.

To secure the realisation of these outcomes the IYFA GAP is structured around seven pillars (please see www.fao.org/artisanal-fisheries-aquaculture-2022 for further details on these pillars). An indicative list of outputs and activities is presented under each pillar to stimulate stakeholders to develop individual and specific activities around these pillars. These outputs and activities are by no means exhaustive and stakeholders are encouraged to interpret these in accordance with their specific context. It should be remembered that the pillars are interconnected and should be treated in a balanced manner, with the order of the pillars not representing an order of priority. Lastly, it must be recalled that the GAP is a living document with the intention of inspiring ideas and initiatives to celebrate IYFA 2022.
Ensuring effective operationalization

The oversight and management of IYFA 2022 is coordinated by two bodies: the FAO IYFA Secretariat and the IYFA International Steering Committee (IYFA ISC), composed of representatives of Member States, United Nations (UN) organizations, civil society organizations, research organizations and non-governmental organisations. The FAO IYFA Secretariat is responsible for coordinating the development and implementation of the IYFA GAP, by preparing regular reports and the necessary documents regarding the activities to inform the administration and planning of the Year. The IYFA ISC provides guidance and assistance to the implementation of the IYFA GAP, including the establishment of regional committees, as well as the mobilization of political and financial support in their respective regions or areas of influence.

As initial steps in the implementation of IYFA 2022, synergies with ongoing UN Decades relevant to small-scale artisanal fisheries and aquaculture will be made, such as with the UN Decade of Family Farming (2028–2019), the UN Decade of Action on Nutrition (2025–2016), the UN Decade of Ecosystem Restoration (2030–2021), and the UN Decade of Ocean Science for Sustainable Development (2030–2021).

IYFA 2022 will also seek opportunities to support the implementation of and benefit from activities related to international instruments. These include among others:

- the Code of Conduct for Responsible Fisheries;
- the 2021 Committee on Fisheries (COFI) Declaration for Sustainable Fisheries and Aquaculture;
- the Agreement on Port State Measures;
- the Voluntary Guidelines for Securing Sustainable Small Scale Fisheries in the Context of Food Security and Poverty Eradication;
- the Voluntary Guidelines to support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security;
- the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security to Food;
- the UN Declaration of the Rights of Peasants and Other People Working in Rural Areas;
- the Principles for Responsible Investment in Agriculture and Food Systems;
- the Voluntary Guidelines on Food Systems and Nutrition;
- the Rome Declaration: Ten Steps to Responsible Inland Fisheries.

Processes IYFA 2022 intends on targeting include the Committee on Fisheries (COFI), the Committee on Food Security (CFS), the World Trade Organisation (WTO), the Convention on Biological Diversity (CBD), the United Nations Framework Convention on Climate change (UNFCCC) and the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), along with key regional processes and organisations.

Similarly, IYFA 2022 will stimulate actions aimed at supporting the achievement of a number of Sustainable Development Goals (SDGs) of the Agenda 2030. IYFA 2022 will draw attention to the contribution small-scale artisanal fisheries and aquaculture already make to the SDGs, in particular SDG 14.b, with a view to channel strong political commitment at national, regional and global levels to further establish supportive measures intended for small-scale artisanal fisheries and aquaculture.

Lastly, the implementation of each and every activity in connection with IYFA 2022 should follow a human rights based approach (HRBA). The HRBA seeks to analyze the inequalities that lie at the heart of development and address them. Three components make up the HRBA and must be acknowledged at all times:

1. It is based on international human rights standards and the overall objective is to promote and protect human rights.
2. Any programs or projects following this approach must respect the human rights principles of participation, accountability, non-discrimination, transparency, human dignity, empowerment and the rule of law. These principles apply to the design, implementation, monitoring and evaluation of programmes and projects, in order to improve targeting, efficiency, effectiveness and the quality of the outcomes.
3. Rights, duties, responsibilities and accountability mechanisms are promoted by developing the capacity of duty bearers to meet their obligation and of right holders to claim their rights.
Market Trends

**SHRIMP**

Supply

**India:** Since farmers had a good harvest this season, they are positive about seeding for the next crop. Broodstock sales in most regions in India have been strong in 2021 and good sales for the next crop in January are expected. However, Gujarat and Orissa harvests are slow. There are consistent landings of 40-50 tonnes per day which go to the shrimp processing plants. Despite ongoing challenges from the COVID-19 pandemic including global supply chain and shipping issues, India exported 32 738 tonnes to the US in September 2021, up from 24 992 tonnes last year.

**Mexico:** The US Department of State has officially lifted the country’s embargo on wild-caught Mexican shrimp. The notice in the Federal Register was posted on 1 November 2021, though according to a State Department press release, the US Congress was notified of Mexico’s certification status under Section 609 of the US law on 21 October 2021.

**Indonesia:** Indonesian shrimp producers are reporting some limited increases in supply, especially for the larger sizes. Demand remains high, but suppliers are struggling with the shortage of containers, particularly for the transport of shrimp to the US. Indonesian producers are hesitant to stock ponds without more certainty as to the market outlook.

In Asia, overall raw material supplies are low as main harvests have just finished, and the next harvest season will not be for many more months as farmers have just started their cropping season. Prices at *vannamei* shrimp farms in Andhra Pradesh (India) continue to rise, and a big influx of large shrimp is not expected to hit the market until the first harvest of 2022. Meanwhile, the prices for large Vietnamese shrimp also continue to rise. However, shrimp prices in Ecuador have dropped as the purchase quota was set for packers.

**Japan:** According to a recent Fisheries White Paper published by the Japan Ministry of Agriculture, Forestry and Fisheries, (MAFF), per capita seafood consumption in Japan decreased from the peak of 40.2 kg in FY2001 to 23.8 kg (estimate) in FY2019. However, with increasing health consciousness, about 60% of consumers say they want to eat fish more frequently in the future.

Since March 2020, eating out has greatly decreased owing to the COVID-19 pandemic while the rising eat-at-home trend led to more purchases at supermarkets and other retail stores as well as through websites and the use of delivery services and takeout from restaurants. This led to an increase in imports of raw frozen shrimp while imports of processed shrimp generally declined.

During the first nine months of 2021, total shrimp imports were the highest in the last four years, the growth largely contributed by the increase in imports of raw frozen shrimp. Interestingly, most of the major suppliers exported more with Vietnam being the largest supplier of shrimp followed by India, Indonesia and Thailand. With the freezing cold winter expected due to the La Nina phenomenon, demand for shrimp is expected to be dull during the end-2021 season.

**USA:** Seafood consumption continued to be in a positive trend particularly for shrimp. The US shrimp market was reported to be getting ready for the expected high demand during the Christmas and New Year holidays. Both foodservice and retail sectors continued to be strong.

Shrimp prices were significantly higher than at any autumn period in the last five years, and with the latest increase, the gap has widened even further. Traders and operators predicted that any kind of price drop before the end of 2021 is unlikely. Meanwhile, supply still cannot match the huge post-pandemic demand in the US.

Although shrimp prices continued to go up due to high freight costs, demand for shrimp was in a positive trend especially during the holiday season. Shrimp trading remains robust and stable in both the foodservice and retail sectors following implementation of different sales channels. Restaurants and food shops are now back to normal operation.

During January-September 2021, US shrimp imports increased by 20% at 642 446 tonnes compared to the same period in 2020. The cumulative total for the main product groups recorded increases by 0.05%, 11%, 39% and 23.6% for shell-on frozen, other preparations (frozen), peeled-raw frozen and breaded respectively. Among the main suppliers, India, Ecuador, Indonesia and Vietnam’s supplies were up. Ecuador was the main supplier of shell-on frozen; India for other preparations (frozen) and peeled-raw frozen; and Indonesia for breaded shrimp product categories. However,
in the month of September imports slightly decreased by 1.4% compared to September 2020 following less supplies from Ecuador, Indonesia and Vietnam for the main shrimp products except for peeled-raw frozen.

In late 2021, it was predicted that demand for shrimp would continue to be strong in the coming weeks as holidays were already around the corner. However, with some problems faced by shrimp suppliers particularly in Asia following container shortage and high freight costs, supplies will be limited. Rapidly rising freight costs were expected to continue at least until the end of 2021.

**Europe:** Steady retail demand and the reopening of the foodservice sector in EU kept the international shrimp market strong during the second and third quarter of 2021. Christmas demand is expected to be very strong.

Argentine shrimp is in its off-season at present, and inventories are minimal. Therefore prices of all sizes in Europe increased by US$ 0.10/kg between October and November (Source: EPR 11/2021).

**India/Europe:** Imports of shrimp during the third quarter of the year (2021) significantly increased by 31% compared to the same period in 2020. The main European markets for Indian shrimp - Belgium, UK, Netherlands, France and Italy - recorded increases of 16%, 29%, 22%, 47% and 39% respectively. Demand for shrimp in Europe continued to be strong as restaurants and food shops are now operating normally in addition to the strong sales in the retail sector.

**TUNA**

According to FAO-Globefish, the global tuna trade in 2021 was characterised by improved demand for non-canned tuna, falling retail demand for canned tuna, and improved sales opportunities in the hotel, restaurant and catering (HORECA) sector, particularly in the western markets. On the supply side, tuna catches were low worldwide during the third quarter of 2021, balancing the slow demand for frozen raw material from tuna canners. Prices are under pressure due to lack of demand for end products.

**SALMON**

**Asia:** Cumulative imports of fresh/chilled salmon during the 3rd quarter of 2021 recorded increases in main Asian markets. Imports into China, the top market in Asia, increased significantly by 28.7% at 41 396 tonnes and 55% at US$ 0.419 million in volume and value respectively compared to the same period in 2020. However, the numbers did not surpass the level in 2019, pre-COVID. South Korea continued to be the second top importer at 22 084 tonnes (up by 24%), while Thailand emerged in third position, followed by Taiwan and Japan. Thailand’s imports were significantly up by 58.6% at 13 897 tonnes from 8 762 tonnes last year in the same period. Other markets which also recorded increases were Taiwan (8.8%), Hong Kong (35.8%), Singapore (16.3%) and Indonesia with a huge increase by 168%, while imports into Malaysia decreased marginally. Demand for high value seafood products were up as the foodservice sector in Asia is now operating full force.

**TILAPIA**

**USA:** Cumulative imports of frozen tilapia were down by 12.8% in volume and 8.6% in value during the third quarter of 2021 as compared to the same period in 2020. Supplies of frozen fillets decreased by 19.6%, while frozen whole tilapia supplies increased by around 13% in volume. Major suppliers of frozen whole tilapia, especially Brazil, recorded a significant increase of exports to the US. However, supplies of frozen fillets were notably down from China and Mexico.

It was noted that sales in the Chinese domestic market for both live and processed tilapia products increased in 2021, which lowered the volume of tilapia exports to the US, particularly frozen fillets. In addition, the decrease in imports of frozen tilapia fillets was due to the increase in imports of high valued species like salmon.
Market Barometer//

Price Trends

FROZEN SHRIMP, C&F JAPAN (US$/Kg)  FROZEN SHRIMP, WHOLESALE TOKYO, JAPAN (¥ 1000/kg)

FROZEN SHRIMP, cfr USA  FROZEN SHRIMP, USA (ex-warehouse NY, US$/lb)

FROZEN SHRIMP, EUROPE (CFR, US$/kg)  FROZEN TUNA (US$/MT)
Price Trends • Cold storage holdings • import trends

**FROZEN WHITEFISH**

![Graph showing price trends for frozen whitefish.](image)

**FISHMEAL/FISHOIL (US$/MT)**

![Graph showing fishmeal and fish oil trends.](image)

**JAPAN COLD STORAGE HOLDING: SELECTED PRODUCTS (MT)**

![Graph showing cold storage holdings for selected products.](image)

**JAPAN COLD STORAGE HOLDINGS TUNAS (MT)**

![Graph showing tuna cold storage holdings.](image)

**JAPAN: MONTHLY IMPORTS OF SHRIMP & TUNA (MT)**

![Graph showing monthly tuna imports.](image)

**USA: Monthly SHRIMP Imports**

![Graph showing monthly shrimp imports.](image)
Freshwater fish

Tilapia

Even before the pandemic, a variety of factors have been dragging down the growth of the Chinese tilapia sector for some years now. With the present addition of soaring freight costs to China’s challenges, producers in Latin America have redoubled their expansion efforts.

Production

The most recent projections for total tilapia growth in 2021 were those presented at the North Atlantic Seafood Forum’s (NASF) global whitefish summit in June 2021. According to NASF figures, tilapia harvests should increase by some 150,000 tonnes globally, equivalent to a year-on-year increase of around two percent. This forecast reflects the expected resumption of harvesting activity in major producing regions amidst an improved market environment relative to 2020. However, it is not clear to what extent the unusually hot summer in China’s southern farming provinces, and a number of factory shutdowns due to Delta variant outbreaks, have affected total output.

China accounts for just over 20 percent of global tilapia production but its share has been declining as producers in other parts of Asia, Africa and Latin America have been posting significantly more rapid growth rates. Areas of Hainan and Guangdong historically used for tilapia farming are now being targeted for tourism development, while rising input costs present an additional challenge. On the market side, access to the United States of America has become more difficult due to the tariff regime and the worldwide container shortage, while other regions such as Africa traditionally supplied by China are investing heavily in domestic production.

In contrast, the Latin American tilapia aquaculture sector has been rapidly growing. The Brazilian tilapia industry continues to expand at an impressive pace, with Brazil now the fourth largest producer worldwide. The Brazilian government approved a law on the use of national waters for aquaculture at the end of 2020, which is anticipated to facilitate and speed up planning procedures and project approvals. Some observers project growth of up to 500 percent over the next decade. Fish consumption has increased since the beginning of the pandemic and the Brazilian Real is now devalued, favouring exporters. Together with the Brazilian Export Promotion Agency (APEX Brazil), the sector is planning for further export industry development and expansion into new markets, with producers emphasising the importance of restoring access to the European Union after a three-year ban on Brazilian farmed fish imports.

In Colombia, the Ministry of Agriculture is strongly focused on promoting exports, including those from aquaculture. There has been an increase in tilapia production centres across the country driven by demand from the US market. In Costa Rica, however, a decline in competitiveness due to high production costs has seen some producing companies close their tilapia operations. Meanwhile, fish farmers are focusing their efforts on supplying the local market and are working together to improve processing capacity at the industry level.

Trade and markets

The US tilapia market has been facing some significant challenges such as logistical delays, high freight costs and raw material shortages. Chinese producers have full orders and in some cases cannot meet growing demand, a situation that has been compounded by the shutdown of some factories due to Delta variant outbreaks. In this environment, some suppliers are focusing on the Chinese domestic market which seems more attractive.

According to the National Oceanic and Atmospheric Administration (NOAA), total US tilapia imports during the first half of 2021 dropped 11.4 percent in terms of volume compared to the same
period of the previous year, to 81,224 tonnes, while value declined 6.3 percent to USD 281.3 million. China, the main supplier, exported 50,556 tonnes worth USD 133 million to the US, respective decreases of 19.4 percent and 18.4 percent compared with the first six months of 2020. This presented an opportunity to Latin American suppliers such as Honduras, Colombia, Mexico and Brazil, which increased their shipments of tilapia to this market.

Brazilian aquaculture exports grew by a remarkable 83 percent during the second quarter of 2021 compared to the same period in 2020. The US is the main market for Brazilian tilapia, followed by China and Chile. Cumulative Brazilian tilapia exports in the first half of 2021 came to USD 7.2 million (+35 percent compared with 2020).

While tilapia has benefitted from its position as a cheaper retail seafood option amidst the broader shift in consumer behaviour during the pandemic, in many markets it is now increasingly being marketed as a premium product with sustainability credentials. In the US, Latin American fresh tilapia competes with Chinese frozen tilapia only to a limited extent, with fresh product from Latin America commanding a far higher price than the frozen product. The same tilapia companies are now actively targeting European consumers with a similar product, bolstered by Aquaculture Stewardship Council (ASC) certification. This is an approach that differs markedly with the high-volume, low-priced strategy that has so far failed to establish the species in this lucrative market. In Colombia, the Colombian Federation of Aquaculture (FEDEACUA) and the foreign trade promotion agency (PROCOLOMBIA) have launched a new quality and sustainability label for the aquaculture sector to generate new export opportunities in both North America and Europe.

Prices

In China, production issues and demand from the domestic market is helping to push prices up. Live tilapia (Guangdong) of size 300-500 g was selling for CNY 7.65 (USD 1.19) per kg in September 2021, compared with CNY 5.78 (USD 0.90) per kg in the same month the previous year. US import prices for frozen fillets and fresh fillets were up 8 and 10 percent respectively over the same time frame.

Outlook

Chinese production is expected to be higher in the second half of 2021, but prices are forecast to remain firm. The domestic market will remain the focus for now, but some relief from duties and logistical challenges may be on the horizon for exporters targeting the US. The current US administration will reopen talks with China to try and resolve ongoing trade issues: the tariffs currently imposed on USD 350 billion worth of Chinese goods will remain in place for the time being, but the authorities intend to reopen the door for US companies to apply for exemptions from the current tariff regime. Even with a resumption of normal US-China trade, however, Latin American producers can be expected to continue gaining market shares.

Pangasius

The volume of pangasius trade has dipped considerably, as restrictions on people’s movement and factory capacity have been introduced in Viet Nam, by far the largest producer and exporter of pangasius. The overall value of trade has not been as heavily impacted, largely due to increased prices, especially in the US. The disruptions being experienced are likely to have a knock-on effect on supply in 2022, with the overall situation remaining difficult for farmers and processors alike.

Production

Viet Nam, by far the main global producer of pangasius, has seen production and processing severely restricted by COVID-19 regulations. Cases of COVID-19 in the country began rising in July 2021, prompting the government to enforce strict measures. Individuals have been largely prevented from travelling between provinces since the end of May 2021, restricting labour force flows. Around half of the pangasius processing factories in the country were expected to remain closed in the second half of the year. Those that are still operating are doing so at far below normal capacity, and with difficult conditions for workers, which include requirements for them to remain within the premises at all times.

Hatchery activity in Viet Nam was also hampered by the government-imposed restrictions, leaving a gap of several months in fry production. As such, the negative production outlook is unlikely to improve in the near future, as there will not be sufficient fingerlings available for restocking at least until early 2022.

Global production of pangasius and catfish is expected to fall by 8 percent between 2020 and 2021. This is largely due to lower Vietnamese production which is expected to amount to 1,200,000 tonnes in 2021, down from 1,600,000 tonnes in 2020. Production in other countries is generally destined for domestic consumption and is unlikely to see significant
changes between 2020 and 2021. All three of the main producers in this category are expected to see increases in volume, with Indian production rising to 600,000 tonnes (+4 percent), Bangladesh to 490,000 tonnes (+2 percent) and Indonesia to 450,000 tonnes (+6 percent).

**Trade and markets**

The overall volume of trade has fallen significantly in the second half of 2021 due to disruptions to the Vietnamese industry. The volume of Viet Nam’s exports halved from 70,000 tonnes in June 2021 to 35,000 tonnes in September 2021. The continued high costs of freight are inevitably disrupting exporters’ margins, with 40-foot containers from East Asia to Northern Europe averaging 14,400 USD. In the previous year, prices were closer to 2,000 USD. Similarly, the average freight cost between East Asia and North America (west coast) has increased more than four-fold, from 4,000 USD in October 2020 to 18,000 USD in October 2021.

There is still strong demand for pangasius in the US market, as reflected by the rapidly rising prices that were seen as supply was reduced. Importers experienced challenges with securing new orders, as processors and exporters attempted to cover existing backlog with available supplies. The US Department of Commerce (DOC) recently announced the preliminary results of the 17th period of review of ‘anti-dumping’ duties applied to Vietnamese pangasius. There are few proposed changes, with the majority of the 35 companies examined expected to continue paying 2.39 USD per kg on exports. Certain individual companies have been given rates varying between 1.94 USD per kg and 3.87 USD per kg. The revised tariffs, which are subject to appeal, are due to come into effect in January 2022, but are almost identical to previous years.

China has seen a significant fall in imports of pangasius, with volumes falling by 4,500 tonnes (-30 percent) month on month between June and July 2021. While it was previously the destination for 40 percent of global imports by volume, this now stands at 30 percent. There have been tighter controls on fish and fish products imported at a time of increased mistrust related to COVID-19 on packaging.

**Prices**

By October 2021, Vietnamese farmgate prices had risen very slightly to around 22,500 VND (USD 0.96) per kg of fish between 1-1.2kg. This equates to very little margin for farmers, who are also faced with reduced volume of demand from processors and increased feeding costs.

On the export side, falling volumes have been accompanied by rising prices across the board for whatever supply is available. While export prices to the US for Vietnamese frozen fillets were around 2.90 USD per kg in the first quarter of 2021, this figure rose to 3.70 USD per kg in September. Similarly, exports to China saw prices rise from 1.90 USD per kg in the first quarter of 2021 to 2.00 USD per kg in September. Relatively new markets, such as Brazil, Mexico and the UK all saw similar increases, with export prices ranging from 2.40 USD per kg to 3.40 USD per kg.

**Outlook**

The ripple effect of restrictions in Viet Nam will likely continue to keep global supply of pangasius low in the first quarter of 2022. The rising prices for pangasius in major markets are a direct result of continuous strong demand in final markets, reduced supply and increased costs, especially the cost of freight. Currently farm supply exceeds processing demand, and so the higher export prices have yet to bring any price increase for farmers, who are also facing increased costs due to higher biomass in their ponds. However, if processing capacity returns in early 2022 at a time when ponds are largely emptied of harvest size fish, we could see higher prices incentivising increased stocking. This would lead the industry to enter the boom phase of the boom and bust cycle that was seen repeated a number of times in recent years.

*Source: FAO Globefish*
DR ASBJØRN WARVIK RØRTVEIT
Director, Southeast Asia, Norwegian Seafood Council

For readers who may not be familiar with the Norwegian Seafood Council (NSC), could you give some background on its mandate and activities? How does the NSC differ from other organisations such as the Norwegian Seafood Association and the Norwegian Seafood Federation?

NSC is a public company owned by the Ministry of Trade, Industry and Fisheries. It works together with the Norwegian fisheries and aquaculture industry to develop markets for Norwegian seafood, representing the country’s seafood exporters and the seafood industry. The main goal is to increase demand and knowledge about Norwegian seafood through market insights, marketing, communication and PR activities. The Council also acts as an advisor for the Ministry of Trade, Industry and Fisheries in affairs concerning seafood exports and trade. However in contrast to the Norwegian Seafood Federation and similar interest organisations, the Norwegian Seafood Council does not have a political role.

Consumers can identify us from the trademark ‘Seafood from Norway’ which is a symbol of origin for Norwegian seafood caught or raised in the cold clear waters of the Scandinavian country.

Moving on to trade, and judging from its performance over the years, the NSC seems to be one of the most successful trade promotion bodies for seafood in the world. In your opinion, what are the key organisational factors that have played a part in that success?

NSC’s strategy is to work together with Norwegian seafood exporters and partner up to establish strong relationships in the local markets. Over the years, we have had successful campaigns together with local retail and foodservice partners in many markets. In Thailand, as an example, we are working with partners such as Thammachart Seafood, Central Food Retail, major Japanese restaurants i.e. ZEN, Sushi Den, etc., and quick-commerce platforms i.e. Grab and LINE Man. We have also partnered with media through advertorials such as The Cloud, and health-conscious influencers such as Phol Foodmafia and Bebe to promote the ‘Seafood from Norway’ trademark, and to build trust and connect with local audiences. The ‘Seafood From Norway’ trademark is an important element in this work, and as it has become well known among consumers in many markets, partners are eager to sign licence agreements.

In 2020 and much of 2021, faced with the unprecedented effects of the pandemic on the HORECA sector as well as the closure of international borders, what was the NSC’s...
response and how did the organisation continue to support the fishing and aquaculture sectors in Norway for both domestic and international markets?

The NSC’s stance is to offer assurance of the Norwegian seafood industry’s commitment in providing safe, sustainable, and nutritious food amid the COVID-19 outbreak. Norway is currently undertaking strict measures to limit the spread of the disease while also ensuring that the value chain supporting food production and delivery remains a critical service to society so that everyone can have access to quality food. Norway exports 95% of its seafood, and many countries, including Thailand where our Southeast Asia office is sited, depend on Norwegian seafood to meet local demand. The NSC has been important for the industry to ensure relevant communication in relation to the COVID-19 outbreak, and people’s increased focus on food safety. Furthermore, we have actively evaluated and adapted marketing strategies and budgets in a fast-changing environment, to simulate demand as efficiently as possible.

Taking Thailand as an example, salmon consumption among Thai customers has climbed by 10-15% in 2021, according to import data. Obviously, this did not happen by accident. The NSC has been active in both educating the market and making it easier for people to find goods. In both cases, by working together with strong partners who could help connect with a local audience.

What are the highlights from the NSC’s market analysis regarding any new trends arising from the pandemic globally, and specifically in Asia?

The COVID-19 pandemic has obviously impacted consumer behavior, as reflected in the rising popularity of home-cooking and ready-to-eat meals as a way for consumers to care for their health and food safety, and convenience during the lockdown. The demand for high-quality food products in which a country of origin serves as a source of trust has pushed Norwegian salmon to become the top-of-mind food choice for Thai consumers, on top of its already strong popularity in the market due to the high density of Japanese restaurants in urban areas. Online and quick-commerce platforms also enable consumers to access Norwegian salmon products easier and faster. Based on the import numbers, I estimate that consumption among Thai consumers has increased by 10-15%.

Renate Larsen, CEO of the NSC, was reported to have said that “everything is pointing towards 2021 being a record year for Norwegian seafood exports” and that “the strongest growth in exports was to Asia...” Taking the example of China, which is Norway’s most important trading partner in Asia, what has the export performance been like this year for Norwegian seafood in China?

In the first 11 months of 2021, the total seafood export volume to China reached 159,490 tonnes, a 28% increase from the same period the previous year. The value was approximately 4.6 billion NOK, a 29% increase. The two species that showed the largest increases were salmon and mackerel. Salmon increased by 52% in volume and 76% in value, while mackerel increased by 75% in volume and 67% in value.

In the past, Norwegian seafood products were primarily consumed in the HORECA sector; however in recent years, retail stores and e-commerce have gained strong momentum. In most large retail chains and online platforms, Chinese consumers can easily find Norwegian salmon, cod, and mackerel.

Seafood from Norway are also highlighted in popular SNS sites such as Weibo and Douyin (Tiktok). And in Xiachufang, the most popular recipe application in China, there are many inspirations for cooking Norwegian seafood.

The trademark is a vital part of the Norwegian seafood marketing campaign
In your presentation entitled “Salmon Revolution in Asia” at the Salmon e-Dialogue webinar in July 2021 which was organised by INFOFISH, you spoke about how the Asian market for salmon is continuing to expand and how the NSC is working with stakeholders in the region. For readers who were unable to participate in the webinar, could you highlight some of the main points from your presentation?

In my presentation at the Salmon e-Dialogue webinar I pointed out that I believe that Southeast Asia will be the highest growth market for Norwegian salmon in the next years. My analysis is based on six factors: the rising economy, the growth of the Japanese sushi trend, positive consumer perception of Norwegian salmon, salmon becoming the most important product on the fish counter, and last but not least the fast-growing trend in online sales combined with advanced delivery service.

Norwegian salmon and to a lesser extent, cod, are well known in Asia due to coherent strategic marketing. Does the NSC have similar plans for mackerel, trout, and herring?

Yes, for fjord trout, we have educated the market that despite the remarkable similarity to Norwegian salmon, there is a difference. Norwegian saba is another promising seafood product that we are trying to promote – this fish is used widely in Japanese restaurants and has gained more popularity because of its juicy taste and nutritious quality. Currently, we are also planning to promote Norwegian shellfish targeting high-end restaurants in Bangkok as the product has not yet established a steady presence in the market, which makes it difficult for restaurants to import due to the small orders.

Norway has many seafood products to offer. What we have promoted in Thailand is just the tip of the iceberg. We aim to introduce new products to our potential retail/restaurant partners, get them to see the quality and the taste, and hopefully to create new demand among their customers.

And on a final note, what are your predictions for Norwegian seafood in 2022 in Asia?

Current consumer trends in Thailand and around the world show a noticeable move from offline to online channels, and ordering food via online channels and food delivery platforms is gaining more momentum. Home-cooking and ready-to-eat trends will continue into 2022, and healthy and sustainable food choices will continue to be in high demand. Meanwhile the NSC plans to conduct various online marketing campaigns and marketing activities as well as to strengthen relationships with retail partners to help uplift the food industry and stimulate consumer demand.
As an opener for readers who may not be familiar with the Pew Charitable Trusts, could you explain a little about its background, what it seeks to achieve and its areas of focus?

The Pew Charitable Trusts is a global nongovernmental organisation with the mission to serve the public interest by improving public policies. These include those related to international fisheries, where Pew works to secure comprehensive management to support healthy, resilient marine ecosystems. As a principal associate with the international fisheries project, I work on high seas longline fishing reform by advocating for improved monitoring and transshipment regulation. This includes advocacy efforts with countries, regional fisheries management organisations, and United Nations agencies to ensure the sustainability of global fisheries.

Much of your work with the Pew Charitable Trusts under the international fisheries programme seems to be linked to transhipment best practices and eliminating (or at least, minimising) the occurrence of illegal, unreported and unregulated (IUU) fishing, particularly in tuna fisheries. This, and also in light of your Fijian heritage, perhaps we could start with your thoughts on tuna fisheries in the Pacific – e.g. its socio-economic importance to Pacific Island communities; current catch and export performance, and challenges faced.

The Western and Central Pacific is home to the world’s largest tuna fisheries, worth US$21 billion, according to the latest figures. A significant portion of this is caught by foreign flagged vessels who pay fishing access fees to Pacific Island countries. Due to their importance both globally and locally to economies in the Pacific, tuna fisheries are therefore an important resource to sustainably manage to ensure their long-term health. Sustainably managing fisheries is complex, but some of the issues affecting management include:

- Impacts of climate change - A new study just published in Nature.com reports that climate change is forcing tuna out from the exclusive economic zones (EEZs) of the Pacific islands into the high seas. This could mean less oversight, which exacerbates illegal fishing, in addition to reduced economic benefits for these countries.
- Illegal transshipments – Transshipments usually involve the transfer of fish between vessels and are common practice globally, especially in the Pacific. These activities often take place on the high seas and outside the view and reach of authorities which can provide avenues for illicit activities.
- Delays in adopting harvest strategies – The Western and Central Pacific Fisheries Commission, the region’s fisheries management organisation (RFMO), once led in efforts to develop harvest strategies to create pre-agreed frameworks for making management decisions that would ensure the long-term sustainability of fisheries. WCPFC agreed to a workplan but has repeatedly delayed decisions related to harvest strategies and has now fallen behind all other tuna RFMOs in this process.
- Inconsistent port controls - The region is home to a number of key ports visited by large numbers of foreign flagged vessels, which give products access to international market. Along with the implementation of other monitoring, control, and surveillance (MCS) measures, it is critical that Pacific port States apply robust port State measures to avoid illegally caught fish being landed or transshipped in port, but standards differ greatly and more information exchange on high-risk vessels is needed.
- Unclear vessel ownership – Fishing vessel ownership is, at times, opaque in nature which makes it difficult to see who actually profits off
the fish on that vessel. It also means that when a vessel is prosecuted for fisheries violations, any punishments fall unequally on the captain and crew instead of the beneficial owners. It is therefore useful for flag states to collect more information on the beneficial owners of fishing vessels.

Elaborating further on illegal fishing, regional fisheries management organisations (RFMOs) have suspended the requirement for independent observers to be onboard vessels fishing in their waters due to COVID-19. What are some key recommendations that you/Pew could suggest that might be useful for them, such as electronic monitoring (EM), in order to gather valid data on harvesting and crew safety at sea?

The observer suspension due to COVID restrictions, while understandable, does mean that independent data on catch, bycatch, fishing effort, and compliance with conservation and management measures will go uncollected, meaning less key scientific and enforcement data and an increased chance that illegal fishing activity will go undetected.

It is now clearer than ever that RFMOs need to move quickly to implement electronic monitoring (EM) programs. EM systems use cameras, gear sensors, and GPS to cost-effectively capture high-quality data, which allows remote review of fishing activity with minimal human contact and leads to more accurate self-reporting by fishing vessels. Pew recently commissioned a report—Roadmap for Electronic Monitoring in RFMOs— which outlines how organisations like RFMOs can implement an EM programme where there is a wide range of vessels, gears, fishing locations, catch compositions, and international stakeholders.

WCPOC can develop well-designed EM programmes to scale up coverage of their fisheries, increase transparency on the high seas, and be better prepared for future circumstances that might limit onboard observation. While work on EM has started within the Commission, it has faced delays in recent years. Countries should refocus on making progress in 2022, especially as the COVID pandemic continues to prevent observers from being on board fishing vessels.

Will the ongoing difficulties with having on-board observers affect the future of current or potential Marine Stewardship Council and other internationally certified tropical tuna fisheries in Pacific waters?

The Marine Stewardship Council (MSC) criteria require that there is sufficient information available to measure the sustainability of fisheries that are certified or are seeking to be certified. Many of the currently certified fisheries in the Pacific rely on independent observer coverage to meet that requirement, so without observers onboard, they may have difficulty achieving passing scores in the future.

The issues again highlight the need for RFMOs and their members to commit to quickly implementing electronic monitoring on their fleets, as cameras and sensors could continue to collect key scientific and compliance data during the current COVID pandemic, helping certified fisheries continue to meet MSC requirements.

At the 2018 meeting of FAO’s Committee on Fisheries (COFI), members called for studies to support the development of guidelines on transshipment best practices. The need for such guidelines was reiterated in an article that you subsequently wrote entitled “The importance of global transhipment guidelines: An opportunity for Pacific Island countries”. Could you give us the gist of the discussion points contained in that article? What has been the progress so far in the formulation of these guidelines?

COFI provides direction on the world’s fisheries and aquaculture industry and has been building towards creating international transhipment guidelines since 2016, when its members specifically requested FAO begin work on transhipment. Following several high-level meetings, expert workshops and in-country research projects, the FAO presented a report on this matter to members during the COFI biennial meeting in February 2021. At that meeting, members supported the development of international transhipment guidelines to help RFMOs and governments manage the practice in a more coordinated, harmonised, and successful way.
My article provided an overview of the current transshipment monitoring and management situation in the Pacific and described ways Pacific Island countries can get involved in the FAO transshipment guidelines development process. Considering that the number of transshipments in the Pacific continues to increase, it is very important that Pacific island countries are represented in these FAO discussions, including at the formal consultation that will occur early in 2022 to finalise and adopt the text of the guidelines, and at the annual COFI meeting in September 2022, where final guidelines will be presented for endorsement.

Linking this question to Pew’s work in reforming marine fisheries management, why do harvest strategies matter, and is there a relevant strategy framework in place for tuna stocks in the Pacific Islands region?

Seven years ago, WCPFC member countries fishing in the Pacific agreed to implement harvest strategies for multiple fish stocks. These are pre-agreed frameworks for making fisheries management decisions, such as setting catch limits. Akin to setting the rules before vessels go fishing, they shift the perspective from short-term, reactive decision-making to a longer-term vision and set of objectives. The result is better for the fish, for industries, and for countries that rely on healthy fish populations, a fact acknowledged by both WCPFC and market stakeholders.

At the WCPFC annual Commission meetings which concluded in December 2021, members agreed to schedule a dedicated meeting between scientists, managers and other stakeholders on the development of harvest strategies. However, due to slow progress to date, the updated timelines are unlikely to satisfy the requirements of the MSC for at least two of the four key tuna species – bigeye and yellowfin. The MSC stated in July that fisheries would need to have harvest strategies in place by June 2023 to maintain the blue tick certification.

Moving to the other end of the supply chain, for buyers who want to be assured that they are purchasing sustainable and traceable seafood, could you suggest any toolkits they could use, or international collaborative platforms they could join?

Seafood buyers - and consumers - increasingly want assurances that their seafood is sustainably and legally sourced and that people have not been harmed or treated unfairly at any point in the catching or processing of it. Currently, the seafood industry depends on third-party certifications and approvals to prove sustainability of their products to consumers. However, if governance is strengthened sufficiently, sustainability should be a given for any product, and would not need to be verified by third parties.

Stakeholders throughout the supply chain can be vital players in achieving this goal by ensuring that they only buy fish from vessels and fisheries complying with flag and port State requirements from individual governments and RFMOs. Pew works with a cross-section of market stakeholders - including processors, buyers, industry associations and coalitions - to increase support for better policies and critical reforms needed to ensure sustainable, verifiable, and transparent supply chains.

And on a final note, Target 14.4 (“to end overfishing, IUU fishing, and destructive fishing practices”) missed its deadline of 2020 but do you think that we are on track to realise its aims by 2030?

Most of the major threats to marine ecosystems and the sustainability of fisheries globally can be tackled with robust, science-based, and transparent fisheries governance. The practical tools are available to make the necessary management improvements, such as measures to prevent IUU fish reaching the supply chain, new technologies to achieve increased observer coverage and improved monitoring, control, and surveillance (MCS) more broadly, and harvest strategies to manage fisheries for the long term. But RFMOs and governments have a great deal of work to do to implement the necessary governance improvements in the coming years.
TRADE PROMOTION OFFICER

Working under the overall supervision of the Acting Director/Director, INFOFISH, the Trade Promotion Officer shall be responsible for the following:

- Monitor and review fishery trade in the Asia Pacific region and beyond;
- Collect and analyse price and market information on specific fishery products for the ‘INFOFISH Trade News’, a fortnightly bulletin;
- Attend to queries on supply, marketing and trade of fishery products worldwide;
- Work on identification and export promotion of fishery products from the region;
- Maintain regular contact with institutions, market news correspondents and organisations relevant to the fish marketing information network;
- Write and review articles pertaining to marketing and international trade of fishery products for the INFOFISH International magazine and other publications;
- Undertake other activities as assigned by the Supervisor or the Acting Director/Director

Qualifications:

- Post graduate degree from a reputable university in Fisheries / Fisheries Economics / Economics / Marketing / Trade/Business Management or related fields;
- Experience in international trade and marketing;
- Excellent writing and communication skills in English;
- National of a Member Country* of INFOFISH

Duty station

These positions are based in Kuala Lumpur, Malaysia. Applicants must be prepared to travel if required to do so.

Age limit

40 years; might be extended in the case of highly qualified and experienced candidates or government employees/nominees from Member Countries.

Emoluments

Salary will commensurate with qualifications/experience.

Applications stating the position applied for and containing full curriculum vitae and recent passport size photograph should be sent to the following, preferably through the INFOFISH National Liaison Office in each Member Country* of INFOFISH.

The Director
INFOFISH, 1st Floor, Wisma LKIM, Jalan Desaria, Pulau Meranti, 47120 Puchong, Selangor Darul Ehsan, Malaysia
Email: info@infofish.org

Closing date: 28 February 2022
for the receipt of application at INFOFISH.
Only short-listed candidates will be notified.

*Bangladesh, Cambodia, Fiji, Iran, Malaysia, Maldives, Pakistan, Papua New Guinea, Philippines, Solomon Islands, Sri Lanka and Thailand.

Please visit our website www.infofish.org for contact details of INFOFISH National Liaison Officers in the respective Member countries.
Tuna is extremely valuable to Pacific Island countries. In recent years, the annual catch of tuna in the western and central Pacific Ocean has been approximately 2.6 million metric tonnes per year, worth almost US$5 billion and representing over 50% of all the tuna landings in the world. Surprisingly, the amount of tuna captured in the Pacific Island region is over ten times the amount of fish from all the other types of fishing in the region combined.

Although tuna is captured by a variety of fishing techniques, the vast majority is taken by industrial-scale operations using either purse seine or longline gear.

### Gear type

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<tr>
<th>Gear type</th>
<th>Typical vessel that uses the gear</th>
<th>Schematic of the gear</th>
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<tbody>
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<td>Purse seine</td>
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### Tuna Transshipment in the Pacific

Transshipment is a legitimate practice in the tuna fishing industry. In a typical transshipment operation, a refrigerated carrier vessel collects catch from multiple fishing boats and carries it back to port. This practice enables fishing vessels to continue fishing, which reduces fuel costs for fishing vessels and gets the catch to port quicker.

There are two types of tuna transshipment in this region. In one type of operation the transshipment occurs in or near a port, normally under the authorisation, control, and inspection of the country where the port is located. In most Pacific Island countries, the staff of the fisheries department monitor the volumes and species composition of the catch being transferred.

The other form of transshipment in the region (which is far more problematic) is transshipment at sea, particularly in the high seas – which are ocean areas beyond the Exclusive Economic Zone of any country. In those areas the authorisation and controls over the transshipment are the responsibility of the country of registration of the concerned carrier vessel and fishing vessel. This type of transshipment is particularly common for longline vessels.

### Problems with Tuna Transshipment

It is generally known that the volumes and composition of the catch being transferred in high seas transshipment are not as rigorously monitored as that for in-port transshipment.

High seas transshipment at sea is widely recognised as one of the main ways that illegally caught fish finds its way to market. Poorly monitored high seas transshipments offer opportunities to hide both illegal catches and prohibited
fishing activities. The Food and Agriculture Organization of the United Nations has stated that in the absence of effective monitoring and control, transshipping poses a serious risk to fisheries by allowing the catching and landing of fish to go unregulated and unreported. Within the western and central Pacific Ocean, it has been estimated by a recent study that US$142 million per year of tuna and tuna-like products are involved in illegal, at-sea transshipment.

**THE WESTERN AND CENTRAL PACIFIC FISHERIES COMMISSION**

Tuna fishing in the central and western Pacific Ocean is regulated by both the countries in the region and the Western and Central Pacific Fisheries Commission (WCPFC). The Commission has a total of 42 Member Countries (including all independent Pacific Island countries), participating territories, and cooperating non-members. The WCPFC seeks to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks (i.e. tunas and billfish) in the western and central Pacific Ocean.

The Commission develops conservation and management measures that are binding on vessels that fish in the region. These are enforced in various ways, including by on-board observers, electronic vessel monitoring systems, at-sea boarding and inspection, and aerial surveillance.

The WCPFC has a role in regulating transshipment. Recognising that transshipment on the high seas could cause problems, the international agreement that established the WCPFC states: “In order to support efforts to ensure accurate reporting of catches, the members of the Commission shall encourage their fishing vessels, to the extent practicable, to conduct transshipment in port.” Recognising this point, the Commission made a rule in 2009 stipulating there shall be no transshipment on the high seas except where a Member Country has determined that it is impractical for a vessel – but the Commission did not define “impractical”, thereby creating a loophole.

**THE CURRENT SITUATION IN THE CENTRAL AND WESTERN PACIFIC**

Contrary to the Commission’s intentions and rules, the number of high seas transshipments in the western and central Pacific is actually increasing. Reports to the Commission indicate that such transshipments have increased from 544 operations in 2014 to 1,472 in 2019. It appears that high seas transshipments are becoming the norm, rather than the exception. This situation is not conducive to the long-term conservation and sustainable use of tuna resources in the region – a stated aim of the Commission.

**THE WAY AHEAD**

Recognising that poorly monitored high seas transshipments are a major factor in illegal tuna fishing in the region, there is a strong case for reforming such operations. There appear to be two possibilities for this:

- **Ban transshipment on the high seas and require any transshipment to take place in a port where it can be easily monitored; or**
- **Greatly improve the monitoring of high seas transshipment.**

The first possibility would certainly result in improved accountability and transparency of the tuna catches – but it would place additional costs on fishing vessels, such as extra distances to travel and port charges. This possibility would likely be opposed by the flag states of the transshipping vessels.

The second possibility for reforming high seas transshipment would be to have the observers onboard the carrier vessels produce detailed reports and have those reports sent in a timely manner directly to the Commission for analysis. This possibility is likely to be less of a burden on vessel operators – and hopefully would meet less opposition than simply banning high seas transshipment and forcing a major change in the way vessels operate.

What can the governments of Pacific Island countries do to promote the reform of high seas tuna transshipment? Through their voice in the Western and Central Pacific Fisheries Commission, they should further point out that poorly monitored high seas transshipment could threaten the benefits they receive from their tuna resources – and insist on closing this loophole that gives opportunities for illegal fishing.

"**HIGH SEAS TUNA TRANSSHIPMENT: THE NEED FOR REFORM**"

*is based on opinions collected from industry sources.*
THE POST-COVID BUSINESS ECOSYSTEM IN INDIAN FISHERIES: PROSPECTS AND STRATEGIES

By A Suresh and CN Ravishankar

Fisheries is the fastest growing primary sector in India. The entire fisheries value chain is labour intensive, with strong interconnecting linkages which exert a multiplier effect so as to enhance the income of the diverse stakeholders. This article examines the current business ecosystem for fisheries-based value chains in the country at this time, when the worst of the COVID-19 pandemic is deemed to be over. It then highlights several business development possibilities and proposes strategies for boosting entrepreneurship within this ecosystem.

Like other countries, India is slowly recovering from the ravages of the COVID-19 pandemic, moving into a period which is characterised by several challenges in generating employment and reviving the economy. In the first quarter of the financial year (FY) 2020-21 (April-June), the latter contracted by 24% and the unemployment rate surged to 23.5% by April 2020. Consequently, an important economic revival strategy during this post-COVID period is to develop entrepreneurship opportunities that absorb manpower and generate income, thereby boosting the aggregate demand. An important part of the strategy is also to build educated and skilled young human resources in the country. Fisheries in India is considered as a key sector that has the potential for entrepreneurship development. Against this background, this article examines the state of the business ecosystem in Indian fisheries and suggests a slew of measures for its improvement.

Further growth possible in the fisheries sector

India has rich and diverse fisheries resources ranging from deep seas to lakes, ponds, and rivers. The marine fisheries resources are spread along the coastline of more than 8,000 km, with an Exclusive Economic Zone (EEZ) of 2.02 million square km and a continental shelf area of 0.53 million square km.

In the past two decades, the annual growth of fish production exceeded 7%. In FY 2017-18, fisheries contributed INR 1,750 billion to the GDP (at current prices). The share of the fisheries sector in the economy increased from 0.40% in 1950-51 to 1.03% in 2017-18 (at current prices) while in terms of volume, the total fish production in the country rose from 0.75 million tonnes in 1950-51 to 14.2 million tonnes in FY 2019-20. The Gross Value Added accounts for about 6.6% of Agricultural GDP (CSO, 2020). One of the key factors that imparts vibrancy to the sector is the high demand for fish in both domestic and international markets.

Notwithstanding the output figures as mentioned above, the potential of fish production in India is higher, at about 22.3 million tonnes consisting of approximately 5.3 million tonnes of marine fish and 17 million tonnes of inland fish. Therefore during FY 2018-19, the harvest stands at 71% of marine and 58% of the inland fish production potential. During that period, the exports of marine products were about 1.4 million tonnes valued at US$6.73 billion (INR 47 thousand crores), accounting for 19% of total agricultural export revenue.

Business development prospects

In order to remain competitive in the globalised world, the fisheries sector has to adopt modern technologies along the value chain of both capture and culture fisheries. The potential newer technologies include mariculture (like cage culture of fish and other species), deep sea fishing, island fisheries, and culture of seaweeds, to mention a few. Recirculating Aquaculture Systems and Integrated Multitrophic Aquaculture have potential for income and employment generation. While these technologies are capital intensive, their utilisation does...
not disrupt the value chain nor displace the labour workforce in the fishing sector; on the other hand they help in creating newer job opportunities. Moving on to other sectors, ornamental fisheries is under-developed in India in terms of scale and geographical coverage, but is fast emerging as a promising business area. Meanwhile, recreational fishing (game fishing, aqua-tourism, agro-tourism etc) has the potential to drive tourism development.

**Employment opportunities in fishing**

Out of the total 164 thousand fishing vessels in India, about 43 thousand are mechanised and 26 thousand are motorised. The marine fishing sector in India employs about 927,000 active fishermen (Gol, 2016). Over the years, the policy has shifted towards sustainable and responsible fisheries. Some of the legislations in this regard require certification of the vessels at regular intervals for sea-worthiness and technological updates, usage of vessel safety measures, and adhering to strict regulations with regard to designs of craft and gear. Imparting skills in deep sea fishing has emerged as a major strategy to enhance fish production.

Fishing is an energy intensive activity, and attaining energy efficiency in fishing requires utilisation of alternative energy sources. Utilisation of solar energy at all the stages of the fish value chain is gaining currency and solar boats, solar fish driers and solar energy-based processing activities will gain more popularity in time to come. Coating fish vessels with nanotechnology-enabled materials can help reduce fouling and corrosion of fishing vessels and cage nets. These developments in fishing technology need a skilled labour force throughout the chain, and have the potential for employment and income generation.

**Fish marketing**

Marketing of capture fish is traditional in nature and complex in terms of institutional arrangements. The structure, conduct and performance of the value chain varies with products and regions. The fisheries sector has also seen the emergence of newer business models - online marketing, direct sales and marketing of value-added products. Several start-ups and business units have emerged in online fish marketing.

**Fish processing and value addition**

As of 2020, about 75% of the fisheries output is marketed fresh, 14% are frozen, and 4.2% cured. Traditional practices like curing and drying provide new opportunities for value addition, targeting mainly the domestic market, and also internationally. Besides these traditional methods, there is opportunity for product development and value addition, particularly for Ready to Eat/Ready to Cook (RTE/RTC) convenience products. Further, online social media platforms have popularised ethnic Indian recipes with a regional flavour catering to niche categories; they include fish/shrimp pickles, fish/shrimp dishes, marinated fish with Indian spices etc. The seafood sector also demands modern packaging technologies that ensure quality and aid the consumers to assess its quality easily. Some fish preparations such as surimi are the least exploited commercially.

**Wealth from waste**

The zero-waste approach visualises fuller utilisation of fish and promotes value addition of discards from processing, as they are organic in nature and serve as excellent raw material for agricultural, pharmaceutical / nutraceutical and industrial applications. About 70% of fishery raw material is discarded as waste in India. Entrepreneurship based on fish waste is an emerging area that could have several agricultural and pharmaceutical applications.

**Exports and foreign trade**

As of 2017-18, out of the total value of marine products exports of US$7.08 billion, $4.8 billion is accounted for by frozen shrimp. Export is a highly skill-oriented activity that requires adherence to strict quality and safety norms. In order to export to international markets, moving towards tertiary processing activities is necessary. The Union Government targets export revenue of about US$14 billion by 2024-25. Certification with regard to quality, food safety and environmental sustainability is a challenge and offers rich dividends in terms of potential economic gains and market accessibility. Certification and ensuring traceability warrant technological solutions and skill sets.

**Live fish transportation**

The demand for live fish species including crab and lobster, is on the increase both in domestic and international markets, which India cannot tap effectively due to lack of infrastructure facilities for transportation of live fish. Research in this direction is expected to overcome this constraint.

**Inputs and service delivery**

Inland fisheries as backyard and household enterprises and in water bodies including reservoirs, is on rise. This warrants supply of adequate numbers of fish fingerlings/larvae of the desired species/varieties as well as the appropriate feed; presently, the scarcity of these items is a major constraint. India imports the bulk of the fish feed that it needs for its aquaculture sector; in 2018-19, imports of prawn and shrimp feed were worth US$0.9 billion. Meanwhile, ornamental fish culture is gradually emerging in India as a business opportunity. Currently, India imports a significant share of ornamental fish fingerlings.
Extension services are also essential, mainly for aquaculture. The extension requirements for cage culture, reservoir fisheries, river fisheries, brackishwater aquaculture, freshwater aquaculture, mussel culture, pearl culture, oyster culture, seaweed farming, recirculation aquaculture etc. are quite diverse and location-specific. The sector also needs improved credit and insurance delivery.

**Creating a business ecosystem**

To boost the fisheries sector, the Government of India announced a comprehensive finance package of INR 2000 billion in 2020 under the Prime Minister’s Matsya Sampada Yojana (PMMSY) scheme, according to the Press Information Bureau. The main focus is to increase fish production by an additional seven million tonnes within a period of five years. The major strategies include:

- **Infrastructure development that can enable business**
  
  The Union and State governments have made considerable investments in developing infrastructure in fisheries, targeting development of harbours and landing centres with modern facilities, establishing cold storage facilities, as well as modernising fish markets, facilities for quality checking and supply of ice and other storage materials. Development of the overhead capital could attract private investment.

- **Reforming the fish marketing system**
  
  Currently the fish pricing system is highly skewed in favour of the traders and auctioneers. There are several unhealthy practices, resulting in lower shares for the fishermen in the price that the consumer pays for fish. “Pricing the fish right” needs to be the motto. Every State needs to look into the prevailing practices and initiate measures to streamline them.

- **Ensuring credit flow to the fisheries sector**
  
  The institutional credit flow to the fisheries sector has increased several folds over a period of time. The tied credit-marketing system is common in fisheries. Fishermen avail loans from traders/auctioneers, which become a binding commitment on the part of the fishermen. The credit instruments for the fisheries sector need to be dove-tailed to its own specific requirements. One approach is by developing cooperatives that understand the nature of credit requirements in the sector.

- **Training facilities**
  
  The emerging business opportunities are more of knowledge and intensive skills training. Development of training facilities by identifying resource centres and resource persons is essential to meet this requirement.

- **Business development support**
  
  The Union and State governments have initiated programmes to facilitate entrepreneurship development. Some of them include Agri-Business Incubation (ABI) centres, startups and forms of direct support. The ABI centres, which are supported by public sector institutions, handhold the emerging business units and help them to establish themselves. Financial support is given to such firms through venture capital, angel funding, and credit from banks at certain relaxed conditions. As of 2021 there were about 38,815 active startups, including both funded and bootstrapped. Fisheries Departments, Universities and Institutions under the Indian Council of Agricultural Research (ICAR) assist by extending technical support in starting businesses and expanding them. Private sector support is also emerging in recent times.

**Conclusions**

Fisheries is considered as a sunrise sector in India due to the high growth that it has registered for quite some time. During the post-COVID period, the economic revival strategy needs to promote entrepreneurship and business so as to absorb labour and raise aggregate demand, and so that fisheries remains an attractive proposition. The sector offers excellent business opportunities in its entire value chain. The demand for fish and fish products is on the increase in India, and it is expected to continue to be so in the near future too. The export demand also is anticipated to be robust during the post-COVID recovery phase. With adequate technical, financial and business support, the fisheries sector has the potential to generate substantial employment and income to overcome the disruptions of the COVID-19 period and achieve inclusive economic growth.

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Dr CN Ravishankar is Director, Indian Council of Agricultural Research-Central Institute of Fisheries Technology (ICAR-CIFT), Kochi, Kerala, India, having joined the Institute in 1991. He had earlier headed the Fish Processing Division. His areas of specialisation include fish processing and packaging technologies and he has developed, popularised and transferred many technologies to the seafood industry.
Potential leader in global tilapia production

Brazil - At this time, only Brazil has the potential to produce more tilapia than China, said Prof Kevin Fitzsimmons, President of the World Aquaculture Society and one of the world’s leading experts in the field. He noted that China has really not increased its production much in recent years as compared to Brazil’s output which has continued to increase significantly even through the pandemic.

Prof Fitzsimmons presented his observations at the virtual International Technical Seminar on Tilapia Health on 1-3 December 2021, which was organised by the FAO with technical support from INFOFISH. According to his latest estimates, Brazil produced around 600 000 tonnes of tilapia in 2020 (from a negligible volume 20 years ago), while China’s output over the last decade has been stagnant or declining. Currently the latter country produces around 1.8 million tonnes per year.

He felt that one reason for the stagnation in China is due to the escalating costs related to land, labour, and environmental regulations, particularly in the warmer southern part of the country where most of the production is from. He added that China appears to be reaching the peak in tilapia production and may not increase much anymore.

Oil rig aquaculture

USA – A press release by Innovasea on 14 December announced that it has helped the Gulf Offshore Research Institute (GORI) to secure a US$100 000 federal grant to continue its plan to repurpose Station Padre, a defunct oil rig in the Gulf of Mexico for aquaculture. The grant money will go toward preliminary

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design of the net pen system and a more in-depth financial analysis of the overall project, both of which will be performed by Innovasea. It will also fund a species study by the Rosenstiel School of Marina and Atmospheric Science at the University of Miami and research into the various permits that will be required to proceed with the project.

“This is a creative project that could potentially pave the way for the reuse of abandoned oil platforms and help spur offshore aquaculture in the Gulf of Mexico,” said David Kelly, CEO of Innovasea. “Rather than spending millions of dollars to dismantle these pieces of ocean infrastructure – and disturb the ecosystems that have sprung up around them naturally in the process – it makes sense to explore productive new uses for them like offshore aquaculture.”

GORI is a not-for-profit corporation engaged in the research of offshore platforms in the Gulf of Mexico and how they can be repurposed once they are no longer producing oil and gas. Scientists have pointed out the rich biodiversity that builds up around the steel supports buried in the seabed and it is thought that these platforms could be converted to artificial reefs or other marine-related uses such as offshore farming.

**Committee proposes European eco-label**

**EU** – At its plenary session on 1-2 December 2021, the European Committee of the Regions (CoR) reiterated its earlier proposal for an European eco-label for aquaculture products. Among other things, Committee Member States asked for a clear definition of the term ‘sustainable aquaculture’, specific guidelines for the sustainable development of aquaculture and a detailed EU action plan for the sector. The European Commission was asked to submit a proposal to Member States on how local and regional authorities should be involved in identifying, developing, planning and managing blue economy policies in order to strengthen dynamic blue economy ecosystems.

On the financial front, EU local leaders reiterated the call to use 10% of the budget from the current Framework Programme for Research and Innovation on marine and maritime objectives. The Committee welcomed the BluelInvest platform but stressed that aquaculture has difficulties benefiting from EU funds and called for a review of the current procedures.

The CoR also called for a one-stop-shop for aquaculture licenses, as well as training modules for local authorities on EU permit granting in order to speed up business development and compliance with EU rules. Currently, the aquaculture sector in Europe is hampered by complicated authorisation procedures and limited access to waters.

**New shrimp farming project**

**Oman** – As reported in the Times of Oman, a 500 hectare shrimp farming project with a total cost of US$52 million (OMR 20 million) has been launched to achieve economic diversification. This is one of several fisheries projects that aims to contribute towards achieving the objectives of the Economic Diversification and Financial Sustainability priority under the 10th Five-Year Development Plan (2021-2025).

Sited in the Qurrón area in the Wilayat of Jalan Bani Bu Hassan, South Al Sharqiyah Governorate, the project has an expected production capacity of 2 100 tonnes by 2022 and it is expected that production capacity will reach 4 600 tonnes per year by 2023.

**Consortium combines technologies to stop IUU fishing**

**EU** – The Copernicus Blue project is a consortium of three companies - Lelieur BV (Belgium), AnsuR (Norway) and Vake (Norway) – working together to deliver near real-time IUU vessel detections. Automated ship detection algorithms in optical satellite imagery are used to generate real-time alerts, triggering drone response and providing accurate deployment direction to marine patrols. At the same time, high precision video is captured from drones, and the footage can be used to identify illegal activity such as banned fishing techniques to provide undeniable proof for prosecution. Once identified, the vessel details will be confirmed and linked to known IUU vessel databases. On identification, a suspect vessel will be requested to provide visual confirmation of onboard activities via ASIGN, a network agnostic smartphone application used to collect and communicate geo-referenced photos and video clips. This project

Small-scale fishers in Oman

Credit: The Times of Oman
has been made possible by PARSEC, a business accelerator made up of nine partners from seven European countries.

FIA-PNG adopted GDST traceability standards

Papua New Guinea - The Fishing Industry Association of Papua New Guinea (FIA PNG) reported that it has adopted the Global Dialogue on Seafood Traceability (GDST) standards for responsible tuna sourcing. FIA-PNG expects that the adoption of the GDST standards across tuna supply chains will benefit the industry globally. Since 2011, FIA-PNG has adopted and implemented the Fisheries Information Management System (iFIMS) platform that allows stakeholders in the Pacific access to real-time information across the tuna supply value chain which is based on e-reporting. The President and Chairman of FIA-PNG said that the members have also made their membership public by formally adopting the GDST standards since their release in March 2020, for their individual fishing and processing companies. He further added that the FIA-PNG members have been using the integrated Fisheries Information Management System (iFIMS) since 2010 to track and trace their tuna and related products in PNG, and which has nearly all of the minimum key data elements as required in the GDST standards.

Hilsa fishing ban ended with record spawning

Bangladesh – Stocks of hilsa, which contributes more than 12% of the fish production in Bangladesh, have rebounded by nearly 160% in the last 15 years due to the conservation method implemented by the government. This includes annual bans on catching broodfish and juveniles as well as selling, handling and transportation of the fish. The most recent ban ended on October 25 and according to a report by The Daily Star, a total of 51.7% of mother hilsa have laid eggs in the rivers and estuaries of the country, the highest ever figure recorded thus far. Anisur Rahman, Chief Scientific Officer of the Bangladesh Fisheries Research Institute,
said “However, you have to let these eggs grow into full-size hilsa. For this, it is necessary to implement a 60-day ban on fishing in hilsa sanctuaries and a 65-day ban in sea areas”.

**Blue Prosperity program launched**

**Fiji** - The Waitt Institute (USA) reports that it has formalised a partnership with Fiji to implement 30% protection of Fiji’s waters from 0-200 nautical miles and support ocean management in three core areas; Marine Spatial Planning, Blue Economy, and Sustainable Fisheries. This 5+ year Blue Prosperity program will be led by the Fijian Government and seeks to assist the country’s vision to sustainably manage 100% of its ocean and marine resources while implementing its global leadership commitments to protect 30% by 2030. The Blue Prosperity program will align with and learn from existing ocean management efforts. The program will be science-based, collaborative, and consultative, with input from government agencies, civil society, stakeholders, NGOs, community groups, ocean experts, and individuals.

The MOU signing launches a 6-month work planning process with government agencies to determine key goals, objectives, and collaborators. Upon conclusion of the work planning phase, the Blue Prosperity program will begin assessments and consultations to ultimately create a legally-binding marine spatial plan, promote economic growth, and support Fiji’s efforts to strengthen sustainable fisheries management. The Waitt Institute is the founding member and organising body of the Blue Prosperity Coalition, which currently has Blue Prosperity partnerships with the Azores, Barbuda, Bermuda, Curaçao, the Federated States of Micronesia, the Maldives, Samoa, and Tonga.

**Large tuna company FCF joins GDST**

**Taiwan** - Tuna giant FCF Co., Ltd. (FCF), which owns more than 30 subsidiaries, fishing bases, and shipping agents around the world, has joined the Global Dialogue on Seafood Traceability (GDST). The company is confident that by adopting GDST 1.0 Standards as well as the Key Data Elements (KDEs) for digital traceability for seafood supply chains, end-market users will be assured that its products are legally sourced.

The Global Dialogue on Seafood Traceability (GDST) is an international platform established to advance a unified framework for interoperable and verifiable seafood traceability. It brings together more than eighty companies...
from around the globe and across different parts of the seafood supply chain. In March 2020, after a multi-year industry-led drafting process, the GDST released the first-ever global standard (GDST 1.0) governing information content and data formats specifically for seafood traceability systems.

Lifting of ban on Mexican wild caught shrimp

US - According to the Mexican government and the Sustainable Fisheries Partnership, the US is lifting its ban on wild-caught shrimp from the country. In a press release and video, Mexico’s Secretary of Agriculture and Rural Development and National Commission of Aquaculture and Fishing (CONAPESCA) said that they had received confirmation from the US that the ban will be removed.

The Mexican government had initiated political negotiations with the US and introduced an official plan of action for the conservation of sea turtles to a US contingent of diplomats in August 2021. That plan included training on TED installation, their use, and greater enforcement efforts. In its press release, the Mexican government said that its programme to reduce the incidental capture of sea turtles with the use of sea turtle-excluder devices (TEDs) in its shrimp fisheries, is now comparable to the US programme.

Request to join the Fisheries Transparency Initiative

Madagascar - A government action plan, supported by the World Bank under its SWIOFish2 project, aims to improve the sustainability of the country’s fisheries, and tackle illegal, unreported and unregulated (IUU) fishing. However, efforts to support sustainability are hindered by a lack of publicly available information on fisheries such as data on licences granted to fishing companies, the conditions of international fisheries agreements and the status of fish stocks and catches. This kind of information is essential to inform ocean management that protects marine life, safeguards food security and ensures a sustainable and equitable ocean economy.

In a related development, Madagascar’s Ministry of Fisheries and the Blue Economy recently announced that it has officially requested to join the Fisheries Transparency Initiative (FiTI), a global transparency standard which aims to help coastal countries increase the credibility and quality of national fisheries information. The Ministry said that it is a major step towards the preservation, management and development of sustainable fisheries for future generations. Madagascar’s small-scale fisheries support the food security and livelihoods of millions but the sector is challenged by unprecedented degradation due to climate change and overfishing.

Saudi Arabia- MoE launches Regional Center for Sustainable Development of Fisheries

The National Program for the Development of the Fisheries Sector, an affiliate of the Ministry of Environment, Water and Agriculture, has launched the Regional Center for Sustainable Development of Fisheries. The Program focuses on research in the fisheries sector and aquaculture related to the health of animals and aquatic organisms and the management of fisheries, in addition to the protection of local marine resources.

Dr. Ali Al-Shaikhi, CEO of the National Fisheries Development Program, said that the ambitious goals set by the Kingdom’s Vision 2030, which include providing seafood with a high nutritional value, reducing dependence on imported food products, allocating job opportunities,
and supporting a sustainable future by preserving our natural resources for future generations, call for extensive and continuous research in the fields of aquaculture, fisheries management, marine environment, and biodiversity, in addition to understanding the impact of climate change on these resources.

**MARKETING**

**Ministry launches websites to promote fishery products**

*Indonesia* - In November 2021, the Indonesian Ministry of Marine Affairs and Fisheries launched two websites - *Indonesia Seafood* and *Indonesian Shrimp* - to promote its fishery products. Minister of Marine Affairs and Fisheries Sakti Wahyu Trenggono said that “Indonesia can play a bigger role in the global fishery product supply chain, given the increasing demand for seafood, with the consumer trends shifting toward a healthier lifestyle”.

He added that the Ministry has established various programs to encourage productivity and quality of domestic fishery products, such as increasing the non-tax state revenue of fishery resources through measurable catch policies.

The two sites were launched during a Buyer & Supplier Gathering event held by the Ministry in collaboration with the Swiss Import Promotion Program (SIPPO), UNIDO’s GQSP Indonesia SMART-Fish2, and the Indonesian Fishery Products Processing and Marketing Association (APSI).

**Rise in tuna exports to Australia**

*Vietnam* – According to Vietnam Association of Seafood Exporters and Producers (VASEP), tuna exports from Vietnam in the first 9-10 months of 2021 recorded increases for Australia (US$2.7 million; +103% from January to October). The main tuna products exported to the Australian market included canned or packaged tuna in oil, frozen tuna meat/fillets, and frozen tuna cuts. Vietnam is currently the third largest supplier to this market, accounting for 1.6% of the total value of Australia’s tuna imports.

**Genome-edited fish go on sale**

*Japan* – Genome-edited “Madai” red sea bream with thicker (20% more) meat has been produced by Kyoto-based Regional Fish Institute by inhibiting a protein that suppresses muscle growth. The company partnered with Kyoto University and Kindai University on genome editing, which was explained as being “a core technology which enables us to fast forward the current breeding process by promoting natural changes in DNA”. President Umekawa Tadanori said that the modified fish is the world’s first genome-edited animal-based food and that orders have already been received.

**Oyster analog enters market**

*US* - The Plant Based Seafood Co. has launched its new plant-based oyster analog for a fried oyster po’ boy sandwich at NOLA Poboy’s outlet in New Orleans, Louisiana. It was so successful that the restaurant owner is adding both the plant-based oyster analog and plant-based shrimp analog to its menu in 2022. The company will start shipping its Mind Blown Plant Based Oyster to foodservice companies in the second quarter of 2022.

The company’s co-founder and vice president of innovations, Shelly Van Cleve, said that oysters have been expensive and difficult to source, so offering a “clean-ingredient” plant-made fried oyster allows price and availability stabilization on restaurant menus. The plant-based oyster analog is also the company’s first foodservice offering. Its other analog products such as the Coconut Shrimp, can be found in retail stores.
WTO fisheries subsidies negotiations will continue in January

A press release on 10 December from the World Trade Organization (WTO) announced that fisheries subsidies negotiations aim to conclude as quickly as possible in the new year, said the chair of the negotiations, Ambassador Santiago Wills of Colombia. Consultations were held with members in the wake of the postponement of the 12th Ministerial Conference (30 November – 3 December) due to the rise of the Omicron variant of COVID-19. Despite the postponement, members have continued work on the draft agreement, with informal consultations being held on the issues of territoriality in Article 11.3(b) and special and differential treatment provisions under the overcapacity and overfishing disciplines in Article 5.4. Just days before the postponement, Ambassador Wills had submitted a draft agreement on fisheries subsidies for the consideration of ministers. The draft is based on the collective efforts of WTO members and represents for the chair the most likely way to build consensus after more than 20 years of negotiations, without undermining the sustainability objective.

Under the mandate from the WTO’s 11th Ministerial Conference held in Buenos Aires in 2017 and the UN SDG Target 14.6, negotiators have been given the task of securing agreement on disciplines to eliminate subsidies for illegal, unreported and unregulated fishing and to prohibit certain forms of fisheries subsidies that contribute to overcapacity and overfishing, with special and differential treatment being an integral part of the negotiations.

SFP & IFFO launch Global Roundtable for sustainable marine ingredients

In October 2021, IFFO (The Marine Ingredients Organisation) and Sustainable Fisheries Partnership (SFP) announced the launch of a new initiative called the Global Marine Ingredients Roundtable, where companies from the entire marine ingredients value chain will drive environmental and social improvements in key fisheries globally.

First priority for the Roundtable is West Africa, where production of marine ingredients (both direct and through by-products) has grown dramatically over the last decade, and a number

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of economic and social challenges have been identified. Southeast Asia is another geographic priority, where multispecies fisheries pose unique management challenges and some fisheries are tainted by human rights and labour abuses. The Roundtable will also address other important topics such as life cycle assessments and potential new raw material sources.

The Global Roundtable builds on existing regional roundtables focused primarily on feed manufacturers. Using a whole value chain approach, it will engage all users of marine ingredients and other stakeholders interested in working collaboratively to increase the availability of sustainable marine ingredients. These include livestock and pet feeds, nutraceuticals, certifications, trade associations, fishmeal, feed and aquaculture producers, scientists, and NGOs.

**WCPFC adopts revised Tropical Tuna Measure**

Pacific nations welcomed the Western and Central Pacific Fisheries Commission (WCPFC)'s adoption of a revised Tropical Tuna Measure at its 18th meeting, which ended on 7 December, 2021. The Measure, which guides fishing controls for bigeye, skipjack, and yellowfin tuna in the WCPFC’s jurisdiction, was due to expire, which would have left the region’s tuna fisheries without updated guidance. It has now been extended for another two years. The WCPFC also adopted new measures on fish-aggregating devices (FADs) that would require they are made of materials that will not entangle sharks and turtles, and progressed toward requiring all FADs be made of biodegradable materials.

However, NGOs such as The Pew Charitable Trusts said that the WCPFC did not go far enough in addressing other issues affecting the sustainability of the region’s tuna-fishing efforts. For example, said Pew, the Commission failed to address increasing observer coverage requirements for longline vessels, leaving 95 percent of longline vessels unmonitored. It also did not make a commitment to improve fisheries monitoring through other techniques like electronic monitoring. Meanwhile the Marine Stewardship Council (MSC) said that 22 tuna fisheries are at risk of facing suspension of their MSC certifications.

**Launch of IYAFA 2022**

The International Year of Artisanal Fisheries and Aquaculture (IYAFA 2022) with the theme ‘Small in scale, big in value’ was officially launched (virtually) on 19th November by the FAO.

It paid tribute to the currently informal World Fisheries Day, celebrated around the world on 21 November. IYAFA 2022 will be an opportunity to celebrate the diversity of small-scale artisanal fisheries and aquaculture, including women and youth; to share the current and potential contributions to achieving the Sustainable Development Goals and highlight related innovation; and to build and strengthen related support and partnerships at all levels. It is also an important opportunity to advance the implementation of relevant normative instruments, such as the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication.

The event also featured the award ceremony of the 2020 Margarita Lizarraga Medal to Margaret Nakato for her immense contribution of women empowerment through the Katosi Women Development Trust in Uganda. The recording is available at FAO Webcast: [https://www.fao.org/webcast/home/en/item/5716/icode/](https://www.fao.org/webcast/home/en/item/5716/icode/)

(Editor’s note: for more information on IYAFA 2022, please see the article on pages 8-11 in this issue of the INFOFISH International).
**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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The FAO’s Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication, 2015 (SSF Guidelines) envisions healthy and thriving small-scale fisher communities amidst the vulnerable and challenging conditions that they currently face. The Guidelines are embedded within a human rights-based approach that guides its principles toward equitable, socially just, economically viable, and environmentally sustainable reform of small-scale fisheries.

In recognition of this, the Regional Small-Scale Fisheries Governance Training Course was developed by the International Ocean Institute – Southern Africa (IOI-SA). It was designed to contribute toward the recognition and understanding of the key themes and principles of the SSF Guidelines, in order to promote good governance principles, approaches and frameworks in small-scale fisheries.

Modules 1 and 2 introduced the SSF Guidelines and explored in some detail, the principles and approaches to good governance. Featured sessions were delivered by Susana Siar (FAO), Herman Kumara (World Forum of Fisher Peoples - WFFP), Prateep Nayak (University of Waterloo), Philippa...
Cohen (WorldFish), Dedi Adhuri (Indonesia Institute of Science), Merle Sowman (University of Cape Town) and Julia Nakamura (University of Strathclyde).

Module 3 highlighted concepts of responsible fisheries and sustainable development, specifically the key thematic areas outlined in the SSF Guidelines — gender equity, governance of tenure, social development, markets and value chains, and climate change adaptation. Regional experts included Sebastian Mathew (International Collective in Support of Fishworkers -ICSF), Nalini Nayak (Self Employed Women’s Association - SEWA), Ronald Rodriguez (Tambuyog Development Centre), Supin Wongbusarakum (FAO) and Venkatesh Salagrama.

The objective of Module 4 was to provide insights toward creating an enabling environment for the implementation of the SSF Guidelines through capacity development, strengthening local-level institutions, collaboration, information and research. Here the focus was on enhancing the capacity, rights and participation of fishers and local-level institutions. This Module engaged with fisher representatives, NGOs and individuals such as Ravadee Prasertcharoensuk, Riza Damanik (Traditional Fisherfolks Union -KNTI Indonesia), Pesisir Lestari, the National Fishers Federation Philippines, and the WFFP.

One of the key outcomes of the event was the recognition of the cross-cutting nature of small-scale fisheries, and the need for cross-sectoral collaboration in addressing the challenges of the sector.

The Asia event concluded the second training of the Regional SSF Governance Training Course, the first event having been held for the African region with seven participating countries in February 2021.

The International Ocean Institute – Southern Africa (IOI-SA), is committed to ocean governance capacity development through its various training programmes. Further information on IOI-SA can be obtained from: www.ioisa.org.
A SUSTAINABLE SEAWEED CULTIVATION MODEL FOR RURAL COASTAL COMMUNITIES IN SRI LANKA

By Shawn Senarath, Dasun De Silva and Malika Sugathpala

Seaweed farming is a sunrise sector in Sri Lanka, where it is regarded as having the potential to uplift rural fishing communities while at the same time, forming a basis for restorative aquaculture in national waters. Several challenges have been identified, among them being consistency in supply and quality, particularly with regard to international markets. A local company has reported early success in its seaweed farming training model which is aimed at creating sustainable and scalable systems, including a high capacity seaweed farm community as well as a farm management integration system using IoT.

Fish is an important element of protein supply in Sri Lanka, where according to FAO (2016) the per capita fish consumption is 31.4 kg per year. The biggest challenges for Sri Lanka and other developing nations will be to meet this deficit in food security and to address it sustainably.

In 2017, marine fisheries production in the country reached over 400 000 tonnes, continuing the trend of unsustainable fishing that has permanently damaged ecosystems. Similarly, the aquaculture segment in Sri Lanka has been growing yearly since 2014; however, there is serious concern regarding sustainability and scalability due to the devastating negative impacts aquaculture can have on the environment such as nitrogen pollution leading to eutrophication of water systems. For every tonne of fish farmed in aquaculture, around 42 to 66 kg of nitrogen waste, along with up to 10.5 kg of phosphorus, is released.

Rural coastal communities in Sri Lanka rely solely on fishing as their main source of income, especially after COVID-19 shut down the tourist economy. Unfortunately their livelihoods are under threat due to unfavourable ocean conditions caused by global warming, overfishing and oil spills. Consequently, there is growing interest in sectors such as seaweed farming from both the Sri Lankan Government as well as from communities. As Ruchira Cumaranatunga, Senior Professor in the Department of Fisheries and Aquaculture at the University of Ruhuna, said in a statement for Mongabay news: “There is a need to create or enhance alternative livelihoods in coastal areas in Sri Lanka, they should be provided with additional sources of income”.

Seaweed farming has the potential to offset many of the environmental harms caused by aquaculture and is a step forward to creating sustainable and scalable systems. In fact, studies show that if 9% of the total ocean surface area could be used to create seaweed farms, it could draw all carbon emissions in a given year. However despite the many economic and environmental benefits in seaweed farming, many developing nations have failed to successfully establish the industry. An exemption is Indonesia which has seen major success, sequestering 2.6 million carbon tonnes a year through seaweed farming, a sector which makes up to 40% of the total output of fisheries and provides employment for nearly 1 million people.
**Historical market challenges**

Although the seaweed industry is still in its infancy, Sri Lanka is rapidly accelerating its development. In 2020, the total seaweed export was roughly only under 50 tonnes, according to the Export Development Board (EDB).

Sri Lanka has great biodiversity in seaweed with up to 32 species which have been identified (Figure 1). Cultivation of the commercially viable species *Gracilaria* has not been popular as farmers perceive it as having a fairly slow growth rate; however, more studies on feasible locations may change this view. By far the most popular is *Kappaphycus alvarezi* which has shown rapid growth performance in Sri Lanka. *Kappaphycus* and *Eucheuma* seaweed make up the bulk of the total seaweed output in the global market as they are used in many value-added products, most importantly carrageenan which is used in the food, cosmetics and pharmaceutical industries. The carrageenan market is expected to grow by 8.12% annually between 2021–2025 leading to the increased demand for *Kappaphycus*.

Fig. 1: Seaweed distribution in Sri Lanka

After deliberation with experts from institutions such as the National Aquatic Research Agency, National Aquatic Development Agency, and the EDB, key issues were identified that were responsible for holding back the seaweed industry in Sri Lanka. First, consistency is a major challenge. Seaweed farming is difficult because without proper care and favourable weather conditions, the plants can easily perish. Farmers can be demotivated by this failure, which is further exacerbated because they need to wait two months to receive their income. As a result, the farmers become reluctant to take up seaweed farming, which causes many projects to shut down in the early stages. Second, even small seaweed enterprises lack credible or consistent buyers which makes the demand and order volumes less predictable and further discouraging farmers who would like a relatively secure/stable income source. A third challenge is the need to ensure that the product meets robust international quality standards, which is difficult for many small-scale farmers to achieve. One reason for this is the lack of knowledge development and programmes offered to help farmers in pre- and post-harvest techniques.

Historically, Sri Lanka has had a weak infrastructure setup in relation to development of the seaweed sector. In 2016, according to the Ministry of Fisheries, a *Kappaphycus* pilot project was launched with a goal of setting up about one thousand SME scale seaweed farms. The project ended up achieving the establishment of around 180 farms with around 500 rafts (12’ x 12’ each), with that number stagnating in recent times.

In another example, a leading conglomerate in Sri Lanka started a relatively large scale operation but could not develop it further due to issues once again with weak infrastructure and lack of trained human resources. The current state of the market consists of a few small enterprises working on producing seaweed with a capacity of around 800 to 1000 kg per harvest. Again, a key market failure is a clear lack of knowledge, social attitudes, and lack of training and coordination, resulting in farmers that do not have the required skills to produce quality crop.

Lastly, there is an obvious lack of competitive innovation, leading to weak technology dissemination. Market analysis shows that no company is currently looking into regenerative aquaculture models which integrate seaweed nor are there any initiatives involving scaling solutions such as deepsea farming in Sri Lanka. This weakness has also extended to Sri Lanka’s seed bank capacity which is far too small, leading to very little ability to consistently cultivate seaweed to scale. Many SMEs currently in the industry are not willing to spend their own capital on infrastructure, as stated in the EDB’s report on seaweed cultivation.
A paradigm shift

One critical factor leading to a boom in seaweed development is the fundamental way we see the world is changing; for example, the massive challenges in environmental preservation and food scarcity, and the role that seaweed has in restorative aquaculture. Furthermore, Sri Lanka is leading the way in nitrogen management: during the recent COP26 Global Climate Summit, President Gotabaya Rajapaksa reaffirmed the country’s resolve to sustainably manage nitrogen. He invited more Member States to come together to adopt the 2019 Colombo Declaration which has a goal of halving nitrogen wastes by 2030.

Accordingly, in Sri Lanka’s 2021 budget, 100 million LKR rupees were allocated to development of fisheries, with new policies formulated to bring foreign investment into the sector. In addition the National Aquatic Research Agency and Development Agency (NARA) and the National Aquaculture Development Authority (NAQDA) have now developed infrastructure such as zonal mapping and feasibility tests along the northern strip of the country, along with better training and knowledge dissemination. A critical observation was that key market players in seaweed-based industries are slowly shifting their interest to establishing new supply chains in lesser-developed regions in the country in hopes of building up a strong supply network outside of competitive zones. Sri Lanka is now well poised to take advantage of global trends in aquaculture.

One local company which has adopted a new approach to seaweed aquaculture is Ceylon Aqua and Agri Products Pvt. Ltd (a subsidiary of Premadasas Holdings, a local multinational company involved in various industries in Sri Lanka). The company is looking at seaweed polyculture as a viable solution to spur coastal development through sustainable aquaculture as well as to uplift rural communities through creating scalability in the seaweed industry; to make seaweed a viable alternative income for coastal communities; and to negate environmental damage from aquaculture. After analysing previous market failures and challenges, Ceylon Aqua is focusing on improving quality, consistency and quantity as the first steps in introducing Sri Lankan seaweed to the international market successfully.

Quality

Offering buyers uncompromised quality is one of the critical factors that will determine success, and in order to do so, Ceylon Aqua Products collaborates closely with NARA on quality testing throughout pre-harvest as well as post-harvest, with base quality (impurities and nutritional data) and carrageenan concentration testing conducted for each batch (Figure 2). At the same time, field officers are deployed to monitor operations. Post-harvest, the seaweed is brought to a drying facility to standardise product quality.

![Fig 2: Carrageenan quality report from Ceylon Aqua](image)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Carrageenan</th>
<th>Specification*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry basis</td>
<td>30.91</td>
<td></td>
</tr>
<tr>
<td>Hardness (g)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Gel strength) (g/cm²)</td>
<td>1811</td>
<td>≥450 (KCL Gel Strength (g/cm²) 1.5%/0.2% KCL)</td>
</tr>
<tr>
<td>Viscosity (cp)</td>
<td>46.01</td>
<td>Not less than 5 cp at 75% (1.5% solution)</td>
</tr>
<tr>
<td>Colour</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Light tan to white course to fine powder</td>
<td>Light tan to white course to fine powder</td>
</tr>
</tbody>
</table>

Data represented as mean. Hardness, Viscosity and yield, dry weight basis

*Specifications for Semi refined and refined carrageenan according to the method established at the 57th IECFA (2001).

Quantity

In order to achieve production on a commercially viable scale (a critical weakness in Sri Lanka), Ceylon Aqua has successfully established a seaweed farm with a capacity of 20 tonnes per cycle, in addition to a trial farming zone for community training consisting of 30 acres.
Consistency

Due to lack of proper farm management and no reliable seed bank system, consistency has been a problem which has hindered progress in the industry. Ceylon Aqua is collaborating with Senzagro, a leader in IoT (Internet of Things) integration in agriculture, to create the first seaweed farm management integration utilising digitisation. With this new system, data can be obtained to build predictive models in order to better plan ahead on crop cycles and when best to grow and harvest.

As mentioned earlier, quality, consistency and quantity are some of the challenges which need to be addressed to achieve feasibility. Through this approach, Ceylon Aqua has achieved international quality harvests with exceptional carrageenan yields, but in order to realise the full potential of seaweed farming, the company is tackling other key components.

Maximising the potential of seaweed in Sri Lanka’s blue economy

Creation of a high capacity seaweed farm community

In order to accomplish this now that research organisations such as NARA are well versed in seaweed aquaculture, it is important to encourage and motivate the farming communities to take on seaweed, and to have training zones to impart skills and acquire real hands-on experience.

Create a training ground

Ceylon Aqua has allocated up to 10 acres of the 30-acre farming zone as an open-source experimental R&D area where all farmers are invited to utilise. At the same time, together with NAQDA, INFOFISH and other collaborators, a world class training programme with hands-on experience can be created. Having a visual model and giving hands-on experience will play a critical role in changing social attitudes towards farming of seaweed. This in turn will develop the skills necessary to establish a robust quality management system covering pre- and post-harvest.

Build an Integrated Multi-Trophic Aquaculture (IMTA) model

IMTA (Integrated Multi-Trophic Aquaculture) principles take advantage of natural processes, utilising the trophic chain cycle by combining different species in a contained system. In doing so, it creates a secular regenerative system having benefits such as increased growth and survival rates as it provides the ideal conditions for aquaculture species to thrive. Seaweed, at the core of this model, is the main extractive species that allows for significant nitrogen and carbon negation.

Creating an IMTA model in Sri Lanka for the first time will help pave the way for sustainable aquaculture with the integration of seaweed. The IMTA set up by Ceylon Aqua includes polyculture of Holothuria scabra (sea cucumber) and Kappaphycus as the first phase in the development of a regenerative farming model with multiple species.
Nitrogen negation in aquaculture is achievable - research done by the University of Hampshire explains that a ratio of 3:1 (3 tonnes seaweed: 1 tonne fish) can achieve nitrogen neutrality (different species and environmental regions may yield different results). Proving the feasibility of regenerative farming through the IMTA model can help attract foreign investment in Sri Lankan aquaculture with its potential for efficiency, higher productivity and environmental impact mediation. If the aquaculture facility is granted sustainability certification by bodies such as the Aquaculture Stewardship Council (ASC), that should make it easier for enterprises to find buyers, and thereby providing greater incentive for farmers.

Value addition

Value addition is a key goal that will need to be addressed to realise the true potential of the seaweed sector in Sri Lanka. Ceylon Aqua’s research division is already working with key researchers in the country in analysing the feasibility of semi-refined carrageenan (e407a) production with locally farmed seaweed. Discussions are also ongoing with UC Berkeley on a project involving seaweed as a material/matrix/reinforcement for polymer-based solutions and leather alternatives. Fertiliser production is another value-addition that can be pursued for the local market as Sri Lankan authorities have recently halted imports of all non-organic fertilisers. Development in this sector can be accelerated through international strategic partnerships, as Sri Lanka is at a stage where seaweed cultivation can be vertically integrated into a strong supply chain while remaining extremely competitive in the cost of raw materials.

Conclusion

The potential of seaweed as a viable resource to combat environmental damage and uplift rural communities is clearly evident. Although Sri Lanka’s seaweed industry has faced many challenges it has now developed robust infrastructure to promote the growth of this segment. In recent years there has been growing interest, favourable policies and greater investment from the Government of Sri Lanka, which is likely to propel the country as a leader in Asian seaweed production.

Sri Lanka aims to tackle issues present in the market by collaborating with the private sector and global organisations in providing expertise, training and subsidies. Meanwhile, large-scale operations will depend on successful implementation of techniques such as IMTA and deep sea farming to attract foreign investment. Through the multiple opportunities offered in seaweed farming, there is a clear pathway for the industry to thrive in Sri Lanka, generating rural coastal development and job opportunities for men and women while protecting the planet, all of which will lead us to achieving a true blue economy.
Micronutrients are essential elements, needed in small amounts, by humans. They are critical for healthy growth and development and can mean the difference between a long or short life span. Currently, around two billion people are estimated to be deficient in essential micronutrients. This suggests that these two billion people are unable to consume enough vitamins and/or minerals to ensure they reach the required levels of intake, putting them at risk of deficiencies and illnesses.

Micronutrient deficiencies occurring during pregnancy, breast feeding, or early childhood can have a detrimental effect on a person. The nutrition we receive during the first thousand days of life, from conception through to the second birthday, is vital, as this is what sets us up for life. Having a micronutrient deficiency during the first thousand days of life can cause irreversible damage, such as lack of growth and development (especially in the brain), diseases and illnesses.

Many species of fish can provide humans with considerable amounts of vitamins and minerals, meaning that fish is an important source of nutrition, especially during the crucial first thousand days of life, as mentioned above. They can potentially help to reduce micronutrient deficiencies as many species are high in essential vitamins and minerals such as potassium, calcium, iron, zinc, magnesium, and selenium, as well as vitamins A, B and D and omega-3 fatty acids.

**Omega-3 fatty acids**

The two omega-3 fatty acids found in fish are EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid). As humans do not produce omega-3 fatty acids, we must consume them through our food or supplements. They can help to maintain a healthy heart by reducing blood pressure; lower the chances of developing diabetes and mental health issues such as depression and ADHD, and help to prevent inflammation.

These fatty acids are especially important for infants as they are essential for the development of the baby’s brain and overall brain function, nerves, organs, and eyes. A deficiency can lead to problems such as delayed motor skills, stunted growth, and neurological problems.

Fish provide a high level of omega-3 fatty acids in a small volume of food, meaning that in lower income countries where food is harder to access, families have a better chance...
of consuming the nutrients they need if they have access to these types of fish, even in small quantities. The content of omega-3 fatty acids varies with the fish species; for example, mackerel contains 4.9g of omega-3 fatty acids per fillet (90g) or 5.5g per 100g; salmon 4.8g per fillet (120g) or 4g per 100g in fresh form; kippers 5.2g per fillet (160g) or 3.3g per 100g; sardines 2.7g per 90g container or 3g per 100g; trout 2.2g per fillet (130g) or 1.7g per 100g; and sea bass 2.1g per fillet (125g) or 1.7g per 100g.

**Vitamins and minerals**

Vitamins constitute another group of micronutrients that can hinder/affect growth and development if the quantities ingested are insufficient. A lack of vitamin A can result in dry skin and eyes, night blindness, infertility, and delayed growth. Low levels of vitamin B6 cause tiredness, weakened immune systems, rashes, and low energy, while vitamin B12 deficiency during pregnancy and birth can cause neural tube defects as well as poor feeding and weight loss especially in children. A lack of vitamin C can cause feeding problems, fever, and low energy. A deficiency of vitamin D can result in rickets, delayed motor development, muscle weakness, aches, pains, and fractures.

With regard to minerals, low iron levels during pregnancy can cause fatigue, a yellow tinge to the skin, cold hands and feet, irregular heartbeat, and weakness.

During the first thousand days of life, one micronutrient which is extremely important is calcium (Ca), one reason being that this mineral is vital for building strong bones and teeth during childhood. Its lack in newborn babies can cause tremors or twitching, and they can often be jittery. Calcium can also help to prevent pre-eclampsia and preterm delivery in women, as well as regulate muscle contractions, including the heart. A lack of calcium can cause rickets in children, osteomalacia and osteoporosis; or contribute to a higher chance of osteoporosis or osteomalacia in later life, weakness, fatigue and fainting, muscle cramps or spasms, weak/brittle fingernails, tooth erosion, as well as growth and development problems in children/babies. Up to 99% of the calcium in the human body is found in bones and needs to be replenished daily from the diet. Calcium is found in dairy products such as milk, cheese and yoghurt, green leafy vegetables, figs, nuts, seeds, and any fish that you can eat the bones, including sardines, pilchards, canned salmon (with bones) and whitebait.

Zn (zinc) is another micronutrient which is important for human health, especially for mothers and babies during the first thousand days. Zinc needs are much higher during the third trimester of pregnancy and for those lactating (around 20mg per day) while children below the age of three require around 5mg per day. This mineral helps to make new cells and enzymes, process carbohydrate, fat, and protein in food, and to heal wounds. Unlike vitamin A, for example, zinc cannot be stored in the body, so therefore it must be consumed in our everyday diet. Small fish are significantly higher in zinc when compared to larger fish species and animal-based foods. Anchovies, herring, sardines, oysters, shrimp, prawns, and crab all contain considerable amounts of zinc.

**An important source of protein**

FAO (The State of World Fisheries and Aquaculture, 2020) estimates that global food fish consumption increased at an average annual rate of 3.1 percent from 1961 to 2017, a rate almost twice that of annual world population growth (1.6 percent) for the same period, and higher than that of all other animal protein foods (meat, dairy, milk, etc.), which increased by 2.1 percent per year.

An analysis of the percentage of fish within the context of global protein intake indicates its prevalence in our diet. As well as this, the digestibility of the protein from fish is around 5-15%, which is higher than protein from plants. This is important as protein plays an essential role in many bodily functions such as the recovery and repair of tissues in muscles, skin, organs, blood, hair, and nails. Specifically, during the first thousand days of life, protein is necessary for babies to develop their organs properly, so fish would be a healthy way for them to consume enough protein.
Consuming small nutrient-dense fish would raise the level of micronutrients in people, even if the quantity ingested is small, meaning the costs would be lower. This would be helpful in preventing micronutrient deficiencies which cause further health implications, especially for babies and mothers during the first thousand days. In addition, the sufficient nutrition would mean that there is a reduced risk of the baby having stunted growth or any brain developmental issues.

Furthermore, studies have shown that by adding these fish to a plant-based diet, protein absorption from the food is increased. This suggests that in developing countries where people may only be able to get a small quantity of fish, it would still have a significant effect on their micronutrient intake because of the micronutrient density in small fish.

In summary, regular consumption of foods such as fish and seafood, which are high in essential vitamins and minerals, will help to prevent any deficiencies and can be used to feed under-/mal-nourished children. Especially in developing countries where food may be scarce or where many families are unable to afford it, consumption of fish, especially locally available species, would be a suitable way for people to get adequate nutrition.

Fish and fish products are recognised not only as some of the healthiest foods on the planet, but also as some of the least impactful on the natural environment. For these reasons, they are vital for national, regional and global food security and nutrition strategies, and have a big part to play in transforming food systems and eliminating hunger and malnutrition.

In 2017, fish consumption accounted for 17 percent of the global population’s intake of animal proteins, and 7 percent of all proteins consumed. Globally, fish provided more than 3.3 billion people with 20 percent of their average per capita intake of animal proteins, reaching 50 percent or more in countries such as Bangladesh, Cambodia, the Gambia, Ghana, Indonesia, Sierra Leone, Sri Lanka and several Small Island Developing States (SIDS).

Source: The State of World Fisheries and Aquaculture 2020. Published by FAO.

References


Marisa Mehta is a student at Tapton Secondary School, Sheffield, United Kingdom.
New INFOPECHE Director

His Excellency Sidi Tiémoko TOURE, Minister of the Livestock and Fishery Resources Ministry in Côte d’Ivoire, and in his capacity as Chairman of INFOPECHE, approved the appointment of Dr SHEP Helguilè as Director of INFOPECHE, effective 23 September 2021. A Water and Forestry Engineer specialising in Fishery Resources Management, he has a Specialized Higher Studies (DESS) Diploma in Project Management; an Advanced Studies (DEA) Diploma in Animal Ecology; and a PhD in Environmental Sciences and Management (specialised in aquatic ecosystems).

Dr Shep’s experience in the fisheries and aquaculture sector includes: Director of Aquaculture and Fisheries, Ministry of Livestock and Fishery Resources, 2011-2021; Responsible for the Sustainable Management of Fishery Resources Program at the Ministry, related to budget program management, 2020-2021; Chairman of the Tropical Tunas Panel at the International Commission for the Conservation of Atlantic Tunas (ICCAT/CICTA) 2011-2021; Deputy Director of Maritime and Lagoon Fisheries at the Ministry, 2007-2010; National Coordinator of the Sustainable Livelihoods Program in Fisheries in West and Central Africa (PMEDP/FAO), 2005-2007; Project Team Leader of fish farming component related to Western Forest Region development project (BAD-WEST Project), 2002-2005.

Eurofish and FAO REU jointly organise fisheries and aquaculture webinar series

Eurofish International Organisation and the FAO Regional Office in Central Asia organised a series of three webinars on the fisheries and aquaculture sector in five countries in the Balkans and the Caucasus. The presentations showed that the sector in the five countries, Albania, Armenia, Georgia, Serbia, and Ukraine, while only a small part of national economies, plays an important role in small, remote, coastal and inland villages, where it is often the only source of employment. All the countries are looking for investments in the sector to develop local economies, maintain viable communities, and provide locally sourced fish and seafood to the surrounding areas and beyond. To attract investments, many of the countries offer incentives in the form of tax rebates and simplified procedures with little bureaucracy so that investors can rapidly get their operations up and running.

The webinars were moderated by Haydar Fersoy, FAO REU and representatives from Eurofish. They offered an understanding of fisheries and aquaculture in the countries, an exchange of experiences, highlighted the challenges and opportunities the sector faces, and promoted a dialogue between stakeholders.

CACFish to produce studies, organise workshops during 2022 and 2023

The Central Asian and Caucasus Regional Fisheries and Aquaculture Commission (CACFish) is a regional fisheries management organization that promotes the sustainable development of fisheries and aquaculture in Central Asia and the Caucasus. The commission currently has five members Armenia, Azerbaijan, Kyrgyzstan, Tajikistan, and Turkey, four of which (Armenia was the exception) attended the seventh session of the commission from 11 to 13 October in Istanbul, Turkey, where the secretariat is based. In addition, invited representatives from seven other countries, Georgia, Kazakhstan, the Republic of Moldova, Mongolia, the Russian Federation, Ukraine, and Uzbekistan also attended. Eurofish International Organisation and the Commission on the Protection of the Black Sea Against Pollution participated as intergovernmental organisations with observer status.

After completing the meeting formalities, the secretary of CACFish, Haydar Fersoy, Senior Fishery and Aquaculture Officer at the FAO Regional Office for Europe, presented the plan for the intersessional period 2021-23 which includes two regional workshops, one each on inland stock assessments, and on ecosystem-based planning and management of fishery and aquaculture resources, a study on fish genetic resources in Central Asia and the Caucasus and another on gender in the region’s fisheries. Commission members actively supported participation by non-members in the proposed activities to foster regional collaboration and increase visibility of the commission. As part of the session, the CACFish secretariat organised a visit to the Istanbul fish auction for delegates. Delegates arrived at the auction as the fish was being landed at 01.00 in the morning. Most of the fish is from the Black Sea, but small quantities from the Sea of Marmara, the Aegean, and even the Mediterranean, as well as farmed fish, were on display. The wholesale market at the auction is the biggest in Turkey handling 40-50,000 tonnes of fish a year which is distributed to the rest of the country.

The eighth session of CACFish will be hosted by Tajikistan in September or October 2023.
whose key message was that disruptive technologies are the key to achieving greater global food security as well as making a difference in establishing responsible and transparent fishery value chains.

From 20-21 October 2021, the 35th INFOFISH Governing Council Meeting was held virtually. There were representatives from ten (10) Member Countries: Bangladesh, Cambodia, Fiji, Republic of Maldives, Malaysia, Pakistan, Papua New Guinea, Philippines, Solomon Islands, Sri Lanka and Thailand, as well as Observers from FAO. The main functions of the Council are to determine the policy of INFOFISH and approve its programme of work and its budget for the upcoming year, giving due consideration to the conclusions and recommendations of the Technical and Advisory Board. The 36th INFOFISH GCM will be hosted by Papua New Guinea in 2022.

The Thirty-fourth Session of the INFOFISH Technical and Advisory Board (TAB) Meeting was held virtually from 13-14 October 2021. Representatives from 11 INFOFISH Member Countries: Bangladesh, Cambodia, Fiji, Republic of Maldives, Malaysia, Pakistan, Papua New Guinea, Philippines, Solomon Islands, Sri Lanka and Thailand, and Observers from FAO, World Sustainability Organization (WSO) and Network of Aquaculture Centres in Asia-Pacific (NACA) attended the session. INFOFISH TAB advises the Governing Council on all technical and economic aspects of INFOFISH activities.

The Secretariat presented an overview of the progress made during the review period (1 November 2019 – 31 July 2021) while highlighting that the organisation has been quick to adapt to the new circumstances to ensure minimum interruption to its services to Member Countries. The mid-term market review presented on trade and markets, the production of fisheries and aquaculture globally in Asia and INFOFISH Member Countries, as well as the impact of Covid-19 on the sector. A second presentation was on “Technological Developments and Innovations in Aquaculture”,

**INFOFISH Advisory Board and Governing Council meetings**

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**Photobook to commemorate IYFA2022**

To commemorate the International Year of Artisanal Fisheries and Aquaculture (IYFA 2022), INFOFISH, under a Letter of Agreement with the FAO Regional Office for Asia and the Pacific (FAO RAP), is developing an electronic photobook, focusing on the small-scale fisheries and aquaculture sector in countries in Asia. The photobook will capture the diversity of small-scale fisheries and aquaculture in Asia covering the entire value chain (including lesser-known activities such as gleaning and backyard fish farming).

High quality photographs will be used to illustrate the following sub-themes in Asian fisheries and aquaculture:

- **Resource utilisation**: Sustainable use of resources by the small-scale sector in fishing and aquaculture;
- **Inclusive value chains**: Diversity of fishers, fish farmers and fish workers from harvest (fishing/aquaculture) through post-harvest processing, and marketing;
- **Social inclusion and well-being**: Healthy, productive communities;
- **Gender equity and equality**: The role of women being equal to men throughout the small-scale fisheries and aquaculture value chains;
- **Food security**: The contribution of the small-scale fisheries and aquaculture sectors to healthy diets;
- **Governance**: Participation of the small-scale fisheries and aquaculture sectors in policy formulation and implementation, capacity development, training, dialogue, etc; and
- **Resilience**: Initiatives which enhance the ability of the small-scale fisheries and aquaculture sectors to withstand environmental degradation, disasters and climate change.

**Forty years dedicated to Asia-Pacific fisheries**

Last year, INFOFISH celebrated its 40th Anniversary since its establishment in 1981 as part of the INFONews Network of regional projects. The core team from FAO which was in charge of setting up INFOFISH comprised Dr Wolfgang Krone, Erik Hempel, Hinko Lisac, and Jochen Nierentz.

In order to commemorate the Anniversary, INFOFISH invited former Directors and staff, as well as Dr Audun Lem and Marcio Castro de Souza from FAO Rome, to convey their thoughts about the organisation. These reminiscences and messages were published in the November/December 2021 issue and can be accessed at www.infofish.org.
Our focus for the Equipment & Supplies pages this time is on stock assessment tools useful in fisheries management as well as navigation.

First AI-enabled satellite fishing buoy

Spain-based Marine Instruments has launched the M3iGO, the first Artificial Intelligence-enabled satellite fishing buoy, which is capable of accurately calculating the amount of commercial fish below it, discarding non-commercial fish and other ‘noise’ from biomass calculation. The buoy has been tested in the Atlantic, Indian and Pacific Oceans. The company developed the first satellite buoy in 2005.

While previous models have an analogue sounder, the new digital sounder and the new microprocessor in the M3iGO allow huge amounts of raw data to be collected, analysed and processed, so that the skipper receives filtered and accurate information on the tonnes of commercial fish below the buoy. The M3iGO also transmits information in real time when the user requests it, which helps the skipper save time by offering the information only when needed. Its solar panel provides enough energy for the buoy’s rechargeable batteries to always be at their maximum level.

In parallel, Marine Instruments has also updated its buoy management and oceanographic information software which incorporates oceanographic data forecasting.


Sonar to assess fish and seabed

SeapiX-F is the first compact civilian system comprising a multibeam sonar transducer. The company says it carries out real-time full 3D biomass assessment and bathymetry from shallow to deep waters and provides unique sea-tested fish classification results for demersal or pelagic species. The species and abundance is shown by area, layer or duration to trawl gear. The data is merged into a 2D/3D plotter which aids in vessel navigation. The sonar can be fitted on any vessel from 5m to 150 m long.

Fish differentiation according to swim bladder

A simple, yet sophisticated equipment that can be used to differentiate fish species in the waters below is the Fish
Species and Biomass Sounder Model FSS-3BB. It incorporates a built-in 3 kW dual-channel TruEcho CHIRP™ fish finder together with the IDENTI-FISH™ function, a patented technology which allows for the differentiation of fish with and without swim bladders.

The high and low frequency echoes picked up are analysed through the IDENTI-FISH™ echo display and histogram. The latter is already pre-set with two model/reference curves: Atlantic mackerel (a fish with no swim bladder) and herring (with swim bladder) which have divergent echo curves due to their major anatomical difference. Any fish species can be determined with a very high degree of probability by comparing the curve of the detected object with those of the model data.

When the colour of the echo is red-brown on the IDENTI-FISHTM echo display, this indicates a school of fish with swim bladders, like herring. A light green colour belongs to a swim-bladderless fish like Atlantic mackerel, as shown in the screenshots above.

For more information: Furuno Electric Co Ltd, Japan (https://www.furuno.com).

Cloud-based digital toolbox

A cloud-based digital toolbox called Blue Insight was launched recently. Focusing on marine and meteorological information, the toolbox aims to enable state-of-the-art collection, visualisation, contextualisation, management and distribution of ocean data.

Key to Blue Insight’s data-streaming functionality is the concept of sensor fusion, by which data is streamlined from various onboard sensors and a local database for seamless transmission into the cloud. In addition, the module serves as a link with onboard sensors for remote operation.

Data can be collected from any platform, ranging from crewed to autonomous surface vessels or even underwater vehicles such as AUVs or gliders. Several other equipment can be paired with Blue Insight including Remote, a module that enables remote access to a KM echosounder via a web interface; Ocean View, a powerful and comprehensive web-based visualisation tool for historic and real-time sensor or database data; and Data Forwarder, enabling data conversion into any common format and automated data forwarding to external cloud systems or databases.

For further information: Kongsberg Maritime, Norway (https://www.kongsberg.com/maritime).
The 34th Session of the FAO Committee on Fisheries held in February 2021 noted that global consumption of fish has increased by 122% since 1990, and that aquaculture and mariculture play a major role in helping to meet the needs. FAO estimates that in 2016, offshore or open ocean farming accounted for 29 million tonnes, or one-third of aquaculture production in that year.

In recognition of the growing importance of this sector, the Innovations section in this issue of the INFOFISH International features a few of the leading offshore farming systems, including artificial intelligence tools, that have been developed by companies throughout the world.

A variety of pen designs

The submersible Aquapod from Innovasea can be lowered deeper to minimise the effects of strong waves, algal blooms, parasites, temperature fluctuations, etc. The company has also developed autonomous underwater vehicles (AUVs) called Teledyne’s G3 Gliders which can be dispatched out to underwater receivers to offload data. They are piloted remotely or can run pre-programmed routes based on GPS coordinates, can dive to depths of 1 000 meters and they can be used in a variety of settings.

A more closed system is being marketed by a Norwegian company which it says eliminates the problem of sea lice and possibility of escape in salmon farming. Each HDPE FishGLOBE is 3 500 cubic metres and has a capacity to grow 250 000 post-smolt salmon to a weight of one kilogram. It incorporates fully automated processes, with technical equipment and an integrated feeding unit housed in the upper section. In trials, the production cost has been less than 1 Kwh per kg of fish.

Pens can be made of HDPE plastic or steel, or a combination of both, depending on the parameters of the ocean environment (e.g. temperature, salinity).

Flexible floating farms

A single-point mooring, submersible and flexible net cage system called SUBflex has been designed by Giliocean Technology (Israel). The system of cages is attached to the seabed by a single anchor and it is able to completely rotate around itself. In doing so, it follows the currents and waves rather than resisting them. At the same time, there is constant movement of the structure, minimising the impact of the seabed and natural marine habitat by dispersing the organic matter, un consumed fish feed and faecal matter. SUBflex is able to withstand harsh weather conditions offshore.
If necessary, the system can be submersed at considerably high sea conditions by opening a simple valve. The two long pipes, made of HDPE, provide strength and flexibility, and help navigate the construction either for floating or submerging it.

**Strong ‘oil-rig’ structures to withstand harsh conditions**

Designed by the SalMar Group (Norway) but constructed in China and then towed to Norway, a fish farming facility called the Ocean Farm 1 was placed in an exposed area of sea off the coast of Frøya in Central Norway in the autumn of 2017. Since then two production cycles have been completed, delivering 10 000 tonnes of salmon to market. Ocean Farm 1 has a similar design to an oil rig, which is not surprising as SalMar had consulted offshore oil and gas standards to ensure that the structure met the biological needs of the salmon and the harsh climate conditions in the North Atlantic Ocean some 20 nautical miles off the Norwegian coast.

Meanwhile, a new offshore joint venture called SalMar Aker Ocean that aims to produce 150 000 tonnes of salmon a year by 2030 was recently established by SalMar and Aker Ocean.

**Remote monitoring and management (Aquaculture 4.0)**

Remotely operated vehicles (ROVs) and drones allow for 24-hour underwater monitoring from a distance and without people leaving their desks. They are fitted with cameras and videos for thorough net inspection, as well as advanced sensors for collection of oceanic data (e.g. pH, oxygen, temperature, pollutants), thus alerting farmers to potential risks. Biosensors can also monitor metabolism and feeding rates.

An example is the UMITRON CELL, a smart fish feeder that holds 400 kg of feed and includes a solar-power management system, onboard computer, weight sensors, dispensing motor and a camera for observing fish 24 hours a day. The feeder is remotely controlled and fish videos are monitored with a smartphone or desktop computer.

**And coming up.....a self-propelled fish ‘superyacht’**

Registro Italiano Navale (RINA), Italy’s marine classification society, has in principle approved a new offshore fish farming system called the Ocean Ark. Developed by Ocean Ark Tech (OATECH) of Chile and London-based Ocean Sovereign, the system is an AI-assisted 170m self-propelled fish farm with self-cleaning copper fish pens.

MOUs to build Ocean Arks have been signed with leading shipyards, including China Merchants Industry holdings, Tersan and CIMC Raffles.
2022

FEBRUARY

13 - 15
Fish International
Bremen, Germany
https://fishinternational.de/en/

MARCH

13 - 15
Seafood Expo North America
Boston, USA
https://www.seafoodexpo.com/north-america/

APRIL

26 - 28
Seafood Expo Global
Barcelona, Spain
https://www.seafoodexpo.com/global/

MAY

3 - 5
Aquaculture UK
Aviemore, Scotland
https://aquacultureuk.com/

JUNE

1 - 3
POLFISH
Gdansk, Poland
http://polfishfair.pl/

8-10
Infofish World Shrimp
Trade Conference and Exhibition (Virtual)
www.shrimp.infofish.org

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

24 - 26
16th Shanghai International Fisheries and Seafood Exhibition
Shanghai, China
https://www.worldseafoodshanghai.com/en/

SEPTEMBER

14-16
Seafood Expo Asia
Singapore
https://www.seafoodexpo.com/asia/

26-27
13th Seafood Expo & Seafood Processing Expo 2022
Dubai, UAE
https://www.dubaiseafoodexpo.com/

OCTOBER

11-13
17th INFOFISH World Tuna Trade Conference & Exhibition
Bangkok, Thailand
www.tuna.infofish.org

26-28
China Fisheries & Seafood Expo
Qingdao, China
https://chinaseafoodexpo.com/

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