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AQUACULTURE//

By Liz Ignowski and Ben Belton

Crop diversification is considered an effective strategy to improve diets and nutrition, and is a key component of nutrition-sensitive agriculture (NSA). The authors compared the economic value and nutrient productivity per hectare for twelve distinct combinations of integrated aquaculture-agriculture (IAA), where aquatic and terrestrial foods are grown together on a single parcel of land, identified from a representative survey of 721 farms in southern Bangladesh. Their analysis shows positive associations between the integration of terrestrial foods into aquatic farming systems and nutrient productivity, but that nutrient productivity is partly disconnected from economic productivity. However, the production of specific combinations of aquatic foods and vegetables can simultaneously improve nutrient productivity and economic productivity, thereby promoting nutrition-sensitive agriculture (NSA).

FEATURE//

By Nicole Franz

The Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines), adopted in 2014 at FAO's 31st meeting of the Committee on Fisheries (COFI), represents one of the most important documents linked to the sustainable development of small-scale fisheries and aquaculture. Next year (2024), which marks the 10th anniversary of the Guidelines, is an appropriate time for all stakeholders from artisanal communities to governments, to take stock of what works, what does not work and what is needed for the future of millions of small-scale fishers, fish farmers, and fish workers who toil to provide fish and fishery products to the world.

Manfred Klinkhardt

Packaging requirements for food, but above all for fish and seafood, are particularly demanding. Packaging needs to protect its perishable contents from spoiling and external influences while being as inexpensive as possible. Plastic packaging meets this requirements profile particularly well. But we wish to replace it with other materials because it is not sustainable. In this article reproduced from Eurofish Magazine, Issue 1/2023 (January/February), the author asks: how realistic is this?

FISHING//

By Steven Adolf and Héctor Fernández

The Western and Central Pacific Fisheries Commission (WCPFC) is playing in extra time in the match for its future sustainable management of tuna fisheries. If they want to win this game, they must score by fully implementing the Harvest Strategy for skipjack at their next meeting, which convenes this December in the Cook Islands. Failure to do so would be a disappointing and dangerous loss for all stakeholders, including the producing, trading and retail companies in the tuna supply chain, who will see their sustainable sourcing policies threatened from the world's main tuna supply area. Member states, in particular those of the influential Parties to the Nauru Agreement (PNA), can secure this WCPFC decision as a continuation of their innovative policies on sustainable fisheries in region.

By Leontine Baje

Rising global temperatures from increased greenhouse gasses in the earth's atmosphere will result in declines in the productivity and food security of our oceans coupled with economic losses from fisheries by 2050 and 2100. This article discusses the different scenarios of these greenhouse gas emissions and associated temperature rises, and their implication on the tuna biomass in the Western and Central Pacific Ocean. The next generation of climate science for finer scale assessments to support climate change attribution and to build the negotiating power of Pacific Island countries is also highlighted, including an avenue where vessels at sea can play an important role in the monitoring of oceanographic conditions.

INDUSTRY PROFILES//

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Cover image : Seaweed farmers from Tarakan Island (North Kalimantan, Indonesia) returning home with 'the brown harvest'.
Credit: ©SujitDas, INFOFISH.

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EDITORIAL OFFICE:
INFOFISH
1st Floor, Wisma LKIM
Jalan Desaria
Pulau Meranti
47120 Puchong, Selangor DE
Malaysia
Tel: (603)80668112 (603)80603734 • 80603738
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E-mail: info@infofish.org
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REGIONAL OFFICES:

Latin America, Caribbean
INFOPESCA, Casilla de Correo 7086,
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E-mail: info@infosamak.org / infosamak@infosamak.org
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Eastern Europe
Eurofish International Organization,
H.C. Andersens Boulevard 44-46,
1553 Copenhagen V , Denmark
Tel: (+45) 33377755 • Fax: (+45) 33377756
E-mail: info@eurofish.dk
Website: www.eurofish.dk

China
INFOYU, Room 901, No 18, Maizidian street,
Chaoyang District, Beijing 100125, China.
Tel (86) 01059195186 • fax: (86) 01059195186.
E-mail: infoyu@agri.gov.cn.
Website: www.infoyu.net.

The Papua New Guinea National Fisheries Authority (NFA) is pleased at the high level of participation, discussions and the overall outcome of the 8th Pacific Tuna Forum (PTF) which took place in Port Moresby, Papua New Guinea, from 6 – 7 September 2023 with the theme ***"Strengthening tuna sustainability and industry development in the 'Blue Pacific Continent' through increased innovation, partnership and participation".***

We at the NFA thank our partner INFOFISH and our co-organisers, namely, the Pacific Islands Forum Secretariat (PIFS), Pacific Islands Forum Fisheries Agency (FFA), Secretariat of the Pacific Community (SPC), Parties to the Nauru Agreement Organisation (PNAO) and the PNG Fishing Industry Association (FIA) in assisting us host the 8th PTF.

The PTF is an important platform to discuss the latest fisheries management initiatives and approaches of the Regional Fisheries Management Organisations, Pacific Islands regional organisations and the Pacific Island Countries (PICs) in ensuring the sustainable management of tuna and other highly migratory and straddling fish stocks in the Western and Central Pacific Ocean (WCPO); and on the latest trends in tuna markets and trade, and in tuna investments and related developments.

The PICs value the importance of maintaining dialogue as can be seen by the numerous regional fisheries conferences, especially the tuna management-related meetings that are held each year. These meetings have assisted the PICs to come together and develop common positions and strategies to ensure the sustainable management of tuna in our region.

The PICs recognise the need to change the trajectory and are taking a different outlook as large ocean states of the "Blue Pacific Continent" and have made huge contributions to the global economy resulting in the successes of many businesses and to the livelihoods of people around the world by ensuring the sustainable management of the tuna and other highly migratory and straddling fish stocks in the WCPO. This can be seen by the fact that tuna fisheries in the WCPO contributes close to 60% of global tuna harvest.

For many countries and peoples in the PICs, fisheries constitute part of the fabric of society and a way of life, providing a significant source of sustenance and livelihood, employment, and income. In addition, the sector is also a source of productivity, revenue, and national advancement for the respective countries. In 2022, the total tuna catch in the WCPO was around 2.7 million metric tonnes with a market value of around USD 5.9 billion.

The commitment of the region to the sustainable management of the tuna resources remains paramount. Large investments have been made over the years in monitoring, control and surveillance (MCS) and this regional commitment is to combat, illegal, and unregulated unreported (IUU) fishing and the implementation of Port State Measures and the Voluntary Guidelines on Transhipment, as well as to improve the sharing of relevant catch information to build transparency and trust in all facets of the tuna value chain. The PICs will work through the FFA and PNA to ensure the continued deliberation and adoption of relevant tuna management measures by the Western and Central Pacific Fisheries Commission (WCPFC).

Tuna development or investments within the region have however, not been given the same level of detail and priority. It was therefore pleasing to see the participation of a number of PICs Fisheries Ministers and senior government officials at the 8th PTF. The participation of the heads of regional organisations, namely, Mr. Henry Puna, Secretary General, PIFS, who delivered the keynote address and the presentations by Ms. Rhea Moss-Christian, Executive Director, WCPFC; Dr. Manu Tupou-Roosen, Director General, FFA; and Dr. Sangaa Clark, Chief Executive Officer, PNAO; elevated the importance of the PTF to the region and contributed to putting sustainable tuna development and investment issues front and centre for governments, industry and associated stakeholders throughout the Pacific Island region.

The sharing of quality and useful information in the PTF on supply chain efficiency, transparency, and accountability; enhanced access to higher-value markets and exploiting opportunities for investment in downstream processing will contribute towards enabling our region to evolve from focusing on sustainable tuna management to embracing opportunities in investments so as to achieve a greater retention of the market value of the billion-dollar tuna fisheries sector to remain within the Pacific Islands region. Securing of preferential and quota-free access to large markets such as the European Union and the United States, for tuna products from the PICs, remains a priority.

Meanwhile, the Pacific Islands Forum Fisheries Committee Ministers recognised the importance of increasing the retention of the value of tuna resources within the region and endorsed the East New Britain Initiative (ENBi) which is based on a proposal by PNG's Minister for Fisheries, Honourable Jelta Wong. I had the privilege to introduce the ENBi at the 8th PTF and highlighted that the ENBi seeks to increase the retention of value by encouraging the PICs to leverage their tuna resources to find collective and inclusive investment pathways. It aims to improve and scale-up the coordination of sustainable tuna development through the "hubs and spokes" concept.

The ENBi also calls for a portion of the profits derived from investments or revenues generated from the tuna fishery by PICs to be invested in a regional fisheries development fund. This is considered as a step to supporting the PICs' resilience in the face of climate change for fisheries infrastructure projects that contribute to building the region's competitiveness. It will also enable the PICs to work together to mitigate the effects of climate change on fisheries production and food security and to prepare for the future impacts of climate change on the oceans and tuna fisheries. The ENBi will be presented for endorsement by the Pacific Islands Forum Leaders at their meeting on the 6- 10 November 2023 in Rarotonga, Cook Islands.

I wish to again thank the Chair of the 8th PTF, Mr. Phil Roberts, the moderators and presenters, sponsors, media partners, the participants and all who had contributed to making the 8th PTF a success and look forward to working with the Ministry of Forestry and Fisheries of the Republic of Fiji Islands in their hosting of the 9th PTF in 2025.

Justin Ilakini
Managing Director, National Fisheries Authority, Papua New Guinea

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Resúmenes de los principales artículos

Las Directrices voluntarias para lograr la sostenibilidad de la pesca en pequeña escala en el contexto de la seguridad alimentaria y la erradicación de la pobreza (Directrices PPE), adoptadas en 2014 en el 31º periodo de sesiones del Comité de Pesca (COFI) de la FAO, representan uno de los documentos más importantes vinculados al desarrollo sostenible de la pesca y la acuicultura en pequeña escala. El próximo año (2024), que marca el décimo aniversario de las Directrices, es un momento apropiado para que todas las partes interesadas, desde las comunidades artesanales hasta los gobiernos, hagan un balance de lo que funciona, lo que no funciona y lo que se necesita para el futuro de millones de pescadores y acuicultores en pequeña escala que trabajan duro para proporcionar pescado y productos pesqueros al mundo.

La Comisión de Pesca del Pacífico Occidental y Central (WCPFC) está jugando el tiempo suplementario en el partido por su futura gestión sostenible de las pesquerías de atún. Si quieren ganar este juego, deben lograr implementar plenamente la Estrategia de Captura para el barrilete en su próxima reunión, que se celebrará en diciembre en las Islas Cook. No hacerlo sería una pérdida decepcionante y peligrosa para todas las partes interesadas, incluidas las empresas productoras, comercializadoras y minoristas de la cadena de suministro del atún, que verán amenazadas sus políticas de abastecimiento sostenible desde la principal zona de suministro de atún del mundo. Los estados miembro, en particular los más influyentes de las Partes del Acuerdo de Nauru (PNA), pueden asegurar esta decisión de la WCPFC como una continuación de sus políticas innovadoras sobre pesquerías sostenibles en la región.

La diversificación de cultivos se considera una estrategia eficaz para mejorar las dietas y la nutrición, y un componente clave de la agricultura sensible a la nutrición (NSA). Comparamos el valor económico y la productividad de nutrientes por hectárea para doce combinaciones distintas de agro-acuicultura integrada (IAA), donde los alimentos acuáticos y terrestres se cultivan juntos en una sola parcela de tierra, identificadas a partir de una encuesta representativa de 721 granjas en el sur de Bangladesh. Nuestro análisis muestra asociaciones positivas entre la integración de alimentos terrestres en los sistemas de cultivo acuático y la productividad de los nutrientes, pero esa productividad de los nutrientes está parcialmente desconectada de la productividad económica. Sin embargo, la producción de combinaciones específicas de alimentos y vegetales acuáticos puede mejorar simultáneamente la productividad de los nutrientes y la productividad económica, promoviendo así la NSA.

El incremento de las temperaturas globales debido al aumento de los gases de efecto invernadero en la atmósfera terrestre dará como resultado una disminución de la productividad y la seguridad alimentaria de nuestros océanos, junto con pérdidas económicas derivadas de la pesca para 2050 y 2100. Este artículo analiza los diferentes escenarios de estas emisiones de gases de efecto invernadero y los aumentos de temperatura asociados, y su implicación en la biomasa del atún en el Océano Pacífico occidental y central. También se destaca la próxima generación de ciencia climática para evaluaciones a escala más precisa que respalden la atribución del cambio climático y fortalezcan el poder de negociación de los países insulares del Pacífico, incluida una vía en la que los buques en el mar puedan desempeñar un papel importante en el seguimiento de las condiciones oceanográficas.

Los requisitos del envasado para alimentos, pero sobre todo para pescado y demás productos pesqueros, son especialmente exigentes. El envase debe proteger el contenido perecedero contra el deterioro y las influencias externas y, al mismo tiempo, ser lo más económico posible. Los envases de plástico cumplen bien estos requisitos, pero queremos sustituirlos por otros materiales porque no es sostenible. En este artículo, reproducido de la Revista Eurofish, número 1/2023 (enero/febrero), el autor se pregunta: ¿hasta qué punto esto es realista y posible?

Rodrigo Misa

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Résumés des articles de fond

Les Directives Volontaires visant à garantir la durabilité des pêches artisanales dans le contexte de la Sécurité Alimentaire et de l'Éradication de la Pauvreté (Directives SSF), adoptées en 2014 lors de la 31ème réunion du Comité des Pêches (COFI) de la FAO, représentent l'un des documents les plus importants liés au développement durable de la pêche et de l'aquaculture à petite échelle. L'année prochaine (2024), qui marque le 10ème anniversaire des Directives, est un moment opportun pour toutes les parties prenantes, des communautés artisanales aux gouvernements, de faire le point sur ce qui fonctionne, ce qui ne fonctionne pas et ce qui est nécessaire pour l'avenir de millions de pêcheurs artisanaux, d'aquaculteurs et de travailleurs de la pêche qui travaillent dur pour fournir du poisson et des produits de la pêche au monde entier.

La Commission des Pêches pour le Pacifique Occidental et Central (CPPOC/WCPFC) joue les prolongations dans le match pour sa future gestion durable des pêcheries de thon. Si elle veut gagner ce match, elle doit marquer des points en mettant pleinement en œuvre la Stratégie de Capture du listao lors de sa prochaine réunion, qui se tiendra en décembre dans les îles Cook. Un échec serait une perte décevante et dangereuse pour toutes les parties prenantes, y compris les entreprises de production, de commerce et de détail de la chaîne d'approvisionnement en thon, qui verraient leurs politiques d'approvisionnement durable menacées dans la principale zone d'approvisionnement en thon du monde. Les États membres, en particulier ceux des influentes Parties à l'Accord de Nauru (PNA), peuvent s'appuyer sur cette décision de la WCPFC pour poursuivre leurs politiques novatrices en matière de pêche durable dans la région.

La diversification des cultures est considérée comme une stratégie efficace pour améliorer les régimes alimentaires et la nutrition, et comme un élément clé de l'agriculture sensible à la nutrition (ASN). Nous avons comparé la valeur économique et la productivité en nutriments par hectare de douze combinaisons distinctes d'aquaculture-agriculture intégrée (AAI), où les aliments aquatiques et terrestres sont cultivés ensemble sur une seule parcelle de terre, identifiées à partir d'une enquête représentative de 721 exploitations agricoles dans le sud du Bangladesh. Notre analyse montre des associations positives entre l'intégration d'aliments terrestres dans les systèmes agricoles aquatiques et la productivité des nutriments, mais que la productivité des nutriments est partiellement déconnectée de la productivité économique. Cependant, la production de combinaisons spécifiques d'aliments aquatiques et de légumes peut améliorer simultanément la productivité des nutriments et la productivité économique, favorisant ainsi une agriculture sensible à la nutrition (ASN)

La hausse des températures mondiales due à l'augmentation des gaz à effet de serre dans l'atmosphère terrestre entraînera une diminution de la productivité et de la sécurité alimentaire de nos océans, ainsi que des pertes économiques pour les pêcheries d'ici 2050 et 2100. Cet article examine les différents scénarios d'émissions de gaz à effet de serre et les hausses de température associées, ainsi que leurs conséquences sur la biomasse du thon dans l'Océan Pacifique Occidental et Central. La prochaine génération de sciences du climat pour des évaluations à plus petite échelle afin de soutenir l'attribution du changement climatique et de renforcer le pouvoir de négociation des pays insulaires du Pacifique est également mise en évidence, y compris une voie où les navires en mer peuvent jouer un rôle important dans la surveillance des conditions océanographiques.

Les exigences en matière d'emballage pour les denrées alimentaires, mais surtout pour le poisson et les fruits de mer, sont particulièrement élevées. L'emballage doit protéger son contenu périssable de la détérioration et des influences extérieures tout en étant aussi peu coûteux que possible. Les emballages en plastique répondent particulièrement bien à ce profil d'exigences. Mais nous souhaitons le remplacer par d'autres matériaux car il n'est pas durable. Dans cet article tiré du magazine Eurofish, numéro 1/2023 (janvier/février), l'auteur pose la question suivante : est-ce réaliste ?

DIGRÉ Arriko Calice

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文 章 摘 要

在粮食安全和消除贫困的背景下，《小型渔业可持续发展自愿准则》（SSF准则）作为小型渔业和水产养殖可持续发展最重要的文件之一，在2014年联合国粮农组织渔业委员会(COFI)第31届会议上通过。明年（2024年）是该准则发布十周年，从社区到政府，所有利益相关方对准则进行评估恰逢其时，探讨哪些可行，哪些不可行以及未来数百万辛勤为世界提供鱼类和水产品的小型渔业渔民、渔场主以及渔业工作者的真正需求是什么。

中西部太平洋渔业委员会(WCPFC)正在为未来金枪鱼渔业的可持续管理争分夺秒。如果想取得一定成果，则必须在今年12月于库克群岛召开的下届会议上，全面实施"箭鱼收获战略"。如果做不到，金枪鱼供应链中所有利益相关方，包括生产、贸易和零售企业在内，都将表示失望并面临较为危险的损失。他们将看到金枪鱼可持续来源政策将受到世界金枪鱼主要供应地区的威胁。各成员国，特别是瑙鲁协议（PNA）中那些具有影响力的缔约方，可以将中西部太平洋渔业委员会（WCPFC）的这一决定作为其区域可持续渔业创新政策的延续。

作物多样化被认为是提升饮食和营养的有效途径之一，并且是营养导向型农业的重要组成部分。我们在对孟加拉南部的721个农场的代表性调查中，比较了12种不同组合的水产—农业综合种养模式(IAA，即水生与陆生食物在一片区域共同养殖)每公顷的经济价值和营养生产率。分析指出，陆生作物-水生生物一体化养殖与营养生产率之间存在正相关，但营养生产率与经济生产率之间存在部分脱节。无论如何，特定的水产品和蔬菜作物的综合养殖可同时提高营养生产率和经济生产率，从而促进营养导向型农业的发展。

到 2050 年和 2100 年，全球气温将随着地球大气中温室气体的增长而不断上升，致使海洋的生产力和粮食安全水平下降，并造成渔业经济的损失。本文探讨了温室气体排放和相关温度上升的不同情形，及其对中西太平洋金枪鱼生物量的影响。同时，强调下一阶段的气候科学应开展更为细致严密的评估，支持气候变化归因，提升太平洋岛国的谈判能力建设，包括探索海上船只在监测海洋状况方面发挥重要作用的路径。

食品对于包装的要求非常高，尤其是鱼和海鲜。包装需要保护其内部容易变质的食物避免受到损坏及外部影响，同时尽可能降低成本。塑料包装十分符合这个要求，但是因为其不可持续，人们希望能有其它材料可以替代它。对此，在这篇转载自《Eurofish》杂志2023年第1期（1—2月刊）的文章里，作者提出实现这个愿景可行性的问题。

Wang Beiyang

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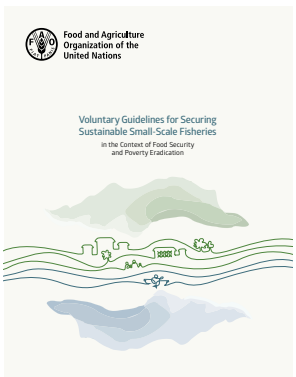
Aziza E Amghari

THE SSF GUIDELINES: REFLECTIONS ON THE FIRST DECADE

By Nicole Franz

The Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines), adopted in 2014 at FAO's 31st meeting of the Committee on Fisheries (COFI), represents one of the most important documents linked to the sustainable development of small-scale fisheries and aquaculture. Next year (2024), which marks the 10th anniversary of the Guidelines, is an appropriate time for all stakeholders from artisanal communities to governments, to take stock of what works, what does not work and what is needed for the future of millions of small-scale fishers, fish farmers, and fish workers who toil to provide fish and fishery products to the world.

Most of Indonesia's fisheries production is artisanal



The Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines) are the first international instrument dedicated to small-scale fisheries.

The week of 9-13 June 2014 in Rome was hot, not only in terms of the outside temperature, but also in terms of emotions inside FAO's main plenary hall, where members and observers of the FAO Committee on Fisheries (COFI) convened for its 31st session.

Agenda item 5.1 of that session was the endorsement of the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines). The journey to get to this moment had been a long and organic one. It is difficult to pinpoint where it really started (and this is not the purpose of this reflection), but discussions on the need for increased attention to small-scale fisheries had intensified during the previous decade. And one could argue that the International Conference of Fishworkers, and their supporters held in Rome in 1984 in a way is what took us to where we are now.

The point here is that in the 31st session of COFI, the global fisheries community did reach an agreement on one pending issue that allowed to turn what was submitted to the session as "Chairperson's report of the Technical Consultation on International Guidelines for Securing Sustainable Small-Scale Fisheries" into a new international normative instrument. It was dedicated to the late Chandrika Sharma, Executive Secretary of the International Collective in Support of Fishworkers (ICSF), who played an indispensable role in bringing together social movements and civil society organizations for the development of these Guidelines.

A large group of COFI observers from ICSF, and the two global small-scale fisheries movements – World Forum of Fisher Peoples (WFFP) and World Forum of Fish Harvesters and Fish Workers (WFF) - as well as from the African Confederation of Professional Organizations of Artisanal Fisheries (CAOPA) attended this COFI session. They proudly reaped the results of their collective action receiving recognition and support for small-scale fisheries in the context of the only global intergovernmental forum where major international fisheries and aquaculture problems are addressed.

In that same session, the foundations for a Global Assistance Programme for implementation of the SSF Guidelines were also agreed, marking the beginning of a new process. This resulted in the establishment of an FAO Umbrella Programme for the promotion and application of the SSF Guidelines – 'Enhancing the contribution of small-scale fisheries to food security and sustainable livelihoods', complemented by a partnership mechanism, the Global Strategic Framework in support of the implementation of the SSF Guidelines, referred to further below.

Implementing the SSF Guidelines – approach, advances and challenges

Strategic approach

The overall proposed strategic approach for the implementation of the SSF Guidelines through FAO, as presented to COFI, was grounded in a stakeholder consultation workshop held in 2014 and a related e-consultation, held optimistically even before the official endorsement, at the end of 2013. It is worth copying the proposed implementation approach here: *'it should build on the inclusive and consensus-seeking spirit and environment that characterized the development process of the SSF Guidelines. Accordingly, future implementation of the SSF Guidelines should be based on participation and partnerships, with implementation anchored at the national and local levels within a framework of regional and international collaboration, awareness raising, policy support and capacity development. This will require support to, and collaboration with, many different actors including governments, development agencies and international financing institutions, NGOs, academia, civil society and the private sector.'*

Related to that, the following was proposed: *A Global Assistance Programme should be established covering four main streams of activities, which can be translated into interrelated programme components:*

i) *Raising awareness: knowledge products and outreach;*

ii) *Strengthening the science-policy interface: sharing of knowledge and supporting policy reform;*

iii) *Empowering stakeholders: capacity development and institutional strengthening*

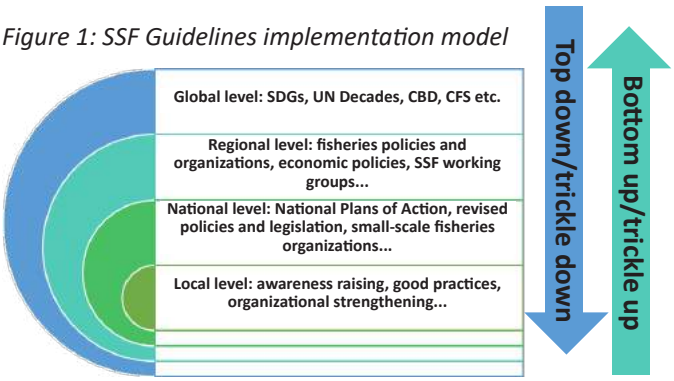
iv) *Supporting implementation: programme management, collaboration and monitoring.*

Advances in implementing the SSF Guidelines

First, funding support for the implementation was provided to FAO by Norway in 2015, and while generous, it was not enough to support a systematic implementation of the SSF Guidelines at country level. A conscious choice in this initial phase directed FAO-led efforts to anchoring the SSF Guidelines in global, and in particular, regional processes and organizations, with the intention to catalyze uptake of the SSF Guidelines at national level, where change has to happen ultimately (see Figure 1).

This led to the organization of a total of seven regional consultations on the implementation of the SSF Guidelines between 2015 and 2018. Almost all of these were co-organized with relevant regional organizations, who have embraced the SSF Guidelines in their own policies and strategies.

Figure 1: SSF Guidelines implementation model



Source: adapted from Jentoft, 2014[1] and FAO, 2020[2]

In parallel with the regional work, various other activities were initiated and implemented by FAO and others, based on demand and identified priorities. The common element of the various initiatives is to support an enabling environment to secure sustainable small-scale fisheries (Figure 2).

Figure 2: Big Numbers on the uptake of the SSF Guidelines, 2020

Source: https://www.fao.org/3/cb7657en/cb7657en.pdf

[1] *https://munin.uit.no/bitstream/handle/10037/7578/articlepdf?sequence=1&isAllowed=y*

[2] *https://www.fao.org/3/cb7657en/cb7657en.pdf*

The combined efforts of small-scale fisheries advocates from different stakeholder groups (social movements and civil society, NGOs, research/academia, inter-governmental organizations, governments etc.) to implement the SSF Guidelines have, without doubt, played a role in re-positioning small-scale fisheries higher on the agenda and in promoting the human-rights based approach, in which the SSF Guidelines are grounded. The declaration of 2022 as the International Year of Artisanal Fisheries and Aquaculture (IYAFA 2022) by the UN General Assembly and the establishment of a dedicated funding stream for small-scale fisheries by the Oak Foundation are examples of the former, while the inclusion of small-scale fisheries and the SSF Guidelines in the UN Declaration of the Rights of Peasants, in a number of new guidelines by the Committee on Global Food Security and in recommendations of the UN Permanent Forum on Indigenous Peoples, demonstrate the latter.

The 10-year Regional Plan of Action for Small-Scale Fisheries in the Mediterranean and the Black Sea of the General Fisheries Commission for the Mediterranean which is well-funded and under implementation is an important example how political will can turn global agreements into concrete action. In research, the Too Big To Ignore research partnership has been a leader in catalyzing research around the SSF Guidelines and the recent FAO, Duke University and WorldFish study *Illuminating Hidden Harvests. The contributions of small-scale fisheries to sustainable development* provides a new global baseline for small-scale fisheries. Also, NGOs have agreed to put aside their organizational identities and to join forces as SSF Hub which is a global electronic interactive platform that pulls together resources on different topics addressed in the SSF Guidelines, and facilitates webinars, interest groups etc.

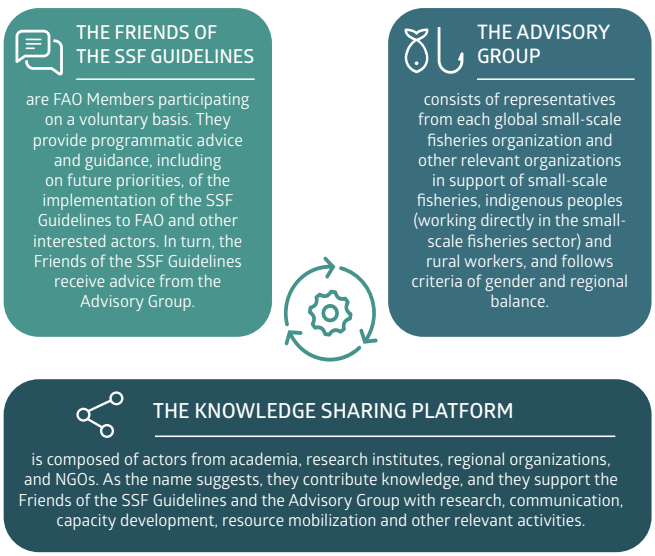
Implementation challenges

The last decade has seen the emergence of 'blue' developments, which have not always included small-scale fisheries, and the recent COVID-19 pandemic has put a brake on the world as we knew it. All of this has had important impacts on the support and attention given to securing sustainable small-scale fisheries.

While the uptake of the SSF Guidelines at global and regional level can certainly be considered as important advancements in the last decade, it is also true that the global small-scale fisheries movements who stood united behind the development of the SSF Guidelines have since struggled to maintain a similar sense of cohesion and impact. A new partnership mechanism for small-scale fisheries organizations and movements, governments and other interested stakeholders in the form of a *Global Strategic Framework in support of the implementation of the SSF Guidelines (SSF-GSF)* that was expected to provide new impetus for global small-scale fisheries actors' engagement has not yet succeeded in becoming fully operational.

How the Global Strategic Framework functions

The SSF-GSF is made up of an Advisory Group, the Friends of the SSF Guidelines, and a Knowledge Sharing Platform. Their work is facilitated by a Secretariat in FAO. The FAO Secretariat supports the SSF-GSF administratively and technically. It consults with representatives from the SSF-GSF on a regular basis, gaining valuable input for FAO's work to implement the SSF Guidelines.



The SSF-GSF is a partnership mechanism giving small-scale fishery actors, government representatives and other stakeholders a space to collaborate at a global level.

Credit: FAO

One major legacy of the International Year of Artisanal Fisheries and Aquaculture 2022 is the establishment of an SSF Summit, as a moment for, in particular, small-scale fisheries organizations and social movements to come together. The first SSF Summit took place just prior to the FAO COFI session in September 2022, and COFI members welcomed the organization of more Summits every two years. Building towards a shared vision and trust to make good use of SSF Summits as an opportunity to collectively explore and address challenges and opportunities for small-scale fisheries and to influence related processes is an important task at hand for the next Summit in 2024.

Challenges in the implementation of the SSF Guidelines lie in particular at national and local level. Changes in governments, for example, often require renewed efforts of capacity building to recreate a sense of ownership. Similarly, even small-scale fisheries organizations at country or local level

often still need awareness-raising about the SSF Guidelines and may not be ready to engage in participatory processes even when the opportunity arises. This was, for example, the case for Tanzania and Namibia, where women in fisheries were not organized to fully take part in the development of National Plans of Action to implement the SSF Guidelines (NPOA-SSF). In response to this, the Tanzanian Women Fish Workers Association was set up in Tanzania (TAWFA) and is a national chapter of the African Women Fish Processors and Traders Network (AWFISHnet). A Namibian chapter (NAMFISHNET) of AWFISHnet has also been established in the context of the NPOA-SSF process, showing the capacity of the sector to turn challenges into opportunities. The list of examples of activities could be long here, including those aiming to improve conditions in the post-harvest sector or access to social protection, just to name a few.

The challenge ahead now for NPOA-SSF implementation and strengthening women organizations – as well as for SSF Guidelines-related initiatives more in general – is to stand the test of time: participatory processes underlying the NPOA-SSFs as well as small-scale fisheries organizations require time, political will, enabling institutions and organizational-human-financial capacities and resources. This applies equally to many of the other initiatives around the world which aim to implement the SSF Guidelines, led by FAO or by the growing number of organizations and individuals embracing them.

It is therefore even more encouraging to see that Malawi, Uganda, the Philippines and Madagascar have embraced the challenges and are also in the process of developing National Plans of Action to implement the SSF Guidelines.

Quo vadis SSF Guidelines: the way forward

2024 provides the global small-scale fisheries community – intended in the broad sense of encompassing all different players – with an important opportunity to take stock of what has happened so far and to understand what works, what does not work and what is needed for the future.

Some key partners are already planning some specific activities for 2024:

- ICSF is planning for a commemorative celebration of the 40th anniversary of the International conference of fishworkers and their supporters held in Rome in 1984, which in many ways set in motion the path of global collective action in support of small-scale fisheries and towards the SSF Guidelines;
- The International Planning Committee (IPC) Working Group on Fisheries has developed a strategy for the 10-year anniversary that aims to foster collaboration with governments and inter-governmental institutions to support the SSF Guidelines' implementation and to raise awareness about the benefits of the SSF Guidelines for communities. Among the planned activities are increasing media coverage of IPC small-scale fisheries organizations to amplify their voices and preparing region-specific recommendations, informed by results of people-centered assessments of the implementation of the SSF Guidelines in Asia, Africa and Latin America;
- The Too Big Too Ignore research network is finalizing a book reviewing the implementation of the SSF Guidelines through a legal lens; and
- This INFOFISH magazine will include features and updates about the SSF Guidelines throughout 2024.

FAO will gather testimonies from those that played a role in the development and implementation of the SSF Guidelines, to ensure that the awareness about the struggles, but also the achievements behind them are handed on to the next generation of leaders and decision-makers, within small-scale fishing communities, governments, NGOs, academia and research, as well as all others who together can make a change towards securing sustainable small-scale fisheries.

All are invited to join these efforts, and to realize what was called for at the closing of the International Year of Artisanal Fisheries and Aquaculture 2022: a new era of support for small-scale fisheries.

Nicole Franz *is Equitable Livelihoods Team Leader, Fisheries and Aquaculture Division, Food and Agriculture Organization of the United Nations, Rome, Italy.*

Market Trends

SHRIMP

USA: Shrimp supplies and demand are now balanced following an improvement in consumption. The levels of inventory at present are also enough for distribution to wholesalers and therefore, the oversupply scenario has also improved. However, there are still specific sizes of shrimp in the market, which are slightly discounted. Meanwhile, shrimp consumption in the US can still be considered as soft, with low demand. Sellers are still seeking strategies other than giving discounts to keep inventories lean following high carrying costs.

Japan: Total imports of raw frozen shrimp decreased both for the month of July (-28.2%) and the year-to-date (January to July by -9.2%) compared to the same period in 2022. Of the top ten exporters, supplies were lower for all for the month of July except for Pakistan (a new entrant ranked in tenth place), which increased its supply to Japan by 413.8%, pushing main suppliers, Russia and Greenland off the top ten suppliers list for that month. In the year-to-date period, supplies from the main producers dropped, except for India (+30.3%), Ecuador (+0.1%), Greenland (+4.6%) and Russia (+27.8%).

Supplies

The supply of main shrimp products particularly frozen raw (-9.2%), prepared/preserved (-14.8%) and cooked, frozen (-16.2%) all declined during January – July 2023 compared to the same period of last year.

India surpassed Vietnam and Indonesia to be the top supplier of frozen raw shrimp to Japan with a 24.9% market share and increased exports by 30.3%. Other suppliers: Indonesia (-8.6%), Vietnam (-24.2%), Argentina (-30.5%) and Thailand (-21.9%) all recorded declines during the review period.

For the prepared/preserved shrimp product category, as per the January to July 2023 review period, India ranked fifth place with a market share of 0.9%, recording an increase of 123.8%. Thailand, the major supplier with a market share of 40% followed by Vietnam (33.9%), Indonesia (16.9%) and China (7.9%) all recorded declining supplies. Despite the upcoming autumn season and its festivities, the weakening of the Japanese yen and the global inflationary pressures continue to threaten the overall strong season of shrimp consumption in Japan.

In the cooked, frozen shrimp product category, supplies declined from its main suppliers Thailand (42.9% market share), Vietnam (34.5% market share), Indonesia (14.9% market share) and China (0.9% market share). Greenland, which ranked fourth place, was the only supplier with a market share of 5.7%, increasing its supplies by 6.5% during this review period.

Indonesia: During January-July 2023, Indonesia's cumulative total shrimp exports decreased by 10.4% to 126 473 tonnes from 141 157 tonnes in 2022 during the same period. Its main market, the US, which was the destination of 66.7% of its shrimp exports in 2022, has seen a decline in its imports by 14.7% resulting in a decreased market share of 63.4%. In the other main markets, Japanese imports also decreased by 15.4%, while China and Malaysia increased by 22.7% and 90% respectively. Meanwhile, Indonesia's shrimp exports to its main markets in Europe – the Netherlands, the United Kingdom and Belgium – decreased by 33.9%, 52% and 45.77%, respectively. It is expected that demand for Indonesian shrimp in the US and European markets will continue to remain weak until the end of the year.

TUNA

Japan: For over a decade, consumption of tuna in Japan, the world's largest sashimi market, has become seasonally associated with festivals such as Cherry Blossom in March/April, Golden Week in May, school holidays in July/August and year-end New Year celebrations in December/January. Moreover, the market preference in Japan for tuna has shifted from fresh to frozen and from whole-dressed fish to tuna fillets due to convenience. However, the summer season catch of local Southern bluefin is producing lesser quality sashimi. Meanwhile, fresh tuna imports from New Zealand and Australia are known to have higher-quality sashimi grades. At the same time, prices have strengthened due to the increased demand for high-value non-canned tuna from Japanese restaurants.

Current trading at the Toyosu daily auction market remains solid for fresh and frozen tuna. Following the autumn events and national holidays, the daily market auction activities have been steady, with seasonal demands. Increased consumption of seafood including tuna is strongly anticipated with the coming of the autumn season and its various activities for both local and international tourists.

Landings of bluefin tuna from local waters have now picked up in the Northern fishing ground. Meanwhile the current market price movements have weakened generally for both fresh and frozen tuna for sashimi compared to the last report.

Imports

The year-to-date total imports of ultra-frozen tuna fillets for

the January to July period decreased by 14.9% against the same period in 2022 because of declining imports of all major species during the review period. Of the three main tuna species imported, Malta was the main supplier of bluefin tuna with a market share of 29.8% over Turkey (19.2%), Spain (14.4%), Croatia (13.4%) and Tunisia (12.3%). China was the main supplier of yellowfin tuna with a 32.6% market share followed by Indonesia (22.3%), South Korea (12.0%), Vanuatu (5.7%) and Fiji (5%). For bigeye tuna, South Korea was the main supplier with a market share of 60.3%, followed by China (21.4%), Taiwan (10.7%), Micronesia (2.4%) and Kiribati (1.7%).

Thailand/ Western Pacific: Fishing in the Western and Central Pacific Ocean continues to improve despite the 3-month FAD closure. Delivery prices of frozen skipjack to Thailand (CFR) closed at US$ 100/tonne lower than in August. Price negotiations remain a challenge, forcing traders to source alternative market options with competitive prices *(Source: EPR 9/2023).*

The total imports of non-canned frozen tuna fillets for the January to July year-to-date period decreased by 36.9% against the same period in 2022. The decline was due to lower exports from the top ten major suppliers except for Thailand, which increased by 5%. The declining total imports (19 469 tonnes) have also been the lowest recorded over the five years. Indonesia, despite its 15.2% decrease in exports to the US, maintained its dominance in the top five suppliers list, with a market share of 42.1%, followed by Vietnam (28.9%), Thailand (10.7%), the Philippines (2.9%) and Taiwan (2.8%).

USA: The total imports of fresh/chilled tuna to the US from January to May 2023 compared to the same period in 2022 rose by 5.0%. Imports of most species into the US have increased except for albacore (-5.9%). The significant jump in the total imports of fresh/chilled tuna in the US has been the highest recorded over the past five years. Meanwhile, total imports of non-canned frozen tuna fillets for January-May 2023 have experienced a decline of almost 37.7% compared to the year before. Overall, US imports from the top ten tuna suppliers have dropped, except for Thailand, which recorded an increase of 8% in tuna exports to the US.

CANNED TUNA

Frozen skipjack landings at the Yaizu market during 1 - 6 October 2023 totalled 590 tonnes, fetching the latest ex-vessel prices at JPY 265- 290/kg for larger sizes (2.5/4.5kg up) and JPY 250 - 276/kg for smaller sizes under 1.8-2.5kg. The September 2023 landings for frozen tuna, compared with the same period in 2022, decreased for skipjack by 11% (4 270 tonnes) and albacore by 66% (234 tonnes) whilst it increased for yellowfin by 236% (1 627 tonnes). Average prices, on the other hand, increased for skipjack by 12% at JPY 293/kg; however there was a decrease for yellowfin by 29% at JPY 360/kg and albacore by 21% at JPY 438/kg. *Source: Yaizu Gyoko Monthly Statistics.*

FRESH/CHILLED FISH

Salmon

China: The cumulative value and volume of fresh Atlantic salmon imports, excluding fillets, increased by 568.0% and 34.6%, respectively, between January and March 2023, in comparison to the corresponding period in 2021. The figures indicate that the domestic market for the product has recovered, as evidenced by the fact that imports in 2019 surpassed the volume recorded before the pandemic, after the relaxation of COVID-19 restrictions. All of the leading suppliers to China experienced growth: the United Kingdom and Chile reported substantial increases of 424 and 152% in exports, respectively; while Australia and Norway reported decreases of 48 and 42%, respectively. The Faroe Islands also experienced a decline in exports. Additional new suppliers made substantial contributions to China's imports: the Netherlands and Denmark contributed 25 MT and 22 tonnes, respectively, from none previously, while Iceland contributed 336 tonnes from 60 tonnes.

The Seafood Guide predicts that by 2023, the proportion of fresh and chilled salmon from Chile on the Chinese market will have increased significantly. According to data from China's salmon industry, Chile exported between 26 000 – 37 000 pieces of chilled salmon to the Chinese market as of the 20th week of the year. Weekly exports of refrigerated salmon from Chile to airports in Beijing, Dalian, Shanghai, Guangzhou, Xiamen, Chengdu, Zhengzhou, Wuhan, Changsha, and Shenzhen, among others, are anticipated to set a new volume record. China imported 26 000 tonnes of chilled salmon from January to April 2023, according to the most recent customs data. Of this total, 15.5% originated from Chile, 19.4% from Australia, and Norway contributed 51.4%.

FROZEN FISH

Pangasius

Vietnam: The export value of pangasius experienced a decline of 41% to USD 570 million during the first quarter of 2023, in comparison to the corresponding period in 2022. Two of the leading destinations experienced a significant decline in import value: the United States (-16.5%) and China (-10.5%). Quantitatively, China imported 56 084 tonnes, a

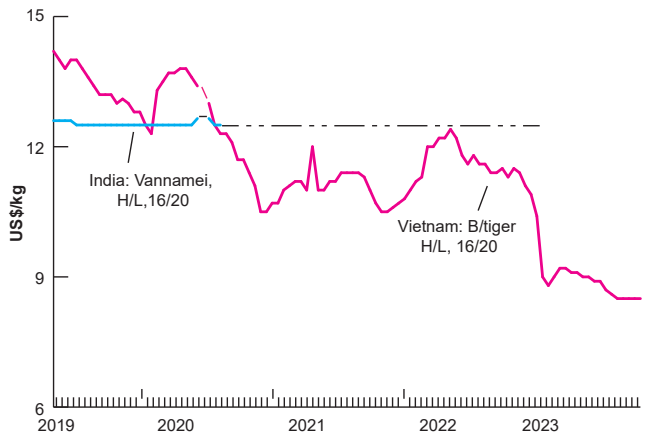
33% decrease from 83 599 tonnes, whereas the United States imported 23 642 tonnes, a 49% decrease from 46 148 tonnes. In contrast, the value of pangasius exports to the European Union decreased by 8% to USD 60 million as of late April compared to the same period last year. Member countries experienced a decline ranging from 13% to 31%, except Germany, which witnessed a 78% increase. Other significant markets experienced declines as well, including Thailand (49%), Mexico (-45%), Canada (51%), and Japan (15%). Brazil (-33%) also witnessed a contraction. Some domestic analysts assert that the decline in the value of pangasius exports is attributable to both high inflation and the worldwide economic depression.

Tilapia

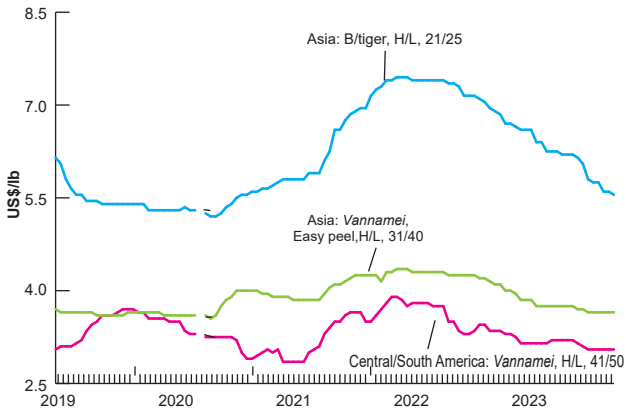
China: In comparison to the corresponding period in 2022, tilapia exports increased by 3.5% to 81 015 tonnes in the first quarter of 2023. The United States, Israel, and Burkina Faso have all experienced growth in their imports of Chinese tilapia (+203%), whereas imports by Mexico and Cote d'Ivoire have declined. The rise in overall tilapia exports can be attributed to the expansion of the frozen fillet (+1.3%) and frozen whole (+57%) product categories imported from China. The top five destinations for frozen whole tilapia imports were all African nations: Cote d'Ivoire (127%), Burkina Faso (38%), Cameroon's emerging market (2 405 tonnes, up from 76 tonnes), Mali (39%), and Rwanda (123%).

Price Trends

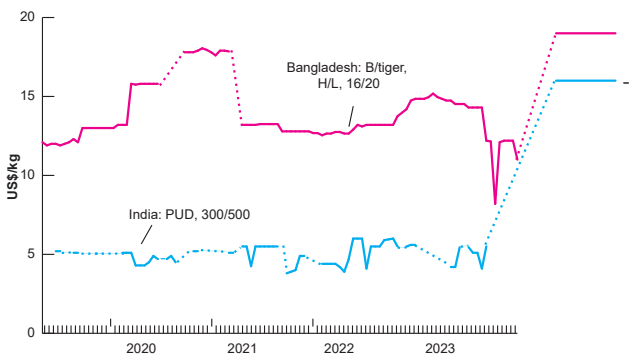
FROZEN SHRIMP, C&F JAPAN (US$/Kg)



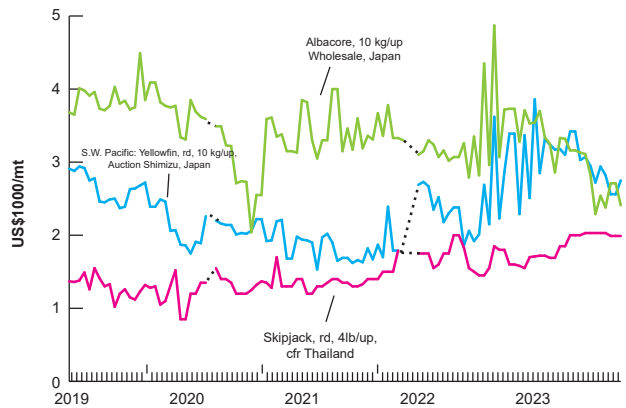
FROZEN SHRIMP, USA (ex-warehouse NY, US$/lb)



FROZEN SHRIMP, EUROPE (CFR, US$/kg)

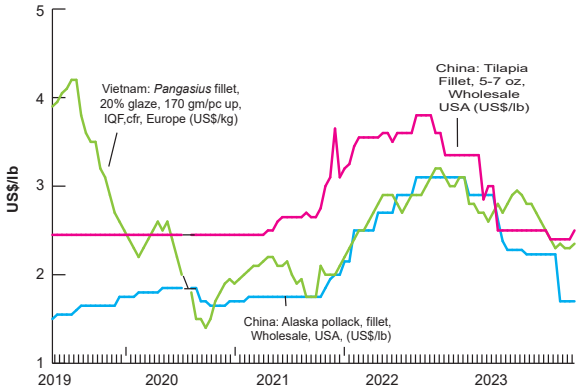


FROZEN TUNA (US$/MT)

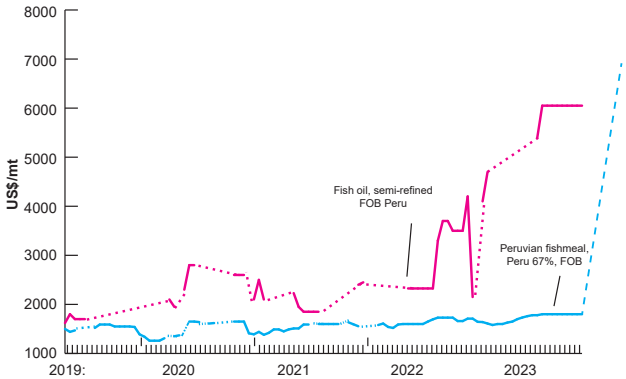


Price Trends • Cold storage holdings • import trends

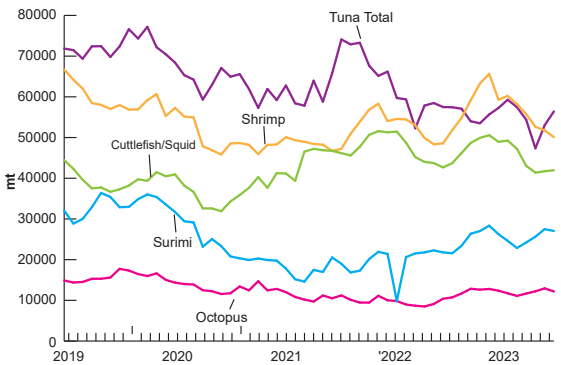
FROZEN WHITEFISH



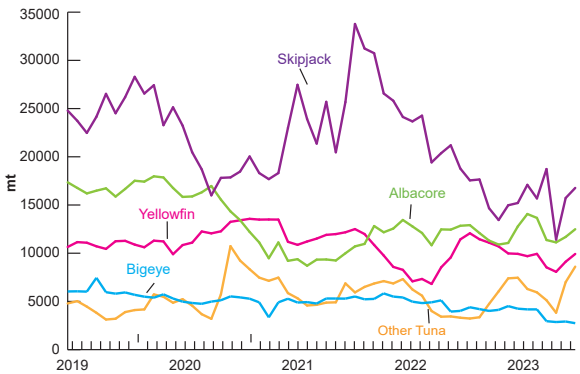
FISHMEAL/FISHOIL (US$/MT)



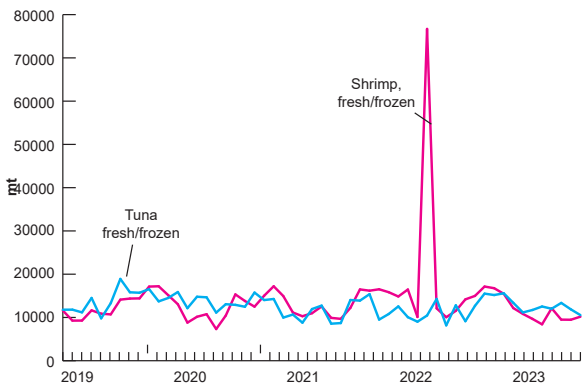
JAPAN COLD STORAGE HOLDING: SELECTED PRODUCTS (MT)



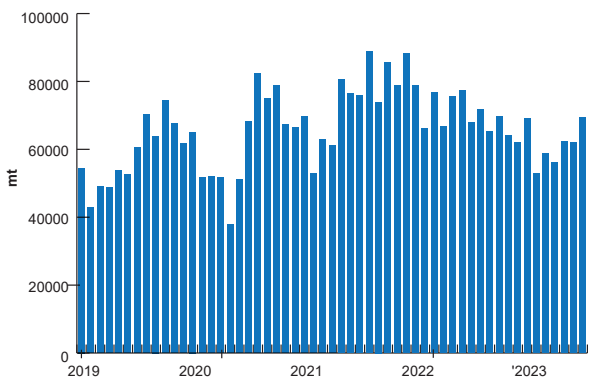
JAPAN COLD STORAGE HOLDINGS TUNAS (MT)



JAPAN: MONTHLY IMPORTS OF SHRIMP & TUNA (MT)



USA: Monthly SHRIMP Imports



TILAPIA

Higher costs are driving tilapia market growth

In the period under review (January–September 2022), global tilapia production was stable, with minimal variation among significant producers. While production costs were rising, trade patterns remained stable, with higher prices driving a steady increase in the value of tilapia trade.

Production

Chinese production reached a plateau, a departure from the previous year's rapid growth. A partial recovery is anticipated as COVID-19 pandemic-related restrictions are lifted, and the domestic economy began to liberalise.

According to the 2022 Global Seafood Alliance Conference projections, Latin American countries are leading growth. Harvests from Brazil, Colombia and Mexico are all growing, although total output is still rather small compared to the major global producers, namely China, Egypt and Indonesia.

Markets and trade

USA: The National Oceanic and Atmospheric Administration (NOAA) reported that between January and September of 2022, US imports totalled 133 801 tonnes, an increase of 1.2 percent compared to the same period the previous year. This transaction was worth USD 563 million, an increase of 25 percent. According to the Department of Commerce, tilapia imports into the country are expected to remain flat through 2022. China continues to be the leading supplier to the US market, with 83 575 tonnes valued at USD 300.4 million, followed by Colombia (12 657 tonnes valued at USD 73.9 million) and Honduras (8 221 tonnes valued at USD 53.1 million).

In the first three quarters of 2022, the United States imported 75.9 tonnes of frozen tilapia fillets, a 5 percent increase year-over-year. This expansion was primarily driven by China and Indonesia, whose exports increased in volume by 6 percent and 33 percent, respectively, year-over-year. The United States imported less frozen whole tilapia, resulting in a 13 percent decline in its share of global imports. This quarter, the country reduced its imports from China and other Asian countries due to rising feed costs. The global market has also witnessed a decline in the supply of frozen whole tilapia from China, totalling 78.6 tonnes this quarter, 12 percent down, year-over-year. This signals trade opportunities for Latin American nations.

Brazil: Tilapia exports remain significant on the Brazilian market in the third quarter of 2022 despite a substantial decline in the overall exports of aquaculture products from Brazil. During the first nine months of the year, the United States market imported 83 percent of the value and 65 percent of the volume of Brazilian tilapia exports. According to the Brazilian Agricultural Research Corporation, the value of exported tilapia decreased by 4 percent annually and 36 percent in the first half of 2022 compared to the second half. The overall export value during January–September 2022 reached USD 18.6 million, seeing a growth of 66 percent in terms of value. The frozen tilapia category kept the first position in the third quarter and accounted for 3 813 tonnes worth USD 9.3 million from January to September 2022. Fresh tilapia fillets were the second most valued product, with 832 tonnes worth USD 4.4 million in the period under review.

Brazilian firms face strong competitors from Colombia and Honduras, both of which benefit from far lower airfreight costs due to their closer proximity to the primary buyer, the US market. Brazilian tilapia suppliers are considering shifting the shipment method from airfreight to container vessels to reduce costs and be more competitive in the US market. In addition, Brazilian producers are investing more in technology innovation and infrastructure development to expand production scale and increase the resilience of the Brazilian tilapia industry.

Prices

After reaching a price peak in the second quarter of 2022, the price of Chinese tilapia significantly declined in the third quarter of 2022, returning to its historical price plateau. Live

tilapia produced in Guangdong province (DAP, Guangdong) of sizes 300–500 g this quarter were selling for CNY 5.93 (USD 0.87) per kg, decreasing 20 percent in price year-on-year and getting close to the pre-COVID-19 pandemic price level in the same period. In each of the first three quarters of 2022, dollar sales of fresh tilapia on the US domestic market decreased by 20 percent, 17 percent, and 22 percent, respectively, compared to 2021. The import prices for frozen and fresh fillets of the United States of America in this quarter were on an upward trend as well. Prices in Latin America vary by region. According to the Center for Advanced Studies in Applied Economics (CEPEA), the average price paid to tilapia producers in some regions of Brazil in August 2022 was R$ 7.93 (USD 1.57) per kilogram of live weight, 0.76 percent higher than in July, while in the other areas the average price was R$ 7.74 (USD 1.57) /kg.

Outlook

In the first nine months of 2022, the tilapia market remained impacted by high inflation and logistical issues, although the global production level remained stable. China's tilapia production growth rate has slowed, but the outlook for production growth remains optimistic. Other Asian nations also face challenges from rising costs, but it is not anticipated that this will affect their trade dominance or global tilapia supply dominance. Increased consumer familiarity with tilapia and government support have boosted confidence on the supply side, resulting in a rapid expansion of production in Latin America. Increasing investment in fostering production has also paved the way for Latin America to emerge as a formidable competitor in the international market to meet the rising global demand.

China exports of frozen whole tilapia
January–September, 2020–2022 (1 000 tonnes)

	2020	2021	2022
Frozen tilapia			
Côte d'Ivoire	33.26	38.71	34.19
United States of America	18.52	19.54	14.30
Burkina Faso	8.45	7.22	8.44
Other countries	58.71	59.73	52.37
Total imports	**118.94**	**125.20**	**109.29**

Source: Author's own elaboration based on TDM. 2023. Trade Data Monitor. Cited 10 January 2023. www.tradedatamonitor.com

United States of America imports of chilled tilapia fillets,
January–September, 2020–2022 (1 000 tonnes)

	2020	2021	2022
Chilled fillets			
Colombia	3.55	3.54	4.71
Honduras	3.99	4.20	4.56
Costa Rica	2.06	1.74	1.73
Other countries	1.73	2.30	1.28
Total imports	**11.34**	**11.78**	**12.29**

Source: Author's own elaboration based on TDM. 2023. Trade Data Monitor. Cited 10 January 2023. www.tradedatamonitor.com

United States of America imports of frozen tilapia fillets,
January–September, 2020–2022 (1 000 tonnes)

	2020	2021	2022
Frozen fillets			
China	50.22	37.91	46.75
Indonesia	3.43	2.86	3.56
Taiwan Province of China	0.48	0.70	0.73
Other countries	2.42	2.30	1.28
Total imports	**56.55**	**43.76**	**52.33**

Source: Author's own elaboration based on TDM. 2023. Trade Data Monitor. Cited 10 January 2023. www.tradedatamonitor.com

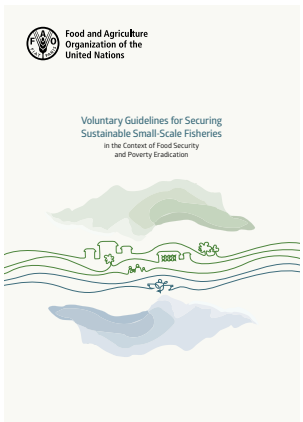
United States of America imports of frozen whole tilapia,
January–September, 2020–2022 (1 000 tonnes)

	2020	2021	2022
Frozen whole			
China	11.57	11.35	11.18
Taiwan Province of China	5.63	6.49	5.85
Brazil	0.08	0.34	1.45
Other countries	0.73	4.07	4.80
Total imports	**18.01**	**22.25**	**23.28**

Source: Author's own elaboration based on TDM. 2023. Trade Data Monitor. Cited 10 January 2023. www.tradedatamonitor.com

Source: FAO Globefish Highlights Issue 1-2023

VOLUNTARY GUIDELINES FOR SECURING SUSTAINABLE SMALL-SCALE FISHERIES IN THE CONTEXT OF FOOD SECURITY AND POVERTY ERADICATION



WHAT ARE THE SSF GUIDELINES?

The Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines) are the first international instrument dedicated entirely to the immensely important – but until now often neglected – small-scale fisheries sector. The SSF Guidelines represent a global consensus on principles and guidance for small-scale fisheries governance and development. They were developed for small-scale fisheries in close collaboration with representatives of small-scale fisheries organizations in a process facilitated by FAO. They are directed at all those involved in the sector and intend to guide and encourage governments, fishing communities and other stakeholders to work together and ensure secure and sustainable small-scale fisheries for the benefit of small-scale fishers, fish workers and their communities as well as for society at large.

Credit: SSF Hub

THE OBJECTIVES OF THE SSF GUIDELINES ARE TO:

- Enhance the contribution of small-scale fisheries to global food security and nutrition and to support the progressive realization of the right to adequate food.
- Contribute to the equitable development of small-scale fishing communities and poverty eradication and to improve the socio-economic situation of fishers and fish workers within the context of sustainable fisheries management.
- Achieve the sustainable utilization, prudent and responsible management and conservation of fisheries resources consistent with the Code of Conduct for Responsible Fisheries and related instruments.
- Promote the contribution of small-scale fisheries to an economically, socially and environmentally sustainable future for the planet and its people.
- Provide guidance that could be considered by States and stakeholders for the development and implementation of ecosystem friendly and participatory policies, strategies and legal frameworks for the enhancement of responsible and sustainable small-scale fisheries.
- Enhance public awareness and promote the advancement of knowledge on the culture, role, contribution and potential of small-scale fisheries, considering ancestral and traditional knowledge, and their related constraints and opportunities.

Underpinned by a human rights approach, these objectives are critical to empower small-scale fishing communities– including vulnerable and marginalized groups – to participate in decision-making processes, and to assume responsibilities for sustainable use of fishery resources.

THE GUIDELINES ARE STRUCTURED IN THREE PARTS:

Part 1: Introduction
Specifies the objectives, the nature and scope, the guiding principles by which the SSF Guidelines are to be implemented as well as their relationship with other international instruments.

Part 2: Responsible fisheries and sustainable development
Provides guidance for fisheries-specific topics such as responsible governance of tenure and sustainable resource management, but also for crucial intersectoral issues: social development, employment and decent work; value chain, post-harvest and trade; gender equality; and disaster risks and climate change.

Part 3: Ensuring an enabling environment and supporting implementation
Provides guidance on how to realize the principles and recommendations of the SSF Guidelines through policy coherence, institutional and supporting implementation; information, research and communication; capacity development; and implementation support and monitoring.

DO YOU WANT TO KNOW MORE?

Partnerships are key to improving small-scale fisheries governance and to implementing the SSF Guidelines. The FAO SSF Guidelines Secretariat is committed to continuing the promotion of collaboration and engagement by all stakeholders at all levels.

Please visit the website:*www.fao.org/voluntary guidelinessmall-scale-fisheries*

E-mail: SSF-Guidelines@fao.org

INFOFISH is greatly privileged to have had the opportunity to interview three eminent Pacific women leaders who were present at the 8th Pacific Tuna Forum 2023 (PTF 2023) to share their valuable insights into tuna sustainability, and industry development in the region.

INFOFISH speaks to …
RHEA MOSS-CHRISTIAN

Executive Director, Western and Central Pacific Fisheries Commission (WCPFC)
Federated States of Micronesia

At its last meeting in December 2022, the WCPFC was commended for making progress on several issues, such as the adoption of a management procedure (MP) which was hailed as the first management strategy evaluation (MSE)-tested procedure for a tuna species adopted in the WCPFC, and indeed, the first across the Pacific. One observation made by several NGOs[1] is that the MP lacks a direct link to setting effort and catch limits in the skipjack fishery. At the recently-concluded WCPFC 19th Scientific Committee Meeting in Palau from 16-24 August 2023, what was decided on this issue, and what are the forthcoming initiatives in this regard?

RM SC19 reviewed the outputs of the initial run of the MP which indicated appropriate baseline levels for relevant catch and effort levels in purse seine, pole-and-line, and other fisheries. Future work was also identified that would reduce uncertainties relating to the estimation model used in the MP. That said, the Commission considered the MP outputs in its most recent workshop on the review of the tropical tuna measure and the MP will continue to feature in those ongoing discussions.

I appreciate the concerns expressed around the MP not setting effort and catch limits in the SKJ fishery. This is an outcome that the Commission is moving toward, and the MP starts that process. Importantly, the MP provides Commission members with an opportunity to enhance their understanding of how harvest strategies will work, and how the traditional approach to managing tuna fisheries will change. The PNA are to be commended for their efforts to move the Commission further along in its harvest strategy work plan. It enables the Members to see a way forward for other species, as well.

The Commission has acknowledged the complexities of managing multi-species fisheries and the impacts that management approaches in one fishery will have on another. An important principle in the WCPFC's tropical tuna measure is balance, meaning that management measures in one fishery should not create inequitable effect in the other fishery. In this case, it means that measures applied in the purse seine fishery in respect of skipjack must be balanced by measures adopted for the longline fishery, which tends to experience positive benefits from strong purse seine management measures.

In an organisation like the WCPFC with the range of stakeholder and fishery interests, small steps are important and should be taken as cumulative together with other gains by the members each year. A particularly challenging piece of the issue of setting effort and catch limits is how to allocate those limits. The Commission has committed itself to developing an allocation framework and this effort is ongoing.

It has been reported that the WCPFC plans to adopt MPs for all five tuna stocks within the next three years, starting with North and South Pacific albacore this year (2023). Do you expect any delays in the workplans?

RM The WCPFC's Harvest Strategy Workplan was adopted as a living document, meant to guide the Commission's efforts without scheduling unrealistic timelines. So I wouldn't characterise the annual revisions of the Workplan as a reflection of delay necessarily, but rather it's a reflection of the complexities associated with adopting a harvest strategy management approach in a multi-species, multi-gear fishery in the midst of a wide variety of competing interests and priorities. Can the organisation move faster? Perhaps, but each year the stakes grow higher, and priorities also increase, so it's difficult to see what has to give in order to make more time and resources available for harvest strategy development.

The Northern Committee adopted a revised NP Albacore harvest strategy that is expected to be adopted by the Commission in December, which together with the NP Albacore harvest strategy adopted by IATTC this year, means that a Pacific-wide harvest strategy will be in place for a key tuna stock.

[1] *Tuna Fisheries Regional Management Organizations Need to Prioritize Transition to Management Procedures. Authored by Sara Pipernos (The Ocean Foundation), Shana Miller (The Ocean Foundation), Grantly Galland (The Pew Charitable Trusts). Published in Fisheries Volume 48, Issue 6, June 2023, pages 225 – 272.*

The implementation of a new conservation and management measure (CMM) for the safety, security and well-being of fisher crews is another area that the WCPFC was asked to look into. As the CMM is voluntary in nature, will there be a stronger legally binding decision from the Commission which will act like a labour standard?

RM The CMM may start out as voluntary, and this is OK as it's still an important starting point that members can work to strengthen over time. The WCPFC has had to navigate the careful balance between carrying out its mandate while not veering into mandates of other established international organisations, such as the ILO. That said, the WCPFC has clearly acknowledged that the safety and well-being of fishing vessel crew is a fisheries issue, and cannot logically be divorced from the mandate to conserve and sustainably manage the region's fisheries resources. Members are united in their resolve to do something to ensure vessel crew are protected; it's the details and extent of that "something" that are still under negotiation.

You have the distinction of being the first woman in the world to head one of the five global tuna Regional Fisheries Management Organisations (RFMOs). Why do you think it has taken so long to break the glass ceiling, and how can young women from the Pacific be empowered to follow in your footsteps and those of other women leaders such as Dr Sangaa Clark and the current WCPFC Chairperson, Dr Josie Tamate?

RM These jobs don't come along very often and there aren't that many of them to begin with. This year happened to present an opportunity for new leadership in the WCPFC. The landscape has changed dramatically since I first started attending regional fisheries meetings in the mid-1990s and far more women are participating in fisheries policy now. Perhaps this is a reflection of an opening up of more opportunities, or the level of importance that tuna fisheries has in the region that it is attracting more people overall, many of whom just happen to be women.

I don't think of myself as having broken a glass ceiling, although I'm more than happy to break it. I have spent the majority of my career and have invested my life's work into this field and my elevation to this role is a natural progression for me based on my professional life, to date. I would say the same of my colleagues Dr. Clark and Dr. Tamate, and I would also add the FFA Director-General Dr. Manu Tupou-Roosen to this list. These leaders have devoted their careers to this field and find themselves in their roles not because they are women, but because they have been committed to the work and progressing in this direction throughout their professional lives.

I don't want to diminish the unique circumstances that women sometimes face in career progression and what it means to push through some very real obstacles, but I also want to acknowledge the work that many of us put in to progress our careers. None of us would ever want anyone to think that we are in our roles because we are women. We are in our roles because we have worked hard, we believe in what we do, and we happen to be women.

Would you say that the interplay between the WCPFC and the PNA represents a kind of functional multilateralism utilising both regional and sub-regional governance platforms for the management of shared resources? Could you present an example where the cooperation has been successful in combatting IUU fisheries and enhancing monitoring, control and surveillance (MCS) initiatives?

RM I think that's a fair characterisation, functional multilateralism. It aptly describes the origins of the WCPFC, as well. The FFA membership initiated the negotiating sessions in 1994 for a regional body to manage fishing on the high seas. The negotiations paused while the UN Fish Stocks Agreement was nearing its negotiating conclusion, and then the negotiating sessions resumed in 1997 for what would become the WCPFC. FFA Members recognised very early on the value and the necessity for shared management of shared resources. WCPFC's geographical management area is comprised mostly of EEZs and what happens in the high seas has impacts in-zone, and vice versa.

I see the WCPFC as a series of concentric circles, each circle representing a group of like-minded Members, whether it's PNA, FFA, developed fishing States, Asian fishing States, market States, etc. These circles are all overlapping each other, shifting at times and always within the larger circle of ensuring the region's fisheries resources are well managed into the future. PNA is an important circle within this relationship, having the responsibility for managing the world's largest skipjack fishery. I wouldn't say it's an interplay between WCPFC and PNA, because PNA Members are Members of the WCPFC. It's more of an interplay of PNA within WCPFC, or between PNA and other members of the WCPFC.

In WCPFC, flag States are the responsible authorities for combatting IUU fishing. Each Member has an obligation to carry out its duties as flag States, coastal States, port States, and licensing States, and members hold each other accountable. Cooperation takes place in many forms, whether it's in sharing data or sharing assets, and there is an overarching commitment across the membership to supporting strong MCS initiatives. But gaps remain, for example in the longline fisheries on the high seas in the WCPFC Convention Area. Monitoring in these fisheries is currently low and initiatives to change have been slow, making it difficult for the Commission to reach consensus.

The Commission's VMS is an extension of the FFA VMS, called "Pacific VMS". It builds on the FFA VMS that covers EEZs by extending Vessel Monitoring System coverage to the high seas. The FFA Secretariat is a service provider to the Commission of the VMS. That in itself is a form of close cooperation between a group of WCPFC Members, in this case the FFA, and the organisation.

The Commission continues to review its monitoring programs on an annual basis and to strengthen activities, where needed, such as in the vessel monitoring system and the record of fishing vessels. Both are important tools to combat IUU fishing and Members have demonstrated strong commitment over the years to strengthening these tools.

INFOFISH speaks to …
DR MANUMATAVAI TUPOU-ROOSEN

Director General, Forum Fisheries Agency (FFA) Solomon Islands

Upon taking up your position as the Director General of the FFA in 2018 (and it should also be noted, the first woman to be appointed in that capacity), you had listed that the critical priorities are: regional solidarity; maximise economic and social benefits through the sustainable use of offshore fisheries resources; and to combat IUU fishing. How is the FFA working with regional and sub-regional Pacific bodies such as the WCPFC, PNA, Pacific Community (SPC) to achieve these aims? In which areas do you see the most progress, and conversely, what is the FFA hoping to see in terms of greater cooperation for mutual benefit?

MT FFA's vision is "Our People enjoying the greatest possible social and economic benefits from the sustainable use of offshore fisheries resources". This vision places Our People at the centre of our work. In order to achieve our vision, I am a firm believer in the power of cooperation. It is the cornerstone of FFA's success over more than 40 years. And with cooperation, it starts from our Members but also includes cooperation with partners and stakeholders.

In particular, the FFA Secretariat works closely with partners such as PNA, the South Pacific Group (SPG - a recently formed sub-regional grouping around the South Pacific albacore) and SPC to ensure that we can all support our Members in achieving our vision. One of FFA's key services to Members is to provide a forum for regional dialogue and negotiations to develop shared regional positions and build solidarity. One such meeting is the current Management Options Consultations in Honiara where all of our Members, with support from FFA, PNA, SPG and SPC, are working together to finalise preparations for the upcoming WCPFC meeting. It is the leadership of FFA Members that has continued to drive the adoption and implementation of key measures at the WCPFC. We are also very pleased about the close work with the WCPFC under the strong leadership of Executive Director Ms Rhea Moss-Christian and the Chair Dr Josie Tamate.

Since FFA's inception, much focus and progress has been related to the goal in our vision on maximising economic benefits, including through the protection of our resources from illegal fishing. Over recent years, what has been most pleasing is the elevation of work needed for the twin goal of maximising social benefits and the associated investments needed to achieve this. This highlights the human side of our work and includes work on improving labour conditions on vessels, ensuring the safety and welfare of observers, economic empowerment of women in the sector and food security.

In recent years, FFA and PNA have called for the support of distant water fishing nations who are also members of the WCPFC, to work transparently towards eliminating IUU fishing in the waters of the Pacific. What are some of the most important ongoing and forthcoming initiatives undertaken by the FFA that address this issue?

MT Over more than 40 years, FFA Members have developed a world-class, regional Monitoring, Control and Surveillance (MCS) framework for combating IUU fishing. This integrated framework involves a range of valuable tools such as the Vessel Monitoring System (VMS); IUU risk assessment through the Regional Surveillance Picture; regional surveillance operations; Aerial Surveillance Programme and cooperative surveillance amongst the Members and our Quadrilateral Partners, namely Australia, New Zealand, France and the United States. This framework provides important coordinated support to prevent, deter and eliminate IUU fishing and ensure compliance with Members' laws, including the WCPFC conservation and management measures.

The FFA Secretariat facilitates the use of these MCS tools as well as provides technical and policy support to strengthen national capacity and regional solidarity to combat IUU fishing. This work is guided by the FFA Regional Monitoring, Control and Surveillance Strategy. In recognition of this highly-effective integrated MCS framework, the International MCS Network awarded the FFA the 'Stop IUU Fishing' award in 2018. We are also very pleased about the recent and well-deserved recognition to the Republic of Marshall Islands, under the leadership of MIMRA Director Glen Joseph, for their Port-State Measures work in Majuro.

One of FFA's exciting initiatives is the Persons of Interest (POI) project which involves the collection, analysis and sharing of information of persons involved in IUU fishing. A lot of the data collected and used is based on vessels including non-compliance history, for example, IUU Lists of Vessels. However, it is persons (both people and companies) that operate and control vessels and ultimately determine if they are used for illegal means. I strongly believe that this POI work will significantly bolster the MCS framework by targeting the actual perpetrators of IUU fishing.

How does the FFA work with other countries in the Pacific such as New Zealand and Australia? For example, there is a partnership agreement between Australia and the FFA until 2028 where the focus areas are cooperation in fisheries, development and security. Similarly, New Zealand has an agreement with the FFA that aims to increase employment and boost economic returns from the Pacific's offshore fisheries. Could you highlight several areas in which these agreements have led to significant progress for the Pacific Islands? How have Australia and New Zealand benefited from the agreements?

MT At the outset, we acknowledge and are grateful for the steadfast and valuable support of our Members Australia and New Zealand who are our two largest donors. These funds contribute significantly to the core work of FFA across the whole range of Members' priorities, including combating IUU fishing; supporting more effective management of the South Pacific albacore fishery to increase food

and economic security; increasing employment that is safe and secure; and increasing returns from fisheries.

Specific examples include:

- enhancing port-State measures (PSM) and ensuring a functioning catch documentation scheme through the development of a Regional PSM Framework and a regional CDS Framework enabling increased traceability of tuna and enhancing market access; as well as ongoing work on the regional electronic system development;
- support for our work with SPC to provide substantive technical information and advice to FFA Members on the status of the South Pacific albacore resources; the fisheries that harvest South Pacific albacore; and biological and economic issues associated with the assessment of options for high-seas and zone-based management;
- progress on integrating electronic reporting (ER) to national and regional information management systems;
- gender development to increase the participation of women in tuna fisheries;
- investment appraisal and facilitation which involves supporting Members with infrastructure development, policy development, and capacity building on finance and corporate governance;
- developing private sector small- and medium-enterprises;
- ensuring market access compliance for exports to key markets in the EU, USA, and other regions;
- enhancing regional information-sharing and cooperation;
- supporting risk-responsive tasking of assets;
- increasing the capacity of Pacific Island Countries (PICs) to undertake enforcement operations and regional monitoring control and surveillance strategy activities to combat IUU; and
- the Aerial Surveillance Program initiated and managed by the Agency to provide aerial surveillance for the 15 FFA Pacific Island Members.

New Zealand and Australia are an integral part of our Pacific Membership and a fundamental development partner for FFA. The mutual benefits that accrue to our region, including New Zealand and Australia, include the continuing safety and security (both economically and socially) of our people. For the FFA, the successes we have achieved, including having the healthiest stocks of tuna in the world, has emanated from the regional solidarity of our Members, including NZ and Australia.

"Security cooperation in the Pacific Islands can be described as a patchwork of bilateral and multilateral, formal and informal agencies, agreements, and arrangements, across local, national, regional and international levels". Would you agree with this statement? What are the advantages and disadvantages of this approach?

MT I agree with this statement. Another way to frame this concept is as a patchwork of cooperation which has been built over several decades - each playing its own role in the security of our valuable fisheries resources. Combating Illegal fishing is central to ensuring that our People can continue to maximise their returns from these resources. In recent years, we have worked together with related agencies including the Pacific Transnational Crime Coordination Centre and Oceania Customs Organisations during regional surveillance operations, noting the value-add of working jointly, for example when aircraft or vessels are searching for illegal fishing they may also identify and share information for broader law enforcement purposes.

I can only see advantages to this, in particular, all the benefits that come with working together. We therefore look forward to the review of the regional security architecture and to seeing how best we can work together for the enhanced security of the region.

As a final question, and not forgetting the most important component in Pacific tuna fisheries: people and communities. How does the FFA work to ensure food security and protection of the livelihoods of Pacific Islanders from threats such as warming seas, low prices paid to fishers for the raw materials, and illegal commercial fishing in coastal zones?

MT Climate change is an existential threat to all Pacific Island Countries. Our Leaders have stated that it is the greatest threat to the security and well-being of our Pacific People. In our tuna fisheries contextures, it places at great risk the current benefits to our Small Island Developing States The latest science shows that under the current GHG emission scenario, it is expected that there will be substantial changes in the abundance and distributions of skipjack, yellowfin and bigeye tunas within the Pacific Ocean Basin, with predicted shifts in biomass from the Western and Central Pacific Ocean toward the Eastern Pacific Ocean, and from areas under national jurisdiction to the high seas. In addition, the impact of climate change on bycatch species has implications for food security given the importance of edible bycatch as a protein source to most of the communities in Pacific Island Countries.

Given the all-encompassing and complex nature of climate change, our collective effort is required to prepare and respond to those threats by taking a proactive approach to managing the potential risks, increasing the resilience of offshore fisheries, and ensuring associated benefits for the people who depend on them. This should be undertaken, maintaining a good understanding of the broader connected impacts of climate change in the region and the associated economic, social, security and environmental implications.

The FFA is taking concrete steps to address climate change impacts in our fisheries, and we are pleased to advise that our FFA Ministers adopted an FFA Climate Change Strategy in August of this year. This Strategy will guide us in our collective effort to increase our resilience to climate change, including strengthening our efforts and commitment to managing our offshore fisheries in an ecologically sustainable manner; as well as advocate for climate action through stronger cooperation and engagement in the broader international community. We also look forward to FFA participating at this year's UNFCCC-COP28 and elevating, from a fisheries lens, the effects of climate change on fisheries.

INFOFISH speaks to ...
DR. SANGAALOFA (SANGAA) CLARK

CEO, Parties to the Nauru Agreement (PNA) Office
Republic of the Marshall Islands

Upon your appointment as the CEO of PNAO in September 2021, you were reported as having said "We are facing a whole range of existing and emerging threats, not least of all from climate change, the warming of oceans, and sea level rise, so we need to refocus on these new issues and get more of our nationals involved and doing work and support in these areas and in tuna management". Specific to the two areas of climate change and tuna management, what are the PNA' s current and future initiatives, their desired outcomes as well as the challenges that may delay progress?

SC There is a lot of work that have been, and are being, undertaken on climate change. So, the PNAO will be focusing on climate change initiatives that are of importance to tuna fisheries for PNA, and that are not being undertaken or are still to be completed.

Four elements of climate change relating to tuna management that PNAO may focus on are:

i) Maintaining PNA boundaries: Our EEZs are shrinking with climate change and could even completely disappear, so we want to maintain our current EEZs so they remain in perpetuity regardless of the impacts of climate change;
ii) Maintaining the buffer for PNA tuna stocks: The stocks in PNA waters are healthy and we want to maintain that buffer, so PNA countries have some resources to use in the event of the tuna populations declining and/or moving out of PNA waters, as has been predicted;
iii) Adaptation of the Vessel Day Scheme (VDS): The VDS has features that adapt to changes in oceanographic conditions, which are very similar to climate changes, so PNAO can work on refining these to adapt to climate change; and
iv) Climate justice: The problems from climate change were not caused by PNA countries and those responsible need to be held accountable, so we will be seeking compensation under Climate Justice for the impact of climate change on tuna stocks in PNA waters.

At that time, you were also reported to have said that "The strength of the PNA has always been the willingness of the Parties to collaborate and cooperate to make hard decisions in the best interests of the collective group, even if those decisions have an impact on the individual country". Could you relate an example where, in the face of initial resistance, a hard-won compromise had been the result?

SC The VDS is a good example. The total number of days (TAE) is allocated to Parties every year as PAEs, so the allocated days change annually, with some countries getting more share of the days than others one year, and vice versa. Under any circumstance, it would be hard for a country to agree to a lesser share and, consequently, less revenue. However, Parties have been able to accept their changing allocations, trading with each other and generally finding ways to address their varying PAEs and changing fishing patterns in their zones. This has meant that the hard decisions taken to accept their changing allocated days has ensured that the stocks in their collective zones are sustainably maintained and they all benefit together as a group.

The core business of the PNA is stated as being the operation of the Vessel Day Scheme[2], which has sustained tuna catches and enabled PNA Pacific Island countries to substantially increase the economic benefits they receive from tuna fishing. With your background in mathematical and computational modelling, what was your role in the early days of the VDS?

SC My role, in the early days of the VDS, was to assist in finding ways to address Parties' concerns about the allocation method. For example, concerns over allocated days not being indicative of the actual effort in Parties' zones; was the historical effort used in the calculations the right data to be using; minimising the fairness and unfairness of the allocation method so all are at least equally unhappy, and so on. Not only that but also finding ways to understand the patterns of effort in Parties' zones and estimating the usage of days; when would each Party run out of days? Mathematical and computational modelling can be used to assist in addressing these issues and the VDS is a dynamic tool that has evolved from Parties working together and exploring solutions to arrive at methods that enable them to work successfully together.

What are the PNA's contingency plans in the event of climate-driven distribution or migration of tuna, as has been predicted in several international studies?

SC As provided in answers to Question 1.

By the year 2050, do you foresee that the tuna resources in the Western and Central Pacific Ocean (WCPO) will be recognised as being fully sustainable, and that all foreign fleets have been replaced by domestic vessels?

SC Unfortunately, I can't foresee the future; predictions have often turned out differently usually due to unforeseen circumstances, but what you've stated is what we are working for, and so, I really hope so.

[2] *The PNA Vessel Day Scheme (VDS) sets an overall Total Allowable Effort (TAE) limit on the number of days fishing vessels can be licensed to fish in PNA Exclusive Economic Zones (EEZs) per year. Each country is allocated a share of the TAE for use in its zone each year. These VDS days can be traded between countries in cases where a country has used up all its days while another has spare days.*

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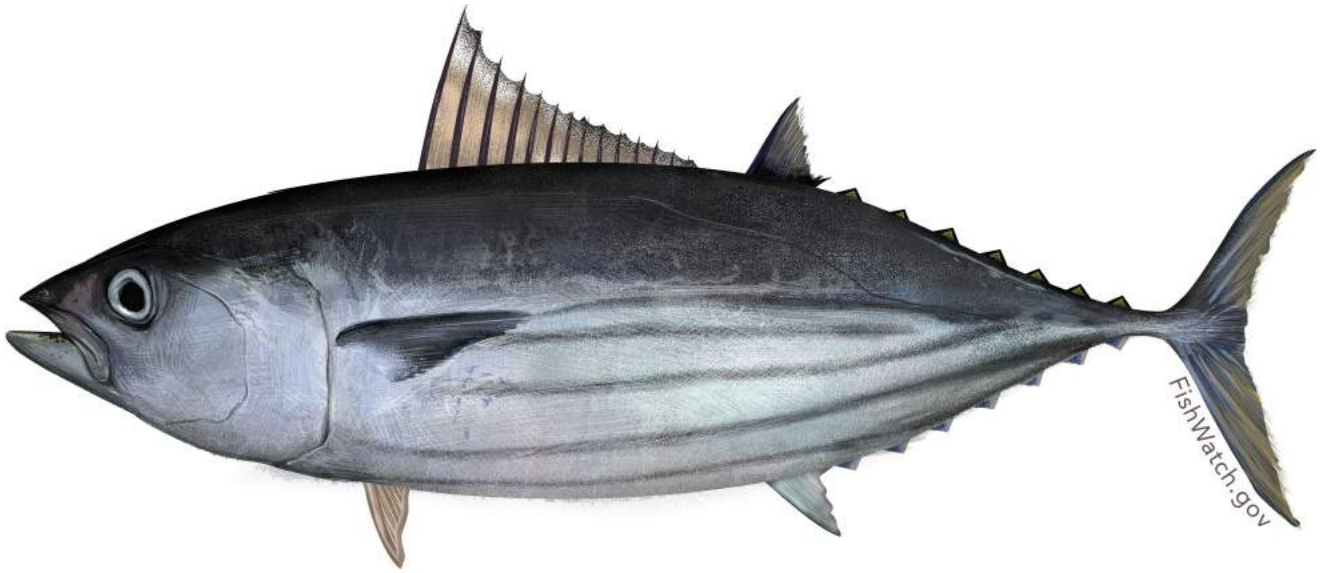
WCPFC IS PLAYING IN EXTRA TIME; MARKETS WOULD LIKE TO SEE THEM SCORE ON HARVEST STRATEGIES NOW

By Steven Adolf and Héctor Fernández

The Western and Central Pacific Fisheries Commission (WCPFC) is playing in extra time in the match for its future sustainable management of tuna fisheries. If they want to win this game, they must score by fully implementing the Harvest Strategy for skipjack at their next meeting, which convenes this December in the Cook Islands. Failure to do so would be a disappointing and dangerous loss for all stakeholders, including the producing, trading and retail companies in the tuna supply chain, who will see their sustainable sourcing policies threatened from the world's main tuna supply area. Member states, in particular those of the influential Parties to the Nauru Agreement (PNA), can secure this WCPFC decision as a continuation of their innovative policies on sustainable fisheries in region.



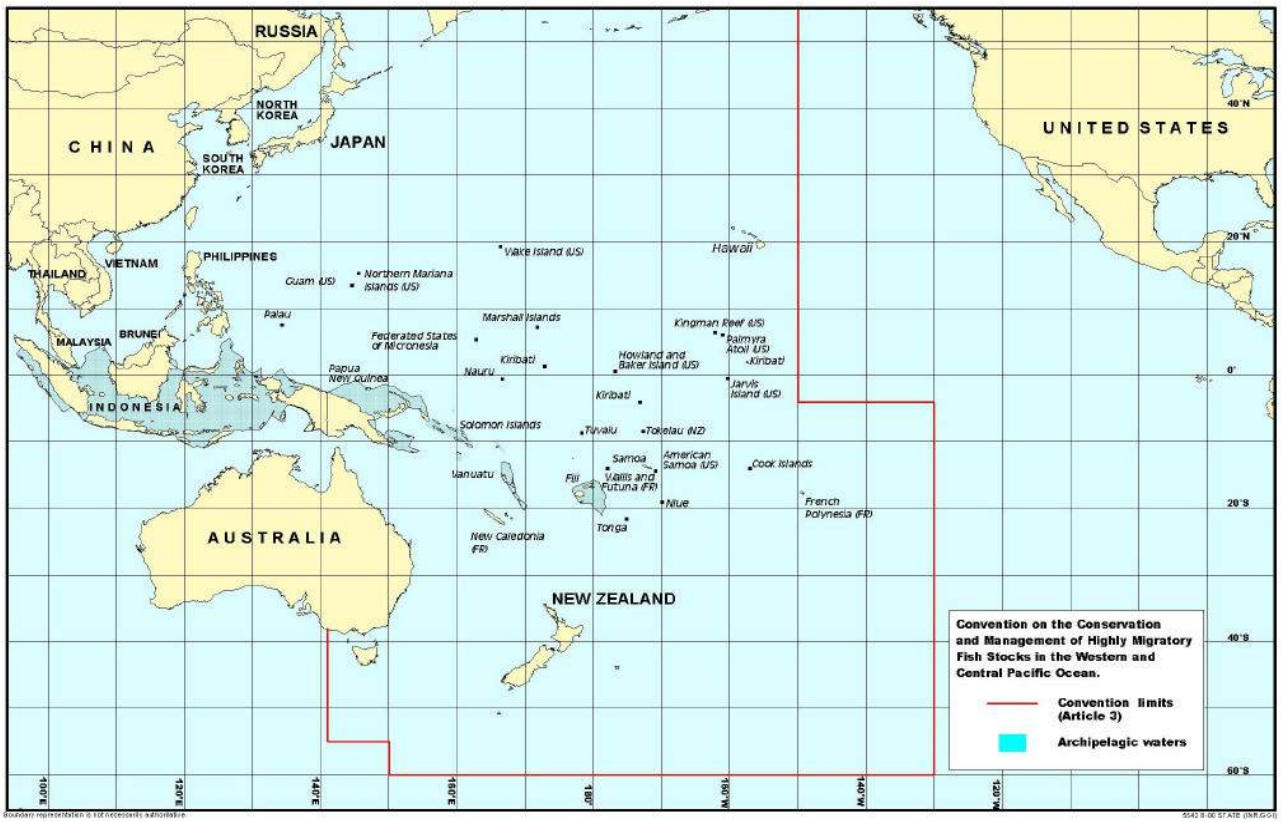
Production, trade, retail, and the seafood markets, are watching carefully what will be decided on the management of tuna fisheries at the next annual meeting of the Western and Central Pacific Fisheries Commission (WCPFC) in Rarotonga, capital of the Cook Islands.

Global tuna markets are worth billions of dollars and the added value generated along the supply chain is several times this primary value of the fishery. The final value in the global consumer market for these species was approximately USD 41 billion for a total catch of 5.5 million metric tonnes in 2018, with the European Union and the United States being the largest individual markets.[1] Hundreds of millions of people rely on the consumption of tropical tuna or tuna-like species to supplement their diet with marine protein of high nutritional value.

The Western and Central Pacific Ocean (WCPO), the convention area of the WCPFC, is by far the most important sourcing area for global tuna supply. About 51% of the world production of all tuna is from the WCPO. Provisional catches of skipjack, yellowfin, and bigeye in 2021 were 2 342 000 tonnes; skipjack accounts for 67% of the catches in weight, followed by yellowfin (27%) and bigeye (6%). Purse-seine vessels take 73% of the total catch.[2] Comprising 35% of worldwide tuna landings, WCPO skipjack is the main source of raw material for the global canning industry.

[1] *The Pew Charitable Trusts, Netting Billions 2020: a global tuna valuation, October 2020, Washington.*

[2] *International Seafood Sustainability Foundation, Status of the World Fisheries for Tuna: March 2023.*



WCPFC convention area.

These facts clearly justify that the European retail and trading companies show a great interest in maintaining the WCPO skipjack stocks on a sustainable level in order to ensure a stable supply in the future. And it follows that the seafood sector has taken up the issue of sustainably managed fisheries with enormous interest. What was once dominated by the interests of the large industrial fishing fleets has changed into a broader consultation in which market stakeholders are increasingly making their voices heard.

Trade and retail are taking responsibility

Trade and retail companies are increasingly taking responsibility for their environmental impacts. For example, the European market has been proactively pursuing Marine Stewardship Council (MSC) certification for their canned and frozen tuna products over the last fifteen years. In countries like Germany and The Netherlands, MSC-certified products have become the standard on supermarket shelves. Few fisheries have seen such quick expansion of MSC certifications as the WCPO tuna fisheries. After the first certification was assessed by the Pacifical in 2011, currently 26 tuna fisheries followed and got certified, while 16 are under assessment.[3]

That the certification was not always free from controversy does not alter the fact that sustainable fisheries policies have changed from an option into a necessity: the big trade and retail companies now demand a sustainable product as part of their commercial policies.

Bolton Food, the Food Business Unit of the Bolton Group, leads the European canned tuna market with its brands Rio Mare, Palmera, Saupiquet, Pêcheur de France, Isabel and Cuca in Italy, Germany, France and Spain. Sustainable fishing sourcing policies have become an essential part of the company's strategy which has enabled it to reach 86.5% of the tuna of the group's brands coming from responsibly managed fisheries by 2022. "Bolton Food has the ambition to become the most sustainable tuna company for the world. To this end, we confirm our target of 100% of tuna sourced from MSC or credible and comprehensive FIP certified fisheries by 2024 across the perimeter of our business unit ", says Luciano Pirovano, Global Sustainable Development Director, Bolton Group Food Business Unit.[4]

Over the last decade, Bolton has focused on improving the sustainability of its supply chains for both small-scale and

[3] *Marine Stewardship Council (https://fisheries.msc.org/en/fisheries/).*

[4] *Bolton Group https://www.boltongroup.net/en/stories.*

The PNA office in Majuro, Marshall Islands.

Regional map showing countries which are members of the PNA.

STOCK ABUNDANCE		SSB > SSB_{MSY}.
FISHING MORTALITY		F < F_{MSY}.
ENVIRONMENT		38% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).
		43% of the catch is made with purse seining on free schools, with little impact on non-target species.
		8% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks.
		10% of the catch is made by other gears such as gillnets, with unknown impacts on non-target stocks.

Last date of a change in Color Ratings: None.
Changes from the previous (original) Color Ratings: None.

State of the skipjack stocks

industrial fisheries. By 2022 it had already achieved nearly 70% of Rio Mare's sourcing from MSC-certified fisheries or credible and integrated Fisheries Improvement Projects (FIPs). The company also actively advocates the adoption of new measures by tuna Regional Fisheries Management Organisations (RFMOs), including the WCPFC, with the aim of contributing to the recovery of overfished stocks and avoiding overfishing in the future.

State of the stocks

How sustainable is the main tuna fishery in the Pacific? At first glance, the WCPO population of skipjack is at a healthy level. According to the latest report of the International Seafood Sustainability Foundation[5], the stock is at safe levels, even though fishing mortality rates have increased significantly since the beginning of industrial tuna fishing. Skipjack is still safely in the green quadrant of the so-called Kobe plot that gives indications on the state of the skipjack population, meaning that the stock is neither overfished nor subject to overfishing.

The remarkable conservation initiatives developed by the Island States that joined the Parties to the Nauru Agreement (PNA) have undoubtedly contributed to maintaining the skipjack resources in a healthy condition. With its unique and innovative Vessel Day Scheme, which limits the number of fishing days in the vast ocean area that belong to their jurisdiction, the PNA has succeeded to put in place a system that controls overall catches in this globally important sourcing area and created a substantial source of income for the local economies.[6]

But despite these innovative efforts, the trends in skipjack tuna fisheries paint a less rosy picture. While the skipjack tuna

[5] *International Seafood Sustainability Foundation , Status of the World Fisheries for Tuna: March 2023.*

[6] *https://foreignpolicy.com/2021/03/05/tuna-fishing-overfishing-conservation-pacific-islands-skipjack-pna/*

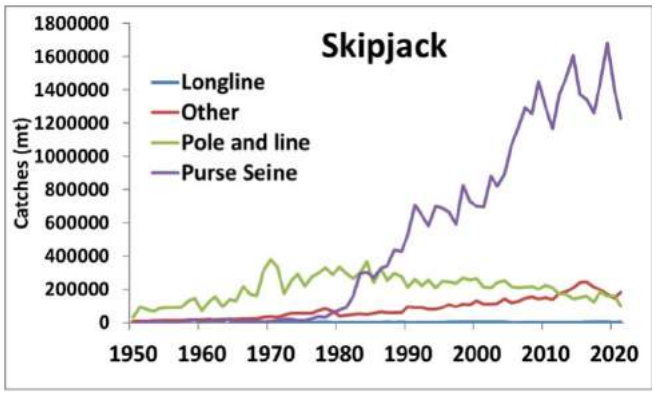


Figure WCPO-7. Catches of skipjack tuna in the WCPO from 1950 to 2021, by gear type

Source: International Seafood Sustainability Foundation , Status of the World Fisheries for Tuna: March 2023.

population is still currently at a healthy level, it has depleted over time. There is much cause for concern, even in the rich fishing grounds of the WCPO. Climate change is now notably affecting the sea surface temperature of the WCPO, with a rise of 0.26 degrees above the anomaly temperature[7] . Early research seemed to point to a sharp decline of skipjack catch in 2020, with a notable drop in the size of the individuals caught.[8] The impact of the fisheries itself also takes its toll. Market players cannot afford to continue to look away from these uncertainties, which could well fundamentally alter the supply of tuna in the not-too-distant future. More than ever, trade and distribution need an effective and modern management system to ensure that stocks are maintained at a sustainable level that allows stable exploitation of the fishing grounds over time. The good news is that such a management system already exists: harvest strategies.

Harvest strategies

Basically, harvest strategies[9] define the rules for fishing tuna to a set of predetermined objectives related to conservation status, catch levels and fishery dynamics. All of the tuna Regional Fisheries Management Organisations (RFMOs) like the WCPFC are developing, or have developed, harvest strategies for their critical stocks. Harvest strategies replace time-consuming and sometimes painstakingly difficult political negotiations over catch levels with proactive, science-based rules that are automatically triggered by indicators of population status. Harvest strategies make fisheries management much more effective and transparent and the supply to markets more predictable.

[7] *The Ecosystem and Climate Indicator report card from SC19,2023, WCPFC-TCC19-2023-IP121.*
[8] *International Seafood Sustainability Foundation, Status of the World Fisheries for Tuna: March 2023.*
[9] *See harveststrategies.org"www.harveststrategies.org for details*

Progress in developing and implementing harvest strategies in the world's tuna fisheries has been relatively slow: only eight out of the twenty-three stocks of major commercial tunas in the world have harvest strategies in place. However, development progress is increasing, and another five harvest strategies are expected to be adopted by the tRFMOs by the end of 2024.[10] The process is a complex one, with a highly technical scientific basis and sometimes challenging negotiations about objectives among scientists, managers, and other stakeholders. It should be emphasised that, in our view, the fact that meetings of RFMO scientific committees and commissions are held only once a year is not conducive to rapid progress in the adoption of these initiatives either .

According to The Ocean Foundation International Fisheries Conservation Project Director Shana Miller, global consensus is building around the viability of harvest strategies for fisheries management. Importantly, retail and tuna suppliers are increasingly vocal[11] in asking for the implementation of harvest strategies in RFMOs. In the long-term, the supply is at stake, but even in the shorter term, failing to introduce harvest strategies can threaten the MSC certifications of the tuna products in which trade and retail have invested heavily. Depending on the situation, fisheries have 5 to 10 years to demonstrate full implementation of harvest strategies to secure MSC certification. If the management procedures in the WCPFC are not fully in place, fisheries will be at risk of getting their MSC certification suspended. Thus, harvest strategies became a necessary condition for the market to keep the MSC-certified tuna product on the shelves.

Point of concern at the WCPFC

This point is of concern at the WCPFC. Last year, at the annual meeting in Vietnam, the WCPFC adopted a modernised management plan for the WCPO skipjack fishery. This was an urgent matter in the uprun to the meeting; there was some concern that skipjack fisheries would already lose their MSC certification if a harvest strategy were not adopted.

Eventually, the WCPFC adopted a management procedure, but it was at best only in name a harvest strategy. By making the measures non-binding, the ruling could not claim to be mandatory in character. After getting the management measure in place, some of the country representatives asked for more time to get used to the new system before having to be bound by it. Unfortunately, a voluntary harvest strategy is not a harvest strategy at all, thus losing the main advantages

[10] *www.seafoodsource.com/news/environment-sustainability/2022-brought-harvest-strategies-to-the-forefront-of-tuna-rfmos*
[11] *https://www.seafoodsource.com/news/environment-sustainability/112-retailers-tuna-suppliers-urge-wcpfc-to-adopt-tuna-harvest-strategies*

of the system, such as predictability and transparency of the catches and jeopardising the projected positive impacts on the stock and fishery. "While it is a step in the right direction, it is disheartening that members have not made the agreement binding'', Glen Holmes, Senior Officer International Fisheries at The Pew Charitable Trusts commented.[12]

Subtle form of greenwashing

By making the harvest strategy a mere factor in the fishing effort limitation debate – rather than the determining factor, as a harvest strategy should be – the WCPFC runs the real risk of heading down a slippery slope towards a subtle form of greenwashing. Under the banner of sustainability, the measure never forces anything, dictated action can be ignored, and the Member States can lull themselves into a false sense of security about their MSC certification, erroneously thinking that their certification conditions have been met.

In October 2022, right before the WCPFC meeting, the MSC released a revised standard 3.0. As a result, fisheries that were certified prior to the launch of the new standard have five years to modernise their fisheries management practices to be in line with the new requirements if they want to maintain certification. That gave the fisheries "breathing room", according to Victor Restrepo, Vice President for science at the International Seafood Sustainability Foundation (ISSF). The skipjack fisheries can take comfort in the knowledge that their certification status will be set for the next five years. But this does not mean that they can leave the decision endlessly pending. Restrepo: ''We must urge these fisheries, however, to maintain the intensity of their commitment to harvest strategies for the long-term sustainable management of all Pacific Ocean tuna stocks. Five years seems ample time by most standards. But it is scarce time by RFMO pace, especially considering the amount of technical and scientific work that remains for most WCPO tuna stocks when it comes to harvest strategies.''

Last August, the Scientific Committee of the WCPFC reviewed the management procedure for skipjack to determine management for 2024-26, and all was working smoothly. The status of the skipjack stock is within sufficient levels, so the management procedure would set the fishing conditions unchanged from the baseline level of fishing effort. The recommendation of the scientists left no doubt: the Member States of the WCPFC should implement the outcomes of the management procedure with no delay in 2024.

Historical moment

This is where we now stand. With the management of tropical tunas again on the agenda , the 2023 WCPFC annual meeting this December can become the historical moment that a management procedure for skipjack becomes a reality in the WCPO.

The alternative paints a bleak picture. Failing to decide on this issue could render the management procedure ineffectual and allow protracted and potentially politicised negotiations that leave the long-term health of the species at risk to continue. It can threaten MSC certification in the longer run. And we are talking about extra time in the end game for sustainability. Not scoring now, will leave the decisions for the WCPFC to be made in future, in much more turbulent waters, when the risk of declining stocks and smaller catches will make consensus negotiations much more politicised and difficult, if not impossible.

We need another ambitious step in the sustainable management of tuna in the region. For the PNA nations this will be a management measure that can only enforce their existing system of managing their fisheries and certainly will not undermine it. Once again it should be acknowledged that the PNA efforts have made an essential contribution to the fisheries management in the region, but that does not exclude a necessary next step of the management on a regional level. The WCPFC took a landmark decision last year to modernise the management of the fisheries by adopting a harvest strategy, or management procedure, for skipjack. Full implementation of the harvest strategy would serve all stakeholders involved. We certainly hope that the WCPFC will set the harvest strategy as the crowning achievement of the innovative sustainable policy work that has characterised the skipjack tuna fisheries in the region.

[12] *https://www.pewtrusts.org/en/about/news-room/press-releases-and-statements/2022/12/03/pew-commends-skipjack-tuna--landmark-policy-but-calls-non-binding-plan-disheartening).*

Héctor Martín Fernández Álvarez *is Sustainable Development Manager of Bolton Food, the Food Business Unit of the Bolton Group, the largest economic operator in the European tuna market.*

Steven Adolf *is advisor on sustainable tuna management and ocean policies and author of the book 'Tuna Wars'.*

AQUACULTURE

eFishery signs partnership with ASC

Indonesia – Aquaculture technology company eFishery has announced a partnership with the Aquaculture Stewardship Council (ASC) in a move that also aims to empower farmers.

Credit: Pierre Banoori

A key goal in this collaboration, according to the ASC press release, is to enhance understanding of the ASC standards within the Indonesian shrimp industry. Local farmers will be supported to achieve ASC certification by eFishery, offering the opportunity for these farmers to access international markets while committing to responsible farming practices. ASC will also work with eFishery to identify opportunities and develop mechanisms to link eFishery's data collection systems to an always-on, seamless digital audit process that enhances efficiency, accuracy and transparency. This approach will help to streamline the auditing process that underpins ASC certification and provide actionable insights for the continuous improvement of aquaculture practices.

ASC announces Improver Programme

The Aquaculture Stewardship Council (ASC) recognises that not all aquaculture producers are able to meet its robust and strict certification requirements aimed at promoting environmental sustainability and social responsibility within the aquaculture industry.

For this reason, ASC created the Improver Programme. The programme supports

farms who are not ready or eligible for ASC certification but are committed to improving their farming practices. As part of the Improver Programme, ASC has announced a new framework for Aquaculture Improvement Projects (AIPs) designed to facilitate improvements and support producers as they develop their practices.

Producers can choose one of two tracks for their AIP. The first route involves a plan of four phases designed to improve performance to a level where the producer is ready to begin the ASC certification process by the end of the AIP. The second is set out to facilitate producers who do not wish to become ASC-certified but want to improve responsible practices in specific environmental or social areas.

Thai Union (Thailand) will be one of the first companies to set up an AIP under the ASC Improver Programme, in line with their own SeaChange® 2030 sustainability strategy.

New aquafarming projects

The NFRDI has partnered with the Bureau of Fisheries and Aquatic Resources (BFAR) Region 10, the local government unit of Lala, Lanao del Norte for the Aqua-business School and Technology Business Incubation (ABS-TBI) project.

The Philippines – The National Fisheries Research and Development Institute (NFRDI) has announced that it will implementing two projects to boost the country's aquaculture sector. The Aqua-business School and Technology Business Incubation (ABS-TBI) project will be implemented in partnership with the Bureau of Fisheries and Aquatic Resources (BFAR) Region 10, the local government unit of Lala, Lanao del Norte. It will be carried out through NFRDI's Brackishwater Fisheries Research and Development Center (BFRDC), aimed at sustaining aquafarming in the country.

For the second project "Promotion of Breeding and Farming Technologies of Commercially Important Freshwater Fishes for Increased Aquaculture Production Phase II", a memorandum of agreement (MOA) was signed between the NFRDI, the Fisheries Biotechnology Center (FBC) and the local government unit of Davao del Sur. The research initiative aims to promote freshwater fish culture technology to enhance aquaculture production of high-quality fry and fingerlings, achieved through the upgrading of hatchery facilities and the capacity development of fisherfolk.

FISHING

New EM contract signed

Credit: WCPFC

The Solomon Islands – In September 2023, the Ministry of Fisheries and Marine Resources (MFMR) signed a new contract with Spanish company Satlink. This new contract expands the scope of the project initiated in 2020, which aims to provide electronic and/or human observation to all longline and purse seine tuna vessels flagged in the archipelago, with financial support from the World Bank through its Pacific Islands Regional Oceanscape Program for the economic resilience of Solomon Islands.

The Spanish company was already awarded the installation of their Electronic Monitoring (EM) system, Satlink SeaTube, on board the Solomon Islands' longline fishing vessels in May 2020 to monitor and efficiently manage fishing activities. Satlink will now provide technical support for their electronic monitoring systems and update their fisheries management center, for which the company will train the local administration team. In addition to certifying compliance with regulation, the analysis of the data obtained on board the vessels allows for generating reports on catch composition, bycatch destination or fishing grounds, among other key parameters to ensure the long-term sustainability of the fishing industry. The tuna industry in the Solomon Islands accounts for 18% of the country's Gross Domestic Product (GDP).

NOAA leads labour initiative

USA – A new initiative called Collaborative Accelerator for Lawful Maritime Conditions in Seafood, or CALM-CS (pronounced Calm Seas), was announced this past July during a collaborative stakeholder summit hosted by NOAA Fisheries. Its goal is to facilitate public-private partnerships between governmental and non-governmental collaborators, such as industry, academic institutions, and non-governmental organisations. It will promote legal and safe working conditions throughout the fishing and seafood industry. CALM-CS efforts will focus on five key strategic priorities:

- Identifying best practices for industry accountability and due diligence for decent working conditions throughout the seafood supply chain;
- Exploring novel sources of information, and enhancing means to share and analyse that information, to better identify illegal and unsafe labour practices in fisheries;
- Leveraging technology and supporting relevant organisations to reduce vulnerabilities of crew and observers to labour abuses at sea;
- Exploring potential tools to enhance safety and labour conditions aboard U.S. vessels; and society to support workers within the seafood industry, including

their ability to organise and access remediation and justice.

NOAA says that CALM-CS is open to participants from all relevant sectors workers, harvesters, processors, retailers, brokers, NGOs, and think tanks.

MARKETING

Uptick in sales of glow widow tetras

Malaysia – A transgenic variety of the black widow tetra *Gymnocorymbus ternetzi* is rising in popularity, favoured by hobbyists for their bright colours. Known as 'glow widow tetra', 'glow skirt tetra', and 'colour widow tetra', the fish glow when kept under blue LED lights. They can be kept with other small community-friendly fishes such as zebrafish, barbs, neon tetras and dwarf fish, but not with larger cichlids. These transgenic tetras are the result of the insertion of genes into normal black widow tetras that code for fluorescent proteins. The genes were sourced from a variety of marine invertebrates such as jellyfish *Aequorea victoria* found off the west coast of North America; and the Indo-Pacific sea anemone *Discosoma* sp.

Other fluorescent species sold worldwide (known popularly as GloFish) include those produced from genetically-modified zebrafish *(Danio rerio),* tiger barbs *(Puntius tetrazona),* rainbow shark *(Epalzeorhynchos frenatum),* Siamese fighting fish *(Betta splendens),* and bronze corydoras *(Corydoras aeneus).*

While these attractive fish look good in tanks, the concern is when they are released to the wild by people who no longer want hobby aquariums, they may have an impact upon the genealogy of native stocks. As one researcher put it, "imagine a brightly coloured zebrafish trying to hide from natural predators".

Sharp rise in fishery exports

Iran – The Tehran Times has reported that 11 104 tonnes of shrimp worth USD 37.6 million were exported in the first five months (March 21 – August 22) of the current Iranian calendar year 1402. According to Abbas Mokhtari, the director general of the Agriculture Ministry's Office of Quality Improvement, Processing, and Aquatic Market Development, this represented a rise of 46% in terms of volume and 32% in value

compared to the same period of time in the previous year. He said that over 83 000 tonnes of fisheries and aquaculture products worth USD 140 million were exported in the period under review, also registering a 32% rise in terms of volume.

Hossein Hosseini, the head of the Iran Fisheries Organization (IFO), said that the country exported USD 600 million worth of fishery products in the previous Iranian calendar year. He said that Iran has an estimated capacity of up to USD 2 billion in fishery exports.

TRACEABILITY & SUSTAINABILITY

Cooperation in preventing illegal trade in lobster larvae

Indonesia/Singapore – Indonesian and Singaporean representatives have met to discuss how to collaborate in cracking down on the illegal transboundary lobster larvae trade, as the latter is a key hub for the regional trade of the crustaceans. Since June 2021, Indonesia had banned exports of lobster seed in an effort to conserve declining wild stocks, but smuggling activities still continued, particularly via the country's Riau Islands which are less than an hour's boat ride to Singapore. For its part, Singapore permits the import of lobster larvae, not only to meet domestic demands but also to forward them to Vietnam and China, where the larvae are raised to maturity in fish farms and tanks and sold at much higher prices.

In the meeting, the Fisheries Ministry said that it is looking to partner with the Singapore Police Coast Guard (SPCG) on tackling the problem together. Daniel Seah, the deputy commander of the SPCG, said that his office is ready to embark on a partnership with Indonesia In beefing up security against the illegal distribution of lobster larvae between the two countries. He also suggested that the Ministry initiate an agreement with Singapore's Food Agency to issue a regulation requiring permits and certificates for every Indonesian fishery commodity that enters Singaporean territory. He said it would grant Singaporean officers more authority to enforce laws against illegal lobster larvae.

Indonesian fisheries ministry surveillance chief Adin Nurawaluddin (left) and Singapore coast guard deputy chief Daniel Seah (right) inspect an Indonesia patrol boat in Batam, Riau Islands province.

Unsustainable harvesting of wild crabs

Bangladesh – The lucrative global market for crab (*Scylla* spp) continues to result in its unsustainable harvesting from wild stocks in the Sundarbans mangrove forest. According to the Bangladesh Export Promotion Bureau, the country exported about USD 35 million worth of hard and soft-shell crabs in the 2019-2020 fiscal year. Hard-shell crabs are mainly exported live to China, while soft-shell crabs are shipped to the US, the UK, Australia, the EU and Singapore.

The government bans crab catching in the Sundarbans in January and February, which is when the crustaceans breed; and then from June through August, no activity of any kind is allowed in the Sundarbans, aimed at allowing the world's most extensive mangrove forests to recover. But regular enforcement of these restrictions is a problem.

According to the Department of Fisheries, some 3 000 people are involved in crab farming in Satkhira district, covering a total area of 321 hectares, and yielding about 2 000 tonnes of crabs annually from this district alone. However, the current practice involves catching juvenile crabs from the wild and keeping them in aquafarm enclosures until they can be sold. If crab-harvesting rates from the wild continue at current rates, says Shafiqul Islam, a professor of marine science at the University of Chittagong, then "the crab becomes endangered. Artificial reproductive techniques should be introduced for crabs rather than catching them from the wild."

Alt protein company bought over

Singapore – In February 2022, a new pilot facility was established, using black soldier fly larvae to process palm oil organic wastes into frass for use as plant fertilisers. The larvae themselves were integrated into shrimp feed for aquaculture. Set up by Singapore-based alternative protein start-up INSEACT, the facility was reported to be supplying local farms with the fertiliser in support of the country's goals to produce 30 per cent of its nutritional needs by 2030.

Hermetia illucens (black soldier fly) larvae

INSEACT has now been bought over by another Singaporean company, Karang Foodie, which specialises in upcycling

food waste. Although there is rising global demand for alternative feed, one of the main reasons why INSEACT decided on selling its company rather than pursuing other forms of funding is reported to be because high-interest rates are impacting the ability of firms to raise cash.

WORLD

High seas treaty signed at the 78th UNGA

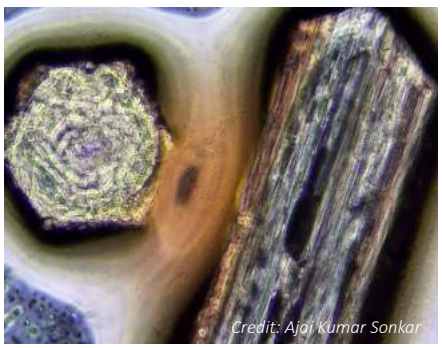
More than 70 nations and the European Union signed the high seas treaty at the 78th UN General Assembly (UNGA) which took place between Sept. 18 and 26 in New York. The signing of the treaty is a significant step in a global effort to protect the high seas, areas of the ocean beyond national borders, which have historically remained ungoverned and unprotected. The high seas encompass two-thirds of the world's oceans, but only about 1% currently have any kind of protected status.

For nearly two decades, U.N. member states belabored the text for the high seas treaty, also known as the BBNJ (biodiversity beyond national jurisdiction) agreement, but failed to agree upon it. Then, in March 2023, nations finally reached a consensus on various issues about governance of the high seas, including how to share its resources; how to conduct environmental impact assessments; how to establish networks of marine protected areas (MPAs); how to offer support to nations in the Global South to achieve treaty objectives; and also how to resolve disputes and fund work related to the treaty's goals. In June 2023, nations formally adopted the treaty after the text was translated into the UN's six official languages. However the treaty had remained unsigned until the UNGA.

Plastic found in Andaman Sea oysters

The author of "pearls through tissue culture – the promise" which was published in the INFOFISH International November/December 2021 issue, reports the presence of tiny plastic particles in the mantle of oysters from the Andaman Sea.

Dr Ajai Kumar Sonkar, who conducts research into marine oysters, said that the source of the contamination was clearly from the environment as further tests showed the presence of plastic particles in every sample of seawater and algae taken in the area. "The plastic we throw has come back to our dinner plates", he said.



Plastic particles in the mantle tissue

Diverse forms of plastic litter, most originating from countries around and beyond the Bay of Bengal, are increasingly found washed up on the beaches, or on the continental shelves of the Andaman and Nicobar Islands. In early 2023, a team of marine biologists during routine monitoring of marine litter in Andaman and Nicobar Islands stumbled upon a piece of rock on Aves island, known as plastiglomerate (a rock composed of sand, rock fragments, shells and other materials held together by plastic). This was the first such find in India but in 2014, other scientists had already reported the phenomenon as a new form of plastic pollution. Plastiglomerates have been found at Kamilo Beach, Hawaii, Indonesia, the US, Portugal, Canada and Peru.

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Universiti Malaysia Terengganu, Malaysia
www.aseanfen.org.my

Krishna R. Salin
Aquaculture & Aquatic Resources Management (AARM)
Asian Institute of Technology (AIT), Thailand
aarm@ait.ac.th www.aitaquaculture.org/ifs2023/

SUMMARY OF THE 8TH PACIFIC TUNA FORUM
6-7 SEPTEMBER 2023, Port Moresby, Papua New Guinea

Key opening remarks

Under the theme "Strengthening tuna sustainability and industry development in the Blue Pacific Continent through increased innovation, partnership and participation", the 8th Pacific Tuna Forum (PTF), jointly organised by the National Fisheries Authority (NFA) of Papua New Guinea and INFOFISH, alongside regional co-organisers, the Secretariat of the Pacific Community (SPC), the Pacific Islands Forum Secretariat (PIFS), the Pacific Islands Forum Fisheries Agency (FFA), the Parties to the Nauru Agreement (PNA) and the PNG Fishing Industry Association (PNG FIA), convened at the Stanley Hotel in Port Moresby, Papua New Guinea from 6-7 September 2023.

Mr. Justin Ilakini, Managing Director of NFA, in his welcome address as host and organiser, acknowledged all dignitaries, heads of regional organisations, industry and all participants, as well as sponsors and regional co-organisers. Mr Ilakini highlighted that the region is the best-managed and has the healthiest tuna resources, but there are always opportunities to do more in terms of sustainable development and in encouraging investment, as well as working to garner more value from these resources. The Pacific Tuna Forum towards this end, continues to be greatly valued as an enabling platform for enhanced partnerships, cooperation and dialogue on both national and regional fisheries management initiatives and actions. The Pacific Tuna Forum is also an opportunity to connect and embrace the region's common aspirations and approaches for tuna sustainability and working to harness greater value from these shared resources, for the prosperity and wellbeing of the people of this region.

Ms. Shirlene Anthonysamy in her remarks as Director of INFOFISH, joint organiser of the event, acknowledged the presence of distinguished guests, speakers, session moderators, delegates and sponsors to the 8th Pacific Tuna Forum which had over 250 participants from 40 countries present. Ms. Anthonysamy highlighted the vital importance of the bi-annual Pacific Tuna Forum as an international forum and exhibition aimed at promoting the regional tuna industry at the global level. The PTF has also evolved into an instrumental platform to deliberate and connect the aspirations of Pacific leaders in the context of the 2050 Strategy for the Blue Pacific Continent; and as the region works to usher in a new era of investment and market opportunities, market access, social responsibility, as well as processing and technological advancements in the regional and global tuna industry.

In his opening remarks, as the 8th Pacific Tuna Forum Chairperson Mr Phil Roberts, Board Director, Tri Marine International Pte Limited, Singapore, highlighted that over the past 40 years, enormous developments have been made in both tuna management and the tuna industry in the region. This includes the founding of the Forum Fisheries Agency,

UNCLOS and the UN Fish Stocks Agreement, introduction of the Vessel Monitoring Scheme, compulsory transhipment in port for purse seiners, inauguration of the Western Central Pacific Fisheries Convention, successful implementation of a Vessel Day Scheme by the parties to the Nauru Agreement, the introduction and expansion of MSC certifications and growth of Pacific Islands-based tuna fishing fleets and processing plants. Mr. Phil Roberts challenged Forum participants to continue to maintain this industry momentum on sound fishery management, to foster greater cooperation and to collectively work to address challenges such as the pressing effects of the climate change crisis on the industry and its consequential socio-economic implications for the people and communities in the region.

The Acting Prime Minister of Papua New Guinea and Minister for Lands and Physical Planning, Hon. Mr John Rosso, officially opened the Forum with an unequivocal message that 'Papua New Guinea is committed to working with the other countries in the region and industry to pursue sustainable investments in tuna fisheries sector' and that 'this development trajectory hinges on harnessing resources judiciously and focused on propelling our communities forward'. In earlier comments preluding this, Hon. Mr. John Rosso also highlighted that the Pacific Island Countries or the Blue Pacific Continent has made huge contributions to the global economy, including the successes of many businesses and to the livelihood of many people around the world by ensuring the sustainable management of the tuna and other highly migratory and straddling fish stocks in the Western and Central Pacific Ocean. It is incumbent that Pacific Island Countries continue to come together as one big Blue Pacific Continent and increase cooperation and collaboration, in strengthening sustainable tuna management, opportunities for processing businesses and supply chain linkages within the region as a major step towards improving regional competitiveness.

The Secretary-General of the Pacific Islands Forum Secretariat, Mr. Henry Puna in his keynote address, highlighted his pleasure that the Conference theme 'Strengthening tuna sustainability and industry development in the Blue Pacific Continent, through increased innovation, partnership and participation', spoke to the 2050 Strategy for the Blue Pacific Continent. Mr Puna stressed that economic prosperity is core to the 2050 Strategy and that it is the ocean and its resources, particularly fisheries, that will underlie the region's prosperity. Tuna, as a highly migratory fishery species that knows no boundaries, will continue to connect the region in ways that transcend geography. Further highlighting the importance of a sustainable tuna industry to the region, Mr. Puna highlighted key regional focuses that will require collective action as being illegal, unreported and unregulated (IUU) fishing, the impacts of climate change on fish stocks and the flow on impacts on trade and market dynamics. Working together in partnership, the Blue Pacific Continent will remain a beacon of sustainable tuna management and regional cooperation.

Session-by-session overview

In "Session 1: The State of the Tuna Supply and the Industry in the WCPO (Blue Pacific Continent)", the Forum heard about the collective efforts and initiatives of Pacific Island Countries through respective regional fisheries management organisations (RFMOs) in continuing to foster and strengthen closer cooperation and broader efforts in maintaining sustainable and healthy tuna stocks in the Western and Central Pacific Ocean. Regional leaders and high-level speakers from the South Pacific Community (SPC), Parties to the Nauru Agreement Office (PNAO) and Forum Fisheries Agency (FFA) highlighted that regional cooperation and action, has been critical to the WCPO or Blue Pacific Continent in maintaining a healthy catch and stock status in the region for all tuna species. This is inclusive of the tuna 2022 harvest at 2.7 million tonnes or almost 60% of global tuna catch. Initiatives such as the Vessel Day Scheme (VDS) have been a vital enabler in this regard and VDS objectives to assert the rights of Parties to their tuna, to conserve and maintain sustainability and increase revenue and benefits for Parties will continue to remain at the fore. The interesting development with FADs over the coming years will also provide more comprehensive data points on fishery sustainability also working forward, as well as supporting healthy marine ecosystems and conservation overall.

In "Session 2: Investing in a Sustainable and Responsible Tuna Landscape: WCPO (The Blue Pacific Continent) and Global Tuna Supply & Demand (Opportunities & Challenges)", regional leaders and voices, both public and private, continued to highlight very topical matters to the Forum on tuna sustainability and solidarity, as well as investment opportunities in the Blue Pacific Continent, effective public-private partnership in the tuna industry, improving fish standards, certification and growth and strengthening stewardship and community benefit through responsible tuna management. As highlighted by FFA, a more holistic approach is needed in terms of sustainability and its approach is one that continues to be encompassing of biological (i.e. climate change & IUU), economic (i.e. increased revenue and earnings) and social sustainability (i.e GESI & safety) aspects, in a much broader and engaged emphasis on sustainability. The FFA also highlighted the need to improve the socio-economic framework to more comprehensively measure the contributions of tuna to Pacific Island economies and value chain and investment opportunities. In terms of the value chain, an emphasis on improving vertical integration, diversification and scale would redress a lot of current

barriers and add greater value to tuna resources in the region. The NFA provided a key overview of the Blue Pacific Continent being one of 96% ocean and the source of 60% of the global tuna catch. The Blue Pacific Continent remains a region with significant investment potential still in terms of tuna fisheries and in returning greater value to countries and peoples in the region. The Joint Communique from the Pacific Islands Fisheries Ministers East New Britain Initiative, held in Kokopo just prior to the convening of the 8th Pacific Tuna Forum, works to further develop regional fisheries hubs and spoke countries in realizing the full potential of the region's tuna resources. This resonates with the PNG Government's approach to harness Special Economic Zones (SEZs) as an opportunity to garner investment, opportunities for processing, greater industry development and greater returns. Speakers from Fiji and the Solomon Islands, mirrored this in terms of the need for greater partnerships and participation between the Government, industry and communities, as well as importantly in ensuring greater community benefit and stewardship of tuna resources. The PNG FIA also highlighted the Responsible Sourcing Policy (RSP) as a vital tool in terms of due diligence 'for our planet' and 'our people', with a particular emphasis on sustainability, marine litter & fishing gear, social responsibility & crew welfare and traceability. This is all very important in supporting the continuing growth and impact of the tuna industry in supporting sustainability, transparency and accountability, better responsibility and safety, and better returns for all partners and stakeholders.

In the last session of Day 1 and what served as the first part of "Session 3: Global Tuna Trade and Markets", with the sub-topic on "The Blue Pacific Continent Trade & Market Dynamics", the participants were treated to well-informed presentations from a panel that covered trade and market issues. The PIFS highlighted a regional perspective in fostering greater economic partnerships and cooperation to enhance high-value market access. This included regional actions on EPA's with the EU and also opportunities within the US market in working to increase the volume and value of trade. The newly appointed Pacific Ocean Commissioner spoke to the WTO Fisheries Subsides Agreement from a Pacific perspective and that national fisheries subsidies and a lack of transparency could result in overfishing. Moreover it was highlighted that the 'Pacific has a strong offensive interest to have effective disciplines to reduce subsidies that support overcapacity (building more/larger boats) and overfishing (increasing fishing effort), but a strong defensive interest on special and differential treatment (flexibilities) for developing countries'. In a presentation from Maersk, the shipping company giant highlighted its integrator strategy in providing a lower-carbon model for the storage of fish and seafood as a one-stop shop, while the WCPFC highlighted opportunities to further develop harvest strategies, incorporate climate in fisheries management, leverage emerging technology and focus on sustainable and ethical economic development. The WCPFC also highlighted that its objective is to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the WCPO region and that stronger cooperation and broader partnership will be critical towards this end.

On the first session of Day 2 and what was the second part of "Session 3: Global Tuna Trade and Markets", speakers spoke to the sub-topic 'Global and Regional Trade and Markets'. A presentation from INFOFISH provided an overview of the state of the global tuna industry and development in tuna trade and markets in the Asian region. An important highlight was that Asia remains both the highest importer of tuna in 2021 at 64% and tuna exports the same year which constituted 46% of global market share. In terms of consumer trends, demand for higher-value tuna, fresh and frozen, is on the rise in South East Asia and the Far East, as well as the preference for eco-friendly and clean labeled tuna products. In terms of an industry perspective shared from Selecting Strategic Partners, Brazil, a market comparison was made that Pacific EEZs make up over 50% of the world's tuna and produce USD$26 billion worth of tuna for consumers and earn 10% of this value mostly from licensing and limited processing, while Ecuador catches and processes about 20% of the world tuna at the value of USD$1.3 billion a year. The PNG FIA re-emphasised this point that the WCPO continues to dominate the global catch for albacore, bigeye, skipjack and yellowfin tuna and at the denominated value of USD$2.7 billion. It was also highlighted that the industry needed to recognise MSC certification as a consumer preference in high-value markets (as in the highlights shared on the EU market) and that there was an opportunity for industry in the region to leverage on these insights, particularly as it looks to process more tuna in the region and value add. In terms of a presentation on the Middle East & North African (MENA) market it was highlighted to participants that this is a growing market and the highest per capita growth in terms of the consumption of tuna products. It was further represented that this is a market that the region could look to engage more with, nurture and grow in terms of the trade of tuna products. From an Australian and New Zealand market perspective as highlighted by a speaker from Simplot Australia, skipjack tuna and yellowfin are the predominant species on the market shelf, with Thailand being the main processing country. As reflected by all speakers in this session, diversification and valued-added tuna products, are an increasing market segment, alongside pricing, sustainability and certification as overall considerations for consumers in this market.

In the third part of "Session 3: Global Tuna Trade and Markets" and under the sub-topic 'Promoting Partnerships

and Participation in the Tuna Industry", the Global Dialogue on Seafood Traceability (GDST) spoke to GDST as a global standard for interoperable digital traceability throughout fishery and aquaculture. GDST partnership remains a critical enabler in terms of the adoption and implementation of GDST tests, tools, consulting and services within the tuna sector to achieve the required level of transparency, as well as progression of standards and relevance within evolving regulatory and responsible sourcing environment. A speaker from BIOLAN Southeast Asia highlighted that the industry is actively moving through a process of innovation and that digitalisation will play a more and more important role in this era. This is especially so to ensure and enhance sustainable and transparent industry processes and practices. Pacific countries working together in partnership can take a lead role in this regard in protecting the quality and value of tuna products, improve monitoring and compliance, ensure data quality, digital access to data in a transparent and accessible way and promote the highest quality standards for the industry and international market. PNAO highlighted that since 2020, the Parties to the Nauru Agreement have continued to forge a path towards greater participation in, and control of, the tropical tuna fisheries in their waters. This has, and continues to open up considerations and opportunities for significantly increased economic returns and variable but very positive additional development opportunities, such as development of domestic fleets through joint-venture arrangements, greater inter-party trading of vessels, on-shore processing, servicing vessel activity, crew placement and employment of observers.

In "Session 4: Leveraging Technological Innovation and Processing Development for a Safer, Secure and Sustainable Tuna Industry", participants were exposed to how technological innovation and novel approaches have been utilised better in informing decision-making, production and value chain efficiencies and sustainable fisheries management in the 'Blue Pacific Continent'. SPC spoke to the development of electronic monitoring in the Pacific and where the efforts of trials have been focused on longline fisheries and the development of standards, with opportunities also for transhipment and port monitoring, as well as for a regional image library to support the development of AI. Challenges however, remain in terms of overall costs and resources, industry cooperation, bad footage, extensive review times, data quality and crew privacy, in terms of realising the full potential of electronic monitoring. PNAO added that FIMS and e-Reporting are also important in strengthening transparency and accountability. Advances include enhanced data accuracy and reliability, timely and comprehensive reporting, improved monitoring and enforcement capabilities and enhanced decision-making, while challenges remain as similar to those highlighted by SPC in terms of infrastructure limitations, ensuring widespread adoption among all stakeholders and capacity needs for technology usage and data management, better reporting and accountability overall. NFA also highlighted how the Integrated Fisheries Management System (iFIMS) provides an array of products and services to the NFA and other clients in serving, supporting and maintaining their fisheries information management needs. This includes the vessel monitoring system (VMS), electronic reporting (e-Reporting) and integrated data management, amongst other important applications. The speaker from TraSeable Solutions highlighted the case for making fisheries data transparent, also suggesting that without transparent and accessible data, achieving the sustainable management of fisheries resources becomes a more complex challenge. The speaker also highlighted that there can be lessons drawn from the launch of its groundbreaking Fisheries Information System (FIMS) and how this is momentous in supporting digital transformation in the case of Seychelles. The fisheries sector is not only an economic driver, but also a vital component of food security and sustainable development. A PhD researcher also highlighted considerations for industry in terms of an appreciable amount of tuna catch that is lost from the value chain due to fleshy quality issues, one of them being due to Mushy Tuna Syndrome (MTS). A survey of the global tuna industry established that MTS is a significant problem in tuna fisheries in the world's tropical oceans and predominately affects skipjack tuna. A current study is exploring the application of a cost-effective, rapid, non-invasive technique using Near Infra-Red-NIR- spectroscopy to identify such fish, as well as benefit the industry in adjusting fishing and processing practices.

In "Session 5: The Future of the Tuna Industry: Eco-Labelling, Social Accountability and Sustainability" speakers highlighted vital considerations and developments in these critical areas. GSSI highlighted its efforts in realising a vision for a sustainable and balanced tuna sector through regional and global company leadership, reliance on trusted codes and guidelines and shifting from fragmentation to a common understanding. At the helm of this is work towards a global benchmarking landscape, tools and seafood map. Over the next 10 years this will be achieved through global networks that are sharing values and taking collective action, efficient supply chains that are responsible & sustainable and industry leadership that encourages continuous improvement in helping the collective to achieve shared goals. The speaker from Global Fishing Watch highlighted how recent advances in satellite technology, machine learning and data availability have expanded the public's ability to monitor global fisheries. In addition, satellite datasets and data transparency can help support strong fisheries management and monitoring programs. Also highlighted was how industry organisations and government agencies, including the NFA and PNG FIA,

are leading efforts to highlight and increase the transparency of tuna fisheries and supply chains. The CEO of Fish Standard Crew spoke to the need to increase attention and focus on the welfare, safety and working conditions of crew on fishing vessels around the globe. It is encouraging that governments, NGOs and actors across the seafood supply chain are more focused on the welfare and fair treatment of fishing crews around the globe. The FISH Standard for Crew is a new, voluntary third-party certification program for labour practices open to fishing vessels globally. The Standard is based on ILO-C88 and related guidance and is currently pursuing sustainable Supply Chain Initiative (SSCI) benchmark recognition. Four fleets around the world have been certified to the FISH Standard, including tuna purse seiners of the Fishing Industry Association of Papua New Guinea. The speaker from the Marine Stewardship Council (MSC) highlighted that its MSC certification is the most widely-used global benchmark for assessing the sustainability of wild capture fisheries. It is used throughout the world to assess, improve and demonstrate the sustainability of fishing activities and seafood products and towards this end, it regularly reviews the Standard. The new Standard published October, 2022, reflects the global evolution and uptake of fisheries management best practice, raises fisheries' performance in key areas and ensures that MSC-certified fisheries continue to be recognised as world leaders in sustainability. The Founder & Director of FOS spoke to 'Satellite and CCTVs monitoring, augmented reality audits and marine biodiversity offsets: sustainable seafood certification according to Friend of the Sea (FOS)'. Friend of the Sea has been the first certification for sustainable seafood to propose only one seal of approval for both aquaculture and fisheries seafood origin. FOS is now exploring other areas of improvement in the certification process. This includes continuous post-audit satellite monitoring of approved Friend of the Sea's vessels to verify compliance with requirements such as those related to Marine Protected Areas (MPA), legal transhipment at sea, fishing season and area limits, and social accountability, as well as other areas of monitoring, compliance, accountability and transparency.

High Level Dialogue

"A High Level Dialogue on Greater Sustainability, Industry Engagement and Enhancing Value Retention in the Blue Pacific Continent", was also held on the margins at the end of Day 1 between Fisheries Ministers from the Pacific Island Countries, fisheries administration officials and the industry. An overview of the resulting Joint Communiqué called for a renewal commitment to combat IUU fishing; sustained efforts to improve regional cooperative frameworks; strengthening collaboration and support for RFMOs; improved awareness at national and regional levels on supply chain, production and value-adding efficiencies; reduction of import tariffs imposed by developed countries; cooperation on climate change mitigation and improvements on industry communication concerning efforts towards enhancing and demonstrating sustainability in the Blue Pacific Continent.

Key closing remarks

Mr. Phil Roberts, the 8th Pacific Tuna Forum Chairperson and Board Director, Tri Marine International Pte Limited, Singapore, highlighted principal themes that were the mainstay of the two-day Forum. These themes were sustainability, climate change, IUU fishing, economic model, markets and cooperation. The latter in particular is critical in binding collective efforts towards all the thematic areas discussed and continuing to make gains for the common benefit. In this regard, Mr. Phil Roberts stressed that "... focus in the coming years should be on the full spectrum of sustainability, preparation for the impacts of climate change, the fight against IUU fishing, increasing sound investment in our various countries, and adding value to our wonderful tuna resource. And to do all that, we need cooperation at all levels and by all parts of our tuna world".

The 8th Pacific Tuna Forum (PTF) was an invaluable opportunity for all industry partners and stakeholders, to engage on and further advance the most pressing conversations and dialogue on sustainable tuna fisheries management and industry development within the Blue Pacific Continent. The Pacific Tuna Forum (PTF) as held bi-annually, will continue to serve as a critical platform and nexus point in gauging the pulse of the tuna industry in the region, showcasing cutting-edge developments and highlighting future pathways for a more sustainable tuna industry in the Blue Pacific Continent.

PTF 2023

8th PACIFIC TUNA FORUM

"Strengthening tuna sustainability and industry development in the 'Blue Pacific Continent' through increased innovation, partnership and participation"

6 - 7 SEPTEMBER 2023

The Stanley Hotel & Suites, Port Moresby, PAPUA NEW GUINEA

Jointly organised by: INFOFISH; National Fisheries Authority Papua New Guinea; Pacific Community Communauté du Pacifique; PACIFIC ISLANDS FORUM SECRETARIAT (PIFS); FFA PACIFIC ISLANDS FORUM FISHERIES AGENCY

Co-organisers: Parties to the Nauru Agreement Office (PNAO); PAPUA NEW GUINEA FISHING INDUSTRY ASSOCIATION (PNG FIA)

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12 September 2023

HIGH LEVEL DIALOGUE ON GREATER SUSTAINABILITY, INDUSTRY ENGAGEMENT AND ENHANCING VALUE RETENTION IN THE BLUE PACIFIC CONTINENT

JOINT COMMUNIQUÉ

A closed-door High Level Industry Dialogue was held in conjunction with the 8th Pacific Tuna Forum (PTF) which took place in Port Moresby, Papua New Guinea, from 6 – 7 September 2023 with the theme ***"Strengthening tuna sustainability and industry development in the 'Blue Pacific Continent' through increased innovation, partnership and participation"***. Present were **Honorable Nestor Giro**, Minister for Fisheries and Marine Resources, Solomon Islands; high level fisheries administration officials; as well as representatives of several international and regional organisations from the tuna industry. The Dialogue was moderated by the 8th PTF Chairperson, Mr Phil Roberts, Board Director at Tri Marine International Pte Ltd, Singapore.

The framework of the Dialogue included, but was not limited to, two main points of discussion:

- How can Pacific Islands countries as a collective work towards supporting greater sustainability of the tuna industry in the region?
- A conducive legislative, policy, regulatory, management and investment environment is crucial in terms of engaging industry towards enhancing value-adding within the region. What are the opportunities and challenges towards achieving these goals?

The Honorable Minister and representatives of the government and industry:

The Western and Central Pacific region and Blue Pacific Continent accounts for 60% of global tuna harvests. For many countries and peoples in the Western and Central Pacific region, fisheries constitute part of the fabric of society and a way of life, providing a significant source of sustenance and livelihood, employment, and income. In addition, the sector is also a source of productivity, revenue, and national advancement for respective countries.

Recognised that despite advancements in recent years, illegal, unreported, and unregulated (IUU) fishing remains a severe ongoing concern in the Blue Pacific Continent. Tackling this issue necessitates having improved monitoring, control, and surveillance (MCS) capacity and an enabling legislative environment that implement vital international agreements that address IUU fishing, thereby ensuring the long-term sustainability of fishery resources, increased access to higher-value markets and facilitating significant opportunities for more investment in downstream processing for the benefit of Pacific Island communities, industry partners and stakeholders;

Further noted that the intergovernmental Regional Fisheries Management Organizations (RFMOs) and sub-regional offices, having the authority to establish fisheries conservation and management measures on the high seas for tuna and other fisheries, provide a common platform for Pacific Island governments and distant water fishing nations to work towards the elimination of IUU fisheries;

Asserted that enhanced industry engagement, especially regional producers and exporters to global markets, is needed to make stakeholders and tuna markets aware of tariffs that unfairly discriminate against 'Blue Pacific Continent' tuna supply chain solutions;

Reminded the industry of the importance of not only focusing on producing premium, world-class products but also being heard and seen to be doing so through effectively communicating the region's commitment to sustainability, transparency, and food safety; and finally,

Emphasized the vital importance of the collective will of all key stakeholders to cooperate in seeking and implementing regional solutions to increase value addition to tuna product exports and to increase community resilience to common threats such as climate change, and the protection of social, environmental, and human rights ("people and planet").

In considering the above, the Hon. Minister and the representatives of government and industry called for:

- A renewal of regional commitment to combat IUU fishing and implementation of Port State Measures and the Voluntary Guidelines on Transhipment; to strengthen implementation of catch documentation schemes as well as monitoring, control and surveillance (MCS) initiatives; and at the same time, to improve the sharing of relevant catch information and transparency to forge greater engagement, understanding and cooperation at all levels of the supply chain in the tuna industry;

- Sustained efforts aimed at improving upon regional cooperative management frameworks to ensure alignment with international agreements and practices mentioned above; the long-term sustainability of common fisheries resources; ensuring safety at sea as well as the well-being of coastal communities; while incentivising transparent and responsible foreign direct investment to catalyse growth in infrastructure and capacity;

- Strengthened collaboration and support for Regional Fishery Management Organizations and their sub-offices to support their mandate for fishery resource management and initiatives to combat IUU fishing;

- Improved awareness at national and regional levels of supply chain efficiency, transparency, and accountability; enhanced access to higher-value markets and exploiting opportunities for investment in downstream processing, thus ensuring that industry partners derive more significant benefit overall from source to the point of sale or export, while seeking and prioritizing opportunities to collaborate with other Pacific Island countries on commercial initiatives which leverage each country's strengths.

- The reduction of import tariffs imposed by developed countries, such as the US and EU, on tuna products imported from Pacific Island processing countries that have obtained tuna raw materials from sustainable fisheries. This is to encourage and enable developing Pacific Island processing countries to improve their local fishery communities' livelihoods and adapt to climate change;

- Countries, especially Pacific Island nations, to work together to mitigate the effects of climate change on fisheries production and food security and to prepare for the future impacts of climate change on the oceans and tuna fisheries;

- Improvements in how the industry communicates with consumers of the region's success in meeting sustainability expectations, as well as to showcase that the industry is meeting the changing needs of the market through continuing innovation, effective branding, adequate use of information technology and increasing value added products in the Blue Pacific Continent.

The 16th RPOA-IUU Coordination Committee Meeting 26-27 October 2023 Dili, Timor Leste

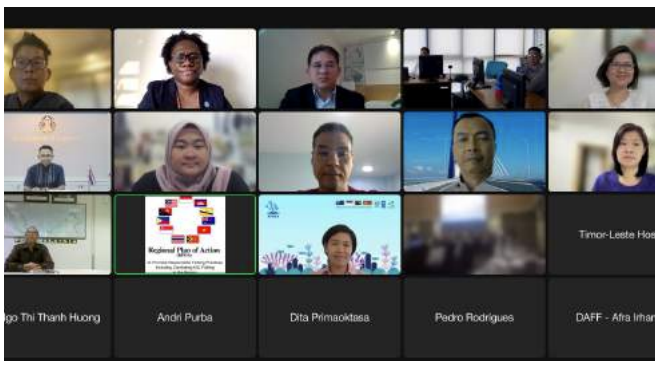
The Regional Plan of Action (RPOA) to promote responsible fishing practices, including combating IUU Fishing in the South East Asia Region convened its 16th session of the RPOA-IUU Coordination Committee Meeting (CCM) in hybrid mode on the 26-27th October 2023 from Dili, Timor Leste.

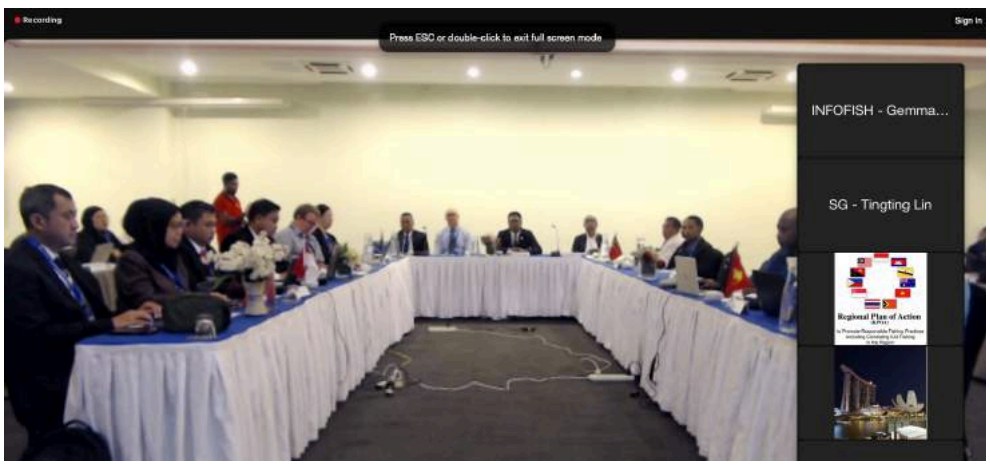
With 11 member countries, including Australia, Brunei Darussalam, Cambodia, Indonesia, Malaysia, Papua New Guinea, the Philippines, Singapore, Timor Leste, Thailand and Vietnam, the 16th session of the RPOA-IUU CCM serves as the platform for member countries to discuss the progress status of implementation of the RPOA-IUU work plans and RPOA-IUU core elements. Participation also included observers such as IMCSN, CCAMLR, USAID SuFia TS and ATSEA-2 Project and advisory bodies such as INFOFISH, alongside other multi-lateral and regional bodies such as FAO and SEAFDEC.

In his opening remarks His Excellency Domingos da Conceicao dos Santos, Secretary of State for Fisheries, Ministry of Agriculture, Livestock, Fisheries and Forestry, Timor-Leste spoke broadly to the objectives of the CCM as to update progress on the 2023 Work plan Implementation, to provide an updated overview and outlook of IUU issues at the regional and international level, and to endorse an action plan as appropriate to further implement RPOA-IUU and the 2024 RPOA-IUU Work Plan. He also highlighted in his remarks that '...illegal, unreported and unregulated fishing poses the greatest threats to marine resource sustainability, which causes fish stocks depletion, marine habitats destruction and as a result leads to great economic loss for countries'.

Meanwhile, Gemma Meermans Matainaho, Trade Promotion Officer, INFOFISH, said that 'INFOFISH as an organisation is focused on promoting sustainable fisheries trade, markets and development, and is committed to doing its part in highlighting this issue and providing effective platforms for increased dialogue and concerted action on all matters concerning sustainable fisheries management in the Asia Pacific region in particular...' and moreover in working with industry and regional organisations such as RPOA-IUU towards this end.

The 16th RPOA-IUU CCM closed with a stronger commitment by member countries and participating bodies to responsible fishing practices, including IUU Fishing in its 2024 RPOA-IUU Work Plan and the call for all member countries to enhance coordination efforts and overall cooperation.





GLOBAL MEET ON

GIANT PRAWN 2023

EXPLORING INNOVATIONS, SUSTAINABILITY, AND INDUSTRY TRENDS

GIANT PRAWN 2023 EDITION

The GIANT Prawn conferences were founded by Michael New, OBE.
The first was held in Bangkok in 1980, followed by two other conferences in India (2003 and 2011). The Asian Institute of Technology (AIT) organized the 2017 edition in Bangkok, Thailand, and the GIANT PRAWN 2019 at Shanghai Ocean University (SHOU), China.

GIANT PRAWN 2023 is the 6th conference in the series, jointly organized by AIT, Thailand, and SHOU, China.

CONFERENCE DAYS: 27-29 NOVEMBER 2023

NOVOTEL BANGKOK FUTURE PARK RANGSIT, THAILAND

REGISTRATION
26 November 2023

MAIN CONFERENCE
27-29 November 2023

FARM TOUR
29 November 2023

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Partners

Krishna R. Salin
Aquaculture & Aquatic Resources Management (AARM)
Asian Institute of Technology (AIT), Thailand
aarm@ait.ac.th www.aitaquaculture.org, www.giantprawn.org
Huang XuXiong
Shanghai Ocean University (SHOU), China
xxhuang@shou.edu.cn www.shou.edu.cn/eng/

The XI ANFACO Tuna World Conference, Vigo, Spain 14th - 15th September 2023

The XI ANFACO Tuna World Conference was held in picturesque Vigo, Spain, from 14th - 15th September 2023, under the theme 'Leading in Uncertain Times'.

The ANFACO Tuna World Conference is held bi-annually, bringing together leading voices and players from across the tuna industry in Europe and across the globe. Session topics highlighted value propositions on tuna marketing; tuna-18' beyond canning; tuna stocks and their sustainable management; the European Commission promoting sustainability, innovation & technology; as well as regional focuses on the tuna business in Europe, Asia, Africa, the Middle East, and North and South America in terms of raw material sourcing, processing and marketing of tuna products. For the participants, it was a wonderful opportunity to share and garner trade trends and market insights on the current state and future outlook of the tuna industry, from both a regional and global perspective. This included key insights from industry, regional organisations and policy makers in continuing to encourage sustainability, further embracing technology and ensuring the viability of the global tuna industry overall.

As a collaborator and supporter of the XI ANFACO World Tuna Conference, INFOFISH was privileged to contribute to the Conference as a moderator for "Session 7 - Tuna Business in Asia" on the "Current situation and future outlook for raw material sourcing, processing and marketing of tuna products". In her opening remarks, Gemma M. Matainaho on behalf of INFOFISH, thanked the organisers for the opportunity to participate and as a segue, highlighted that the "Asia Pacific holds the second-largest share of the global tuna market and is also an important regional player within the global tuna industry". Further reflections were also that this share is only likely to expand with an increasing population, rising per capita income and growing middle class. The session also saw an engaging discussion at the end, with all session speakers and the moderator contributing to a lively discourse.

In the declaration of the World Tuna Industry XI ANFACO (https://anfaco.es), it was highlighted that the "...conviction, after holding this Conference, is that the solid foundations of a sector with history and tradition, supported by innovation and technology, are robust tools that will contribute to the Blue Transformation, to successfully address the current challenges that allow the sector to grow and continue its leadership in the supply of an essential and nutritious product". The XI ANFACO World Tuna Conference was attended by over 400 participants from more than 40 countries and will next be held in Vigo, Spain, in 2025.

World Seafood Congress 2023

in association with International Conference on Molluscan Shellfish Safety

25-27 September 2023
Peniche-PORTUGAL

Group photo of the participants

WSC2023 was a resounding success

The 12th World Seafood Congress 2023 (WSC2023) was held in Peniche, Portugal on 25-27 September, in collaboration with the 13th International Conference on Molluscan Shellfish Safety. The event was co-hosted by the International Association of Fish Inspectors (IAFI) and the Instituto Politécnico de Leiria, School of Tourism and Maritime Technologies (ESTM-IPL), Portugal.

The World Seafood Congress 2023 was attended by 150 participants from 30 countries, with top-level interventions by WorldFish, DG SANTÉ, NOAA, Thai Union, UNIDO and FAO, along with a host of leading academics from universities and research institutes on all five continents. INFOFISH was the media partner for the event.

Key themes discussed were technology for the circular economy; emerging food safety hazards in fishery and aquaculture products; safety of bivalve molluscs; impacts of microplastics; traceability tools; fraud in the international supply chain; and ethical drivers including crew welfare, human rights and animal welfare, both in aquaculture and capture fisheries.

The Congress kicked off on Sunday 24th September with regional developing country workshops for Asia, Africa and Latin America. Sujit Krishna Das, representing INFOFISH, gave a presentation on 'Innovations in Seafood Processing, Packaging and Distribution Technology', in line with the theme "Advances in Safety, Science, Technology, and Utilisation of Aquatic Products".

Sujit Krishna Das, Technical Officer, INFOFISH, speaking on Day 2, Session III during the WSC 2023.

Participants also joined the technical tours after the Congress, visiting state-of-the art fishery and aquaculture operators in the West Region of Portugal, including a tuna/sardine cannery, a molluscan shellfish hatchery producing for offshore production, and a modern fish processing facility for retail sale.

WSC 2023 was also the venue for the announcement by The International Association of Fish Inspectors (IAFI) of the winners of the 2023 IAFI Peter Howgate Award: Ms Polina Rusanova from Russia and Mr Samuel Koduah from Ghana. Ms Rusanova has a background in marine ecology and is a researcher at the Institute for Biological Resources and Marine Biotechnology of the National Research Council of Italy, having completed a joint master's degree in environmental management at Irkutsk State University, Russia and the Christian-Albrecht University of Kiel, Germany. Her research area concerns the impacts of the environment on seafood safety and quality. In particular, she presented a paper on microplastic contamination in elasmobranch fish and its impacts on seafood quality. Mr Koduah works as a Fish Inspector in the Fish Inspection Department of the Ghana Standards Authority, located in Accra. His main duties are as a front-line officer undertaking the food safety inspection and auditing of fishing vessels and fish processing establishments listed for export of fishery products from Ghana. This work involves checking hygiene conditions of the facilities, its staff and HACCP food safety control systems, and the preparation of reports. IAFI sends warmest congratulations to them both.

Ms Polina Rusanova from Russia (left) and Mr Samuel Koduah from Ghana (right)

Participants enjoyed numerous interesting interdisciplinary discussions, both formal and informal. Diversity always thrives at the interface between systems, and the Congress certainly generated plenty of diverse ideas from an exciting mix of disciplines. IAFI will carry these deliberations in the future, as it contemplates its new elevated role as a registered NGO with the UN's Economic and Social Committee.

On closing the event, Dr. Ian Goulding, President of IAFI, announced that the IAFI Board has considered several applications for future Congresses and decided to hold WSC2025 in Cochin, India, in collaboration with the Society for Indian Fisheries and Aquaculture and PDA Ventures as the congress organiser. This is scheduled to be held at the end of October 2025.

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Delegates from Cambodia led by H.E. Mr Has Sareth, Secretary of State, Ministry of Agriculture, Forestry and Fisheries (MAFF), Royal Government of Cambodia (3rd from the left) also attended WSC 2023 and visited one of the most versatile and modern Tuna cannery plants in Europe, the Thai Union Group, as a part of their technical visit.

Participants visited the Oceano Fresco, a state-of-the-art bivalve hatchery and nursery located in Nazaré, producing juvenile clams for grow-out in an open sea farm in the Algarve Coast during the technical visit.

Training Course on Risk Analysis in the Aquaculture Value Chain, 3-5 September 2023

A Training Course on Risk Analysis in the Aquaculture Value Chain was held at Swissotel Bangkok Ratchada, Thailand from 3-5 September 2023. The 3-day training course was organized by the Food and Agriculture Organization of the United Nation (FAO); the ASEAN Network of Aquatic Animal Health Centres (ANAAHC); and the Department of Fisheries Thailand. The training was supported by INFOFISH and Network of Aquaculture Centres in Asia-Pacific (NACA), with financial support provided by the Norwegian Agency for Development Cooperation (Norad).

INFOFISH was among the 79 participants from various countries who participated in this training course. They were from Brunei, Cambodia, Ethiopia, Indonesia, LAO PDR, India, Iran, Malaysia, Maldives, Myanmar, Philippines, Saudi Arabia, Sri Lanka, Thailand and Viet Nam.

Targeting those directly and indirectly involved in the aquaculture sector, the training course introduced the Progressive Management Pathway for Aquaculture Biosecurity (PMP/AB) and used a risk-based approach to improve the overall sustainability of the aquaculture sector. It outlined the concepts and steps needed to apply a risk analysis in the context of aquaculture with the goal of improving aquaculture biosecurity. Key topics of interest were:

- The Progressive Management Pathway for Aquaculture Biosecurity (PMP/AB);
- Risk analysis approach as it applies to aquaculture biosecurity;
- How import risk analysis (IRA) can be used to manage disease risks associated with the importation of live aquatic organisms; and
- The application of risk analysis along the aquaculture value chain.

Participants were briefed that risk analysis is an essential component of any national aquatic organism health strategy. Now widely applied in many fields, risk analysis provides a science-based framework for evaluating hazards, determining the likelihood and extent of potential harm, mitigating risks and guiding policy decisions. Combining risk and value chain analysis provides a risk-based and people-centred approach for managing disease risks and planning control measures in the aquaculture systems.

Another risk management system called the Hazard Analysis and Critical Control Points (HACCP) was also introduced in this training. As it applies mainly in post-harvest processing systems, it is increasingly being used in the aquaculture industry. It provides a logical approach to identify and control pests, pathogens and environmental hazards associated with aquaculture production and processing facilities.

Group photo of the workshop participants

Virtual Training Workshop on Seaweed Processing for Value-Added Products, 23-24 August 2023

A virtual training workshop on "Seaweed Processing for Value-Added Products" was held on 24 August 2023. The day-long training workshop started at 10.30am Malaysia Time with the opening message from INFOFISH Director Shirlene Maria Anthonysamy. Ms Yamuna Sumanarathna, Export Promotion Officer from the Export Development Board of Sri Lanka, set the stage with a presentation entitled "Seaweed Production, Trade and Marketing Status in Sri Lanka". The session continued with three consecutive presentations entitled "Small-scale Seaweed Processing for Food-Based Products" by Ms Maria Gigih Setiarti, Indonesia; "Seaweed Processing for Non-food Products" by Mr Philip Gu, Singapore; and "Value-added Fresh Seaweed Products: On-shore Seagrape Farming" by Dr Dao Huy Giap, Vietnam.

The most interesting part of the training workshop was the step-by-step video demonstration of production of seaweed snacks and seaweed juice where the participants had the chance to watch the video and obtain the recipe to produce seaweed-based crackers and drinks.

This training was attended by 67 participants from six (6) INFOFISH Member Countries including Bangladesh (1), Malaysia (11), Papua New Guinea (5), Philippines (25), Sri Lanka (23) and Thailand (2). The training was organised in response to a request from the Export Development Board of Sri Lanka, but considering the importance of the topic, it was opened to other Member Countries.

Group photo of some of the participants

The 14th Philippines Shrimp Congress, Bacolod City, Philippines 20 - 22 September 2023

The 14th Philippines Shrimp Congress was held in the vibrant Bacolod City, Philippines from 20 - 22nd September 2023 under the theme "The Philippine Shrimp Industry: Building and Adapting to the Regional Open Market". As highlighted by Senator Hon. Mrs. Cynthia A. Villar, Chair, Senate Committee on Agriculture and Food, the "Philippine shrimp industry plays a vital role in the country's pursuit of food security, livelihood generation, and foreign exchange earnings".

The 14th Congress Chairman Mr. Ryan Michael C. Alegre from the Philippine Shrimp Industry Inc. (PHILSHRIMP), highlighted that the theme spoke to "the importance of embracing updates and transformation for the shrimp industry to build a coordinated response in dealing with concerns and challenges" and that the "theme couldn't be more relevant as the shrimp industry adjusts to its new reality and seeks to establish connections with various sectors and the government".

The 14th Philippines Shrimp Congress covered considerable breadth and depth in innovative topical matters most pressing to the industry. As highlighted by Joseph Edgar M. Sarrosa, the President of the Philippine Shrimp Industry Inc (PHILSHRIMP), "our goal is to familiarize all participants with cutting-edge technological innovations that have the potential to enhance daily operations, leading to increased production and a competitive edge in the market".

Technical Session topics included global trends, hatchery, health, nutrition, marketing, government policies and interventions. Congress participants comprised leading voices and players from the industry, including shrimp growers, hatchery operators, suppliers, industry experts, industry associations, regional organizations and policy makers, with over 900 participants in total coming from across the Philippines and internationally.

For INFOFISH it was an opportunity to contribute to "Technical Session 1: Global Trends", with a presentation from Gemma M. Matainaho, Trade Promotion Officer, on "Global Trends in Shrimp Trade, Post-Pandemic". The presentation provided an overview of the global shrimp trade; current market scenarios in terms of leading shrimp importers and exporters at a country level; current market trends in terms of diversification of shrimp products; and a market outlook. There was also a further opportunity to engage in an open forum at the end of the session, alongside the other session speaker and to further articulate and share on the presentations made during that session.

The Shrimp Congress is held annually and is the premier convening of the shrimp industry in the Philippines. Shrimp ranks fourth among major fisheries exports from the country after tuna, seaweed and crab, and continues to grow in importance as an industry.

FAO Regional Workshop on understanding fisheries support measures in the Asian context 17 – 19 October 2023, Bangkok, Thailand

Fisheries support may have both positive and negative consequences for the sector and the resources on which it relies, sometimes unequivocally and sometimes in more contrasted ways. For example, supporting measures for improved management, monitoring, control and surveillance (MCS) can directly contribute to ensuring the health of fish stocks and the sustainability of fisheries when they are implemented effectively. Sometimes, support measures have socio-economic benefits for recipients in the short term. However, they can also increase fishing pressure and potentially harm fish stock health as well as operators' long-term profitability and resilience due to overfishing, stock depletion, and increased environmental and social costs.

This latter support can have additional trade-distortive effects and disadvantages for developing and least-developed countries, and small-scale fishers.

Considering the myriad government support measures aimed at ensuring the sustainability of the resources, the resilience of small-scale operators, and the growing pressures on the fisheries sectors globally, there is an increasing need for better understanding of support policy options, their fundamental characteristics and possible interlinkages, and their primary purpose. In addition, it is essential to differentiate between the categories of policies under consideration and how they contribute towards achieving Blue Transformation and the sustainable use of marine resources.

Against this context, a Regional Workshop on **"Understanding Fisheries Support Measures in the Asian Context"** was organised by FAO, with participation from the Organisation for Economic Co-operation and Development (OECD), and technical support from INFOFISH.

The main objective of the Workshop was to establish a common understanding of the various possibilities of fisheries support, their application, effectiveness and related policies through:

- Offering the opportunity to explore issues, implications, advantages and disadvantages associated with fisheries support measures;
- Demonstrating the importance of a platform for sharing national and regional experiences on government support measures; and
- Discussing potential fisheries support policy options for more effective and sustainable fisheries management in the region, including identifying types of fisheries support measures that many negatively impact fisheries sustainability, and discussing ways to reduce or mitigate the associated risks.

In addition, the Workshop aimed at familiarising the country representatives with:

- The OECD Fisheries Support Estimates (FSE) database, which contains a framework which was developed to help governments assess the risk that their support policies may present for fish stock health. It classifies

fisheries support types based on the level of risk they may pose to fishery sustainability, and lists mitigating factors that can limit this risk; and

- The WTO Fisheries Subsidies Agreement. It was explained that FAO is a key partner in the WTO Fisheries Funding Mechanism aimed at implementing the Agreement. In this regard, FAO and other partner organisations provide expertise on strengthening fisheries management and assisting governments to meet the specific requirements of the Agreement.

High-level officials from 11 countries – the People's Republic of Bangladesh, the People's Republic of China, the Republic of India, the Republic of Indonesia, Malaysia, the Islamic Republic of Pakistan, the Independent State of Papua New Guinea, the Republic of the Philippines, the Democratic Socialist Republic of Sri Lanka, the Kingdom of Thailand, and the Socialist Republic of Viet Nam – delivered presentations on the issue and shared their experiences in closed-door sessions. OECD was represented by **Claire Delpeuch,** Head of the Fisheries and Aquaculture Unit, while **Angela Lentisco,** Fishery and Aquaculture Officer; **Marcio Castro de Souza,** FAO Senior Fishery Officer; **Simon Funge-Smith,** FAO RAP Senior Fishery Officer; **Joseph Zelasney,** Fishery Officer; and **Justin Giannolo,** GEF Programme Support Specialist; were present for FAO. **Gemma Meermans Matainaho,** Trade Promotion Officer, INFOFISH, welcomed all participants to the Workshop, which ended with an overall summary by FAO.

Summary of discussions

In considering fisheries support measures, including subsidies, there are three major issues to consider: (i) the extent to which they stimulate fishing and/or have an adverse impact on fisheries sustainability; (ii) the extent to which they may interfere with international trade and market access; and (iii) the extent to which they distort economic performance. However, defining and measuring fishery support measures is challenging and it is even more difficult to determine their effects, because often their effects may be indirect.

The Workshop recognized that:

- Countries are providing support to fisheries, much of it related to social protection and welfare;
- Fishery support should also be directed towards enhancing fisheries sustainability;
- 'No one size fits all' in developing fisheries support measures and that the national context matters;
- Any evaluation of the effect of fishery support measures on the sustainability of fishery resources requires adequate understanding of the status of those fisheries; and
- The OECD Fisheries Support Estimate database can be a useful tool and platform for:
    - Defining and measuring fishery support, including those that constitute subsidies;
    - Increasing transparency and common understanding;
    - Informing WTO-associated fisheries issues; and
    - Justifying further investment in fisheries within the national context (especially investment in management) because it is an accounting of investment in fisheries.

The Workshop also:

- Emphasized the need to invest and support stock assessment , particularly methods applicable for multi gear and multi-species fisheries:
- Noted that there are ways to adhere to WTO requirements using indicator species, and groups of species, but that in some cases this will require adjustment of stock assessment programmes. If these programmes are well-designed and based on sound science, they can demonstrate effective management and transparency, for use with trading partners; and
- Recognized the connection between this work and fisheries support and trade issues.

The Workshop appreciated and recommended FAO to continue this work to advise and support the region on issues related to trade and market access, including implementation of the WTO agreement. The OECD is also willing to assist should countries want to participate or contribute to the FSE database.

Further Workshop planned

The **"Regional Workshop on Understanding Fisheries Support Measures in the Asian Context"** indicated that a follow-up workshop should be conducted in 2024 to further explore:

- Data collection, transparency, notification, and other challenges related to fisheries support and trade; and
- The application and implication of the WTO fisheries subsidies agreement along main pillars of the agreement (i) IUU fishing; (ii) fishing on overfished stocks; (iii) unregulated fishing on the high seas; and (iv) notification.

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MEASURING MICRONUTRIENT PRODUCTIVITY IN INTEGRATED AQUACULTURE-AGRICULTURE TO PROMOTE NUTRITION-SENSITIVE FOOD SYSTEMS

By Liz Ignowski and Ben Belton

Crop diversification is considered an effective strategy to improve diets and nutrition, and is a key component of nutrition-sensitive agriculture (NSA). The authors compared the economic value and nutrient productivity per hectare for twelve distinct combinations of integrated aquaculture-agriculture (IAA), where aquatic and terrestrial foods are grown together on a single parcel of land, identified from a representative survey of 721 farms in southern Bangladesh. Their analysis shows positive associations between the integration of terrestrial foods into aquatic farming systems and nutrient productivity[1], but that nutrient productivity is partly disconnected from economic productivity. However, the production of specific combinations of aquatic foods and vegetables can simultaneously improve nutrient productivity and economic productivity, thereby promoting nutrition-sensitive agriculture (NSA).

Integrated-Aquaculture-Agriculture farms viewed from the air, with vegetables grown on trellises over ponds, and fruits and coconuts on pond banks

Malnutrition is persistent in many countries that experienced the green revolution, despite large increases in staple crop production per hectare of arable land and per capita over the past half-century. Growing awareness of this disconnect has led to calls for nutrition-sensitive approaches to agriculture that emphasise increasing consumption of micronutrient-rich foods, as opposed to prioritising meeting energy needs with staple grains. Nutrition-sensitive agriculture (NSA) programs are designed to address the underlying determinants of malnutrition within a population and incorporate specific nutrition goals. Our recent study published in Nature Food[2] analysed the nutrient productivity and economic productivity from differing combinations of aquaculture-agriculture integration from smallholder farms in southern Bangladesh. We found that production of specific combinations of aquatic foods and vegetables can simultaneously improve nutrient and economic productivity, therefore promoting NSA.

[1] *Nutrient productivity is expressed as the number of adults whose complete annual dietary requirements for energy, protein, calcium, iron, zinc, vitamin A, and vitamin B12 can each be met from one hectare.*

[2] *Ignowski, L., Belton, B., Ali, H., and Thilsted, S.H. Integrated aquatic and terrestrial food production enhances micronutrient and economic productivity for nutrition-sensitive food systems. Nature Food (2023). https://doi.org/10.1038/s43016-023-00840-8*

The importance of nutrition-sensitive agriculture, and role of integrated aquaculture-agriculture

Food production and income generation are the two main pathways linking agriculture to household nutrition. Increased production of diverse, nutritious foods may improve home consumption by producers and can create spillovers for non-producer households through markets, while income from crop sales may allow households to purchase foods they are unable to produce on-farm to diversify their dietary intakes.

A farmer harvesting fish from a pond, with climbing vegetables growing on frames visible in the background.

Since the 1990s, rapidly growing domestic and export markets have increased aquaculture demand in Bangladesh. Aquatic foods are typically nutritious and economically valuable relative to staple foods. To promote enhanced production diversity, land productivity, and nutrient cycling on-farm, a wide variety of integrated aquaculture-agriculture (IAA) methods are practiced in Bangladesh. Examples of IAA include growing rice, fish, and crustaceans in the same plot, concurrently or in rotation or growing climbing vegetables on frames built over ponds.

However, to date, little attention has been paid to whether or how IAA practices enhance productivity of micronutrients by smallholder farmers. This is the motivation of this research, which presents a methodology for measuring the economic productivity and nutrient productivity of farming systems and identifying complementarities and trade-offs between these outcomes.

Productivity of IAA farms in Bangladesh

We analysed data from a representative survey of 721 farms in the seven most important aquaculture producing districts in southern Bangladesh, spanning a wide range of IAA practices. On each farm, detailed production data were collected for a single randomly-selected 'sample parcel' of land that had been used for aquaculture within the past 12 months, whether or not integrated with terrestrial foods. The sample represents the entire population of aquaculture farms in the seven selected districts.

Data on the production of 35 aquatic and 31 terrestrial foods harvested from these farms over the most recently completed cropping cycle (a period of approximately one year) were combined with food composition data to estimate the productivity per hectare of energy, protein, and five key micronutrients that are both critical for human health and commonly deficient: calcium, iron, zinc, vitamin A, and vitamin B12.

We expressed economic productivity as the annual value of food production (USD/ha), calculated as income received from sales of food produced, plus the imputed value of any self-produced food consumed, minus the variable costs of food production. Nutrient productivity is expressed in annual adult equivalents per hectare (AEs/ha) for 12 combinations of IAA. AEs are equivalent to the number of adults whose requirements for a specific nutrient could be met from one hectare for a period of one year. We used regression analysis to estimate correlations between production of aquatic and terrestrial foods and economic value and nutrient production.

Figure 1: Sample distribution by farming system

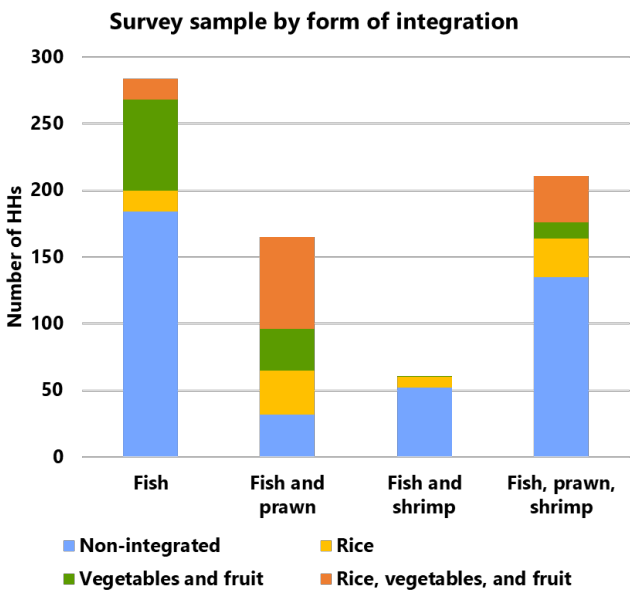


Figure 1 presents the distribution of 721 farms in our sample by farming system, defined in terms of four combinations of aquatic foods and four combinations of terrestrial foods. Among aquatic food combinations, production of only fish is

most common (39%), followed by fish, prawn, and shrimp (29%), fish and prawn (26%), and fish and shrimp (8%). Among the households in our sample, 96% produce some carp species, 83% produce unstocked fish species, 82% produce other stocked fish species, and 59% produce crustacean species.

Some 56% of households do not integrate agriculture into their aquaculture production. Integration of aquatic foods with vegetables and fruits and rice is the most common form of IAA (17% of farms), followed by integration with only vegetables and fruits (16%), and integration with only rice (12%). The potential for integration of terrestrial foods is related to the type of aquaculture practiced. Giant freshwater prawn is produced in freshwater or low-salinity environments and is thus well-suited to integration with terrestrial foods. Shrimp (mainly black tiger shrimp) is produced in saline water that damages terrestrial food crops, making crop integration more difficult. However, there is significant overlap in the range of salinities in which both crustacean species can thrive, giving rise to a diverse mix of IAA. Most households producing prawn integrate with agriculture (81%), whereas IAA is only moderately common for households that produce only fish (35%), and comparatively rare for those producing shrimp (15%).

The diversity of production in our sample varies by farming system and by the combinations of foods produced on each farm. Farms harvested an average of nine aquatic products each, while the 32% of households that produced vegetables and fruits harvested 3.5 types each on average.

Figure 2: Economic productivity by farming system

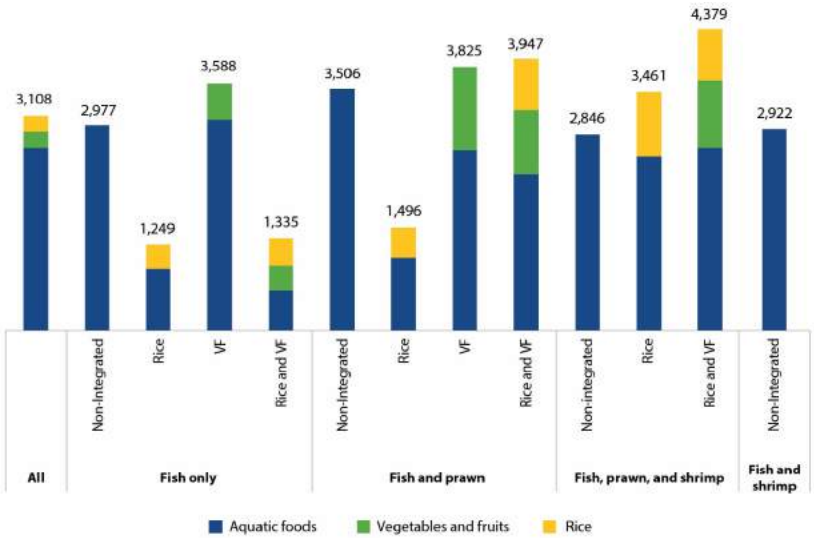


Figure 3: Economic productivity and estimates of nutrient productivity by farming system

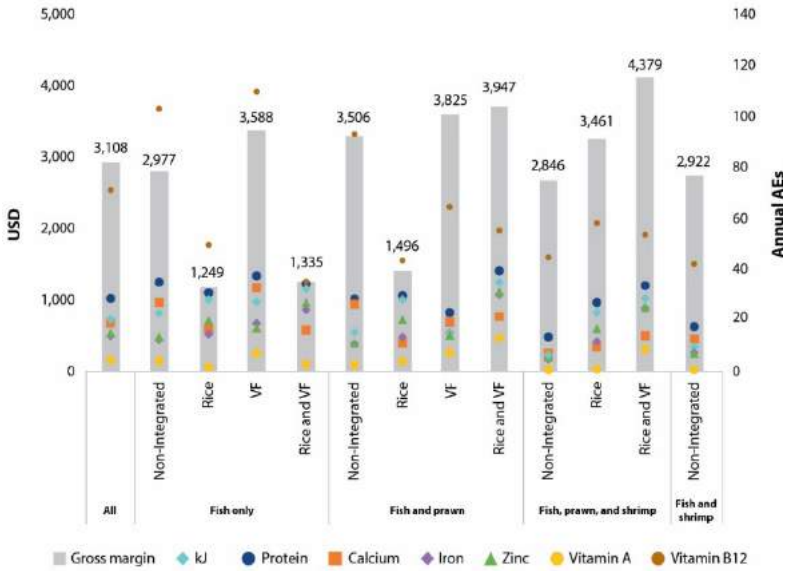


Figure 2 presents the economic productivity per hectare by farming system, disaggregated into aquatic foods, vegetables and fruits, and rice. The most profitable farming systems produce fish, prawn, and shrimp with rice, vegetables, and fruits (4 379 USD/ha), and fish and prawn with rice, vegetables and fruits (3 947USD/ha). The least economically productive farming systems produce fish integrated with rice (1 249 USD/ha), and fish integrated with rice, vegetables, and fruits (1 335 USD/ha).

Figure 3 extends this comparison by presenting the economic productivity per hectare, overlaid with estimates of productivity of energy, protein, calcium, iron, zinc, vitamin A, and vitamin B12, expressed as AEs/ha, by farming system. The Figure shows that the nutrient productivity of farming systems is partly disconnected from their economic productivity. IAA systems that combine fish and prawn with vegetables and fruits and rice – one of the most economically productive food combinations – also have the highest productivity of energy, protein, iron, zinc, and vitamin A. However, whereas the economic productivity of farming systems that include shrimp but are not integrated with terrestrial foods is close to the sample average, these systems supply much lower-than-average quantities of almost all nutrients per hectare. These results point to positive associations between the integration of terrestrial foods into aquatic farming systems and nutrient productivity.

Further analysis

The relationships outlined above are analysed with greater precision in a regression analysis presented in the full paper, where we divided the three main food groups into four sub-categories of aquatic food and eight sub-categories of terrestrial food, and regressed economic productivity and nutrient productivity against the quantities of each group of foods produced and numerous control variables. We found a positive and significant relationship between the productivity of three out of four aquatic food groups and economic productivity, with yields of crustaceans having the largest positive correlation with economic productivity, followed by yields of carp species. Yields of other stocked fish species, nuts/oilseeds, and vitamin A-rich vegetables are also positively and significantly associated with economic productivity.

We also found multiple positive and significant correlations between the productivity of foods and nutrients. Unstocked fish species which enter ponds naturally, such as when water is exchanged, are strongly associated with the productivity of multiple key micronutrients. Productivity of green leafy vegetables is highly significantly associated with productivity of iron, zinc, and vitamin A, as is the production of vitamin A-rich vegetables and other vegetables, but with a smaller coefficient. Production of vitamin A-rich fruits and other fruits has smaller and/or insignificant correlations with most nutrients, as do root crops. The yield of nuts/oilseeds is highly positively correlated with calcium and iron productivity. As expected, rice is an important source of energy and plant protein.

Women transplanting rice in the raised central portion of a gher also used for fish and giant freshwater prawn cultivation.

Further results show that two unstocked small fish species, *mola* and *tengra,* are particularly significant sources of micronutrients. Consumption of small fish species such as these has been shown to improve intakes of calcium, iron, and vitamin A in Bangladesh. This result underlines the importance of the region's aquatic biodiversity in supporting human nutrition, with the Sundarbans (the world's largest contiguous area of mangrove), located adjacent to the southwestern portion of the study area acting as a nursery ground for many of the unstocked aquatic species harvested.

Among vegetables and fruits, okra, gourds, and long beans are all statistically significantly correlated with the productivity of protein, iron, and zinc. Pumpkins (vitamin A-rich vegetables), *shak* (leafy vegetables), mangoes, and betel nut are important sources of vitamin A. Coconuts are also positively statistically correlated with the productivity of energy and all nutrients in our study, except vitamin B12.

Our results indicate that the species and combinations of aquatic and terrestrial foods produced matter for economic and nutrient productivity, and that the mix of aquatic foods and vegetables included in integrated farming systems could be key to optimising economic productivity and nutritional adequacy. Aquatic foods are more nutritious per kilogram for certain nutrients, but their integration with terrestrial foods improves the overall availability of the nutrients included in this analysis. These results only relate to the production of foods, not the effects of their sale or consumption.

Discussion

Our study contributes to a growing body of research on nutrition-sensitive food systems and NSA. Most literature on NSA to date has been conceptual or has evaluated the impact of planned nutrition-sensitive interventions on demand-side outcomes. Our study's key contribution is to provide a supply-side methodology for estimating the nutrient productivity of farming systems.

Agricultural productivity is conventionally measured in terms of biomass or income per area of land. Our study introduces a nutrition-sensitive metric for agricultural productivity, expressed as production of kilojoules (kJ), protein, and micronutrients, relative to human nutritional requirements (AEs/ha). This approach made it possible to explore the relationship between economic and nutrient productivity across a range of IAA systems, identified inductively from a representative survey in Southwest Bangladesh. The results provide an intuitive measure of nutrient sensitivity that may be easily understood by researchers and policymakers and mobilised by development practitioners and food producers.

We find strong empirical evidence that production diversity associated with integration of aquatic and terrestrial foods in IAA systems can be beneficial for both economic and nutrient productivity. This finding has important implications for the design of NSA programs to enhance the contributions that aquaculture makes to nutrition security in Bangladesh and other countries where IAA is commonly practiced, and for the realisation of nutrition-sensitive food systems.

A crop of nutritious gourds, grown on trellises over a pond.

These results can also be used to identify and promote culturally and agroecologically suitable combinations of foods that optimise nutritional and economic outcomes. For example, common crops such as bitter gourds, bottle gourds, and long beans are associated with high levels of nutrient productivity, in addition to better-known vitamin A-rich crops such as green leafy vegetables.

However, increasing production diversity is not necessarily the most effective path to improving diet diversity. Income is another pathway to nutrition, and households that earn money from economically productive but less nutritious foods such as crustaceans may use it to purchase nutritious foods instead of producing them. This is a crucial point as shrimp (which are economically valuable) are produced in saline ponds, making integration with terrestrial crops challenging. It may be more beneficial for these households to seek to increase yields of shrimp and diversify production of aquatic crops to maximise income and aquatic source nutrients.

The approach presented in this paper can also be used to identify possible improvements to farming practices such as facilitating the entry of nutritionally and economically productive unstocked fish species into ponds, or identifying suitable candidate fish species for domestication via investments in fish breeding research. Future research using the methods developed here can also seek to identify and promote recommendations for specific crop combinations that maximise economic and nutrient output for a given level of salinity.

Note: *This research was made possible by the Feed the Future Innovation Lab for Fish, through the United States Agency for International Development (USAID). The Feed the Future Innovation Lab for Fish is managed by Mississippi State University through an award from USAID (Award No. 7200AA18CA00030; M. Lawrence, PI). The work was also implemented as part of the CGIAR Initiative on Securing the Food Systems of Asian Mega-Deltas for Climate and Livelihood Resilience (INIT-18), which is carried out with support from funders through their contributions to the CGIAR Trust Fund.*

Dr. Liz Ignowski *is a Postdoctoral Fellow at WorldFish, Phnom Penh, Cambodia. Her research areas include food systems, nutrition, and agricultural economics.*

Dr. Ben Belton *is a Research Fellow at the International Food Policy Research Institute, Dhaka, Bangladesh, and Associate Professor of International Development with Michigan State University, East Lansing, USA. His work focusses on the links between value chains and food systems, rural development and food and nutrition security.*

THE IMPACTS OF CLIMATE CHANGE ON THE FISHERIES SECTOR IN THE WESTERN AND CENTRAL PACIFIC OCEAN

By Leontine Baje

Rising global temperatures from increased greenhouse gasses in the earth's atmosphere will result in declines in the productivity and food security of our oceans coupled with economic losses from fisheries by 2050 and 2100. This article discusses the different scenarios of these greenhouse gas emissions and associated temperature rises, and their implication on the tuna biomass in the Western and Central Pacific Ocean. The next generation of climate science for finer scale assessments to support climate change attribution and to build the negotiating power of Pacific Island countries is also highlighted, including an avenue where vessels at sea can play an important role in the monitoring of oceanographic conditions.

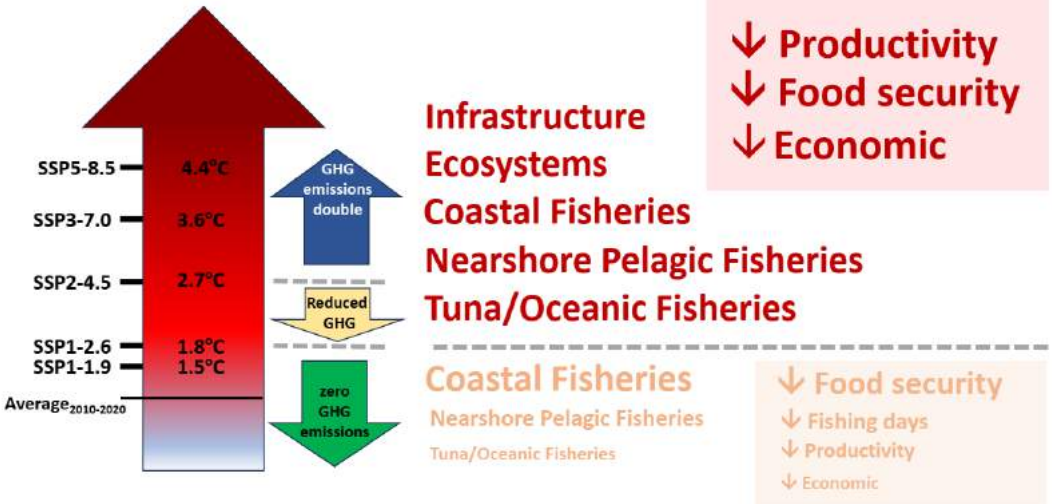
With the advent of warming seas, how will Pacific tuna fisheries be affected?

Climate change is an existential global threat. In the Pacific where most islands are low-lying, entire communities, cultures, and livelihoods are at imminent risk from the impacts of global warming. Is there also a risk for the tuna fisheries in the western and central Pacific Ocean (WCPO)? These fisheries contribute significantly to the supply of tuna for world markets and the economies of Pacific Island countries and territories (PICTs). The level at which global warming compounds the effect of naturally-occurring fluctuations in climate which influence the movement of tuna stocks, is important to understand and to determine what is attributed to the change in climate from greenhouse gas emissions.

To project medium to long-term impacts of climate change, the Intergovernmental Panel on Climate Change (IPCC) has developed a suite of possible scenarios that describe the likely evolution of Green House Gases (GHG) emission referred to as "Shared Socioeconomic Pathways" (SSPs). The SSPs range from achieving net-zero emissions by 2050 (SSP-1.9) which is also called the Paris Agreement, through to SSP-8.5 where the production of GHGs double by 2050 (Figure 1). Generally, as global temperatures rise, coupled with increasing GHGs emissions, the more severe the impact that will be felt in the fisheries sector.

Current average global temperatures have increased by 1.06°C since the pre-industrial era (1880-1900), by an average of 0.08°C per decade. The rate of warming since 1981 is more than twice as fast: 0.18 °C per decade. The SSPs that achieve net-zero carbon emissions by 2100 project an average increase in global temperatures of up to 1.8°C (green arrow). Under these scenarios, impacts

Figure 1: Shared Socio-economic Pathways (SSP) with corresponding global temperatures



Note: The graphic indicates different scenarios of zero, reduced or doubling of greenhouse gas emissions and the likely associated impacts on the western and central Pacific Ocean and fisheries.

on Pacific fisheries are expected, including significant degradation of coastal habitats, shifts in species distribution and exacerbation of productivity losses resulting in losses in economic performance and increases in food security risks.

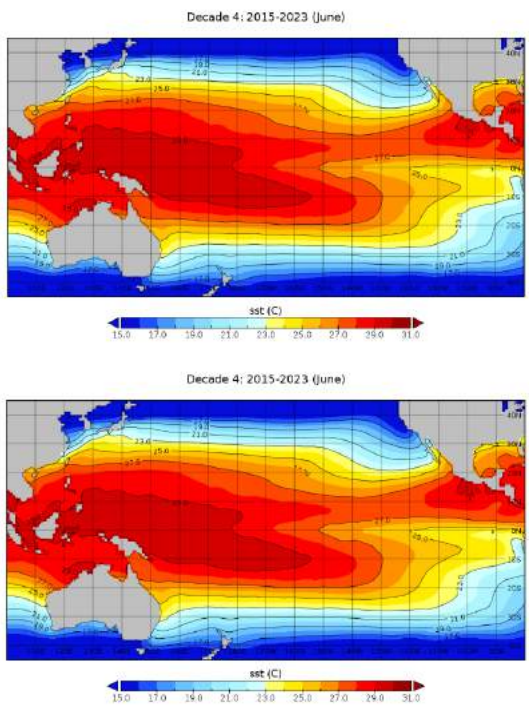
The SSPs that project a reduction in GHG emissions but do not achieve zero emissions by 2100 (yellow arrow) or project an increase in GHG emissions are expected to result in severe impacts on marine ecosystems and disruptions to economies and food systems that are reliant upon them. Therefore, achieving the net-zero GHG emission scenarios (the green arrow in Figure 1) will be the most effective means to achieve minimal disruption to Pacific fisheries, economies and livelihoods from climate change.

Expansion of the warm pool

According to the US National Oceanic and Atmospheric Administration (NOAA), records of global temperatures observed show an increase of 0.08°C per decade over the past century. More recently since 1981, the level of warming is more than twice as fast at 0.18 °C per decade.

From the Indian Ocean to the west Pacific stretches the warmest region of ocean in the world with sea surface temperatures of about 28°C. Known as the "warm pool", this area is not only a habitat of tunas and a driver of their recruitment but is also a major driver of global weather conditions. Along with this trend of increasing global temperatures, an expansion in the size of the warm pool is also observed. Comparisons of the area of the warm pool in the Pacific between the periods 1985-1994 and 2015-2023 show the expansion in its size. This will directly impact the distribution of tuna stocks.

Figure 2: The average warm pool area for the period between 1985 and 1994 and 2015-2023



Note that the mean for these decade blocks removes the annual variation due to La Nina (contraction) and El Nino (expansion).

Impact on tuna fisheries

The impact on the different tuna species skipjack *(Kasuwonus pelamis),* yellowfin *(Thunnus albacares)* and bigeye *(Thunnus obesus)* can be modelled against the different SSPs scenarios to show changes in distribution that can be attributed to climate change.

In Figure 3, the top panel shows the average distribution of biomass for skipjack, yellowfin and bigeye at the present day (2010-2019). Under the worst-case scenario of doubling of GHG emissions by 2050 resulting in 4.4°C warming (middle panel), the models predict an eastward shift of biomass particularly for skipjack and yellowfin. If there is a reduction in GHG emissions (but not achieving net-zero emissions by 2100) resulting in 2.7°C warming (bottom panel), the tuna biomass distributions will be characterized by a more moderate eastward shift and latitudinal expansion of tuna biomass distributions in WCPO. These projections were achieved with basin-scale 2-degree longitude x latitude models. While they are useful for looking at basin scale patterns in redistribution, they are not well-suited to EEZ scale analyses.

Overall, an eastward equatorial shift of fishable biomass for all three species under both scenarios is expected, the severity of which is dependent on the degree of global warming. A shift to sub-tropical high-seas areas can also be expected. The projections indicate that skipjack and yellowfin tuna are more susceptible to the changes than bigeye.

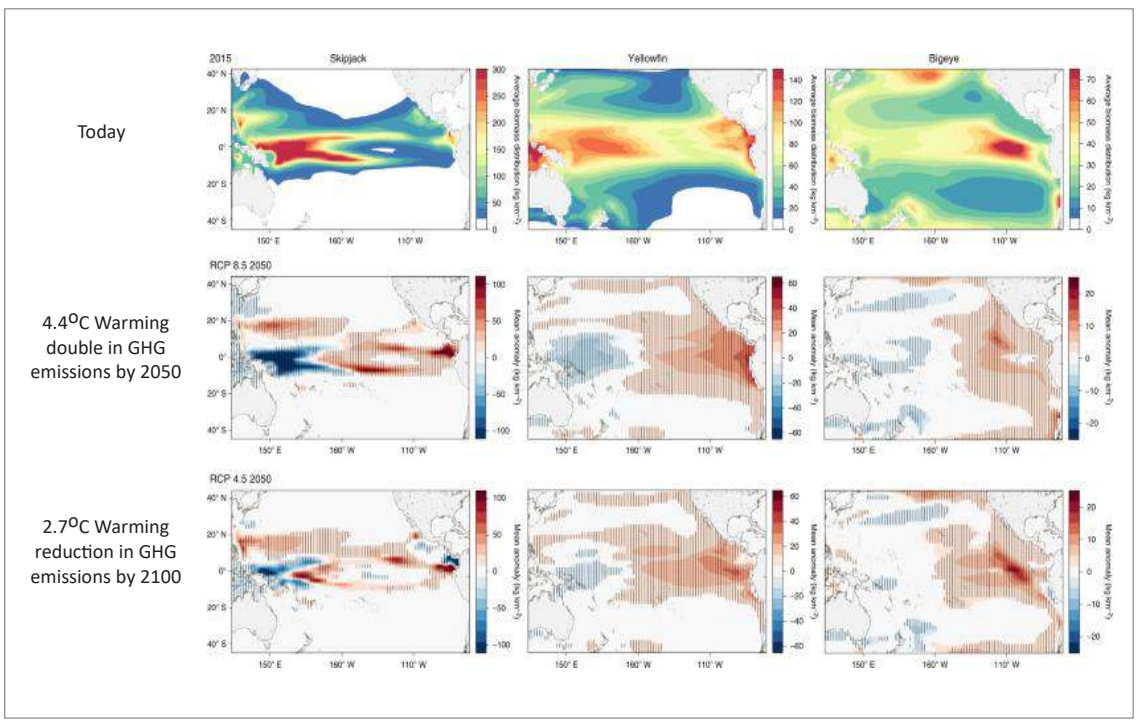
In the case of South Pacific albacore *(Thunnus alalunga)* under the increasing emissions scenario, a redistribution of biomass shows a development of similar eastward shift, with the highest negative impacts (-20% relative to historical values) localized in the western area of known spawning grounds around 25°S. Thus, the significant impacts on adult biomass are expected to be delayed compared to the other three tuna species and predicted to occur after 2050.

The economic impact of climate change is also determined by the severity of global warming. If the net-zero emission scenarios are met by 2100, losses will be minimal in the sale of access fees across the region. If, however, net-zero emissions are not achieved by 2100, the eastward and sub-tropical redistribution of biomass is expected to impact the economic benefit for purse-seine fishing between an average of USD 12 million and USD 90 million per year depending on the severity of the global warming. This equates to an average loss of up to 13% in government revenue for Small Island Developing States (SIDs) in the Pacific.

New prediction models are being developed

The next generation of models under construction are utilising new 1-degree resolution climate models. These will be able to project at the country or exclusive economic zone (EEZ) scale impacts of climate change to forecast more immediate term impacts, previously not achievable.

Figure 3: Tropical tuna biomass models



Note: Figure 3 indicates tropical tuna biomass modelled for the present (2010-2019) and according to global warming scenarios of doubling of emissions by 2050 and reduction of emissions by 2100. In the two global warming scenarios, the blue indicates less biomass than the current situation, and the red indicates more biomass.

Figure 4: Molecular sampling equipment

Sampling at point of capture or during unloading *Match head size*

The strength of the next generation of models is dependent upon national and fishing industry contributions. The industry can support climate change modelling by using echosounders and other instruments already onboard to record the state of the ocean whilst in transit to fill in gaps in ocean observation.

At the national or country level to support the EEZ scale projection of changes in biomass distribution, the scaling-up of biological sampling (including new molecular methods) will allow for more precise estimation of population dynamics parameters and the influence of the climate on them (Figure 4). Being able to forecast the impact of climate is dependent upon an accurate representation of current conditions to accurately predict future conditions. The implementation of e-reporting and e-monitoring to reduce the time-lag between catch and catch-reporting will also support finer-scale projections of climate impacts.

In summary, climate change impacts are already observable in the Pacific Ocean and likely disrupting current fisheries dynamics. Achieving net-zero GHG emissions by 2100 (and preferably by 2050) is more likely to contain the redistribution of tuna biomass within the western and central Pacific Ocean. Current management frameworks for the purse-seine and longline fisheries are likely sufficient to ensure sustainability of stocks and economic returns to participating Pacific Island Countries. Maximizing national and regional negotiating power will be key to achieving net-zero emissions. This will require investment in up-skilling national and regional agencies in climate awareness. Partial reduction of GHG emissions by 2100, or increase in GHG emissions, will result in significant redistribution of tuna biomass into the high-seas and result in losses to Pacific Island economies.

This will result in greater emphasis on:

- Loss and damage and "climate justice";
- Securing high-seas access rights to tuna resources;
- Development of tools that guide strategic investments to build resilience in the fisheries sector to climate change impacts and to maximise economic returns from tuna;
- Climate-responsive fisheries management; and
- Scale-up fisheries and ocean monitoring at the EEZ scale to meet the needs for higher-skilled projection and forecasting models.

Note:

This article was developed with support from Dr. Simon Nicol, Dr. Inna Senina and Dr Patrick Lehodey. For further information on the Pacific Community's work on climate change or information on how you can help support data gathering towards improved climate modelling, please contact Dr Simon Nicol (simonn@spc.int) and Dr Hau Halafihi (tuikolongahauh@spc.int).

Dr Leontine Baje *currently serves the Pacific Community as a Fisheries Advisor within the Fisheries Ecosystem Monitoring and Analysis division of SPC's Oceanic Fisheries Program based in Noumea, New Caledonia. Her area of focus is supporting Member Countries with trials and implementation of electronic reporting and monitoring, and contributing to the broader development of data standards in the western and central Pacific. She has held prior roles in the national fisheries administrations of Papua New Guinea and the Federated States of Micronesia. Dr Baje joined the SPC to serve in her current role in 2022.*

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FISH PACKAGING IS BECOMING A HIGH-TECH PRODUCT

Manfred Klinkhardt

Packaging requirements for food, but above all for fish and seafood, are particularly demanding. Packaging needs to protect its perishable contents from spoiling and external influences while being as inexpensive as possible. Plastic packaging meets this requirements profile particularly well. But we wish to replace it with other materials because it is not sustainable. In this article reproduced from Eurofish Magazine, Issue 1/2023 (January/February), the author asks: how realistic is this?

Even traditional fish products such as dried cod are today often packaged in a supermarket-ready and customer-friendly way in trays and bags made from plastic

Plastic was once viewed as the ideal solution for many packaging problems. The material is light, offers endless design possibilities, is food-safe and is also relatively inexpensive. But the shocking extent of plastic waste in the seas has brought plastic into disrepute and made it the focus of public attention. Industrial and retail companies have recognised the problem and are looking for more environmentally friendly, sustainable packaging materials.

But for fish in particular it is very difficult to replace traditional plastic packaging with materials with similarly good properties. Plastic packaging for fish and seafood products has been tried and tested over many years. It is safe, hygienic and taste and odour-neutral, which is particularly advantageous for moist fish products. A plastic covering also protects its contents from premature spoiling. It shields the product from negative external influences such as microorganisms, oxygen, light and mechanical stresses and often even expands and reshapes, which makes manufacturing temperature-insulating, salt and acid resistant containers and shipping boxes possible. Plastic containers, trays, wraps or bags are versatile and suitable for almost every application. Despite all of the justified criticism, plastic is simply optimally suitable for packaging purposes.

Packaging is usually designed for single use and as such it is an example of the convenience-based lifestyle in our modern throwaway society. As soon as its contents have been removed, it has fulfilled its purpose and becomes waste. Therefore anyone wanting to act sustainably must first change their lifestyle. Some problems would completely cease to exist if all consumers properly disposed of plastic packaging as soon as the products it contained were removed. And not just now and again, but every time, and also everywhere in the world.

A pipe dream, as we know, since for one thing, many places lack functioning disposal options for recycling used plastic. And for another, many people are not at all as environmentally aware as they frequently claim themselves to be. Much packaging is carelessly thrown away after use, pollutes the natural world and then unfortunately often ends up in the sea. For this reason, the manufacturers and providers of products packaged in plastic are under pressure worldwide to find more environmentally friendly packaging materials.

The variety of packaging materials makes the search more difficult

Despite some ideas and progress in some areas, there is currently no prospect of a material that could replace plastic packaging completely in the near future. Sustainability is well-known not to be a short-term task, but rather an ongoing, continuous process that requires strategically-oriented, wise action. Especially since the alternative materials must replace all traditional product coverings, i.e. wraps, boxes or insulating polystyrene cool boxes, for the storage, transport and retailing of fish products as well as for the takeaway business and online retail. And in addition to the actual packaging, this also includes other products such as strapping and adhesive bands or gel-filled cold packs and pads.

Manufacturers, catering businesses and fish retailers must move away from tried and tested packaging practices and find new ways to continue to supply customers with products of the desired freshness and quality. The transition to recyclable, compostable or biodegradable packaging is a real challenge, especially since the costs for such materials are 30 to 50 percent higher on average. If these additional costs were passed on to the retail price in full, however, this could appreciably reduce the willingness of many consumers to buy the products.

Some plastic packaging can already be replaced by alternative materials, but their sustainability is also sometimes viewed critically by experts. If all MAP trays and folding cartons, wraps, delicatessen bowls, blister packs and polystyrene cartons made from plastic were completely replaced with containers made from glass, paper, tin cans or cardboard, this would more than double energy consumption.

Glass, for example, is very suitable for recycling, but is highly energy-intensive to manufacture. Glass is also significantly heavier than plastic, which results in higher transport costs. It is also prone to breaking and is thus associated with certain risks when it comes to packaging food. Packaging manufacturers therefore face the challenge of developing completely new designs that meet hygiene, safety and labelling standards, guarantee the integrity and intactness of the packaged products, require less material if possible, and result in fewer greenhouse gas emissions associated with their manufacture. This requirements profile makes it clear that the development of more environmentally friendly and sustainable packaging requires new ideas and significant expertise.

The optimisation potential of plastic is being better exploited

Despite all of their problems and their poor image, thermoplastics will continue to play a very central role in the packaging sector for the foreseeable future. They simply offer too many advantages to be completely replaced yet. Nevertheless, there are some changes on the way in the use of plastic packaging which can be briefly expressed by the terms less, simpler and different. 'Less' refers to the quantity of the plastic material used. Wherever possible, plastic is avoided (for example in viewing windows in cardboard packaging) and material saved, for example by rolling out plastic wrap more thinly or shaping thermoformed trays differently and designing them to be lighter.

'Simpler' primarily means that the composition of the plastic packaging is significantly changed. Instead of standard wraps and trays that are often composed of several layers, which makes recycling them significantly more difficult or even impossible, monomaterials are increasingly preferred, which can re-enter the materials cycle after use much more easily. And 'different' refers in particular to the type of plastic material used, that preserves the usefulness of the packaging, but also offers specific advantages, for example the incorporation of recycled plastics or of plastic based on natural raw materials.

Vacuum skin packaging, where the covering film wraps around the packaged product like a second skin, is a great example of these innovative packaging strategies that aim to be less, simpler and different. Recently it has increasingly also been used in retailing fish and seafood products. With skin packaging, film use is significantly reduced and mono-APET films can also be used (APET stands for amorphous

polyethylene terephthalate), more than two-thirds of which are composed of recyclate (chemically recycled plastic).

The term 'simpler' must therefore be qualified somewhat, since manufacturing these special films with defined shrink properties is of course an advanced technology. Skin packaging offers enormous advantages both for the manufacturer and for customers. The use of material and therefore the quantity of packaging waste saved is significantly reduced and customers can see the whole product. Integrated easy-peel corners also often make opening the packaging and removing the contents easier.

Reusability is the order of the day

Returning supposed plastic waste to the proper materials cycle is a model that is favoured by many in the packaging industry. Packaging made from recycled polyethylene terephthalate (rPET), a break-proof plastic that can be reused up to 25 times, also has a positive ecological balance due to its low transport weight. Recycled PET, which is used, among other things, for vacuum bags, MAP trays and other packaging, saves natural resources, protects the environment and contributes to reducing CO_2 emissions.

Traditional plastics therefore should not be prematurely written off. This also applies to expanded foamed polystyrene (EPS), from which heat-insulating polystyrene boxes are usually manufactured for the transport of fresh fish. These boxes are often already made from recycled polystyrene, without the performance characteristics of the packaging being in any way affected by this. Insulating boxes made from recycled EPS, usually called 'Ccycled polystyrene' for short, are even suitable as primary packaging for fish. Ccycled boxes have "like-new" quality and are approved for direct contact with food.

Great hopes are now resting on bioplastics, which are seen as particularly environmentally friendly, because they cause significantly less greenhouse gas emissions than standard plastic material. A study carried out in 2017 calculated that the switch from conventional plastic to bioplastic based on corn would reduce the USA's greenhouse gas emissions by 25 percent. According to estimates, the global market for bioplastics is currently approaching 44 billion US dollars. Bioplastics for packaging in the food sector are usually made from polylactic acid (PLA) which is typically obtained from the sugars in corn starch, manioc or sugar cane. PLA looks like and has the same properties as polyethylene (PE) but is biodegradable, climate-neutral and often even edible.

Other biodegradable plastics are made from polyhydroxyalkanoates (PHAs) that are created from organic raw materials by microorganisms that are often genetically modified. However, PHA plastics are only rarely used for single-use food packaging. Because they are particularly biocompatible, they are more often used in the medical sector, such as for suture material after operations, as artificial bone plates and for skin replacements. What makes the use of bioplastics in the area of packaging difficult at the moment is their higher prices. They are on average 20 to 50 percent more expensive than comparable conventional plastics. Prices do have a tendency to fall, because more efficient methods for producing bioplastics are being developed, but only slowly.

Bioplastics not as sustainable as is assumed

A study from the University of Pittsburgh from 2010 also cast doubt on the environmental friendliness of bioplastics. The cultivation of corn, manioc, sugar cane and other plants that serve as the basic raw materials for biodegradable plastics is claimed to lead to increased land use, require greater water and energy consumption than conventional plastics, increase the use of fertilisers and pesticides and also contribute to higher greenhouse gas emissions.

The Plastic Pollution Coalition assumes that currently, an area of arable land greater than Belgium, the Netherlands and Denmark together would be required to meet the global demand for bioplastics. This is currently lacking for the cultivation of food. In addition, bioplastics – contrary to generally held assumptions – are not industrially compostable. Biodegradable plastics will 90% decompose at 60 degrees Celsius after a maximum of 12 weeks. Despite all of these restrictions and doubts, teams of researchers across the world are looking for new ways to make the production of bioplastics more efficient and cost-effective.

At Michigan State University, experiments are being carried out with cyanobacteria (blue algae) which create chemical bonds using photosynthesis. The California startup Mango Materials is working on eventually being able to convert methane gas from sewage treatment plants or landfill sites into bioplastic. Researchers from the Centre for Sustainable Technologies at the University of Bath in Britain claim to have already found a cheaper way to make polycarbonate out of sugar and carbon dioxide.

Fish processors and retailers are not just ready in principle, but often actually have a keen interest in exploiting innovative packaging concepts. Doing without plastic would be somewhat easier, however, if the available alternatives were equivalent or at least had similar properties to previously

used packaging. Finally, it is not just the avoidance of waste that needs to be taken into account, but also transport and logistics, product safety, hygiene and attractive product presentation.

Not every innovative packaging idea is actually mature and supermarket-ready. Some concepts that superficially appear to be quite acceptable have not yet been able to be implemented as hoped. These include packaging materials made from red seaweed agar, and edible and biodegradable wraps made from the milk protein casein or from the mycelium of fungi. Bioplastics made from wood biomass, energy grasses and crop residues, as well as lignin or cellulose, have barely passed the testing stage. Now and again, disposable dishes and packaging made from bamboo can be found on the market, but critics doubt their sustainability, because many of these products are to a large extent composed of synthetic plastics.

Natural packaging materials are gaining ground

There are already environmentally-friendly alternatives to polystyrene crates made from foamed plastic, namely reusable boxes and transport crates that are made of over 95 percent cardboard and can therefore simply be disposed of in the paper recyclables bin. Both fresh fillets and frozen products, for example, can be packed in folding cartons that can withstand even cold and damp conditions with a wafer-thin PE coating.

Another interesting option is dimensionally-stable and environmentally-friendly packaging made from paper injection moulding. This is made solely from paper fibres, water and industrial starch and exposed to heat by baking and is therefore particularly environmentally-friendly. Paper can be processed, coated and printed into very different products or folded into complex packagings with the help of complicated folding techniques similar to Japanese origami.

The purpose of use is crucial for selecting the right material. Corrugated cardboard, for example, is light, dimensionally-stable, has a long lifespan and also has very good insulating properties. Many of these features are also true of solid cardboard, but with the limitation that it has a lower insulating value, which makes solid cardboard boxes the ideal packaging for the energy-saving freezing and frozen storage of fish. Products in a solid cardboard box freeze about 35% faster.

Credit: Manfred Klinkhardt

Environmentally-friendly packaging made from paper and cardboard is gaining in importance in the growing takeaway business as well. Snack boxes, moulded trays and boxes with folding lids have similarly good performance characteristics as previous packaging made from aluminium or plastic, and are therefore a sustainable alternative for burgers, baguettes, burritos or wraps. Even for challenging takeaway dishes, suitable paper boxes are now available. They usually have separate sections for the individual components, such as fish, sauce and sides, and can often even be reheated in the microwave if needed. After use, they can then simply be returned to the paper cycle via the paper recycling bin.

However, even the use of paper in the area of packaging is now no longer completely uncontroversial, because the cellulose required often leads to the deforestation of entire forests, which are well-known to play an important role in climate protection. For this reason, packaging manufacturers are searching for suitable materials in this area as well, and they have hit on the composite cup plant *(Silphium perfoliatum)*, among others. Sustainable papers and cardboards can be made from this plant species, which is native to North America, and is already being used for packaging perishable fish products such as hot smoked salmon. Cup plant paper is resource-efficient. Relatively little water and energy are required for the preparation process and the fibres are obtained without harmful chemicals. Its regional cultivation also shortens transport routes and reduces associated CO_2 emissions.

Dr Manfred Klinkhardt *is a marine and fisheries biologist, and has worked for many years as a scientist at the University of Rostock, Germany. Since 1997, he has been a seafood journalist, and has authored or co-authored numerous books and reports on the industry. This article is a reproduction of one that he had written for the Eurofish Magazine Issue 1/2023.*

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INFOPESCA

LATIN AMERICAN WORKSHOP ON BLUE PORTS INITIATIVE

INFOPESCA participated in the regional workshop *"Strengthening fishing ports in the traceability processes of the value chain"*, developed within the framework of the Blue Ports Initiative, during June 21 and 22 in Manta, Ecuador. The initiative was promoted by the Food and Agriculture Organization of the United Nations (FAO) with the support of The Seafood Alliance for Legality and Traceability (SALT) and the Ecuadorian Chamber of Tuna Industrialists and Processors (CEIPA).

Representatives of fishing ports and fisheries authorities with jurisdiction in ports, industrial chambers, regional associations, retailers, academics, and other stakeholders participated in the event.

The workshop had four modules which focused on traceability from different actors of the value chain, while the last module was a joint analysis to identify challenges and possible solutions to reinforce the traceability process from fishing ports, with the involvement of fisheries authorities and others. The event also included a visit to the Port of Manta.

The Executive Director of INFOPESCA, Graciela Pereira, participated on the first day, moderating the roundtable discussion regarding the module on "Traceability in processing and exporting", with the topic of "Challenges of the fishery industry within the framework of the traceability of fishery products, and the role of fishing ports".

On the second day, Dr. Daniel Gilardoni spoke for INFOPESCA about "Transparency and traceability of the supply chain and market outlook". He also participated in the roundtable with representatives of important supermarket chains from Peru and Ecuador to discuss traceability.

Increasing the efficiency of the value chain of fishery products by improving fish landing points in coastal areas (in Latin American countries), one of the objectives of the workshop, was highlighted in social, economic and environmental terms.

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INFOFISH

MEDIA TRAINING WORKSHOP AHEAD OF 8TH PACIFIC TUNA FORUM

About twenty media practitioners from Port Moresby and East New Britain Province completed a three-day media training workshop from the 30th of August- 1st September 2023 at Kokopo, PNG, organised by the National Fisheries Authority (NFA).

As the "Blue Pacific Continent" strives to ensure long-term sustainable management of tuna fisheries, the region faces multiple complex challenges, including the ongoing threats from Illegal, Unreported and Unregulated (IUU) fishing and overfishing. Against this backdrop, the two main objectives of this workshop were to bring PNG's media fraternity together to foster a culture of knowledge exchange and to provide a platform to disseminate critical and accurate information to media practitioners in Papua New Guinea. A desired outcome of the workshop was to ensure that the journalists were better prepared to report on the 8th Pacific Tuna Forum hosted by Papua New Guinea in the capital city, Port Moresby, from the 6th to the 7th of September 2023 (please see pages 37- 43).

The media training workshop was designed and delivered by facilitators from diverse backgrounds, such as the Pacific Islands Forum Fisheries Agency (FFA)'s Market Access Specialist Jope Tamani; media trainer Neville Choi; NFA Strategic Communications Manager Carolyn Ive; Pacific Islands Forum Secretariat (PIFS) Public Affairs Adviser Lisa Williams-Lahari; and INFOFISH's Trade Promotion Officer, Nawin Rajah. The facilitators led sessions on various topics, including marine ecology, sustainable fishing practices, and effective communication strategies.

On the whole, the media training workshop focused on how to create a foundation to foster interactive discussion between facilitators and journalists about some of the issues impacting the tuna market directly, such as Illegal, Unreported and Unregulated (IUU) fishing and the impacts of external forces such as climate change and COVID-19.

The planning for this media workshop had two main phases. The first phase involved formative research and content planning, ensuring that the journalists' needs were integrated into the training design, and that outcomes were clearly defined. A needs assessment was administered where a consent form, baseline/end-line survey, and training evaluation form were also developed, along with training handouts focusing on critical points. These training materials were prepared to cultivate research interest among PNG's leading journalists on the tuna industry to report on these topics effectively. The second phase of planning this training workshop involved logistical planning, including a participant field trip to NFA's regional office in Rabaul, New Britain Province that included preparing a media informative kit to help enhance the communication skills of fisheries professionals and media practitioners, enabling them to convey complex scientific information in an accessible and compelling manner.

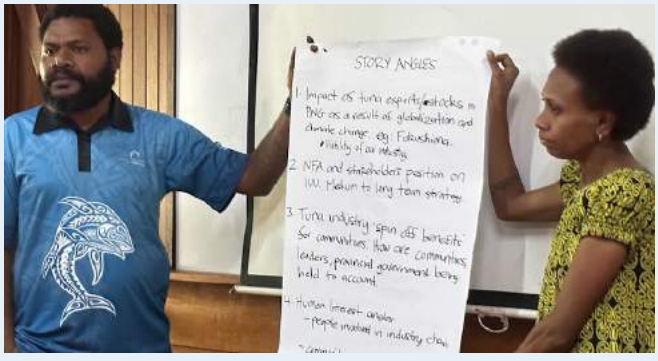
Lisa Williams-Lahari shared her experiences as a Pacific islander and a journalist covering the tuna industry in the "Blue Pacific Continent". She called upon the participants to address pressing issues such as overfishing, climate change impacts, and policy advocacy. The sessions' discussions and activities provided a platform for diverse perspectives and fruitful exchanges between the participants.

Neville Cho presented on effective storytelling techniques, where the outcome of his session was solely intended to increase the journalists' awareness about the importance of sustainable fisheries management and its impact on the environment and local economies. This session provided a platform for participants to understand the connections between fisheries experts, media professionals, and environmental advocates, so as to encourage future collaborations. The participants reported that they would be able to better communicate complex fisheries concepts to the public through various media channels.

Jope Tamani facilitated his session by encouraging participants during the training to lead activities in their small groups and develop stories on the tuna industry that were then shared with other participants during the workshop. The session was structured to build the participants' confidence to use compelling journalism. This was done through hands-on workshops and interactive discussions to facilitate practical learning and skills development among the media practitioners.

Finally, Nawin Rajah led sessions on various topics, including the evolution of the fisheries sector in the Asian-Pacific region, sustainable fishing practices, and effective communication strategies. Case studies showcasing successful initiatives and innovative approaches in fisheries management worldwide were presented. The participants also received training on various media formats, including written articles. These practical exercises were intended to enhance the attendees' ability to apply their newfound knowledge in a real-world scenario.

The media training ended with field visits to local fishing communities and a tuna transshipment port in Rabaul that provided participants with a first-hand experience of the challenges and opportunities in the field. These visits also offered valuable material for participants to develop engaging and authentic narratives when reporting on the tuna industry in the "Blue Pacific Continent".



As stated in FAO's "Food Loss and Waste in Fish Value Chains" website: "To minimise food loss and waste in the fish value chains and, at the same time, improve fish waste management strategies, several methods can be used to convert by-products into value-added products: animal feed ingredients (fishmeal and fish oil), biofuel and biogas, dietetic products (chitosan), pharmaceuticals (omega-3 oils) and constituents in other industrial processes. Other popular products include fish leather, fish silage and fertiliser."

While recognising that discards are important in the manufacture of fishmeal, fish oil and silage, in this issue of the INFOFISH International, we focus on the more innovative utilisation of fish skin from byproducts/discards/low-value species to create value-added products such as pet treats and for biomedical purposes.

Helping wounds to heal

In the development of products for medical applications, acellular fish skin (AFS) grafts have emerged as a potentially cost-effective wound treatment method with improved wound healing outcomes. AFS grafts are also very porous, having about 16.7 large diameter apertures for every 100 μm^2 allowing it to properly adhere to human skin and promote the passage of human fibroblasts, which are known to play an important role in effective wound healing.

Several years ago, a company in Iceland called Kerecis had found an interesting and innovative use for fish (cod) skin which would otherwise have been disposed of. Fish skin, which has been shown to be more similar in structure to human skin, has a porous microstructure which provides a scaffold for efficient ingrowth of dermal cells and capillaries. It also contains lipids (include sterols, fat-soluble vitamins, and phospholipids as well as polyunsaturated fatty acids or Omega3) and proteins that, in a concerted manner, help the body regenerate damaged tissue.

Kerecis MariGen® Shield integrates the company's proven fish-skin grafts with a silicone contact layer for treating chronic and complex wounds.

Research was carried out on the fish skin and it was found to help greatly in skin reconstruction in burns, chronic wounds, and oral wounds, hernia repair, breast reconstruction, and dura mater reconstruction. In addition, Kerecis Omega3 fish skin does not elicit an immune response since the major antigenic components present within cell membranes are removed during processing. Recently, Kerecis® improved its skin graft tissue by incorporating a silicone contact layer for treating chronic and complex wounds. Called MariGen® Shield, the dressing is being promoted for treatment of diabetic foot ulcers.

In Fortazela (Brazil) in 2017, doctors were reported to be covering burn patients with strips of sterilised Nile tilapia. In patients with superficial second-degree burns, the doctors apply the fish skin and leave it until the patient scars naturally. For deep second-degree burns, the tilapia bandages must be changed a few times over several weeks of treatment, but still far less often than the gauze with cream. The tilapia treatment is also said to cut down healing time by up to several days.

Tilapia skin has been used for burn patients

The huge (and growing) pet food market

In 2022, the Marine Stewardship Council (MSC) reported that the number of pet food products – including dog and cat food, fish oil supplements, and yummy treats – containing MSC-certified ingredients in the US has grown by an incredible 614% over the last five years. In fact, companies around the world are increasingly going into the business of using fish and fishery products (including discards) to make pet foods.

Salmon strips from All Fish For Dogs. The pet treats market is estimated to be worth USD185 million in Australia.

One example is Australian company All Fish For Dogs, which takes offcuts from fish that have been landed such as the tails of Spanish or Grey Mackerel, as well as trimmings from other processors, and low-value fish. These pieces are then dehydrated and prepared as treats for dogs and cats, while anything else left over is converted into organic fertiliser. According to the All Fish For Dogs website, it takes four kilograms of fish to produce one kilogram of treats. The treats are aimed at the premium end of the dog treat market, promoted and priced as a wild-caught, organic product.

As food for humans

In Asia, which probably ranks as the biggest consuming region in the world for the product, the most common use of fish skin for human consumption is to fry it and add seasoning to taste. There are countless brands and varieties of crispy fish skin snacks sold in Asia, usually made from tilapia and carp. The skin is cleaned, fried and coated with spices and other condiments such as salted egg yolk to suit the local palate.

Fried fish skin may also be used as an accompaniment to noodle soups, or in Chinese salads. Another item on supermarket shelves is pickled fish skin, which is popular in Taiwan and Japan.

Fashionable leather products

The use of fish skin for clothing is an ancient tradition in Arctic societies along rivers and coasts and there is evidence of fish skin leather production in Scandinavia, Alaska, Japan, northeast China and Siberia. An interesting historical fact is that centuries ago, communities (e.g. in the Arctic and tribes in Siberia and China) used dried fish skin as items of clothing. In some areas of the world, this practice is being revived within the context of the preservation of cultural practices. One example is the Hezhen, one of China's smallest ethnic minority groups, sometimes also called the "Fish Skin Tribe."

Hezhen fishskin jacket
Credit: Wikimedia Commons

Much more recently, commercial fish skin leather products have been around for about two decades, made from species such as salmon, trout, tilapia, shark and rays. The difference now is that more companies are going into the business because of considerations of sustainability and a mission to reduce the impact of environmental pollution due to discards, and of course, profitabiity. Technology has also improved such that utilisation rates of discards have increased, and the products themselves are more durable and aesthetically pleasing.An example is Tidal Vision (Alaska). Using only byproducts from certified sustainable fisheries, the company produces salmon leather wallets. Tidal Vision says that "in Alaska alone, 2 billion pounds of fish and crab byproducts are discarded to rot annually. This waste poses a potential environmental threat when concentrated on the ocean floor."

Salmon leather wallets are available in different colours

Credit: Tidal Vision

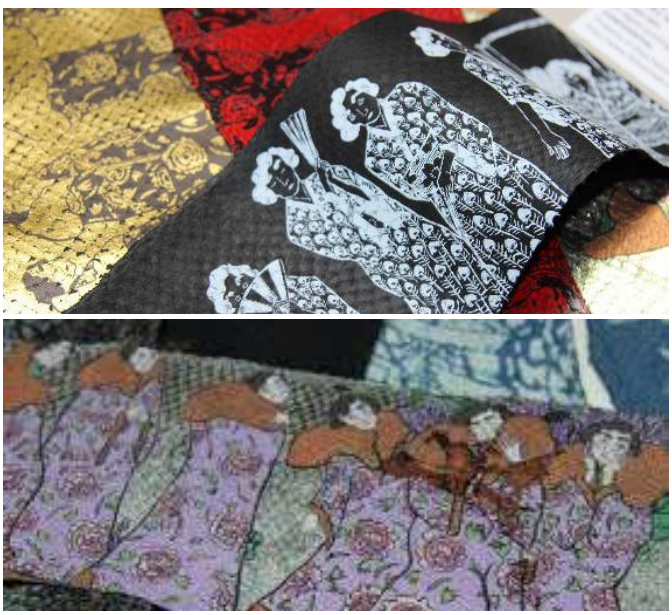
As mentioned on their website, salmon skin is treated with vegetable-based tanning oil and used to make wallets. Tidal Vision also has a proprietary 'Chitofining' process which is the world's first zero-waste process for extracting chitosan, which is a renewable, antibacterial, antimicrobic, and antifungal fibre found in crab shells. The chitosan is then used commercially as fibres, yarn, woven and non-woven textiles. What isn't isolated as pure chitosan becomes an organic, nitrogen and calcium-rich byproduct that is blended into fertiliser.

Watch straps made from fish leather

Credit: Think Sea Co

On the other side of the world in Japan is a startup called Think Sea Co. Based in Toyama Prefecture, the company turns raw skin from fish such as yellowtail, red sea bream, and sea bass into items such as wallets, belts, business card cases, and cellphone cases. The company buys raw skin normally discarded by fishmongers and other suppliers, then turns it into fish leather during a month-long process that involves removing oil and other substances, salting, tanning, dyeing, and sewing – all without artificial chemicals. Another Japanese fish leather producer, Ocean Leather, which launched in 2021 on the island of Shikoku, makes and sells fish leather from yellowtail, sea bream, salmon, dorado, sturgeon, tuna, and other fish.

In Europe, FISHSkin, a research consortium of organizations from six different countries, is worth noting. This is a collaborative effort between ten organisations which aims to promote this sustainable and circular economy project. The consortium is formed and supported by the European Union's Horizon 2020 RISE (Research Innovation Staff Exchange) framework and will continue this research through the end of 2023. FISHSkin's objective is to develop state-of-the-art technology using fish skin to make leather products using circular economic practices, and ethical and sustainable sourcing.



Dyed and printed fish skin

Credit: FISHSkin

AQUACULTURE

Next gen sequencing-based solutions


Credit: Luminis Water Technnologies

Millions of microbes make up the microbial community, which underpins health and wellness in water and stock. The microbiome carries out many critical functions, including pathogen control, water cleaning, ammonia removal, and immune support of the stock. However, much of it is lost during the farming process leaving many operations open to risk.

"Water disinfection is a necessary step in preparing aquaculture facilities before stocking, but it also causes microbiome die-offs which result in the higher likelihood of disease further down the line," says Rachelle Jensen, founder of Luminis Water Technologies. AquaGENius is a microbiome field testing kit which allows farmers to quickly and easily take a sample and send it to the Luminis lab for next gen sequencing and in-depth analysis.

Jensen added that "farmers can gain "health snapshots" at the species-level of all beneficial bacteria, determine if probiotics are seeding properly, spot problems with imbalances or biodiversity, dive into Cyanobacteria, algae and parasites, including pathogen and viral loads. We think of microbiome analytics as a form of X-ray vision for water. We've found that 9 times out of 10 probiotics are not working, which means the operator is simply throwing money down the drain. Some of the mistakes we see are using blends that have the wrong profile of bacteria, using low quality products, or using probiotics that don't address the specific issue present in the water at the time of seeding." This is said to be the only company offering next gen sequencing to gain insights into the microbiome.

Microbiome analytics are particularly well suited for RAS or closed systems where water is prone to pathogen build-up and water quality issues, as well as pond operations that use probiotics and water treatment protocols.

Further information: Luminis Water Technologies, Singapore (enquiries@luministech.com)

Optical delousing

Salmon lice are one of the biggest problems in the aquaculture industry in Norway. Fish farmers annually spend a total of EUR 1 billion in direct and indirect costs of combating salmon lice and are increasingly seeking to control sea lice through non-medicinal, environmentally friendly approaches. The use of lasers is one of the more recent advances in this fight. Norwegian company Cermaq Group AS is the latest to employ this approach, having been supplied with the laser system from Stingray Marine Solutions AS, also in Norway. Cermaq plans to install around 140 different lasers at its sea sites Veggfjell and Svartfjell in the next few weeks, with more to be installed at other sites over time.


Credit: Stingray Marine Solutions AS

Lice lasers use stereo camera vision, advanced software and targeted lasers to automatically remove lice while salmon swim around the cages. The fish are not handled, and no chemicals are used.

Further information: Stingray Marine Solutions (mail@stingray.no); Cermaq Group AS (post.group@cermaq.com)

FISHING

Seabird bycatch mitigation

The Hookpod is backed by governments and regulatory bodies as the only (so far) standalone seabird bycatch mitigation device for use in pelagic longline fishing. It comes in two versions: The Hookpod Mini and The Hookpod LED.

The Mini is a smaller (49g), more compact version which has the sole purpose of preventing seabird bycatch, rapidly sinking below the diving depth of albatrosses and most petrels. It is primarily designed for fisheries where longline fishing lights are not used and is operationally effective to a depth of 1000 metres.

The Hookpod LED is larger and heavier (69 g) and contains a built-in LED fishing light, removing the need for chemical light sticks.

The Hookpod LED contains a 3mm green LED fishing light which illuminates automatically on opening. It has a dual function of eliminating seabird bycatch whilst providing a reliable, reusable and economic fishing light. Powered by 2 AG13 LR batteries, the Hookpod LED emits a brilliant light of 0.08 lumens. This works to attract small fish and cause movement around the hook, which in turn pulls in the larger, predatory target species. It sinks below the diving depth of albatrosses and most petrels, and is operationally effective to a depth of 1000 metres.

Further information: Hookpod Limited, UK (info@hookpod.com)

PROCESSING

Processing of very small fish

SEAC AB is one of the very few manufacturers that produces machines which can process small fish (70—100 pieces/kg) at a speed of more than 300 fish/minute. Its nobbing machine FPM-200 processes H &G + T products (removes heads, guts, and tails), while the nobbing and filleting FPM-400 is for filleting.

FPM-500

The FPM-500 is an automatic feeder which guides the fish – sardine, mackerel, herring and similar – into the pocket conveyor of the FPM-200 or FPM-400. It needs only one operator to run the entire line in order to control, correct and add the fish into empty pockets. The feeder works with a range of 2–25 fish/kg, with a capacity from 150 up to 300 fish per minute.

Further information: Seac AB, Sweden (info@seac.se)

CIRCULAR ECONOMY

Recycling discards into usable products

Discarded equipment ends up as raw material for the recycling industry, where it's used in a wide variety of products such as garden furniture and automotive parts.

A company in Norway collects discarded, landfilled, or incinerated equipment from fishing and fish farming around the world, turning it into raw material for the recycling industry which is used in a wide variety of products. ECONYL is therefore described as a 100% regenerated nylon yarn made from old fishing nets and other nylon waste, which can be reused repeatedly, even indefinitely, without degradation. This reduces overall demand for virgin plastic, thereby reducing the use of petroleum resources and resultant carbon emissions.

Since 2011, Nofir says it has collected 60 847 tons of discarded fishing and fishing equipment, and has prevented 23 500 metric tons of discarded equipment from going to landfills or ending up at sea.

Further information: Nofir AS, Norway (kristian@nofir.no/ +47 993 59 545)

Twine from seaweed

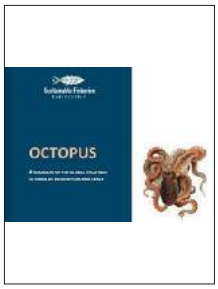
A new startup called Viable Gear is in the early stages of making equipment for the aquaculture industry using a seaweed polymer to reduce the amount of petroleum-based plastics entering our oceans from the sector.

Viable Gear's pilot product, a seeding twine made from kelp for use in seaweed hatcheries

The company's pilot product is a seeding twine made from kelp for use in seaweed hatcheries. This product will be part of the circular economy, as the cultivated kelp used to create the material will go back out to the farm at sea as seeded twine to grow more kelp. By using seaweed to make twine instead of plastic materials, microplastics are not released into the ocean. Additionally, the material will biodegrade in time, and its ingestion by marine animals is not fatal.

If this pilot product works, Viable Gear will scale-up to produce bait bags for the lobster industry as its first product to market. There are an estimated 23.9 million bait bags used annually, from Massachusetts up through eastern Canada, with a market value of roughly USD55.1 million.

Further information: Viable Gear, USA (katie@viablegearco.com)



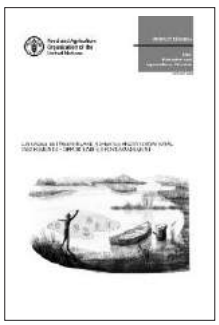
OCTOPUS: A SUMMARY OF THE GLOBAL SITUATION IN TERMS OF PRODUCTION AND TRADE

SFP. 2023. Octopus: a summary of the global situation in terms of production and trade. Sustainable Fisheries Partnership (SFP). August 2023. 26 pp.

This report provides a concise summary of the global status of the octopus sector, with a primary focus on production and trade. The analysis is based on publicly available data from sources such as FAO FishStatJ, UN COMTRADE, and FishSource. While the report is not exhaustive, it offers valuable insights into the sector. The analysis involved a thorough examination of internet-accessible information, including international production and trade data. The collected information encompasses five main areas: (1) availability of fisheries data, (2) fisheries production, (3) fisheries trade, (4) stock status, exploitation, and management performance, and (5) certification and improvement initiatives.

Although sustainability status and challenges in octopus fisheries were not extensively investigated in this report, available information suggests a general dearth of biological and fisheries-dependent and independent data for most octopus stocks, making it difficult to assess stock status and exploitation levels. Consequently, in many cases management is not considered a priority, and specific regulations tend to be lacking or inadequate. Despite an increasing number of fishery improvement projects dedicated to octopus, most of the sector lacks evidence of engagement in market-based initiatives to improve fisheries sustainability. For a more comprehensive understanding of the sector, readers are encouraged to consult the original data sources and other relevant literature.

This publication can be downloaded at no cost from: https://heyzine.com/flip-book/e02633de9e.html

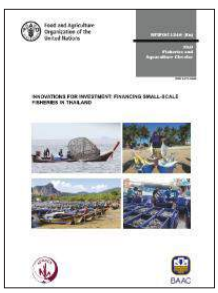


LINKAGES BETWEEN INLAND FISHERIES AND INTERNATIONAL INSTRUMENTS – OPPORTUNITIES FOR ENGAGEMENT

Coates, D., McInnes, R.J. & Davidson, N.C. 2023. Linkages between inland fisheries and international instruments – Opportunities for engagement. FAO Fisheries and Aquaculture Circular No. 1239. Rome, FAO.

In response to the ecosystem approach to fisheries (FAO, 2003), there is a need to mainstream understanding of inland fisheries beyond the confines of the fisheries sector. This report assesses the degree to which various international instruments, frameworks or processes, other than those specific to fisheries, pay attention, or have relevance, to inland fisheries. It assesses the potential for awareness raising of inland fisheries among them. This review aims to highlight the needs and opportunities for the diverse actors working in inland fisheries so they can engage more effectively in these international frameworks and processes that are relevant to their work.

This publication can be downloaded at no cost from: https://doi.org/10.4060/cc2760en



INNOVATIONS FOR INVESTMENT: FINANCING SMALL-SCALE FISHERIES IN THAILAND

Gietzen, T., van Anrooy, R. & Das, P.K. 2023. Innovations for investment: financing small-scale fisheries in Thailand. FAO Fisheries and Aquaculture Circular No. 1246. Rome, FAO.

To make small-scale fisheries in Thailand more sustainable, fishers need to invest in responsible fishing operations and technologies, reduce overfishing, contribute to fisheries management, and implement climate change adaptation measures. Small-scale fishers often do not have access to financial services to innovate and to make the necessary transition to sustainable fishing operations. Access to financial services will help them to innovate and adopt measures that will provide social, economic and environmental returns, the desired triple bottom line.

The Asia-Pacific Rural and Agricultural Credit Association (APRACA) and FAO, in collaboration with the Bank for Agriculture and Agricultural Cooperatives (BAAC), implemented a project to analyse and improve the access of small-scale fishers to financial services in Thailand.

This publication can be downloaded at no cost from: https://doi.org/10.4060/cc5414en

2023

NOVEMBER

1-3
BUSAN INTERNATIONAL SEAFOOD & FISHERIES EXPO
Busan, Republic of Korea
https://www.bisfe.com:456/eng/sub01/sub01.php

2-4
International Fisheries and Aquaculture Expo (AQUAEX INDIA)
Andhra Pradesh, India
https://aquaexindia.com/

8-11
SEAFOOD SHOW OF ASIA EXPO
Jakarta, Indonesia
https://seafoodshowasia.com/

22-24
11th International Fisheries Symposium IFS2023
Bangkok, Thailand
https://www.aitaquaculture.org/ifs2023/

27-29
GIANT PRAWN 2023
Bangkok, Thailand
https://giantprawn.org/index.htm

DECEMBER

4-7
7th Int'l Fisheries Industry Exhbition (IFEX 2023)
Tehran, Iran
https://www.ifex.ir/en/

7-9
SEAFOOD EXPO EURASIA
Istanbul, Türkiye
https://seafoodexpoeurasia.com/en/

2024

FEBRUARY

19-23
FISHFORUM
Türkiye
https://www.fao.org/gfcm/fishforum2024/en/

21-22
21st Seafood Show Osaka
Osaka, Japan
https://seafoodshow-japan.com/osaka/

27-29
BANGLADESH INTERNATIONAL AQUACULTURE & SEAFOOD SHOW 2024
Dhaka, bangladesh
https://seafoodexpobd.com/

MARCH

10-12
Seafood Expo North America (SENA)
Boston, USA
www.seafoodexpo.com/north-america/

20-22
VietShrimp 2024
Ca Mau city, Vietnam
https://vietshrimp.net/

APRIL

23-25
Seafood Expo Global (SEG)
Barcelona, Spain
https://www.seafoodexpo.com/global/

MAY

8-11
International Indonesia Seafood & Meat (IISM)
Jakarta, Indonesia
https://iism-expo.com//

20-22
18th INFOFISH World Tuna Trade Conference & Exhibition
Bangkok, Thailand
www.tuna.infofish.org

EDITORIAL PLAN 2024

INFOFISH

ISSUE	FISHERIES & AQUACULTURE	PROCESSING & MARKETING	EQUIPMENT & TECHNOLOGY	SUSTAINABLE DEVELOPMENT GOALS
1/2024 (Jan/Feb) **Deadline: 15 Nov 2023**	• The importance of monitoring shrimp uniformity for better performance during production	• Women in Papua New Guinea embrace new technology in fish processing • Sri Lanka: Seaweed production, trade and marketing	• Supporting sustainable fisheries with satellite technology and open data	• Translating the SSF Guidelines into practice • Promoting community engagement and partnership: Lessons learnt from the FishFAD Tuna Project in the Pacific
2/2024 (Mar/Apr) **Deadline: 15 Jan 2024**	• Bringing fishing vessels into the fold: why an agreement on fishing vessel safety is big news • The increasing role of RFMO's in addressing sustainability and broader regional prosperity	• Canned tuna, regulatory challenges and seafood innovation	• Smart technologies towards a new era in sustainable tuna fishing • Supercooling for seafood preservation	• Empowering workers: understanding and addressing fairwashing challenges in the seafood industry • Tuna sustainability, solidarity and communities
3/2024 (May/June) **Deadline: 15 March 2024**	• Restorative aquaculture for people and oceans	• Seaweed-based nutraceuticals/ Seaweed processing for non-food-based products • Tuna hubs & spokes in the Pacific: Where are we now and where are we going in the tuna Industry in the Blue Pacific Continent?	• Innovations in packaging of seafood	• Blue Transformation: What does it really mean for the global tuna Industry? • Financing innovations for sustainable small-scale fisheries • Powerful Women in Seafood - Leading responsible tuna supply chains
4/2024 (July/Aug) **Deadline: 15 May 2024**	• Illegal, unreported and unregulated fishing costs the industry billions of dollars: where does that money go?	• How is growing competition from "China in Latin America" undermining Ecuador's supremacy? • Canned tuna and consumer behaviour in Papua New Guinea	• Application of SNP Genomic tools to revolutionize breeding, enhancing productivity and boosting sustainability • Managing seafood safety risks in a changing global environment	• The life of responsible tuna fishers in the Madives • Fisheries leadership and governance in the Pacific
5/2024 (Sep/Oct) **Deadline: 15 July 2024**	• How can Pacific island countries/states take greater ownership of their tuna resources?	• Fish byproduct utilization in Asia: status and prospects • Bioprospecting of marine natural products	• Shipping seafood safely • Recirculating aquaculture equipment	• Collective action for sustainability and efficiency- A fisheries perspective • AI and small-scale fisheries development
6/2024 (Nov/Dec) **Deadline: 15 September 2024**	• Moving beyond the stalemate: how a clear mechanism for how to allocate fishing opportunities should save time and money in fishery negotiations	• What's trending in the global seafood market: A wrap-up of 2024 • Emergence of cool chain management in the seafood industry	• IoT-based aquaculture monitoring and control system • Innovations along the seafood value chains: Policy recommendations	• On tuna RFMOs and the road to 2030: Improvement implementations necessary in science and management to achieve the SDGs

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Advancing Blue Transformation, Sustainable Development and Innovation through the Global Tuna Industry

20-22 MAY 2024

Shangri-La Hotel,
Bangkok, Thailand

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Ministry of Agriculture and Cooperatives

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