CATCH THE LATEST IN FISHERIES

INFOFISH International

ISSUE: 5/2023/SEPTEMBER-OCTOBER

www.infofish.org

INFOPESCA • INFOFISH • INFOPECHE • INFOSAMAK • EUROFISH • INFOYU

Price: US$10

www.infofish.org

INFOFISH

ASSOCIATE MEMBERSHIP

To forge a closer link with

GLOBAL SEAFOOD INDUSTRY

THE AIM OF THE PROGRAMME

The objective of the scheme is to provide a formal mechanism through which the global fishery industry may effectively interact with **INFOFISH Member Countries,** policy makers, financial institutions and academia, especially in The Asia-Pacific region, to promote intra-regional trade and exchange of marketing and technical information.

WHO SHOULD JOIN

Companies, corporate bodies, institutions and associations, academia etc. linked to fisheries and aquaculture, irrespective of nationality

HOW TO JOIN

Those who wish to join the Membership Programme should indicate their interest to INFOFISH with some background information of themselves, institution or the corporate body as applicable.

In response to such requests, they will receive an application form which has to be duly filled out and submitted, along with the annual fee for membership.

THE FEE

The fee for Associate Membership is **US$3,000** per annum which is to be paid at the time of submission of the membership application.

AQUACULTURE//

Sourabh K Dubey, Francois Rajts, Kalpajit Gogoi, Rashmi Ranjan Das and Ben Belton

Persistent malnutrition in Asia necessitates innovative solutions. This article explores the potential of nutrient-rich small indigenous fish species (SIS) to combat undernutrition and promote nutrition-sensitive aquaculture in South Asia. Integrating SIS into carp polyculture systems has great potential to increase the micronutrient productivity of traditional aquaculture, but, until very recently, a lack of techniques for hatchery-based mass production and distribution of SIS seed was a key bottleneck hampering the widespread adoption of SIS aquaculture. This article draws attention to significant new breakthroughs in hatchery-based seed production for multiple SIS in India, and their implications for scaling up nutrition-sensitive aquaculture throughout the region.

FEATURE//

By Aileen Tan Shau Hwai

Universiti Sains Malaysia (Science University of Malaysia) has pioneered research in oysters since 1988. Based on the fact that oyster farming is a clean and green aquaculture, plus its low cost and adoptable technology ('Low technology with high touch"), coastal communities have been introduced to sustainable oyster farming as a means of income generation. Through training and hands-on engagement, these empowered communities have become entrepreneurs, producing and marketing oysters successfully. The author concludes that a sustainable oyster farming system is able to offer economic returns for coastal communities, while significantly improving their living standards.

By U.L.K. Perera, K.L.D. Nilanka, J.A.R.U. Jayakody, and R.A.R.M. Ranasinghe

Gleaning of mussels, clams, and oysters is important in terms of its contribution to animal protein intake and food security, and also as a means of livelihood and income generation for the rural poor. As those engaged in this traditional fishery in Sri Lanka are mainly women, gleaning is important as an activity that adds value to these women in the household economy as well as nationally. However, this small-scale fishery sector receives very little attention and therefore remains poorly developed. Providing women gleaners with the necessary financial and technical support will enhance their economic potential, improve their quality of life, and contribute to the expansion of the sector.

By Yinji Li

Although it has received a lot of attention in recent years, the topic of fisheries sustainability isn't new. Despite years of research, it is still difficult to achieve sustainability in many fisheries, and the discussions seem never-ending; but for the future of our planet, it is imperative that we change our food production systems. There is a growing interest in small-scale fisheries and recognition of how crucial they are to the development of sustainable fishery systems. One of the most intriguing and possibly among the best replicable models could lie in Japan's small-scale fisheries and their unique "Umigyo" way to protect life below the water by protecting life above water.

By K.W. Sujeewa Ariyawansa, K. B.Chandrani Pushpalatha, Omar Riego Peñarubia, and Ansen Ward

This article presents a summary of a comprehensive study conducted in Sri Lanka to assess postharvest losses from harvesting to unloading at fishery harbours in the multiday fisheries sector. Multidimensional solutions are proposed, including implementing supportive policies and regulations, investments in fleet development and infrastructure, capacity-building programs, improved market linkages and value addition activities. These solutions offer a pathway towards improving fish quality, minimising losses, and promoting sustainable fisheries, thereby enhancing food security and supporting the country's economic and social development.

INDUSTRY PROFILES//

FISHBYTES//

EVENTS//

OTHER SECTIONS//

Cover image : Oyster farming by coastal communities in the Pacific
Credit: INFOFISH

data

Track tuna prices, trade flows, supply and quota with UCN

For everything you need on tuna and the global seafood industry visit:

www.undercurrentnews.com/species/tuna

1. **Stay on top of the category with our breaking news and weekly tuna round-up.**
2. **Get in-depth behind the story with our extensive archive.**
3. **Manage your business with our up-to-date pricing info.**

ucn undercurrentnews

Corporate accounts: subscribe@undercurrentnews.com | www.undercurrentnews.com

CATCH THE LATEST IN FISHERIES
INFOFISH
International

Editor-in-Chief
Shirlene Maria Anthonysamy

Editorial Board
Lahsen H Ababouch, Shep Helguilé, Graciela Pereira, Chen Shuping, Ouati Youssef, Marco Frederiksen, Shirlene Maria Anthonysamy

Editor
Firoza Buranudeen

Editorial Consultant
Audun Lem

Contributing Editors
Shirlene Maria Anthonysamy,
Sujit Krishna Das, Gemma Meermans Matainaho

Designer/Illustrator
Mohd Syahir Zahardin

Editorial Assistants
Norezah Ismail

Advertisement, Promotion and Circulation
Mohd Syahir Zahardin

Web Administrator
Mohd Aftar Aris

EDITORIAL OFFICE:
INFOFISH
1st Floor, Wisma LKIM
Jalan Desaria
Pulau Meranti
47120 Puchong, Selangor DE
Malaysia
Tel: (603)80668112 (603)80603734 • 80603738
Fax: (603)80603697
E-mail: info@infofish.org
Website: www.infofish.org

REGIONAL OFFICES:
Latin America, Caribbean
INFOPESCA, Casilla de Correo 7086,
Julio Herrea y Obes 1296, 11200 Montevideo, Uruguay
Tel: (598) 2 9028701/29028702 • Fax: (598) 2 9030501
E-mail: infopesca@infopesca.org
Website: www.infopesca.org

Africa
INFOPECHE, BP 1747 Abidjan 01, Côte d'Ivoire,
Tél (225) 20 21 31 98/ 20 .21 .57.75
Fax (+225) 20 21 80.54
Email: infopeche@aviso.ci / infopech@gmail.com
Website: www.infopeche.ci

Arab Countries
INFOSAMAK, 71, Boulevard Rahal, El Meskini
Casablanca 20 000, Morocco.
Tel: (212)522540856 • Fax: (212)522540855.
E-mail: info@infosamak.org / infosamak@infosamak.org
Website: www.infosamak.org

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.

This issue of the INFOFISH International focuses heavily on the important but under-valued small-scale fisheries sector, and more specifically, the diverse and complementary roles that policy makers, researchers, and communities can, and should, play in developing the sector so as to enhance food security and elevate incomes for households.

In one of these articles, a team of researchers looked at the potential of small indigenous species (SIS) in inland aquaculture to contribute towards the nutritional intake of communities but which had in the past, been limited by the lack of seed. However, new breakthroughs in hatchery-based seed production of several SIS in India, as well as the adoption of an inclusive approach between researchers, authorities and communities, signal a new era of aquaculture practices which are nutrition-sensitive and economically viable. In similar vein, community engagement, government support and the successful application of research are highlighted in an article on oyster farming in Malaysia. The author, from Universiti Sains Malaysia (Science University of Malaysia), relates how communities, including an increasing number of women, have been able to raise their income levels through oyster culture.

In another interesting article centred on empowerment in the small-scale sector, women gleaners in Sri Lanka have proven that, given the necessary financial and technical support as well as training, their income levels and standard of living can be elevated. Moving on to Japan, we feature an article which highlights a more holistic view of small-scale fisheries and its role in developing sustainable fisheries systems. The author relates the interesting concept of "umigyo" in Japanese fisheries, which accords value to fisheries (life below water) as an economic activity, but at the same time, the traditions and culture of the communities and people (life above water) are also regarded as being of equal importance.

The fifth article in this magazine highlights an assessment of the postharvest losses in the multiday fisheries sector of Sri Lanka, and presents recommendations to minimise such losses such as fleet development, capacity building programs and improved market linkages. The authors stress that by all stakeholders collectively working towards fish quality and reducing losses, food security and livelihoods can be strengthened.

Our "Industry Profile" interview this time focuses on Mr Itamar Rocha, President of the Brazilian Shrimp Farmers Association. Mr Rocha gives interesting insight into the farmed shrimp sector in Brazil, the challenges it faces, and the rising domestic consumption trend, among others. The interview is accompanied by a detailed overview of the sector under the 'FishBytes' category, authored by Mr Rocha.

Meanwhile, the 8th Pacific Tuna Forum (PTF 2023) is taking place very soon, from 6-7th September, 2023 in Port Moresby, Papua New Guinea. This bi-annual event is jointly organised by the National Fisheries Authority (NFA) of Papua New Guinea and INFOFISH, alongside relevant regional organisations. It provides a highly valued platform for policy makers, industry players, and prospective investors within the Asia-Pacific region and beyond to converge on all matters concerning tuna in the WCPO Region and the broader Pacific and/or Blue Continent. PTF 2023 will be held the Stanley Hotel in Port Moresby, Papua New Guinea under the theme, "Strengthening tuna sustainability and industry development in the 'Blue Pacific Continent', through increased innovation, partnership and participation". Please visit our conference website www.ptf.infofish.org for updated information on this event.

On a personal note, this issue will be sentimental for me, being the last Editorial that I am writing. After 23 years, I am moving on to another pasture. It's been truly an awesome experience and I am deeply honored to have spent most of my professional life with INFOFISH. A big thank you to all readers, advertisers, authors, contributors and collaborators for your continuous support and valuable contributions. Rest assured INFOFISH International will continue its journey in being an advocate of fisheries and aquaculture progress and development.

Happy reading!

Shirlene Maria Anthonysamy
Director, INFOFISH

INFOFISH *International* - your key to world markets: high technology applications by prime specifiers and purchasers in global fisheries - from catching and farming through processing and preservation to packaging, storage, transport and marketing. Advertising rates are available on request from the Advertisement Manager, INFOFISH International, P O Box 10899, 50728 Kuala Lumpur, Malaysia. E-mail: info@infofish.org. Web: http://www.infofish.org.

INFOFISH *International* is published bimonthly by INFOFISH, INFOPESCA, INFOPECHE, INFOSAMAK, EUROFISH and INFOYU, the Regional Marketing Information and Advisory Services for Fish Products. Subscription rate for six issues: US$50 airmail (non members); concessionary rates available for individual subscribers in member countries of the Regional Services. Discounts available for three year subscriptions.

Resúmenes de los principales artículos

Una universidad pública (Universiti Sains Malaysia) ha sido pionera en la investigación de ostras desde 1988. Teniendo en cuenta que el cultivo de ostras implica una acuicultura limpia y verde, además de su bajo costo y su fácil adopción tecnológica, las comunidades costeras se han introducido a la actividad como medio para generar ingresos. A través de la capacitación y el compromiso práctico, estas comunidades empoderadas se han convertido en emprendedoras, produciendo y comercializando ostras de forma exitosa. El autor concluye que un sistema sostenible de cultivo de ostras puede ofrecer beneficios económicos para las comunidades costeras, al tiempo que mejora significativamente su nivel de vida.

La recolección de mejillones, almejas y ostras es importante en términos de su contribución a la ingesta de proteínas animales y a la seguridad alimentaria, como también como medio de sustento y generación de ingresos para las zonas rurales pobres. Dado que quienes se dedican a esta práctica tradicional en Sri Lanka son principalmente mujeres, la recolección es importante como actividad que agrega valor en la economía del hogar, así como a nivel nacional. Sin embargo, esta actividad de pequeña escala recibe muy poca atención y, por lo tanto, sigue estando poco desarrollada. Proporcionar a estas mujeres el apoyo financiero y técnico necesario mejorará su potencial económico, mejorará su calidad de vida y contribuirá a la expansión del sector.

Aunque ha recibido mucha atención en los últimos años, el tema de la sostenibilidad de las pesquerías no es nuevo. A pesar de varios años de investigación, todavía es difícil lograr la sostenibilidad en muchas pesquerías, y las discusiones parecen interminables; pero para el futuro de nuestro planeta, es imperativo que cambiemos nuestros sistemas de producción de alimentos. Hay un interés creciente en la pesca en pequeña escala y en lo cruciales que son para el desarrollo de sistemas pesqueros sostenibles. Uno de los modelos más intrigantes, y posiblemente de los mejores para replicar, podría estar en las pesquerías de pequeña escala de Japón y el concepto *"Umigyo"* que implica proteger la vida debajo del agua protegiendo la vida fuera del agua.

Este artículo presenta un resumen de un estudio exhaustivo realizado en Sri Lanka para evaluar las pérdidas post-captura de las operaciones pesqueras por varios días, desde la cosecha hasta la descarga en los puertos. Se proponen soluciones multidimensionales, incluida la implementación de regulaciones y políticas de apoyo, inversiones en la infraestructura de las flotas, capacitaciones, mejoramiento de los vínculos comerciales y actividades de valor agregado. Estas soluciones ofrecen un camino para mejorar la calidad del pescado, minimizar las pérdidas y promover la pesca sostenible, mejorando así la seguridad alimentaria y contribuyendo al desarrollo económico y social del país.

La desnutrición persistente en Asia requiere soluciones innovadoras. Este artículo explora el potencial de las pequeñas especies autóctonas ricas en nutrientes (SIS) para combatir la desnutrición y promover la acuicultura sensible a la nutrición en el sur de Asia. La integración de las SIS en los sistemas de policultivo de carpa tiene un gran potencial para aumentar la productividad de micronutrientes de la acuicultura tradicional, pero, hasta hace poco, la falta de técnicas para la producción masiva de semillas en criaderos y su distribución eran un cuello de botella importante que obstaculizaba la práctica generalizada de la acuicultura de SIS. Este artículo explora los avances significativos en la producción de semillas en criaderos para múltiples SIS en la India y sus implicancias para ampliar la acuicultura sensible a la nutrición en toda la región.

Rodrigo Misa

Para obtener mayor información sobre este material, puede ponerse en contacto con la sede de INFOPESCA:
Dirección/Street address: Julio Herrera y Obes 1296, C.P. 11200, Montevideo, Uruguay
Dirección postal/Mail address: Casilla de Correo 7086

Web: http://www.infopesca.org
Tel: (598)-2-902 8701 / E-mail: infopesca@infopesca.org

Résumés des articles de fond

Depuis 1988, une université publique, l'Universiti Sains Malaysia, est à l'avant-garde de la recherche sur les huîtres. L'ostréiculture étant une aquaculture propre et verte, ainsi qu'une technologie peu coûteuse et facile à adopter ("Low technology with high touch"), les communautés côtières ont été initiées à l'ostréiculture durable comme un moyen de générer des revenus. Grâce à la formation et à l'engagement pratique, ces communautés responsabilisées sont devenues des entrepreneurs, produisant et commercialisant des huîtres avec succès. L'auteur conclut qu'un système d'ostréiculture durable est capable d'offrir des retours économiques aux communautés côtières, tout en améliorant de manière significative leur niveau de vie.

Le glanage des moules, des palourdes et des huîtres est important car il contribue à l'apport en protéines animales et à la sécurité alimentaire, et constitue également un moyen de subsistance et de génération de revenus pour les populations économiquement faibles des zones rurales. Étant donné que les personnes engagées dans cette pêche traditionnelle au Sri Lanka sont principalement des femmes, le glanage est une activité importante qui leur apporte une valeur ajoutée dans l'économie du ménage ainsi qu'au niveau national. Cependant, ce secteur de la pêche à petite échelle reçoit très peu d'attention et reste donc, reste peu développé. En apportant aux glaneuses le soutien financier et technique nécessaire, on renforcera leur potentiel économique, on améliorera leur qualité de vie et on contribuera à l'expansion du secteur.

Bien qu'il ait fait l'objet d'une grande attention ces dernières années, le thème de la durabilité de la pêche n'est pas nouveau. Malgré des années de recherche, il est encore difficile de parvenir à la durabilité dans de nombreuses pêcheries, et les discussions semblent interminables ; mais pour l'avenir de notre planète, il est impératif que nous changions nos systèmes de production alimentaire. Les pêcheries à petite échelle suscitent un intérêt croissant et leur importance est cruciale pour le développement de systèmes de pêche durables. L'un des modèles les plus fascinants, et peut-être l'un des meilleurs à reproduire, pourrait résider dans les pêcheries à petite échelle du Japon et leur façon unique, "*Umigyo*", de protéger la vie sous l'eau en protégeant la vie au-dessus de l'eau.

Cet article présente un résumé d'une étude complète menée au Sri Lanka pour évaluer les pertes post-captures, de la capture au débarquement dans les ports de pêche, dans le secteur de la pêche pluriquotidienne. Des solutions multidimensionnelles sont proposées, notamment la mise en œuvre de politiques et de réglementations favorables, des investissements dans le développement de la flotte et des infrastructures, des programmes de renforcement des capacités, l'amélioration des liens avec le marché et des activités de valorisation. Ces solutions offrent une voie vers l'amélioration de la qualité du poisson, la minimisation des pertes et la promotion d'une pêche durable, renforçant ainsi la sécurité alimentaire et soutenant le développement économique et social du pays.

La malnutrition persistante en Asie nécessite des solutions innovantes. Cet article explore le potentiel des petites espèces de poissons indigènes (SIS) riches en nutriments pour lutter contre la dénutrition et promouvoir une aquaculture sensible à la nutrition en Asie du Sud. L'intégration des SIS dans les systèmes de polyculture de la carpe a un grand potentiel pour augmenter la productivité en micronutriments de l'aquaculture traditionnelle, mais, jusqu'à très récemment, le manque de techniques pour la production de masse en écloserie et la distribution de semences de SIS était un goulot d'étranglement majeur qui entravait l'adoption généralisée de l'aquaculture des SIS. Cet article attire l'attention sur de nouvelles percées significatives dans la production de semences en écloserie pour de multiples de SIS en Inde, et sur leurs implications pour l'expansion de l'aquaculture sensible à la nutrition dans toute la région.

DIGRÉ Arriko Calice

Pour plus amples informations et pour la traduction des articles contenus dans cette revue, veuillez vous addresses à INFOPÊCHE , BP 1747 Abidjan 01, Côte d'Ivoire
Tél (225) 20 21 31 98/ 20 .21 .57.75 / Fax (+225) 20 21 80.54
Email: infopeche@aviso.ci / infopech@gmail.com
Website : www.infopeche.ci

文 章 摘 要

By Aileen Tan Shau Hwai

马来西亚理科大学是一所公立大学，自1988年以来一直致力于牡蛎领域的研究。牡蛎养殖是一种清洁与环保的水产养殖模式，而且其成本低、技术接受度高（“可掌握的低技术”），目前可持续的牡蛎养殖已被作为一种创收途径推广到沿海社区。通过培训及实践参与，掌握了养殖技术的社区创立了公司，成功生产并销售牡蛎。本文认为，一个可持续的牡蛎养殖体系能够为沿海社区提供经济回报，同时显著提高他们的生活水平。

By U.L.K. Perera, K.L.D. Nilanka, J.A.R.U. Jayakody, and R.A.R.M. Ranasinghe

拾捡贻贝、蛤蜊和牡蛎对于促进动物蛋白摄入和粮食安全具有重要意义，同时也是农村贫困人口的一种谋生方式和创收途径。在斯里兰卡从事这一传统渔业的主要是妇女，也成为她们增加家庭收入和国民经济的一项重要工作。但是，这一小规模渔业很少受到关注，因此仍然较为落后。向这些女性海洋“拾穗者”提供必要的财政和技术支助将提升她们创造经济价值的潜力，改善她们的生活质量，并有助于推动该传统小规模渔业的发展。

By Yinji Li

近年来，渔业可持续发展的话题并不新鲜，且得到了诸多关注。尽管进行了多年的研究，但在许多渔业领域实现可持续发展依然面临重重困难，对此的相关探讨也似乎永无止境；但是，为了地球的未来，我们必须改善粮食生产系统。小规模渔业及其对可持续渔业发展的重要性越来越受到人们的关注。其中，日本的小规模渔业及其一个名为“Umigyo”的独特小规模渔业模式非常引人注目，它们通过保护水上生命来保护水下生命，有可能成为最具可复制性的渔业模式之一。

By K.W. Sujeewa Ariyawansa, K.B.Chandrani Pushpalatha, Omar Riego Peñarubia, and Ansen Ward

本文概述了在斯里兰卡进行的一项综合研究，该研究评估了连日渔业从捕捞到渔业港口卸货的渔获损失。本文提出了多维度的解决方案，包括实施支持性政策和法规、投资船队发展和基础设施建设、开展能力建设项目、加强与市场的联动以及开展渔产品增值活动。这些解决方案为提高渔产品质量、减少渔获损失和促进渔业可持续发展提供路径，以期由此加强粮食安全，并推动国家经济与社会的发展。

By Sourabh Dubey, Francois Rajts, Kalpajit Gogoi, Rashmi Ranjan Das, and Ben Belton

在亚洲，营养不良问题持续存在，迫切需要创新性解决措施。本文探讨了南亚富含营养的小型本土鱼类(SIS)在对抗营养不良问题及促进营养导向型水产养殖等方面的潜力。将小型本土鱼类整合到鲤鱼混养系统，对于提高传统水产养殖的微量营养素生产力具有巨大的潜力。但是，迄今仍缺乏基于孵化场的小型本土鱼种苗大规模生产和种苗分布的技术，成为阻碍小型本土鱼水产养殖广泛推广的主要瓶颈。本文聚焦印度在基于孵化场的多种小型本土鱼种苗生产中取得的重大新突破，以及其对于发展该地区营养导向型水产养殖业的作用。

Wang Beiyang

欲想获得以上文章相关内容，请与INFOYU联系
地　　址：北京市朝阳区麦子店街18号全国水产技术推广总站 中国水产学会
邮政编码：100125
电　　话：（86）010-59195070
传　　真：（86）010-59195070
电子信箱：infoyu@agri.gov.cn

خلاصة لأهم المقالات

بقلم Aileen Tan Shau Hwai

قامت إحدى الجامعات الحكومية والمعروفة ب "University Sains Malaysia"، ببحوث رائدة فيما يتعلق بالمحار منذ سنة 1988. واستنادا إلى حقيقة مفادها أن استزراع المحار هو نشاط يهم استزراع أحياء نظيفة وخضراء، بالإضافة إلى تكلفتها المنخفضة وتقنيتها القابلة للتبني ("تقنية منخفضة ذات لمسة عالية") ، فقد تم إدماج المجتمعات الساحلية ضمن الاستزراع المستدام للمحار كوسيلة لتوليد الدخل . ومن خلال التدريب والتفاعل العملي، أصبحت هذه المجتمعات المستقلة رواد أعمال تقوم بإنتاج المحار وتسويقه بنجاح. وختاما يستخلص الكاتب أن نظام الاستزراع المستدام للمحار قادر على توفير عوائد اقتصادية للمجتمعات الساحلية، مع تحسين مستويات معيشتهم بشكل ملحوظ.

بقلمU.L.K. Perera و K.L.D. Nilanka و ,J.A.R.U. Jayakody و R.A.R.M. Ranasinghe

يعد تجميع بلح البحر والمحار مهما من حيث مساهمته في تناول البروتين الحيواني والأمن الغذائي، فضلا عن كونه وسيلة أساسية لكسب العيش وتوليد الدخل لدى فقراء المناطق القروية .ونظرا لأن الأشخاص الذين يمارسون صيد الأسماك التقليدي في سري لانكا هم في الغالب من النساء، فإن التجميع مهم باعتباره نشاطا يضيف قيمة لهؤلاء النساء في الاقتصاد المنزلي فضلا عن المستوى الوطني. وبالرغم من ذلك، فإن قطاع المصايد الصغيرة هذا لا يحظى باهتمام كبير، وبالتالي لا يزال ضعيف التطور .ومن ثم فإن تزويد النساء اللواتي يعشن بالدعم المالي والتقني اللازمين سيعزز إمكانياتهن الاقتصادية، ويحسن نوعية حياتهن، ويساهم في توسيع هذا القطاع.

بقلم Yinji Li

بالرغم من حظوتها باهتمام كبير خلال السنوات الأخيرة، إلا أن موضوع استدامة مصايد الأسماك ليس بالتوجه الحديث. وبالرغم من سنوات من البحث، لا يزال من الصعب تحقيق الاستدامة في العديد من مصايد الأسماك، ويبدو تواصل المناقشات في هذا الصدد؛ إذ من الضروري ومن أجل مستقبل كوكبنا تغيير أنظمة إنتاجنا الغذائي. وتجدر الإشارة إلى الاهتمام المتزايد بالمصايد الصغيرة ومدى أهميتها في تطوير أنظمة مصايد الأسماك المستدامة. ويمكن أن يكمن أحد أكثر النماذج إثارة للاهتمام وربما من بين أفضل النماذج القابلة للتكرار ضمن مصايد الأسماك اليابانية الصغيرة وطريقتها الفريدة من نوعها "Umigyo" لحماية الحياة تحت الماء من خلال حماية الحياة فوق الماء.

بقلم K.W. Sujeewa Ariyawansa و K.B.Chandrani Pushpalatha و ,Omar Riego Peñarubia و Ansen Ward

تقدم هذه المقالة ملخصا لدراسة شاملة أجريت في سريلانكا لتقييم خسائر ما بعد المصيد من المصيد إلى التفريغ في موانئ الصيد ضمن قطاع المصايد. وقد تم اقتراح حلول متعددة الأبعاد، بما في ذلك تنفيذ السياسات واللوائح الداعمة، والاستثمارات في تطوير الأسطول والبنية التحتية، وبرامج بناء القدرات، وتحسين الروابط مع الأسواق وأنشطة إضافة القيمة. وتوفر هذه الحلول سبيلا نحو تحسين جودة الأسماك وتقليل الخسائر وتعزيز مصايد الأسماك المستدامة، ومن ثم تعزيز الأمن الغذائي ودعم التنمية الاقتصادية والاجتماعية للبلاد.

بقلمSourabh Dubey و Francois Rajtsو Kalpajit Gogoi و Rashmi Ranjan Das و Ben Belton

يستلزم سوء التغذية المستمر في آسيا حلولا مبتكرة. وتستكشف هذه المقالة إمكانيات أنواع الأسماك المحلية الصغيرة الغنية بالمغذيات لمكافحة نقص التغذية وتعزيز استزراع الأحياء المائية الحساسة للتغذية في جنوب آسيا. ويتوفر دمج الأسماك المحلية الصغيرة الغنية بالمغذيات ضمن أنظمة الاستزراع متعدد الأنواع لسمك الشبوط على إمكانيات كبيرة للرفع من إنتاجية المغذيات الدقيقة ضمن الاستزراع المائي التقليدي، وبالرغم من ذلك وإلى عهد جد قريب، كان الافتقار إلى تقنيات الإنتاج الضخم القائم على المفرخات وتوزيع بذور الأسماك المحلية الصغيرة الغنية بالمغذيات يمثل عنق الزجاجة الرئيسي الذي يعيق انتشار الاستزراع المائي. وتلفت هذه المقالة الانتباه إلى الاختراقات الجديدة الهامة في إنتاج البذور المعتمدة على المفرخات لأنواع متعددة من أنظمة معلومات السلامة في الهند، وآثارها على توسيع نطاق استزراع الأحياء المائية الحساسة للتغذية في جميع أنحاء المنطقة.

للمزيد من المعلومات الرجاء الإتصال ب «إنفوسمك»
71، شارع رحال المسكيني، الدار البيضاء - المملكة المغربية
الهاتف : 212522540856 - الفاكس : 212522540855
البريد الإلكتروني : info@infosamak.org - الموقع الإلكتروني : www.infosamak.org

Aziza E Amghari

EMPOWERING COASTAL COMMUNITIES IN MALAYSIA THROUGH OYSTER FARMING

By Aileen Tan Shau Hwai

Universiti Sains Malaysia (Science University of Malaysia) has pioneered research in oysters since 1988. Based on the fact that oyster farming is a clean and green aquaculture, plus its low cost and adoptable technology ('Low technology with high touch"), coastal communities have been introduced to sustainable oyster farming as a means of income generation. Through training and hands-on engagement, these empowered communities have become entrepreneurs, producing and marketing oysters successfully. The author concludes that a sustainable oyster farming system is able to offer economic returns for coastal communities, while significantly improving their living standards.

Based on the Food and Agriculture Organization (FAO) report entitled "Relocation of Fishermen Program in Peninsular Malaysia" (2010), the average income of traditional fishermen at the time was around USD50-USD60 per month per household. This clearly indicates that small artisanal fishermen are grouped in the 'bottom billion' community and that captive fisheries are no longer providing a sustainable income for fishermen due to over-harvesting and the pressure of climate change in the ocean. The global supply gap caused by decreasing harvests from capture fisheries therefore needs to be filled by aquaculture. However, aquaculture is not applicable to all because of the high costs involved, which most local communities are unable to sustain.

Fishing communities in Malaysia need to have an alternative or additional means of livelihood to sustain their daily expenses. One of the options is oyster farming, which requires easily-adoptable technology, and which can be readily applied by the fishermen and coastal communities. In addition, oyster farming is considered a form of green aquaculture because oysters, being filter feeders, do not require feeding like prawns or fish, where excessive feed will pollute the water and environment, besides needing a higher investment cost to operate.

In the late 1980s, the coastal communities in Malaysia had been encouraged to farm oysters but efforts failed due to lack of oyster seed supply and inadequate knowledge on farming and marketing. Under the auspices of the Bay of Bengal Program (1988 – 1993) and the Department of Fisheries Malaysia, oyster farming was introduced in the States of Kedah, Perak, Langkawi, Johore, Kelantan and Terengganu. The coastal communities were taught how to collect oyster seeds from the wild using materials such as oyster cultch and used tyres. The expansion of the oyster farming industry in Malaysia could have been much faster if not because of limited seed supply. Only hatchery production can provide the required supply of seed both in terms of quantity and quality, for any real progress in oyster farming.

Universiti Sains Malaysia (USM), based in the State of Penang, has more than 30 years of experience in oyster research and farming. The University has advanced from fundamental research to applied or advanced research innovation. In 2008, it successfully initiated a commercial oyster hatchery, which was considered a breakthrough in helping to solve the bottleneck of insufficient seed supply to sustain the oyster farming industry in the country.

The approach used to empower coastal communities to venture into oyster farming has been proven successful in several places in Malaysia. In general, the coastal communities

are supplied with sustainable oyster seeds from the hatchery and are also guided on how to culture the oysters so as to attain a high survival and growth rate. Through various social innovation projects by the Malaysian government where funds are awarded to institutions of higher learning, the researchers have been able to guide these communities how to farm oysters in a sustainable manner and how to market their products.

Based on three decades of research and engagement with the coastal communities, the research team has simplified the whole farming process to "biteable sizes", making it easy for the coastal communities to adopt the technology. Simple oyster farming technology can therefore be easily introduced to the local community.

Unrealised potential for market growth

Oyster farming is relatively easy and can be adopted and adapted by coastal communities in the selected areas. However, usually these communities lack the financial resources to invest in setting up the facilities (i.e. floating cages) for oyster farming as well as to overcome insufficient seed supply from the wild. In addition, the coastal communities do not have the right information or means to market their product.

Guided by food security and community engagement policies, the Malaysian Government through the Ministry of Higher Education (MOHE) had pledged to strengthen the capability and to empower coastal communities to generate sustainable income through several initiatives such as "Knowledge Transfer Program" (KTP) and "Translational Research Grant" (TR@M). Under these initiatives, USM has transferred knowledge on technological innovation and development in oyster farming to the coastal communities. At the same time, MOHE had provided initial funding to start up a farm where the coastal communities could work closely with the researchers from USM using the research innovations generated since the late 1980s.

Oyster farming is a newly emerging seafood industry in Malaysia, having enormous potential for growth in both the local and international market. The oyster trade in Malaysia was valued at RM 24 million in 2015 (Trade Statistics, Malaysia) which is estimated at meeting only 14% of the demand. This indicates that there are solid grounds for increasing production in order to meet market demand. In the past, production has tended to be affected by the limited availability of oyster seed supply from the wild and the long culture cycles, but now, oyster farming can rely on hatchery-produced seeds instead of the natural seeds, which are inconsistent in amount and seasonally distributed. Therefore, the oyster industry in Malaysia should be able to take off if the farming technology can be transferred to the coastal communities or growers.

Setting up sites for oyster culture

Preliminary assessment on site selection was conducted by USM researchers while talking to the coastal communities to promote oyster culture. Members of the communities were briefed on the advantages of venturing into oyster farming for sustainable income generation and as an alternative livelihood. They were assured that the right culture method as well as the right culture site will be able to produce a superior product with a regular shape and size, as well as high quality taste and texture. An initial site survey was conducted throughout Malaysia by the researchers from USM, who also determined the carrying capacity of the selected sites for the purposes of commercial culture. The sites selected needed to be away from the route of traditional fishing and other human activities.

Some trial oyster seeds were initially provided with the aim of confirming the feasibility of the selected site as well as to cultivate confidence and interest among the coastal communities on this new income-generating activity. It was important to ensure that the coastal communities get the buy-in and be committed to the project.

Constructing the oyster rafts

Several training sessions on oyster farming, which included handling, maintenance, grading and sorting were conducted, both formally and informally. As a result of the training, the

coastal communities were able to do grading as well as sorting the oyster seeds to enhance the growth and later, to separate the marketable-size oysters. They also gained knowledge on nutritional values and were briefed on the advantages of oyster farming. In addition, the coastal communities were made aware of the importance of preserving and protecting the mangrove areas as well as the environment surrounding their farms to enhance aquaculture sustainability.

Hands-on training was provided to the coastal communities including how to make floating rafts from scratch, to maintain them, cleaning, sorting and harvesting. This was to ensure that the coastal communities could build their own rafts as and when they decide to expand their culture capacity.

The USM team visited the sites regularly to ensure that the coastal communities were able to handle the oysters. Their regular presence helped to create trust between the researchers and the coastal communities, which made it much easier to effect the knowledge transfer. This also opened the opportunity to co-create and co-produce knowledge between the researchers and coastal communities.

Once the facilities had been set up, the oyster seeds, which were produced from USM and the commercial hatchery, were transferred to the growout site. The coastal communities' task was to monitor the growth and survival of the seeds until the oysters reach marketable size.

Since oyster farming USM-style requires simplified technology and low labour, this type of aquaculture can be done on a part-time basis. The coastal communities can still be involved in their daily activities, such as fishing or farming in the morning and handling the oyster farming in the afternoon. The major labour, once the floating rafts are built and the oysters are growing, is periodic agitation at the beginning (about once a week, to prevent seed oysters from fusing to one another) and removing algae and other fouling organisms which can restrict the flow of water and food organisms into the floats and compromise growth and survival. Regular checks on predators such as crabs and carnivorous snails are required and these predators needed to be removed.

Processing and marketing options

The coastal communities have been made aware of the importance of quality control of the oysters produced, to ensure that the industry remains sustainable in Malaysia. Along the pipeline, the project had incorporated technology to convert the fresh oysters to other marketable products such as freshly frozen oyster (whole and shucked), dried meat, shucked meat in saline water and extraction of the juice for other usages like oyster sauce or for pharmaceutical purposes. These technologies will open up more opportunities for the coastal communities to grow oysters, where the market for their products is wider.

Once the oysters reach marketable size (between 8 to 10 months, depending on the site selected), the coastal communities have the option to sell their harvest to their

own customers or to sell the mature oysters to middlemen at a controlled price. On average, each grower is able to sell approximately 2 000 oysters per month at USD1.50 per piece, which enables them to generate an additional USD3 000 per month on a part-time basis. There are some costs such as petrol and seeds (seeds need to be continuously purchased for sustainability), but the profit is still attractive.

The coastal communities involved in the oyster farming project have now started to enjoy the benefits from the farming, where oysters can be sold continuously after the first 8-10 months of culture. With the income they have generated, the culturists now are able to purchase their own oyster seeds to sustain the farming. As mentioned earlier, oyster farming is a sustainable activity because it is a clean aquaculture and involves minimal investment after the set-up of the floating rafts. The communities can extend their farming activities in the future by building more floating rafts to increase the holding capacity for the oysters.

Besides growing oysters, these coastal communities had been trained to be eco-tourism operators in order for them to promote sustainable green aquaculture as well as environment protection for a better and safer ocean and environment. There is opportunity for the local communities to be social entrepreneurs when they are able to manage their own eco-tourism business through oyster farming.

A quintuple-helix approach

Oyster farming has been proven successful with the coastal communities in the USM project and a similar approach can be used to create an industry for other communities in Malaysia through partnerships between university, government, industry and community. Oyster farming in fact, links the Higher Education Institution (HEI), government sector (Department of Fisheries, Ministry of Education, Tourism Malaysia, etc), private sector/industries, communities and it is also aligned with environment protection. This project is able to link all these five components with the SDGs – a "Quintuple-helix approach", the first of its kind to be implemented successfully.

Oyster farming is not only able to address the issues of food security as well as protection of the environment (green and clean aquaculture), it fits in ideally within the Blue Economy's three Pillars of Sustainability (People, Planet & Profit). Therefore, through oyster farming, public awareness on environment protection and sustainability can be executed effectively among all communities as well as the younger generations. Oyster farming can also be an attraction for eco-tourism or knowledge-based tourism. This has been proven successfully at another site in Sg. Merbok, Kedah State, Malaysia.

In addition, from past experience and success stories, oyster farming can be an excellent vehicle for the empowerment of womenfolk in the community. In the past, women played a secondary role, usually preparing meals for eco-tourists at the oyster farm as well as the mangrove sites. The womenfolk have proven to be very committed and are open to learning new skills and knowledge. Currently, one or two of the targeted communities taking part in oyster farming projects consist of womenfolk from the coastal areas, which addresses the SDG#5 on Gender Equality.

In general, the knowledge and technology which had been translated to the coastal communities include:

- Production of entrepreneurs in oyster farming and seed production through technology transfer from USM or/and the commercial oyster seed producer;
- Training of farmers in producing seeds to ensure consistent and sustainable oyster seed supply;
- Training of farmers on the different forms of products that can be produced from oysters such as dried oysters, frozen oysters etc; and
- Initiation and empowerment of women in oyster farming.

The oyster culture model and its best practices as described in this article can be replicated easily. Oyster farming has now expanded to the States of Penang, Kedah, Perak, Negeri Sembilan, Selangor and also Sabah. It is hoped that Malaysia will soon be able to produce oysters for local consumption as well as for the export market. What is most important in this project is that the coastal communities were able to learn and be successful in oyster farming, resulting in a tremendous uplifting of their standard of living. Oyster farming is therefore an answer for poverty eradication in Malaysia.

Professor Dr Aileen Tan Shau Hwai *is the Director of the Centre for Marine and Coastal Studies (CEMACS) in Universiti Sains Malaysia; Executive Director of the Asia-Pacific University-Community Engagement Network (APUCEN) and Vice Chair of UNESCO IOC of Western Pacific. Her field of expertise is in marine science, specialising in mariculture and conservation of molluscs, and promoting "green aquaculture" to create an impactful sustainable income for the local communities, besides creating a balance between profit and environment protection. She believes strongly in translating her knowledge and benefitting communities with research findings, creating a better tomorrow for all.*

Market Trends

SHRIMP

USA: The market for imported farm-raised shrimp appeared to remain stable during the third week of July. However, it remains unclear if this upward trend will influence the ongoing weak global trade for shrimp. Despite the sluggish trading, large headless shell-on shrimp from Ecuador is going strong whilst easy peel remains stable.

Meanwhile, shrimp consumption is considered as soft, with low demand. Sellers are still seeking strategies other than giving discounts to keep inventories lean following high carrying costs.

VIETNAM/EUROPE: According to the Deputy Minister of Agriculture and Rural Development (MARD), as stated during the Shrimp Summit 2023 in Ho Chi Minh City on the 25th of July, the country's shrimp industry contributes about 40-45% of the total national seafood export value at USD 3.5-4.3 billion. Currently, Vietnamese shrimp are exported to 100 countries, with the five largest markets being Europe, the US, Japan, China, and South Korea. However, the shrimp industry has suffered this year due to the global economic crisis. During the first five months of the year, Vietnam's shrimp export value declined by 34% to USD 1.2 billion compared to last year. In May, it decreased by 28% to USD 331 million.

In the EU, which remains a traditional market for Vietnamese shrimp, imports have declined during the first four months of the year. These included a fall in shrimp imports to the Netherlands (-61%), Germany (-41.6%), Belgium (-42%), France (-21%), Denmark (-49%) and Sweden (-30.7%).

JAPAN: The total imports of raw frozen shrimp into Japan over January-June 2023 recorded a drop of almost 17.9% against the same period in 2022. Supported by increased production of farmed shrimp, India overtook Vietnam and Indonesia as net exporters to Japan with a substantial market share lead of 21.5% for June and 25.0% for the year-to-date (January to June 2023). During this period, India had increased its supplies for June (+23.1%) and overall, for the first six (6) months in 2023 by 44.3%.

SUPPLY

India, Ecuador, and Indonesia maintained their position as the world's top three shrimp exporters to the US from January to May 2023. However, based on recent market intelligence reports, India and Indonesia suffered a significant drop in shrimp landings in May 2023. For instance, India recorded a decline in shrimp exports to the US by almost 2 500 tonnes or a 10% decrease compared to the same period the year before. Meanwhile, Indonesia's shrimp exports to the US during the first five months of 2023 had fallen by almost 41%. The decline in shrimp landings has dramatically impacted India and Indonesia's shrimp exporters, given that the US remains its primary export market. Despite the current economic headwinds, both India and Indonesia have been aggressive in their efforts to source new alternative markets for their products.

Venezuela: According to the Minister of Fisheries and Aquaculture, a shrimp production of 40 000 tonnes is projected for 2023 from 39 000 tonnes in 2022. It is noted that the country's shrimp exports to the US increased by 140.7% during the first five months of the year compared to last year.

USA/Domestic: Based on reports from the Texas Parks and Wildlife Department's (TPWD) Coastal Fisheries Division, the Gulf of Mexico commercial shrimp season for state and federal waters will reopen on the 15th of July, 2023, after sunset.

TUNA

Japan: For over a decade, consumption of tuna in Japan, the world's largest sashimi market, became 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.

Current trading at the Toyosu daily auction market remains solid for fresh and frozen tuna. 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 higher demand for high-value non-canned tuna from Japanese restaurants.

Yaizu fish market: Landings of skipjack on the 3rd of July were about 400 tonnes, fetching ex-vessel prices at JPY 258-265/kg for smaller sizes (1.8 kg up/under) and JPY

265-269/kg for larger sizes (2.5 kg/4.5kg up). Landings for June fluctuated across species with a decrease in skipjack (-20%) and yellowfin (-38%), whilst albacore recorded a remarkably high increase of 1781%. In terms of average price, it increased for both skipjack (+40%) and yellowfin (+6%) and decreased for albacore (-45%).

Kesenuma fish market: Albacore landings at the Kesenuma fish market on the 28th of June have picked up from last year's nil-record landing. A total volume of 7 200 tonnes was recorded, which has been sold chiefly for sashimi and canning purposes.

Thailand/ Western Pacific: Generally, the current fishing conditions have improved, although carriers from the Indian Ocean continue to supplement raw material supplies. As the FAD closure commenced on the 1st of July in the Western and Central Pacific Ocean, skipjack prices have remained firmly higher, impacting buying interest. (Source: EPA June 2023).

USA: The total imports of fresh/chilled tuna to the US from January to May 2023 compared to the same period in 2022 have increased by 5.0%. Imports of most species to the US have increased except for albacore (-5.9%). The significant increase in the total imports of fresh/chilled tuna to the US has been the highest recorded over the past five years. Meanwhile, the 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, imports from the top ten tuna suppliers to the US have dropped, except for Thailand, which recorded an increase of 8% in tuna exports to the US.

CANNED TUNA

USA: The total imports of canned and processed tuna for the year's first four months decreased by 2.1% in volume and 0.3% in value compared to the same period in 2022. Imports from its top five suppliers increased for Thailand (2.9%) and Senegal (20.4%), whilst Ecuador (-4.9%), Vietnam (-6.7%) and Mexico (-0.8%) recorded lower supplies. Thailand continues to maintain its strong market share dominance of 45.8% over Ecuador (11.6%), Vietnam (10.1%), Mexico (7.7%) and Senegal (7.35).

FRESH/CHILLED FISH

SALMON

China: During January – March 2023, the cumulative total of fresh Atlantic salmon, excluding fillets, increased by 34.6% in volume and 56.8% in value compared to the same period in 2021. The market for the product has already bounced back in the country, as seen in the figures which had surpassed the number of imports in 2019 pre-pandemic, following eased restrictions with regards to COVID-19. Among the leading suppliers to China, increases were recorded from all countries: UK and Chile have increased their exports significantly by 424% and 152%, respectively; Australia by 48% and Norway by 42%, except for the Faroe Islands, which recorded a decline in its exports. Other new suppliers significantly contributed to China's imports: Iceland with 336 tonnes from 60 tonnes, Netherlands, and Denmark with 25 tonnes and 22 tonnes, respectively from none.

As reported by the Seafood Guide, the share of Chilean fresh/chilled salmon in the Chinese market could increase rapidly in 2023. As of the 20th week of the year, Chile exported 26 000-37 000 pieces of chilled salmon to the Chinese market based on China's salmon industry statistics. A new volume record is expected to be set for weekly exports of refrigerated salmon from Chile shipped to airports in Shanghai, Guangzhou, Xiamen, Chengdu, Zhengzhou, Wuhan, Changsha, Shenzhen, Beijing, Dalian, and other cities. Based on the latest customs data, from January to April 2023, China imported 26 000 tonnes of chilled salmon, of which 51.4% were sourced from Norway, 19.4% from Australia and 15.5% from Chile, respectively.

FROZEN FISH

PANGASIUS

Vietnam: In the first four months of 2023, the export value of pangasius declined by 41% to USD 570 million compared to the same period in 2022. Among the top destinations, a sharp dip in import value was recorded from China (-10.5%) and the US (-16.5%). In terms of quantity, China imported 56 084 tonnes from 83 599 tonnes, down by 33%, while the US dropped from 46 148 tonnes to 23 642 tonnes (-49%). Meanwhile, as of late April, the pangasius export value to the EU was down by 8% at USD 60 million from last year, with a decline between 13% and 31% specifically for Member Countries, except for Germany, which had a 78% increase. Decreases were also recorded for some other major markets, such as Mexico (-45%), Canada (-51%), Japan (-15%), Brazil (-33%), and Thailand (-49%). According to some analysts

in the country, the pangasius export value declined due to high inflation and the global economic depression.

TILAPIA

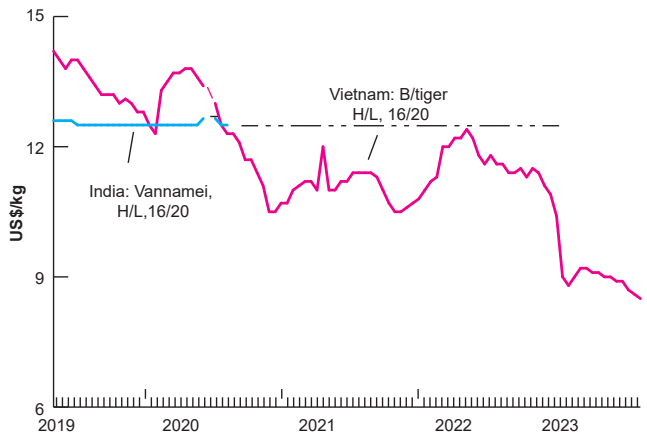
China: During the first quarter of 2023, tilapia exports increased by 3.5% at 81 015 tonnes compared to the same period in 2022. Among the leading importers of Chinese tilapia, the USA, Israel, and Burkina Faso (+203%) have seen increases, while imports to Mexico and Cote d'Ivoire decreased. The increase in the total tilapia exports was due to the growth in imports of frozen whole (+57%) and frozen fillet (+1.3%) product categories from China. Increased imports for frozen whole tilapia from African countries dominated the top five spots: Cote d'Ivoire (127%), Burkina Faso (38%), the emerging market of Cameroon, which increased to 2 405 tonnes from 76 tonnes, Mali (39%) and Rwanda (123%).

MACKEREL

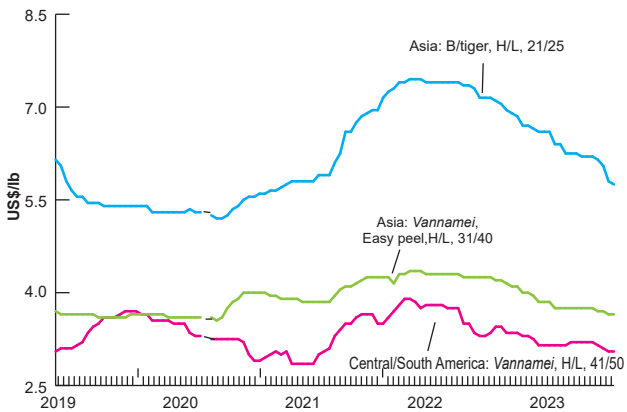
Peru: During the first quarter of 2023, the export value of whole frozen jack mackerel increased by 36.6% to USD 26.4 million compared to the same period in 2022. The main destinations for this product were Cameroon, Ghana, and Nigeria. For whole frozen mackerel exports, its USD 5.6 million accumulated value meant a growth of 180%, with Cote d'Ivoire being the leading destination. Although squid and jumbo flying squid are the most representative product within "non-traditional fishing", Peru's mackerel offers opportunities to continue expanding exports and reaching more international markets.

Price Trends

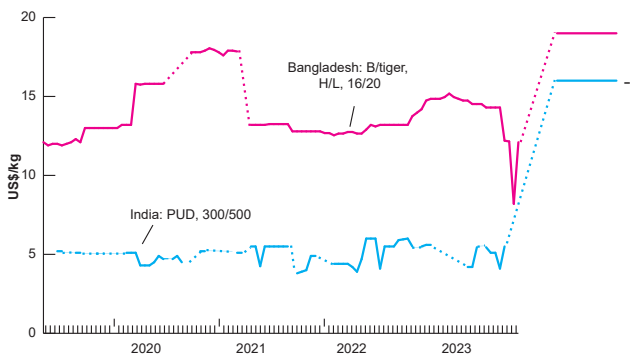
FROZEN SHRIMP, C&F JAPAN (US$/Kg)



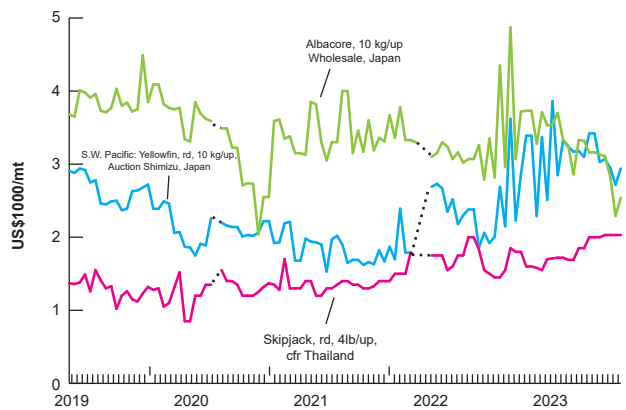
FROZEN SHRIMP, USA (ex-warehouse NY, US$/lb)



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

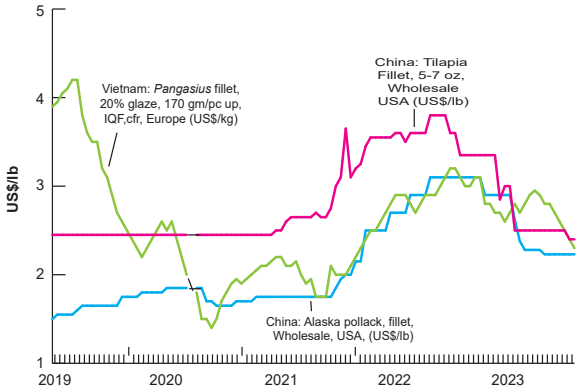


FROZEN TUNA (US$/MT)

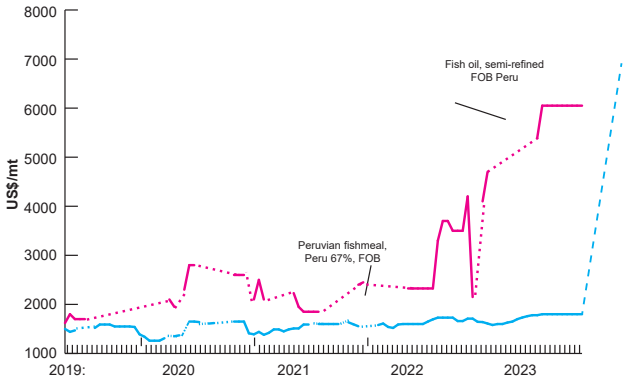


Price Trends • Cold storage holdings • import trends

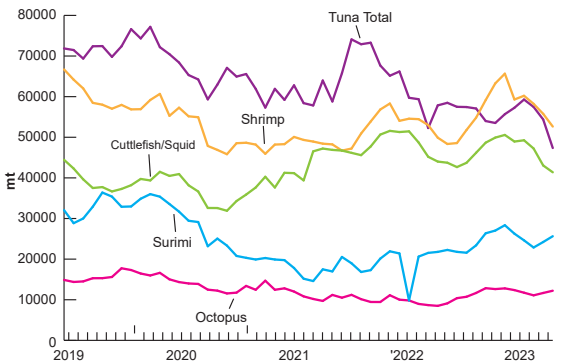
FROZEN WHITEFISH



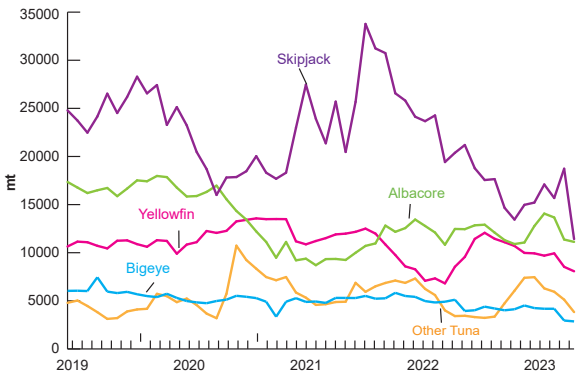
FISHMEAL/FISHOIL (US$/MT)



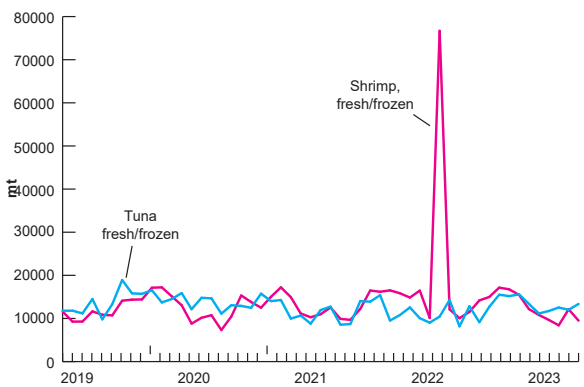
JAPAN COLD STORAGE HOLDING: SELECTED PRODUCTS (MT)



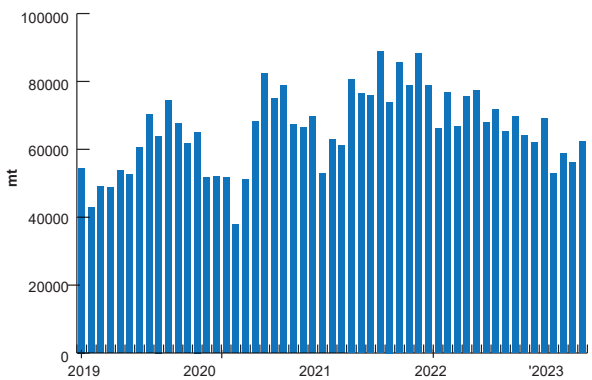
JAPAN COLD STORAGE HOLDINGS TUNAS (MT)



JAPAN: MONTHLY IMPORTS OF SHRIMP & TUNA (MT)



USA: Monthly SHRIMP Imports



Pangasius

Robust demand supported by increased harvests

Pangasius is becoming increasingly popular in all markets as consumers, retailers, and processors look for cheaper fish options. To meet the brisk demand in major markets, especially China, the world's largest pangasius producer, Vietnam has increased production by about 200 000 tonnes in 2022. Since the start of 2022, the demand for pangasius has been stable as its prices are now significantly lower than those of other whitefish species.

Production

Most of the pangasius traded internationally comes from the Mekong Delta, and in 2022, annual production had increased by 14%. Additionally, the global pangasius market saw the introduction of 200 000 tonnes of pangasius, most of which were destined for the Chinese market. Due to global economic uncertainties, pangasius farmers continue to be plagued with higher costs for inputs as stockpiling for the harvest of 2023 continues. Furthermore, high-quality fingerlings are in short supply, driving up prices at the start of 2023 as demand rises—early indications for the 2023 season point to expanding farmland and increasing production.

There have been recent announcements of new government initiatives to formally register pangasius producers in Vietnam. For example, the provincial government in Dong Thap, responsible for a third of Vietnam's harvests, has developed a strategy to improve the export quality by bringing the production of half of the commercial producers in line with Vietnamese Good Agricultural Practices. According to the new rules, the 76 fish farms in Dong Thap are crucial to the nation's supply of fingerlings, and 75% of all pangasius fingerlings must be of "high quality" to meet the standards set by the government. Vietnam's agricultural development policy emphasises pangasius to boost trade revenue and improve the quality of exported fish.

Trade

China's pangasius imports began to rise again in the second quarter of 2022, and the country once again became the primary market for fish. Trade had been severely hampered in the two years leading up to the 2022 Lunar New Year due to challenges such as import testing and port delays, and there were massive backlogs of trucks waiting to be processed at the Vietnam-China border. Chinese processors and retailers are stocking up in anticipation of easing Chinese import requirements, facilitating the circulation of fresh and frozen food products. Compared to the same period in 2021, China imported 162 000 tonnes of pangasius fillets from Vietnam in the first nine months of 2022.

For the first nine months of 2022, the United States imported 104 600 tonnes of pangasius, representing a 15% increase over the same period in 2021. Pangasius is performing exceptionally well in the retail and hospitality sectors of the United States, where a growing trend among consumers to consume less fish has increased its popularity.

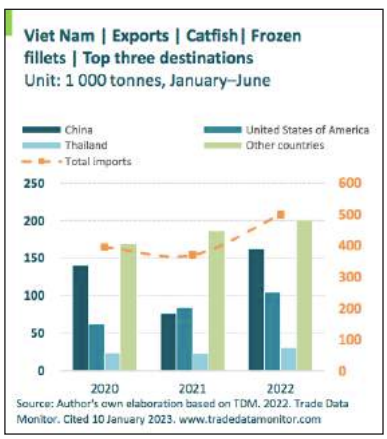
Prices

Prices for pangasius in Vietnam increased by 15% from 2021 to late 2022, reaching 28 000 VND per kilogram (about USD 1.20). High demand in major markets has kept processors under pressure and domestic prices high despite significant production increases.

Pangasius fillet prices have fallen from their peak in early 2022 to usual levels. The average price of Vietnamese exports fell from USD 3.40 to USD 2.75 per kilogram between April and December 2022. The main factors causing the drop in prices were the decline in US prices and the rise in exports to China, where prices are lower than in other markets.

Outlook

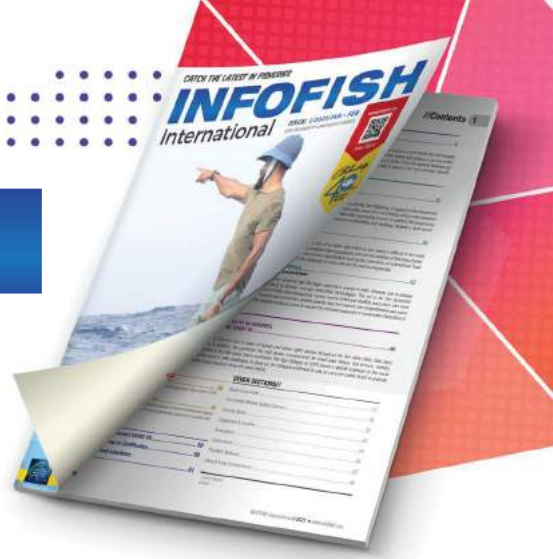
Current Vietnamese stockpiles are low, and a further drop in supply is projected to continue through the first few months of 2023. Only after the late spring and summer harvests increased after the Lunar New Year were consumers expected to demand pangasius due to inflationary pressure.



Source: FAO Globefish Highlights Issue 1-2023

CATCH THE LATEST IN FISHERIES

INFOFISH International



This longstanding bimonthly magazine distributed globally since 1981 is also included as a complimentary copy to subscribers of the fortnightly INFOFISH Trade News, 6 issues every year.

- ***More than 40 years in publication, with a focus on the Asia-Pacific***
- ***Distributed worldwide to all sectors within the industry***
- ***Articles by experts in their field, industry leaders, and policymakers***
- ***Developments in aquaculture, processing, harvesting, fishing, etc.***
- ***News on state-of-the-art technology and products***
- ***In-depth analysis of market trends and trade outlooks***

For more information, please scan this QR Code

Subscription order form

☐ **ONLINE**

☐ **INFOFISH member countries* : USD50/year**
☐ **Other countries : USD80/year**

Name: .....

Position: .....

Company/Organisation: .....

Address: .....

Telephone: .....

Email: .....

Type of business: .....

Mode of payment

☐ **Bank draft** (drawn on US bank) payable to INFOFISH
☐ **Telegraphic Transfer** to INFOFISH, Account No: 512772514667, Malayan Banking Berhad, H-01-09 & 10, Jalan Prima 5/4, Taman Puchong Prima 47100 Puchong, Selangor Darul Ehsan, Malaysia I SWIFT CODE: MBBEMYKL

Important: *i) If your banker is remitting payment on your behalf, please give specific instructions to indicate name and address of sender*
ii) Bank charges for both ends are to be borne by sender

☐ **PayPal** (kindly provide copy of the transmission)

A joint publication of the
GLOBAL FISH INFONETWORKS

INFOFISH speaks to …
ITAMAR ROCHA

President, Associação Brasileira de Criadores de Camarão (ABCC) / Brazilian Shrimp Farmers Association

For readers who are not familiar with the Associação Brasileira de Criadores de Camarão (ABCC), could you elaborate on its mandate and role in developing the shrimp sector in Brazil?

IR Brazilian shrimp farming began its commercial exploitation in the late 1970s. When ABCC came into existence in 1984, at which time I was the Technical Director, the Association played a unifying and catalytic role in terms of technological development in the sector. This prominent role contributed to the creation, in 1989, of an ambitious National Development Project, which included the setting up of 100 000 hectares of shrimp ponds in a 10-year period. However, following the formation of a new federal government in 1990, this project was put aside and only in the second half of the 1990s, with me now as President of ABCC, did shrimp farming begin to grow, going from a production volume of 3 600 tonnes in 1997 to 90 190 tonnes in 2003, reflecting a growth of 2 405.3% in this short period of time. This growth was export-led, with shrimp exports showing an even more surprising growth of 14 513%, rising from 400 tonnes in 1998 to 58 455 tonnes in 2003.

Could you also provide some essential background on the shrimp farming sector in Brazil?

IR The intensification of Brazilian shrimp farming began soon after our involvement with Taiwanese shrimp farming. In 1986, we contacted Dr I-Chiu Liao, Director of the Tungkang Marine Laboratory (Kaohsiung, Taiwan) and participated in an intense exchange program in freshwater shrimp *(Macrobrachium rosenbergii)* and marine shrimp *(Penaeus monodon)* farming. This learning process was the basis for the development of advanced technology that guided the growth of Brazilian shrimp farming, contributing to Brazil taking the lead in marine shrimp production in the Americas, where in 2003, Brazil placed first in the world in terms of productivity with 6 083 kg/ha. ABCC has led successful efforts to implement Best Management Practices and biosecurity measures for over 20 years now, with the main challenges that affect productivity being the presence of well-known diseases that can have a seasonal effect on production.

A few years ago, the ABCC had announced its intention to set up a shrimp farming site in Rio Grande de Norte, which combines the activities of large and small producers. This new type of farming system was dubbed the Marine Shrimp Farm Condominium Model. Could you provide an update on the initiative?

IR Unfortunately, the Marine Shrimp Farm Condominium Model project elaborated by my consulting company, MCR Aquaculture, never got off the ground, both by a lack of financial support as well as interested partners. The Environmental Licence, which was only issued after a long two-year delay, placed too many restrictions on the project, which in turn discouraged potential investors. But I am still confident that this model of long-term investments into shrimp farming can provide a profitable return on investment within 3-5 years and can be technically viable for small, medium and large shrimp farms.

In an article entitled "Domestic market for farmed shrimp in Brazil" that you had co-authored in March 2015, it was mentioned that the bulk of the farmed shrimp production is absorbed by the domestic market. At that time, average annual per capita shrimp consumption in Brazil was just 0.6 kg but this figure was expected to rise. In addition, those in the industry made a conscious decision to develop the domestic market. Furthermore, in your recent interview with Intrafish earlier this year, you highlighted that a 20% increase in production is targeted, anticipating domestic demand. What were the reasons for this shift in focus, and what are the present and predicted trends in the domestic market for shrimp products? Also, what made farmed shrimp a preferred item for domestic consumers?

IR The original reason for this shift towards the domestic market was the USA dumping process against Brazilian shrimp. The support behind the exports of Brazilian farmed shrimp came from some big American importing companies, due mainly to the links they had with the Brazilian lobster industry, which also became involved with farmed shrimp. However, with the dumping process coming into play and some Brazilian political

instability, these companies decided to no longer import shrimp from Brazil, considering that the importer and not the exporter is responsible for "paying the dumping duty". On the other hand, due to low international prices and the devaluation of the US dollar, farmed shrimp producers, even with a lack of financial support, started to deliver their best product to local markets leading to an increase in demand and, eventually to production growing to 150 000 tonnes, or 150 % in relation to 2016 (60 000 tonnes). Domestic prices remain competitive in relation to international prices.

On to international trade, what is the export target for Brazilian shrimp in 2023? Is the industry on track to realize this target?

IR At this time, considering the unstable situation in terms of international farmed shrimp demand and prices, we can safely state that Brazil will continue to concentrate its effort in opening additional local markets, through increased processing and value-adding, mainly to transform fresh shrimp into value-added products, such as headless, fillet, breaded, butterfly, etc. A few companies are exporting small quantities and the sector closely follows the international shrimp market, but export projections for 2023 have not, and probably will not be met.

Brazil's phytosanitary health risk policy in the past has meant that imports of shrimp into the country were curtailed until May 2019 when a Supreme Court ruling allowed the entry of foreign shrimp. Does the ABCC agree with this decision and what are your thoughts on the perception by some countries that the biosecurity policy is a form of protectionism?

IR There is no way we can agree with the absurd decision by the Brazilian Supreme Court!! First of all, nothing justifies putting at risk the rich Brazilian crustacean biodiversity. One only has to see that Ecuador prohibits the entry of crustaceans, including *Artemia salina* from Brazil because of only one disease, IMNV, when in fact we have scientific evidence that the two whitespot strains present in Ecuadorian shrimp farming are different from the two strains present in Brazilian farmed shrimp. In addition, Brazil has a legislation, IN 02/2018, which prohibits the import of crustaceans from countries that have a lower sanitary standard than Brazil (e.g. Ecuador) or that do not report their sanitary condition to OIE (e.g. Argentina).

In Latin America, Brazil and Chile are said to be investing large sums of money into developing the alternative seafood sector on the basis that it provides sustainable alternatives to conventional seafood. On example of this is when the Good Food Institute was reported to have allocated funds to the Brazilian Agricultural Research Corporation (Embrapa). Is the ABCC seriously concerned that one day, alternative seafood will significantly erode the market for shrimp?

No, ABCC is not at all concerned that alternative seafood will in any way affect the market for shrimp or for seafood in general in Brazil. First of all, the question states that "on the basis that it provides sustainable alternatives to conventional seafood". Well, we are of the opinion that aquaculture in general and shrimp farming specifically, is done the right way, in a sustainable manner in many regions of the world, including Brazil, so there seems to be a certain bias in the question. But to get to the point, it is our belief that alternative seafood will not be a factor anytime soon in our market because, for example, Embrapa does not have the funds for this kind of research to provide practical results, even with allocation of resources from outside sources. In addition, even if at some point in time ,some types of alternative seafood did become commercially viable and available, it is very difficult to say what kind of reactions consumers would have to these products in Brazil; perhaps at best they could become a niche market but not a threat to the shrimp market.

What does the future look like for Brazil's shrimp industry?

IR My thesis to obtain my Fisheries Engineer Degree in 1974 was "Raising Marine Shrimp with Feed", when global farmed shrimp production was 14 000 tonnes. After visiting and getting to know very well all the main farmed shrimp producing countries, I can safely say that Brazil will never be a major player in the farmed shrimp sector. Although *L. vannamei* is already farmed in more than 250 small cities around the Northeast Region and involving 3 300 shrimp farmers, due to the lack of government support as well as the uncertainties brought about by changing environmental policies, it will be very difficult to attract the necessary big investors who can bring technology and financial support to also help the small farmers.

Shrimp farmers in Rio Grande do Norte, Brazil

BRAZILIAN FARMED SHRIMP 2022: CHALLENGES AND PERSPECTIVES FOR 2023

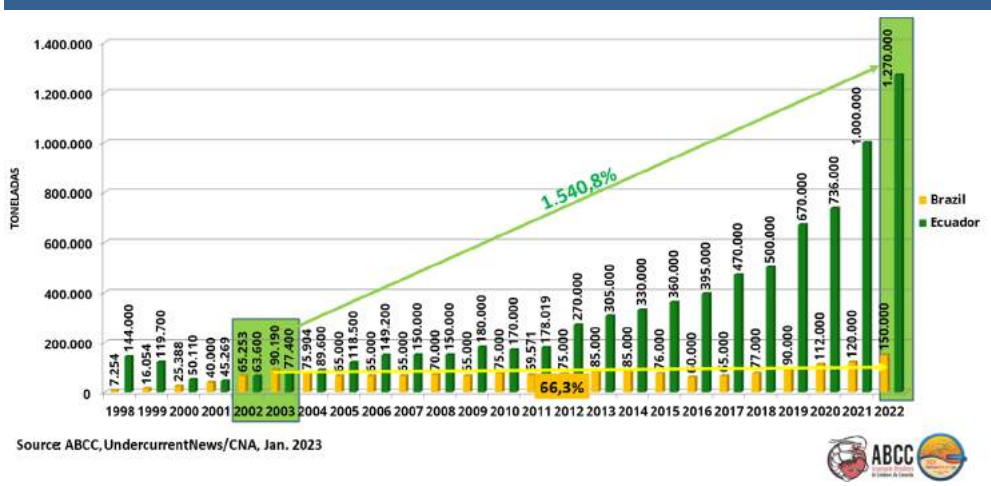
Itamar Rocha, Fishery Engineer, President of ABCC – Brazilian Shrimp Farmers Association

Hundreds of farms belonging to micro and small producers of marine shrimp (L. vannamei) in the State of Ceará - Northeastern Brazil

Brazilian marine shrimp *(Litopenaeus vannamei)* farmed production decreased by 33.54% between 2003 (90 190 tonnes) and 2016 (60 000 tonnes) due to various factors, including white spot syndrome virus (WSSV), infectious myonecrosis virus (IMNV), USA dumping practices, and the US dollar devaluation. These factors have not only impacted production but also heavily affected the country's exports (58 455 tonnes in 2003 to 77 tonnes in 2016).

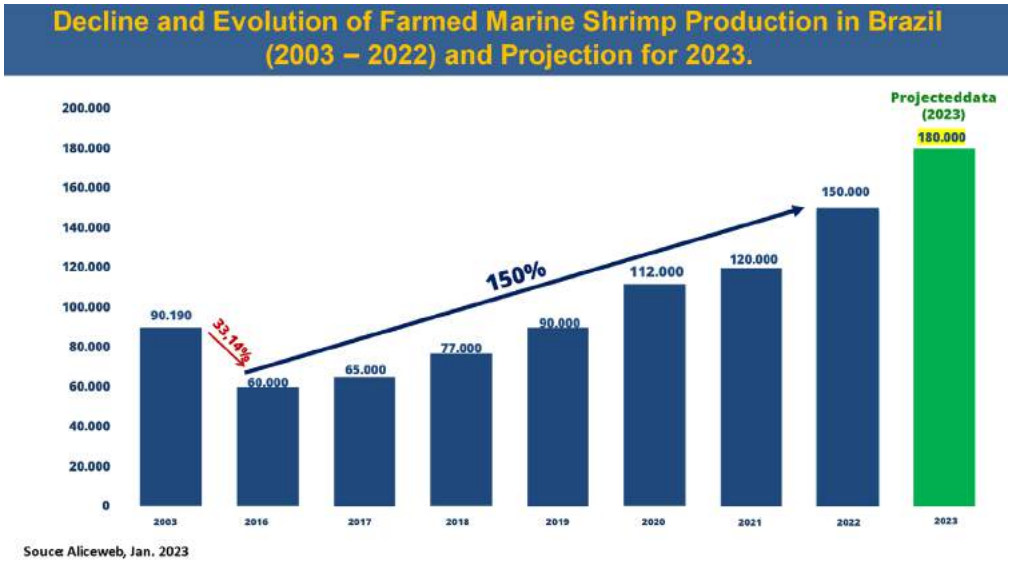
However, the implementation of Best Management Practices (BMPs) and Biosecurity Measures, coupled with proactive political actions by ABCC (especially in terms of expanding farming areas to the interior and promoting domestic market sales), contributed to overcoming these challenges, leading to a significant (+150%) recovery in the production between 2016 (60 000 tonnes) and 2022 (150 000 tonnes). This recovery was even evident during the COVID-19 pandemic period (2020-2021), where there was an increase of 33.33% (120 000 tonnes) compared to 2019 (90 000 tonnes).

Ecuador and Brazil: Comparative Data on the Evolution of Farmed Marine Shrimp Production between 1998 and 2022, with Highlights for the Years: (2002/2003 and 2022)



Source: ABCC, UndercurrentNews/CNA, Jan. 2023

An analysis indicates that it was the micro and small producers, the productive segment that already accounts for 85% of the number of shrimp farmers in Brazil, that drove sectoral growth between 2017-2022. Clearly, the cultivation of Pacific white shrimp *(L. vannamei)* is contributing significantly towards socio-economic growth



in Brazil. An important detail is that this is being mainly accomplished using inland oligohaline waters which are unsuitable for human and animal consumption. It includes vast areas, which, due to soil salinisation and scarce rainfall, have become unsuitable for irrigated fruit cultivation. It is worth noting that almost all the micro and small producers (98.8%) do not have access to any form of financing, whether for investments, operational costs, or processing of their production.

ABCC'S ROLE IN ENSURING THAT THE SHRIMP MEETS STRINGENT STANDARDS

Achievement of the targeted productivity performance goals for Brazilian shrimp farming in the mentioned period and the coming years has been/is based on the execution of four main pillars, emphasised by ABCC as being essential for maintaining sustainable and continuous growth in the sector:

(i) Utilisation of genetically improved and disease-resistant broodstock, either specific pathogen-free (SPF) or specific pathogen-resistant (SPR); (ii) Use of nutritionally balanced diet with current nutritional tools (probiotics, prebiotics, and symbiotics); (iii) Increasing processing volume, as well as value-addition and domestic market commercialisation; (iv) Re-entry into the international market, particularly targeting demand for small to medium size categories which comprise the base of the consumer pyramid. Not only is competition with the major exporters (Ecuador, India, Vietnam, Thailand,

Shrimp Farm – Ceará/Brazil


Credit: Itamar Rocha

and Indonesia) avoided, the detrimental and orchestrated policy of low pricing pursued by the intermediary chain in the Brazilian domestic market, especially concerning fresh head-on shrimp, is countered.

The industry is aware that Best Management Practices (BMPs) and Biosecurity Measures are indispensable tools for Brazilian cultured marine shrimp to regain the prominent position it had held in the exports of small to medium-sized shrimp to the USA in 2003 and tropical shrimp to the European Union in 2004, notably to France, the world's most demanding shrimp market. Of a total of 101 049 tonnes imported into France in 2004, 28% (28 293.7 tonnes) was from Brazil.

In this context, ABCC has focused its efforts on empowering its affiliated producers with the newest technical information. Financial support was obtained from BNB (Bank of the Northeast) to edit and publish an updated "Manual of Good Management Practices and Biosecurity Measures", accompanied by a didactic set of 6 (six) video lessons. These materials encompass the key technical and operational procedures for semi-intensive and intensive cultivation of Pacific white shrimp *(Litopenaeus vannamei)*, covering everything from post-larvae selection and functional feeds to presumptive analyses, harvesting, production, processing, and value-addition. These resources have been disseminated and made accessible to all.

DOMESTIC CONSUMPTION EXPECTED TO KEEP RISING

The Brazilian market has the potential to absorb more than double its current production of cultured marine shrimp. Currently, much of the sales (60%) is comprised of product in its natural state (fresh shrimp), with a short shelf life. This contributes to a detrimental low-price policy that often fails to cover the actual production costs, mainly due to the significant portion of producers lacking financial support for both investments and operational expenses. This situation therefore challenges the sustainability of one of the most promising industries in the country in terms of financial returns on investments, and utilising otherwise unsuitable agricultural areas. It's worth noting that the Northeast Region, which accounts for 99% of national production, benefits from climatic conditions allowing for 4-6 production cycles per year, and most importantly, is not affected by rainy seasons. This region possesses an exploration potential exceeding 1 million hectares.

Domestic consumption is merely 0.72 kg/ha/year, but in reality, when one takes into account that the 5 300 cities with populations less than 100 000 inhabitants have no access to fresh cultivated shrimp, the actual shrimp consumption in Brazil amounts to approximately 1.15 kg per capita. In other words, there is ample room for growth in domestic consumption.


Shrimp Farm – Rio Grande do Norte/Brazil

Explore Seafood of Asia, The Focused Platform For Marine & Fish Industry

SEAFOOD SHOW of ASIA expo

HELD IN CONJUNCTION WITH

SIAL InterFOOD
INSPIRE FOOD BUSINESS

SEAFOOD SHOW ASIA 2023

The 4th Int'l exhibition on Fishery and Seafood, Seafood materials, Products and Processing equipment & Cold Chain technology

08 - 11 November 2023

Jakarta International Expo, Kemayoran - Indonesia

- Seafood Products
- Seaweed
- Fish & Seafood Processing
- Refrigeration & Cold Chain
- Seafood Spices & Seasoning
- Seafood Technology & Services

HOW EMPOWERING WOMEN GLEANERS IN SRI LANKA WILL BUILD STRONGER HOUSEHOLD ECONOMIES

By U.L.K. Perera, K.L.D. Nilanka, J.A.R.U. Jayakody, and R.A.R.M. Ranasinghe

Gleaning of mussels, clams, and oysters is important in terms of its contribution to animal protein intake and food security, and also as a means of livelihood and income generation for the rural poor. As those engaged in this traditional fishery in Sri Lanka are mainly women, gleaning is important as an activity that adds value to these women in the household economy as well as nationally. However, this small-scale fishery sector receives very little attention and therefore remains poorly developed. Providing women gleaners with the necessary financial and technical support will enhance their economic potential, improve their quality of life, and contribute to the expansion of the sector.

Women gleaners hard at work

Gleaning of clams, oysters and mussels is an isolated and silent fishery in Sri Lanka. Due to its non-popularity, hardly anyone's attention is being paid to this unique small-scale sector. However, as the majority engaged in this fishery are women, gleaning is a very important fishing activity than it would appear. Not only does it create job opportunities for women, it also contributes toward the equitable participation of women in fisheries.

Representation and recognition of fisherwomen in policy dialogues and implementation are not at a satisfactory level. Even though there are various strategies which have been implemented uplifting the living standard of fishers and the empowerment of women engaged in fishery-related livelihoods, women gleaners are, to all intents and purposes, forgotten and none of the strategies have focused specifically on them.

Numerically, more than 1 000 women earn their livelihood from this fishery on a full-time or part-time basis and a similar number of families are dependent on it. These women are most likely under-represented in national fisheries statistics as this fishery is considered as an informal production sector and is not usually accounted for in marine capture fisheries production. Data on subsistence fisheries, especially from gleaning, are not included in official fisheries statistics and its contribution in the national GDP is hidden.

Clams, oysters and mussels are widely distributed in the shallow waters along the northwest, north and east coasts of the island. Hence gleaning is carried out in extremely remote areas where life is very difficult and finding a means of livelihood is a challenge. It is observed that many families who depend on this fishery are satisfied only with the basic needs and the standard of living is low. Therefore, this artisanal

fishery is crucial for the survival of communities along the coast to some extent. According to the prevailing information, Puttalam situated along the northwest coast, Trincomalee and Batticaloa to the east, and Mullaitivue, Mannar, Jaffana and Kilinochchi in the north can be identified as the coastal districts where gleaning activities are generally taking place with the significant involvement of women. According to the national statistics, most of these districts have been identified as areas with monetary poverty.

Due to the availability of resources, this fishery is carried out near the shore in most areas. But the women in some areas such as Puttalam, Batticaloa and Trincomalee have to travel a certain distance to the respective grounds by boat in order to engage in this fishery. The grounds are located between 0.5 km to 25 km distance from the shore in those districts. For travelling purposes, they avail the services of fishing boats on payment basis as a group.

Among those engaged in this fishery, 34% are men and 66% are women. They live in fishing villages as nuclear families with the average household size being 3.7. In the Puttalam, Mannar, Trincomalee and Batticaloa districts, women are represented in higher numbers among the gleaners involved in collecting clams, oyster and mussels. In districts such as Jaffna, Mullaitivu and Kilinochchi, both men and women are involved in mussel gleaning, with men being more represented; nevertheless, the processing of mussels gleaned by the men is done by women. All the women who engage in this fishery are married and the majority of them are in the age group of 40 to 60 years.

Almost everyone who engages in this industry are Tamil-speaking Muslims as generally, Buddhist women have a strong aversion to killing or harming living beings based on their religious beliefs. Some 95% of the women involved in this fishery have only attended school up to primary level or not been schooled ever. About 68% of the women have been engaged in gleaning as their traditional fishing activity for as long as between 5 to 40 years, approximately 58% of women have experience from 15 to 30 years, and around 32% are new entrants.

Harvesting, processing and marketing of mussels

In mussel harvesting, the season of gleaning usually spans about eight months and often varies regionally; in general, it can be said that this duration varies between March and October. A specific peak production period can be identified for each area, which is limited to a period of three to four months.

The daily harvest of mussels is approximately 40 kilograms per woman. After processing the mussels, they attain an average volume of 4.15 kilograms. The volume of harvest and the species composition vary from region to region. These women work hard, about 15 days per month, spending about 8.5 hours per day in the harvesting of clams, oysters and mussels, with the rest of the days given to processing the harvest. They get a fairly good income commensurate with the effort.

Happy with her harvest

Clams, oysters and mussels are sold in various forms depending on the consumer demand or ease of processing or ease of preservation. With regard to mussels, these are available in fresh, dried, as well as boiled forms for sale in most of the districts where the gleaning is carried out by women. Mussel gleaning in the Kilinochchi district is not for commercial purposes; it is gleaned to use as a source of seafood for household subsistence. Gleaned mussels in districts like Jaffna are for both human consumption and as a feed for animals.

Using a sharp knife to remove fresh mussel meat

Fresh mussels are in high demand and sold in nearby areas at relatively high prices as they are regarded as being very tasty. However, it appears that some consumers are wary of eating too much mussel meat due to concerns over side-effects such as food poisoning, allergic reactions, etc.

Gleaned mussels in all the districts other than Jaffna and Kilinochchi are processed by removing the shell after having been boiled in large aluminium containers. The processing is done by the gleaning women themselves with the assistance of the rest of the members of their families. They add salt and turmeric powder when boiling the mussels. Boiled mussels are sold in the same form and some portion of it is sold after drying.

Processing the boiled mussels with the support of household members

(Left) Boiling mussels in an aluminium container; (Right) Boiled mussels ready for processing

Processed boiled mussels

Generally, the gleaners receive payments of about Rs. 920 per kilogram for fresh mussel without shell, Rs. 150 per kilogram for fresh mussel with shell, Rs. 3 440 per kilogram for dried mussel, and Rs. 840 per kilogram for boiled mussel.The dried mussel production in Mullaitive and Mannar is exported for the consumption of Sri Lankans in foreign countries, which brings in higher incomes for the gleaners. Accordingly, the average daily income of these women is around Rs. 3 625 (approximately USD 11). However although they are regarded as the high income earners of their households, these women gleaners are obviously missing out on real income as they are not aware of commercial markets, proper processing technology, and they lack funds to invest in the industry. In most cases, the spouses of these women engage in small-scale traditional fisheries using non-powered small coastal boats.

During the off-seasons, the women gleaners complement their livelihoods by engaging in weaving and selling coconut fronds for roofing and fencing, preparation of food for sale, collecting moss, etc. However none of these activities give them a better living than what they receive from gleaning mussels.

The income received from gleaning mussels is used for their daily expenses such as food, education requirements of children and medicine; and they do not forget to keep some amount securely in their possession for future needs and to be used in an emergency. Although they do not make formal savings through bank savings accounts, they appear to have good financial management. In cases of dire financial need, they borrow money from money lenders and pay them back in instalments.

There are some challenges faced by the women in this industry. Since this gleaning fishery is limited to a certain period of the year, they do not have an opportunity to obtain continuous income from it. Additionally, although the consumer demand and prices are better for fresh mussels, these women are more inclined to process boiled mussels as they do not have the appropriate technology to prepare mussels in fresh form. In order to remove the mussel meat in fresh form, they have to use a knife to pry open the shell using the strength of their hands, which is not only a relatively time-consuming task, it also tends to injure their hands. Another health risk is because these women have to spend a lot of time in the water during mussel gleaning, they suffer some health problems such as asthma, other respiratory diseases and skin problems.

A patented knife has been invented to help the gleaners to process the mussels safely

A further challenge is when women have to go some distance out to sea to collect mussels. They have to pay a considerable amount for the boat rent due to high fuel prices; therefore their profit is relatively less. As this industry is still at the traditional level, a competitive market with value-added products has not been developed yet; hence the women gleaners have to work long hours to harvest more mussels for better income. In certain areas such as Mullaitivu and Batticaloa, these women have to be more careful when engaged in this livelihood due to the crocodiles that live in the sea.

Strengthening gleaning communities

The introduction of new tools for processing mussels in fresh and other forms, as well as offering training on them, would enable women gleaners to save more time and earn a comparatively higher income after having produced a higher quality product that meets consumer demand. Appropriate technical tools have already been invented for mussel processing and there is a need to increase women gleaners' access to that technology by funding. The industry would benefit from gradually taking the necessary steps to enhance the mussel stock which is used for farming; attracting unemployed women to this industry; introducing value-added products; training women on processing higher-value products; as well as expanding the existing market by identifying new opportunities.

In terms of the framework, community-led initiatives, including the establishment of fisherwomen cooperative societies related to this fishery at village level, would result in ease of management and administration. Guiding fisherwomen towards financial management through a formal banking system would greatly benefit their household economy. Furthermore, the income of these women during the mussel off-season can be strengthened by introducing aquaculture-related livelihoods such as food fish farming, crab fattening, etc.

In summary, with the implementation of technical interventions, training, access to funding, and the establishment of women's cooperative societies, the economic status of the local communities can be strengthened and the standard of living of those who are involved in this industry, can be uplifted.

***U.L.K. Perera**, Statistician and the Head of the Statistics Unit of the Ministry of Fisheries, with more than seventeen years' experience in the fisheries statistics field including handling national fisheries statistics and IOTC and FAO data. A graduate from the University of Kelaniya with a Bachelor's degree with Statistics, she has participated in numerous national and international surveys, studies, feasibility studies, etc.; and is presently developing as a trainee researcher under the research-based policy formulation and researcher development programme of the Sri Lanka Institute of Development of Administration.*

***K.L.D. Nilanka,** Graduated from University of Sri Jayawardanapura with a special degree in Social Statistics and a post-graduate diploma from the same university. He has more than seven years' experience in the Ministry of Fisheries as a Development Officer and has participated in several local and international surveys related to the fisheries industry, including "Resilience and Seizing Opportunities: Small-scale Fisheries and Aquaculture Businesses that Thrived during the COVID 19 Pandemic in South and South East Asia - Sri Lanka" conducted by INFOFISH.*

***J.A.R.U. Jayakody** is a Statistical Officer at the Ministry of Fisheries and has been working for three years. A graduate from the University of Peradeniya with a Bachelor's degree specialised in Economics and a Master's degree from the University of Kelaniya in the same field, he has contributed to several local and international surveys related to the fisheries industry including "Resilience and Seizing Opportunities: Small-scale Fisheries and Aquaculture Businesses that Thrived during the COVID 19 Pandemic in South and South East Asia - Sri Lanka" conducted by INFOFISH; and a Food Loss and Waste Assessment conducted by FAO. At present, he is engaged in data analysis activities while studying further methodologies of fisheries data analysis.*

***R.A.R.M. Ranasinghe** is a Statistical Officer at the Ministry of Fisheries, and has been working for two years. She graduated from the University of Peradeniya with a Bachelor's degree specialised in Economics and graduated from the same university with a Master's degree in Economics, Currently conducting data analysis while studying further methodologies of fisheries data analysis, she enjoys using her skills to contribute to decision-making in Sri Lankan fisheries.*

OVERVIEW OF CURRENT STATUS, CHALLENGES AND FUTURE TRENDS ON SEAWEED FARMING IN THE PACIFIC REGION

Ruth Garcia Gomez, FAO Fisheries and Aquaculture Division, Rome, Italy; Jamie Whitford, Pacific Community (SPC) Noumea, New Caledonia. *2023. FAO Aquaculture News. June 2023, No. 67. Rome. pp. 36-38.*

Seaweed farming in Tonga using a floating raft of bamboo.

INTRODUCTION

The Pacific Island Countries and Territories (PICTs) have actively collected wild seaweed and cultivated various species of seaweed over the past decades. Several local and exotic seaweed species have been both cultivated and harvested from the coastlines of the Pacific islands traditionally for food consumption and as a natural fertilizer. Many communities in these regions rely on this production for a significant portion of their income.

However, production is relatively fragmented across the Pacific Region. The economic benefits of seaweed farming are high given the relatively low GDPs of many PICTs. Furthermore, the involvement of women and youth in the sector is relevant for its livelihood generating potential.

TARGETED AQUATIC COMMODITIES INCLUDING NATIVE AND EXOTIC SPECIES

The production of seaweeds is largely based on the cultivation of species of the genus *Kappaphycus*, intended for export as raw materials to produce important hydrocolloids such as agar, alginates and carrageenan. These species are not native to the Pacific Region and were introduced in different waves of introduction of exotic genetic material in the 1950s and 1960s. Countries like the Solomon Islands have maintained a relatively constant production of these species, mostly destined for export.

In addition, other countries, mainly located in Polynesia, have focused their production on local species of the genus *Caulerpa* (among others) for both domestic and export markets – destined mainly for Asian markets, but for direct human consumption.

Furthermore, in several Polynesian countries including Tonga, the production of *Mozuku* seaweed (*Cladosiphon* spp.) either for domestic consumption or for exports is gaining a lot of attention from national governments, investors, farmers and exporters.

CHALLENGES AND BOTTLENECKS FOR SUSTAINABILITY AND EXPANSION

The production of seaweeds in PICTs presents numerous limitations for its sustainable maintenance and responsible expansion, such as the optimization of production systems, management of disease and epiphyte risks, improvement of harvesting and post-harvesting strategies, storage, pre-processing and processing strategies, as well as facilitation of negotiations for export, among others. Moreover, quality assurance, consistency and maintenance are key challenges faced by many producers and exporters.

Meanwhile, challenges associated with climate change are notably affecting the consistent production and high quality of seaweed crops in the Pacific. These challenges include rising temperatures, increased eutrophication, drastic changes in salinity and pH – mostly associated with extreme weather events, increased prevalence and incidence of infectious diseases (for example ice-ice disease syndrome) and pests such as epiphytes, as well as existing conflicts with other users of the same coastal resources. The main challenges to seaweed production in PICTs are to maintain a constant and adequate production volume considering its geographical isolation and to ensure optimal and constant quality throughout the production system and storage.

Development of the culture of native edible seaweed species traditionally consumed in the region with an important cultural value, including *Caulerpa* spp. and *Mozuku*, is required to improve domestic food supplies, assure food safety requirements, and access regional markets with value-added products. Furthermore, national legislation related to seaweed farming, processing, marketing and consumption is relatively vague and needs further development and alignment.

At the same time, developed countries within the region including Australia and New Zealand have experienced a recent rise in imports of edible and pharmaceutical seaweed products, which could drive domestic culture.

Even though seaweed-farming production has declined over the last five years in most PICTs, this commodity continues to play an important role at the economic and rural development level in various countries and territories within the region. For example, in Solomon Islands, seaweed farming is one of the main sources of income on Wagina and Manaoba Islands and is often run as a family business, with more than 80 percent of women in these two islands involved either directly or indirectly in seaweed farming (Jamie Whitford, personal communication). Through the expansion of the traditional applications of locally grown seaweed, there are also opportunities for the Solomon Island farmers to sell the products to neighbouring communities as well as in the capital, Honiara.

Caulerpa harvested from a farm in Samoa.

Regarding seaweed consumption, Samoan consumers have reported consumption of sea grapes especially linked to traditional events or ceremonies, noting it as a choice food chosen for taste and value for money, and recognizing its nutritional value.

The cultivation of seaweeds currently plays an important positive role on Pacific communities and may continue to do so in the future by facilitating food security, improving quality of life, enhancing livelihoods, and diversifying income generation activities. However, coherent and rapid action is required to minimize production risks and find feasible solutions to the main constraints faced in the production and marketing of seaweed.

PACIFIC SEAWEED PRODUCTION DATA

In contrast to global trends, seaweed production in PICTs has declined since 2000. *Kappaphycus alvarezii* production has suffered from technical issues that relate to productivity declines mostly due to rising water temperatures and poor farm-management practices. Moreover, the variation in production and quality of final products creates uncertainty in the market chain. Precise action points have been identified by many governments, such as the provision of a regional standard protocol for seaweed production to deliver a consistent supply and grade for carrageenan processing, which will build confidence in the marketability of the product. Furthermore, alternative product streams for low to medium quality *Kappaphycus*, such as solid or liquid agriculture fertilizers or biochar, may provide an opportunity to maintain commercial activities where acceptable quality grades cannot be consistently met (consistent high-quality production is required for hydrocolloid extraction, for example).

Edible seaweed production of local species including *Caulerpa* and *Mozuku* is very encouraging in some PICTs, for example Fiji, French Polynesia, Samoa and Tonga. However, this requires the development of appropriate farming, processing and value adding strategies and techniques to prolong shelf life and improve access to both domestic, regional and international markets.

Looking at the production in major producer countries, Kiribati produced *Kappaphycus* from only one atoll (Fanning Atoll) in the early 2000s. Production faced domestic supply chain problems related to limited infrastructure used to transport the seaweed from Fanning to the main island of Tarawa, as well as key environmental challenges including heavy storms, increased water sediments and eutrophication, rising water temperature, and ocean acidification. Furthermore, Kiribati seaweed farming is competing against copra production, which has a regulated price, mostly in terms of labour and public sector subsidies and assistance.

Fiji's seaweed has been heavily affected by cyclones in the past years. Although Fiji had three local companies buying dried *Kappaphycus* in the early 2000s, now only a single trader is left. Solomon Islands' number of *Kappaphycus* seaweed farms have been slightly decreasing in the past years, mostly due to Solomon Island's limited local buying agents and domestic supply chain problems. Having said that, Solomon's production volumes seem stable, with an annual average of 12 000 metric tonnes of wet weight production.

The Australian and New Zealand seaweed industries are currently small, with most of the production coming from various endemic species of kelp, collected as beach cast. This production is predominantly for export to large alginate-manufacturing companies and for use as biofertilizer products. There are no commercial seaweed farms in Australia or New Zealand, though there are some pilot projects for the cultivation of *Ulva* spp. and invasive *Undaria* spp. There are research projects underway to progress the production of *Asparagopsis*, a genus endemic to both Australia and New Zealand, which shows promise in reducing enteric methane emissions when used in feed for cows and other ruminants.

Emerging market options in Australia and New Zealand appear promising. There has been a long-standing production of beta-carotene from microalgae grown in large tidal ponds previously used for salt production. Also, Atlantic salmon companies in both countries are trialling the development of multitrophic aquaculture systems to reduce the impact of nitrogen and phosphorous produced by marine fin fish farming using mussels and propagated kelp adjacent to sea cages. Land-based farming of *Ulva* spp. is in a commercial pilot stage aiming at being added to feed manufacturing, as well as reducing the nutrient outfall of land-based fin fish farming (barramundi, abalone and shrimp). Land-based farming of *Ulva* spp. is also being tested for use as a carbon sink and use as fertilizer.

LOCAL SEAWEED SPECIES FOR HUMAN FOOD CONSUMPTION

Wild harvesting of *Caulerpa* is limited in most Pacific countries due to fishing pressure and environmental challenges, and this has motivated many countries to look into *Caulerpa* farming. Several *Caulerpa* species have been traditionally consumed in the region and have an important cultural and nutritional value as healthy fresh products, easily available for rural and isolated communities. Furthermore, there is increasing interest from exporters, destined for several Asian countries including China, Japan and the Republic of Korea. Low-technology culture methods have been introduced, including off-bottom culture in plastic trays. Development of preparations and packaging options for transport to reduce spoilage and to access regional markets have also been tested and validated.

Mozuku (Cladosiphon okamuranus) is a highly valuable species that is very rare in many regions of the world, is endemic in Tonga and Samoa and possibly the wider Pacific, and consumed traditionally as fresh food. Nowadays, a private-sector modern processing facility (South Pacific *Mozuku* Tonga) is producing dried *Mozuku*, for both domestic and export markets, such as Japan and United States of America.

REGIONAL CHALLENGES

Major regional challenges faced for the sustainable expansion and intensification of the seaweed farming sector in the Pacific Region are listed below:

- Competition against established industries in Indonesia, Malaysia, Philippines and Thailand;
- Logistical challenges and small populations, difficulty in identifying traders;
- Price fluctuations, and high bargaining power by the traders;
- Limited interest in seaweed farming when compared to nationally subsidized copra farming or more lucrative sea cucumber fisheries;
- Good aquaculture practices not yet established for species currently being harvested
- Limited processing and/or value addition undertaken by the farmers or local community, reducing the farmers' share of the total value and limiting access to foreign markets;
- Regulatory frameworks, including policies and laws governing seaweed farming in the Pacific Region are limited or non-existent and need to be developed and enforced;
- Limited management and monitoring actions against biosecurity risks including diseases, pests, epiphytes, and invasive species.

THE WAY FORWARD

Wild harvesting of *Caulerpa* is limited in most PICTs. Major actions identified by seaweed stakeholders within the region for future development of the sector include actions to empower the farmers and strengthen the value chain, both upstream and down. This may include facilitating connections with existing and new hydrocolloid buyers and improving the negotiating power of the farmers. It may also include identifying and developing new seaweed products for traditional and emerging markets. Farmer clusters can be used to achieve productive scales and stronger supply and marketing solutions. Improved seed supply through nursery production, complemented with genetic selection will enhance production and quality of the final product. Moreover, improved varieties can be selected for traits to offer better adaptation and resilience to climate change challenges. Production can be further improved through modernization and digitalization of farming systems and environmental monitoring. Finally, strengthening of existing domestic markets, including through awareness raising, can further the contribution of seaweed to diverse and healthy diets in coastal communities.

UMIGYO IN SMALL-SCALE FISHERIES IN JAPAN: HOW PROTECTING LIFE ABOVE WATER LEADS TO PROTECTING LIFE BELOW WATER

By Yinji Li

Although it has received a lot of attention in recent years, the topic of fisheries sustainability isn't new. Despite years of research, it is still difficult to achieve sustainability in many fisheries, and the discussions seem never-ending; but for the future of our planet, it is imperative that we change our food production systems. There is a growing interest in small-scale fisheries and recognition of how crucial they are to the development of sustainable fishery systems. One of the most intriguing and possibly among the best replicable models could lie in Japan's small-scale fisheries and their unique "Umigyo" way to protect life below the water by protecting life above water.

Credit: Yinji Li

About 50 years ago, the phrase "small is beautiful" was very much in vogue. What it emphasised was the importance of a human-centred economy rather than the expansion of industrial society (Schumacher, 1973[1]). In the agricultural studies of the past decades, small-scale farming has been attracting attention as a countermeasure against large-scale industrialisation. Similarly, there is growing interest in small-scale fisheries in the fishing industry because they have the potential to sustain local communities and use natural resources sustainably.

As represented by the Too Big To Ignore Global Partnership Project (TBTI)[2], small-scale fisheries are generally centred around family businesses that have a strong position in local communities and use fishing practices that have remained practically unchanged throughout centuries. This is not romanticising 'small'; It merely emphasises the ability of local people and communities, who traditionally have lived with natural resources such as fish and the sea, and who have the deepest relationship with those resources, in protecting life below the water.

Japanese-style management

The Japanese fisheries governance system is globally recognised as having long valued 'small'. Since the Edo (or Tokugawa) Period stretching from 1603 to 1867, there has been a rule governing the use of resources called *"Iso Wa Jitsuki, Oki Wa Iriai",* meaning that the coast or inshore areas should be used and managed by local communities, while the offshore area is open or communal access (Li and Namikawa 2020[3]). These customary fishing rules have been passed down from the 17th century to the present day, protecting the resources and fish-eating culture along the Japanese coast. This type of 'Japanese-style management' system has been attracting attention from around the world.

However, three years ago, the revision of the Fisheries Act introduced the keywords "growth industry", which has enabled private capital to enter the coastal fishing industry. As a result, there is concern, and rightly so, that something "beautiful" will be lost. The time has come to seriously rethink the meaning of small-scale fisheries.

[1] *Schumacher, E.F. (1973) Small Is Beautiful*

[2] *http://toobigtoignore.net/*

[3] *Li Y, Namikawa T (2020) In the era of big change: essays about Japanese small-scale fisheries. TBTI Global Publication Series, St. John's, Canada*

Tenacity in a harsh environment

Japanese small-scale fisheries play an important role in ensuring socially, economically, and environmentally sustainable fisheries. However, they face various challenges, such as the unpredictable household income from fishing, an ageing population, the shortage of people to lead the industry, the lack of successors, and the loss of regional vitality.

In order to protect their livelihood without giving up even in these difficult circumstances, various efforts to revitalise fishing villages are being developed along Japan's coastline. That means fisheries are not just a profit-generating system, but a way of life and gives purpose in the lives of small-scale fishers. In addition to reaffirming the crucial role of small-scale fisheries, it is important to improve the income of fishers and provide security for fishery workers by supporting the revitalisation activities in which small-scale fishers are the main players in various ways. In other words: it is essential to enable viable fisheries.


Credit: Yinji Li

International recognition of small-scale fisheries

As large-scale and commercial fisheries spread around the world, small-scale fisheries centred on family businesses have been under pressure. Therefore in 2017, the 72nd General Assembly of the United Nations proclaimed 2022 as the International Year of Artisanal Fisheries and Aquaculture (IYAFA 2022), with the FAO serving as the lead agency, in collaboration with other relevant organisations and bodies of the UN system. IYAFA 2022 provided an opportunity to recognise the importance of artisanal fisheries and aquaculture in contributing to sustainable development and to promote solutions to the challenges faced by these fisheries. Other initiatives like the UN Food Systems Summit in 2021 also highlighted the role that artisanal fisheries can play in ensuring access to safe and nutritious food for all, shifting to sustainable consumption patterns, boosting nature-positive production, advancing equitable livelihoods and building resilience to vulnerabilities, shocks and stress.

Life above and below water

Small-scale fisheries account for about 50% of the world's wild-caught seafood but employ more than 90% of the people working in the seafood industry. In Japan, 80% of fishers are engaged in coastal fisheries, and 90% of fishing entities are family operations, but the number of fishers has decreased significantly over the last years.

"The future of fishing is in artisanal and without large fleets," stated world-renowned scientist, Daniel Poly[4]. Sven Jentoft[5], also a prominent sociologist of fisheries, said in his book 'Life Above Water (2019)', that it is essential to protect small-scale fisheries and fishing villages.

All of them strongly express the role and significance of small-scale fisheries, which have the ability to be fully sustainable and are capable of preserving ecosystems, because they value their resources. More important to remember is that preserving the pride and happiness of the people involved in small-scale fisheries, while passing on their history and traditional culture and sustaining local communities, cannot always be expressed in a spreadsheet or on graphs. Their significance is truly great.

A history of injustice and inequality

The stakes have never been higher for small-scale fisheries. Often ignored due to their small(er) scale, small-scale fisheries have always faced many challenges, including poverty, food insecurity, lack of access to resources, gender inequality, and unequal allocation of resources.

In recent years, economic initiatives such as "Blue Economy" and "Blue Growth", have taken the lead in industry and ironically, small-scale fisheries are increasingly exposed to the threat of annihilation. One example is the Japanese Fisheries Act that underwent a major revision, with the key word being "growth industry." Updated policies, such as allowing private capital to enter coastal fisheries, have given rise to a range of concerns about the sustainability of small-scale fisheries under new legislation that emphasises economic efficiency.

Because small-scale fisheries have been consistently marginalised and persecuted relative to their importance, the concept of "Blue Justice" has been advocated as a counter-concept and we see this concept rapidly spreading (Li, 2022[6]). That the United Nations dedicated the whole of 2022 to artisanal fisheries and aquaculture (IYAFA 2022) is reflective

[4] *Costa Rica News November 14, 2020.*
[5] *Jentoft, S (2019) Life Above Water. TBTI Global Publication Series, St. John's*
[6] *Li, Y. (2022). Adopting a Blue Justice Lens for Japanese Small-Scale Fisheries: Important Insights from the Case of the Inatori Kinme Fishery. In: Jentoft, S., Chuenpagdee, R., Bugeja Said, A., Isaacs, M. (eds) Blue Justice. MARE Publication Series, vol 26. Springer, Cham. https://doi.org/10.1007/978-3-030-89624-9_15*

of the fact that small-scale fisheries, which play an important role in maintaining sustainable fisheries, are in such a critical situation.


Credit: IPNLF

The watchword for small-scale fisheries protection - Too Big To Ignore

Researchers, who have pointed out the current situation of small-scale fisheries at various conferences and policy forums, launched a project called the TBTI (Too Big To Ignore) Global Partnership in 2012. In Japan, the TBTI Japan Research Network was launched in 2020, focusing not only on research, but also bringing together researchers, government officials, practitioners, fishery officials, and community groups to participate in creating standpoints, based on local knowledge and facts.

Every four years, TBTI organises a large multidisciplinary forum called the World Small-Scale Fisheries Congress (WSFC). This is a conference where anyone who works with, or is interested in small-scale fisheries, can participate. The overarching goal of the WSFC is to bring everyone together to share information on all aspects of small-scale fisheries and develop action plans and capacity-building programs to support the implementation of FAO's Voluntary Guidelines for Securing Small-Scale Fisheries (SSF Guidelines). For example, the 4th World Small-Scale Fisheries Congress Asia Pacific which was held in Shizuoka in 2022, brought together 250 delegates from over 30 countries with its main theme "Building Forward Better."

Because we are in a period of significant changes in policies regarding marine resources and environmental protection, Japan must reaffirm the importance of small-scale fisheries and fully implement the SSF Guidelines.

Small-scale fisheries are not only 'too big to ignore', their policy failures are irreversibly costly to the environment, natural resources, and providing food security to the world. When you put seafood on your table, please think about the small-scale fishers around the world making strenuous efforts to provide it to you.

Umigyo: from vulnerability to viability

The term *"Umigyo"* refers to a variety of values as well as resources for the revitalisation of regions and fisheries, including the culture associated with fishing and the landscape of fishing villages. Recently, this maritime term has been frequently heard from governments and the private sector. However, there is a concern that it will be perceived as nothing more than "marine business" in comparison to the initial "economic activities led by fishers and community people." Rather, it means more than just economic development.

The social significance of Umigyo

There are various examples of *Umigyo, i*ncluding direct seafood sales, marine leisure and tourism, maritime culture, and hands-on learning. These not only provide new opportunities and livelihoods for those involved in the fishing industry, but also provide a social contribution and fulfil a social responsibility relevant to small-scale fisheries and coastal communities in order to contribute to the prosperity of the entire nation.

Based on this, *Umigyo* is defined as "a series of economic activities carried out by community people, centred on fishers and fishers' organisations, for answering diverse needs on marine and coastal use today, utilising not only fishery resources but also various local resources such as the sea, landscapes, traditions, and cultures (Lou 2013[7])."

On the other hand, the idea proposed by the Japanese Fisheries Agency in 2022 was that it is "a business that utilises the value and charm of local resources such as the sea and fishing villages, and by responding to various domestic and overseas needs, it is expected to generate income and employment."

The definition of "who uses what" and "who does what" needs to be clarified. The Fisheries Agency's proposal, however, is ambiguous regarding the "who", which clearly differs from the earlier understanding. If only economic development proceeds while the actor is ambiguous, there is a concern that the entry of private capital will result in development without fishers.

[7] *Lou X (2013) The era of Umigyo: challenges towards the activation of fishing communities. Rural Culture Association Japan, Tokyo [In Japanese]*

Protecting marine resources and fishing communities

Japan's small-scale fisheries clearly have an important role to play and they provide a good example of how sustainability can be achieved in fisheries. However, to this day, small-scale fisheries still face various challenges, such as the ageing population, lack of successors and workers, instability of fishing household income, and declining regional vitality.

In addition to these issues, there have been recent calls for Blue Economy and Blue Growth initiatives, and policies such as "turning fishing communities into theme parks" have been launched both in Japan and overseas to encourage private capital to enter coastal fisheries and fishing communities. The danger here is that fishers can get left behind.


Credit: Yinji Li

Umigyo is an effective and indispensable means of responding to these longstanding unresolved matters as well as new issues that are emerging. What makes this possible is the deep philosophy and science that "*Umigyo* is not just a business related to the sea."

In order to protect the life below water (marine resources), it is essential to protect the people, communities, and societies (life above water) that are closely related to them. The *Umigyo* is a way to protect life below the water by protecting life above water, and it can be said that it is a strategy that enables Japan to fulfill its responsibilities as an advanced country to achieve the Sustainable Development Goals in the marine and fisheries industries.

Reviving fisheries is a national challenge

Future development of diverse *Umigyo* in many fishing communities will require the protection of independent rights like fishers' management of sea and coastal resources, and local resource management; as well as the participation of people from various fields both inside and outside the region. It is necessary to encourage cooperation with the fishing communities and to determine a proper *Umigyo* approach, which takes into account the unique circumstances of the communities and areas where fishing is practised.

Smaller fishing communities may be less familiar with the *Umigyo* concept and do not have the ability to collect information, so there is a possibility that they will be left behind in the development process. However, these same communities are the ones which need more awareness regarding *Umigyo*, and in order to avoid leaving them behind, we must also consider what form the government support and research promotion should take.


Credit: Yinji Li

As a researcher of small-scale fisheries and fishing communities, I have great expectations for the *Umigyo* concept, but I am keenly aware of my own responsibility at the same time, to promote it. It is hoped that consumers will pay close attention to the development of *Umigyo* as a topic that affects all citizens, and actively communicate what they want to see in terms of fisheries, marine resources, and the way of existence of fishing communities.

Note: *This article is an adaptation of articles published in Tabemono Tsushin (Food News) (No.616, No.621, No.626).*

Dr Yinji Li *is an Associate Professor at Tokai University, Japan. With language skills in Japanese, Korean, Mandarin, and English, her research interests and expertise lie in small-scale fisheries in Northeast Asian regions.*

Dr. Li leads the TBTI (Too Big To Ignore) Japan Research Network. Her recent books 'In the Era of Big Change', and 'Suimen Jono Seimei (Life Above Water translation)' emphasising the importance of small-scale fisheries, co-edited with Tamano Namikawa, were published by TBTI Global in 2020 and 2022. She is also the Japan country team coordinator of the Vulnerability to Viability Global Partnership (V2V) project, and a member of the Board of Trustees at the International Pole and Line Foundation (IPNLF).

8th PACIFIC TUNA FORUM

PTF 2023

"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)

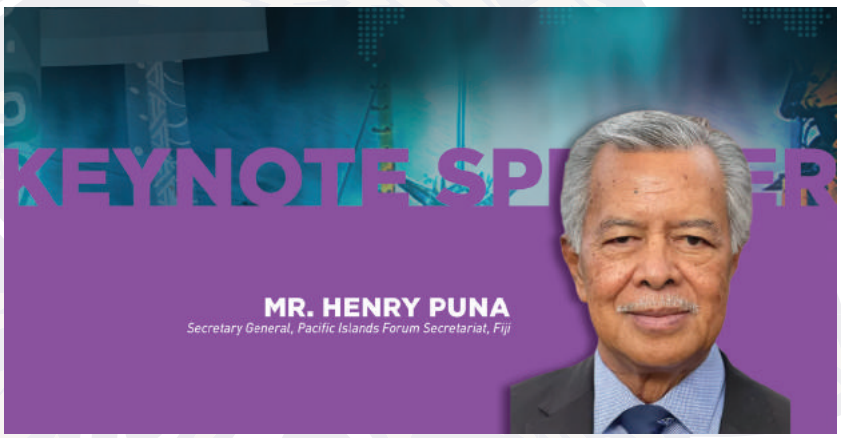
Co-organisers: FFA Pacific Islands Forum Fisheries Agency; Parties to the Nauru Agreement Office (PNAO); PAPUA NEW GUINEA FISHING INDUSTRY ASSOCIATION (PNG FIA)

Media supporter: ucn

Bronze sponsor: BIOLAN

Release, August 2023

JOIN US at the **8th** PACIFIC TUNA FORUM, the largest regional tuna industry and trade conference in the Pacific Region to be held in *Amazing* Port Moresby, Papua New Guinea, from the 06th – 07th of September 2023**.** Don't miss this significant opportunity to listen, share and engage with leading tuna players, regional partners and stakeholders who will all be speaking to the theme, "***Strengthening tuna sustainability and industry development in the 'Blue Pacific Continent' through increased innovation, partnership and participation".***



The **8th PACIFIC TUNA FORUM** is privileged to have the keynote address from **Mr. Henry Puna, Secretary General, Pacific Islands Forum Secretariat** on the 'The Blue Pacific Continent and Tuna Sustainability'. Mr. Puna will be speaking to the 2050 Strategy for the Blue Pacific Continent, endorsed by the Pacific Islands Forum Leaders in 2022, the centrality of oceans and its resources, the importance of tuna to Pacific Islands countries, the challenges faced in managing the tuna resources and the emphasized need to work together for greater regional cooperation in fostering this collective endeavour of importance to all in the region.

Mr. Henry Puna is a lawyer by profession and a former Prime Minister of the Cook Islands. He has served extensively in leadership roles for many years nationally, regionally and internationally; and as the current Secretary General, Pacific Islands Forum Secretariat, Mr. Puna remains a leading voice, advocate and champion for all issues and concerns that matter the most to Pacific Island peoples and nations. In this capacity, Mr. Puna continues to advocate for, and champion issues such as gender equality, accessibility, climate change, tuna fisheries, innovative partnerships for oceans and energy sustainability.

Don't miss this rare opportunity to listen to key industry players and regional leaders such as Mr. Henry Puna, who are driving sustainability in the region through increased innovation, partnership and participation. REGISTER NOW and JOIN US at this flagship PTF2023 event and be part of this premier convening of the world's leading tuna players and regional leaders who are driving sustainability and industry growth in the 'Blue Pacific Continent' and Pacific region.

Please visit our conference website www.ptf.infofish.org for the updated programme and other related information. We are also very pleased at this opportune moment to introduce and present, our esteemed speakers as highlighted on the next page.

MEET OUR SPEAKERS

Session 1: "The State of the Tuna Supply and the Industry in the WCPO (Blue Pacific Continent)"

Session 2: "Investing in a Sustainable and Responsible Tuna Landscape: WCPO (The Blue Pacific Continent) and Global Tuna Supply & Demand (Opportunities & Challenges)"

Session 3: Global Tuna Trade and Markets
The "Blue Pacific Continent" Trade and Market Dynamics

Session 3: Global Tuna Trade and Markets
Global and regional tuna trade and markets

Session 3: Global Tuna Trade and Markets
Promoting Partnerships and Participation in the Tuna Industry

Session 4: "Leveraging Technological Innovation and Processing Development for a Safer, Secure and Sustainable tuna Industry"

Session 5: "The Future of the Tuna Industry: Eco-Labelling, Social Accountability and Sustainability

8th Pacific Tuna Forum (PTF 2023) Conference Programme

Strengthening Tuna sustainability and industry development in the Blue Pacific Continent
through increased innovation, partnership and participation
06-07, September 2023
Port Moresby, Papua New Guinea

Chairperson: Mr. Phil Roberts, Board Director, Tri Marine International Pte Ltd, Singapore

Tuesday, 05th September 2023

17:00 - 20:00 **Pre-Registration** - Venue: Entrance of the Main Ballrooms 1 – 3, Level 2, The Stanley Hotel & Suites, Port Moresby, Papua New Guinea

Day 1: Wednesday, 06th September 2023

07:30 - 09:00 **Registration** (Tea/Coffee)

09:00 - 10:00 **Opening Ceremony** - Venue: Main Ballrooms 1 – 3, Level 2, The Stanley Hotel & Suites, Port Moresby, Papua New Guinea

Welcome Address by **Mr. Justin Ilakini,** *Managing Director, National Fisheries Authority*

Remarks by **Ms. Shirlene Maria Anthonysamy,** *Director, INFOFISH*

Remarks by the Conference Chair, **Mr. Phil Roberts,** *Board Director, Tri Marine International Pte Ltd, Singapore*

Statement and Official Opening by **Hon. James Marape,** *MP, Prime Minister of Papua New Guinea*

(Photo Session for VIPs on Stage)

10:00 - 10:30 Press Conference / Tour of Exhibition and Tea Break

Keynote Address

10:30 - 11:00 ***The Blue Pacific Continent and Tuna Sustainability*** - **Mr. Henry Puna**, *Secretary General, Pacific Islands Forum Secretariat, Fiji*

Session 1: The State of the Tuna Supply and the Industry in the WCPO (Blue Pacific Continent)

11:00 - 11:20 ***Overview of tuna stocks in the WCPO (Blue Pacific Continent)*** - **Dr. Samuel McKechnie** *(Oceanic Fisheries Scientist (National) Stock Assessment and Modelling, SPC FAME Division, Pacific Community (SPC), New Caledonia)*

11:20 - 11:40 ***The Challenges of sustainability and working towards a regional blue initiative for Tuna: The role of WCPFC*** - **Ms. Rhea Moss-Christian** *(Executive Director, Western and Central Pacific Fisheries Commission (WCPFC), Federated States of Micronesia)*

11:40 - 12:00 ***The Vessel Day Scheme (VDS) and contributing to tuna stock sustainability*** - **Dr. Sangaalofa Clark** *(CEO, Parties to the Nauru Agreement Office (PNAO), Republic of the Marshall Islands)*

12:00 - 12:20 ***Regional and global implications of IUU fishing in the Pacific*** - **Mr. Jason Raubani** *(Monitoring, Control and Surveillance (MCS) Policy Advisor, Pacific Islands Forum Fisheries Agency (FFA), Solomon Islands)*

12:20 - 12:40 ***Climate change scenarios for the tuna industry and adapting to a changing global environment*** - **Dr. Leontine Baje** *(Fisheries Advisor, (E-technologies) Fisheries Ecosystems Monitoring and Analysis, SPC FAME Division, Pacific Community (SPC), New Caledonia)*

12:40 - 13:00 Panel Discussion [20 mins]

13:00 - 14:00 Lunch - Venue: Main Ballroom 4, Level 2, The Stanley Hotel & Suites, Port Moresby, Papua New Guinea

Session 2: Investing in a Sustainable and Responsible Tuna Landscape: WCPO (The Blue Pacific Continent) and Global Tuna Supply & Demand (Opportunities & Challenges)

14:00 - 14:20 ***Tuna sustainability and solidarity*** - **Dr. Manumatavai Tupou-Roosen** *(Director-General, Pacific Islands Forum Fisheries Agency (FFA), Solomon Islands)*

14:20 - 14:40 ***Increasing investment and sustainability outcomes in tuna fisheries for the socio-economic benefit of FFA Member Countries*** - **Mr. Tony Sullivan** *(Investment Facilitation Manager, Pacific Islands Forum Fisheries Agency (FFA), Solomon Islands)*

14:40 - 15:10 ***Investing in sustainable Tuna management in the Blue Pacific and the opportunities of the Special Economic Zone (SEZ) in PNG*** - **Mr. Justin Ilakini** *(Managing Director, National Fisheries Authority, Papua New Guinea) and the Office of the Special Economic Zone Authority, Papua New Guinea*

15:10 - 15:20 Tea/Coffee Break [10 mins]

15:20 - 15:40 ***Improving fish standards, certification and growing the Tuna industry in Papua New Guinea*** - **Mr. Marcelo Hidalgo** *(Director of Sustainability & CSR, Fishing Industry Association (PNG) Inc., Papua New Guinea)*

15:40 - 16:00 ***Strengthening stewardship, sustainability and community benefit through responsible Tuna management in Fiji and the Blue Pacific Continent*** **(Fiji)**

16:00 - 16:30 ***Effectively framing Public-Private Partnership in ensuring sustainability in the Tuna industry and changing lives in the Solomon Islands – The Bina Harbour Tuna Processing Plant Project*** - **Mr. Peter Cusack** *(Tuna Industry Adviser, Bina Harbour Project Office, Solomon Islands)* and **Mr. Chris Bleakley** *(Pacific Hub Leader, Public Private Partnership, International Finance Corporation (IFC), Solomon Islands)*

16:30 - 16:50 Panel Discussion [20 mins]

Session 3: Global Tuna Trade and Markets

The "Blue Pacific Continent" Trade and Market Dynamics

16:50 - 17:10 ***A regional perspective: Fostering greater economic partnership and cooperation to enhance market access in the region (in the context of national development aspirations)*** - **Mr. Rodney Ned Kirarock** *(Programme Officer - Economic Policy, Programmes and Initiatives, Pacific Islands Forum Secretariat (PIFS), Fiji)*

17:10 - 17:30 ***A Pacific perspective: The WTO Fisheries Subsidies Agreement*** - **Dr. Filimon Manoni** *(Pacific Ocean Commissioner, Office of the Pacific Ocean Commissioner, Fiji)*

17:30 - 17:50 ***Shipping tuna from the Pacific to the rest of the world*** - **Mr. Thue Barfod** *(Global Head of the Fish & Seafood Segment, Center Reefer Management, Maersk Hong Kong Limited, Hong Kong)*

17:50 - 18:05 Panel Discussion [15 mins]

18:30 - 20:00 ***Ministerial & Industry Dialogue (closed door session)*** *– Venue: Mt. Victoria Rooms 1 & 2, Level 2, The Stanley Hotel & Suites, Port Moresby, Papua New Guinea*

18:30 - 22:00 **Networking Welcome Cocktail** – Venue: Poolside, Level 5, The Stanley Hotel & Suites, Port Moresby, Papua New Guinea

Day 2: Thursday, 07th September 2023

Session 3: Global Tuna Trade and Markets

Global and regional tuna trade and markets

09:00 - 09:20 ***The state of the global tuna industry and developments in tuna trade and markets in the Asia/Pacific Region*** **- Ms. Gemma Meermans Matainaho** *(Trade Promotion Officer, INFOFISH, Malaysia)*

09:20 - 09:40 ***How growing competition from China in Latin America undermines Ecuador's tuna supremacy: Lessons for the Pacific region*** **- Mr. Dario Chemerinski** *(Business Director, SSP-Selecting Strategic Partners, Brazil)*

09:40 - 10:00 ***The EU market and its relevance to the Pacific: How consumers' decisions are shaping tuna sourcing and the Pacific Sustainable Fisheries landscape*** **- Mr. Marcelo Hidalgo** *(Director of Sustainability & CSR, Fishing Industry Association (PNG) Inc., Papua New Guinea)*

10:00 - 10:20 ***Middle East Market: Opportunities for tuna from the Pacific*** **- Mr. Arnab Sengupta** *(Deputy CEO, J.M.B INTERNATIONAL, Thailand*

10:20 - 10:40 ***Developments in the Australia and New Zealand markets and opportunities for the Pacific region*** **- Mr. Tim Anastasopoulos** *(Procurement Senior Category Manager, Simplot Australia)*

10:40 - 10:50 Panel Discussion [10 mins]

10:50 - 11:00 Tea/Coffee Break [10 mins]

Promoting Partnerships and Participation in the Tuna Industry

11:00 - 11:20 ***The role of Global Dialogue in Seafood Traceability (GDST) on the impact of the tuna supply chain*** **- Mr. Greg Brown** *(CEO, Global Dialogue on Seafood Traceability (GDST), USA)*

11:20 - 11:40 ***The importance of industry and regulatory agency partnership in the development of digital systems for quality assurance of tuna products*** **- Mr. Antonio Bustamante** *(Manager, BIOLAN Southeast Asia, Thailand)*

11:40 - 12:00 ***Promoting partnerships and inclusive participation, "the Pacific way": Promoting a conducive policy and business environment for all stakeholders*** **- Mr. John Maefiti** *(Commercial Manager, Parties to the Nauru Agreement Office (PNAO), Republic of the Marshall Islands)*

12:00 - 12:20 ***Promoting community engagement and partnership: Lessons learnt from the FishFAD Tuna Project in the Pacific*** **- Mr. Michael Savins** *(Project Technical Adviser FishFAD Project and international Fish Value Chain Expert, Sub-regional Office for the Pacific, Food and Agriculture Organization, Apia, Samoa)*

12:20 - 12:30 Panel Discussion [10 mins]

12:30 - 13:30 Lunch - Venue: Main Ballroom 4, Level 2, The Stanley Hotel & Suites, Port Moresby, Papua New Guinea

Session 4: Leveraging Technological Innovation and Processing Development for a Safer, Secure and Sustainable Tuna Industry

13:30 - 13:50	***Smart technologies towards a new era in sustainable tuna fishing*** **- Mr. Javier de la Cal** *(Regional Sales Director, APAC - SATLINK, Spain)*
13:50 - 14:10	***An overview of the development of electronic monitoring in the Pacific*** **- Dr. Leontine Baje** *(Fisheries Advisor, (E-technologies) Fisheries Ecosystems Monitoring and Analysis, SPC FAME Division, Pacific Community (SPC), New Caledonia)*
14:10 - 14:30	***Advances and challenges in Pacific-wide FIMS and e-reporting / Strengthening transparency and accountability*** **- Mr. Penihulo Lopati** *(VDS / VMS Officer, Parties to the Nauru Agreement Office (PNAO), Republic of the Marshall Islands)*
14.30 - 14.50	***NFA FIMS Platform: Sustainably managing the tuna industry in Papua New Guinea*** **- Mr. David Karis** *(Acting Executive Manager, Monitoring, Control and Surveillance Business Unit, National Fisheries Authority, Papua New Guinea)*
14:50 - 15:10	***Mushy tuna syndrome: Investigating its prevalence and an amelioration plan for fishers and processors*** **- Ms. Soni Maria Jacob Peter** *(PhD Candidate, School of the Environment, Faculty of Science, The University of Queensland, Australia)*
15:10 - 15:30	***The case for making fisheries data transparent: Lessons from the Seychelles*** **- Mr. Kenneth Katafono** *(Founder and Managing Director, TraSeable Solutions Pte Ltd, Fiji)*
15:30 - 15:40	Panel Discussion [10 mins]
15:40 - 15:50	Tea/Coffee Break [10 mins]

Session 5: The Future of the Tuna Industry: Eco-Labelling, Social Accountability and Sustainability

15:50 - 16:50	***Panel: Social accountability and sustainability initiatives in the tuna industry Collective action for sustainability and efficiency*** **- Ms. Eva Mudde** *(SDG Impact Manager, Global Sustainable Seafood Initiative (GSSI), Netherlands)*
	Supporting sustainable fisheries with satellite technology and open data **- Dr. Tim White** *(Senior Manager of Global Analysis, Global Fishing Watch (GFW), USA)*
	FISH Standard for Crew **- Mr. Mike Kraft** *(CEO, FISH Standard for Crew, USA)*
	Implications of the MSC Fisheries Standard v3.0 on WCPO tuna fisheries **- Mr. Bill Holden** *(Senior Tuna Fisheries Outreach Manager, Marine Stewardship Council (MSC), Australia)*
	Satellite and CCTVs monitoring, augmented reality audits and marine biodiversity offsets: sustainable seafood certification according to Friend of the Sea (FOS) **- Mr. Paolo Bray** *(Founder and Director, Friend of the Sea (FOS), Italy)*
16:50 - 17:00	Panel Discussion [10 mins]
17:00 - 17.30	Wrap up and closing remarks
19.00 - 23.00	**Closing Dinner** - Venue: Main Ballrooms 1 – 3, Level 2, The Stanley Hotel & Suites, Port Moresby, Papua New Guinea

AQUACULTURE

ADB invests millions in aquaculture sector

Vietnam – The Asian Development Bank (ADB) and Australis Holdings, Inc. have signed a US$15mn convertible note to promote climate-resilient, ocean-based barramundi and seaweed aquaculture in Vietnam. The investment will fund working capital to expand Australis' operations at Van Phong Bay in central Vietnam and support the development of a second regional production hub in the southern region.

Asparagopsis taxiformis seaweed

An additional US$3mn grant will be provided by the Climate Innovation and Development Fund (CIDF), administered by ADB. The CIDF grant to Australis' subsidiary, Greener Grazing LLC, will support research and development into the cultivation of *Asparagopsis taxiformis* seaweed for commercial ocean farming. This species of seaweed has been demonstrated to significantly reduce enteric methane emissions when included in cattle feed. Seaweed farms can mitigate ocean acidification and enhance climate resilience of marine ecosystems and have carbon sequestration potential.

Digital training tools to enhance biosecurity

Bangladesh – In a July 2023 press release by the University of Exeter, researchers said they were helping the Bangladesh shrimp industry become more sustainable through a new set of digital training tools.

The digital tool set (in Bengali) raises awareness of the importance of biosecurity, increasing the accessibility of good biosecurity practices and illustrating low-cost, feasible options to achieve this.

The shrimp industry is hugely important for the Bangladesh economy, employing around 3.5 million people. It is a key source of dietary protein for the Bangladeshi people. Project lead Professor Charles Tyler said that "If we can support the shrimp industry to improve biosecurity in Bangladesh, this should in turn increase productivity and lower the impacts on biodiversity loss, pollution of water systems and the risk of antimicrobial resistance."

The digital tools are for shrimp hatcheries, which produce larval shrimp and supply the entire industry of more than 300 000 farmers across Bangladesh. They have been produced in collaboration with shrimp hatcheries and in-country partners WorldFish and the Centre for Communication Action Bangladesh.

Lead researcher Dr Kelly Thornber said: "Most biosecurity training materials are not aimed at low-income, extensive farming systems, which are commonly found across Bangladesh, and they are usually technical and text-based, so not very appropriate or readily accessible. By working with in-country partners, we have identified pragmatic solutions that are simple and relatively cheap to implement. We have developed a set of digital training videos, a self-assessment app and monitoring sheets, to make biosecurity training more engaging and accessible."

This project is funded by the Biotechnology and Biological Sciences Research Council and is one of many being run from the Centre for Sustainable Aquaculture Futures (SAF), a collaboration between the University of Exeter and UK's Centre for Environment, Fisheries and Aquaculture Science (CEFAS). For further information and to access the digital training tools, go to: https://www.exeter.ac.uk/research/saf/projects/hatchery-biosecurity-english/

SDDV causes mortality in sea bass farm

Singapore – As at June 2023, Singapore's leading fish farm operator, the Barramundi Group, has harvested all of its Asian sea bass (also known as barramundi) and stopped stocking its three ocean-based farm sites with juvenile fish due to outbreaks caused by the scale drop disease virus (SDDV).

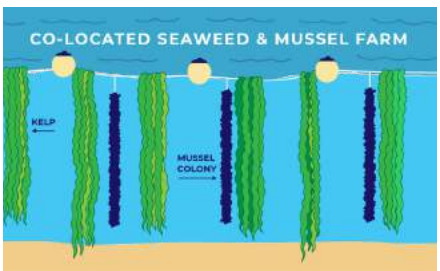
According to The Straits Times, Barramundi Group's annual report for financial year (FY) 2022, published on June 23, states that farming at its Singapore sites off Pulau Semakau, Pulau Senang and St John's Island will be held off until "an efficacious vaccine is available, for animal welfare and ethical reasons". The company also intends to move its base for fish production to oceanic sites in Brunei, from where the harvested sea bass will be processed and shipped to Singapore and international markets.

"Our Singapore operations will continue to focus on aqua-tech capabilities such as vaccine and therapeutics development, veterinary and animal health, broodstock research and development, and the supply of high-quality fry and fingerlings," a spokesman for the company told ST on July 18.

Community-focused research project to explore regenerative farming

Australia – The Blue Economy Cooperative Research Centre (CRC) and University of Wollongong have partnered with local aquaculture industry leaders to undertake social, economic, and cultural research to support regenerative farming in waters off the south coast of NSW, focusing on the emerging seaweed farming industry and shellfish farming. The NSW south coast is already home to a healthy and vibrant oyster industry along with two mussel farms in Jervis Bay and Eden.

This collaborative research project will examine the potential to further develop regenerative farming in the waters off the south coast of NSW, including optimising marine space through the co-location of seaweed and shellfish at the same sites.



Proposed illustration of co-located seaweed and mussel farm

The project team will work alongside community, indigenous rights holders and other marine estate users to understand what matters to them when it comes to growing the blue economy, and what is needed to address community sentiment and grow community support for regenerative aquaculture opportunities in the local area. Outputs will include guidance for industry leaders to inform any future consultation processes for new regenerative farming leases.

First seaweed innovation project announced in Sulawesi

Indonesia – On 21 July, the Maritime Affairs and Fisheries Ministry of Indonesia announced a model project integrating seaweed production in varying ecosystems, as reported in Antara News. The project is the first step

in supporting momentum in Indonesian seaweed innovation throughout the coast of Indonesia in the Southeast Sulawesi Wakatobi district.

Cottonii seaweed after harvest, Indonesia

The support for downstreaming includes good post-harvest handling, modernisation of drying facilities, packaging, market arrangement, and allocation of relevant facilities—all of which are expected to lead to better dry seaweed products that meet the industry standard, Maritime Affairs and Fisheries Ministry of Indonesia Director Budi Sulistiyo said. Wakatobi is one of the select few areas in Southeast Sulawesi that have great potential in seaweed production; in 2022, the production of dry seaweed in the district was recorded at 3,951 tons. Other areas with similar potential comprise Wangi-Wangi Island, Kaledupa, and Tomia. "Seaweed's derivative products can be made into food and non-food products, such as food for farm animals/fish, fertilisers, cosmetics, and also pharmacy (products)," he added.

The announcement on 21 July follows an earlier press release in June which had quoted Marine Affairs and Fisheries Minister Sakti Wahyu Trenggono as having said that President Joko Widodo had asked the Ministry to carry out the downstream of seaweed products by establishing pilot projects in five regions: Buleleng (Bali province), Wakatobi (Southeast Sulawesi province), Southeast Maluku (Maluku province), Rote Ndao (East Nusa Tenggara province), and West Nusa Tenggara (NTB) province.

The Minister said that "Indonesia has enormous potential (with a seaweed cultivation area) of 12 million hectares or more. However, only 0.8 percent of the area has been utilised, with a total production of around 9 million tons in 2021". According to the Marine Affairs and Fisheries Ministry, Indonesia's seaweed export volume reached 225 thousand tonnes in 2021, or 30 percent of the total volume of global seaweed exports, making Indonesia the largest seaweed exporter by volume.

MoU signed to assist small-scale sector

India – The Global Seafood Alliance, The Center for Responsible Seafood (TCRS) and Choice Canning Co. on June 21, 2023, signed a memorandum of understanding (MoU) designed to uplift small-scale aquaculture farmers in India by offering more education and training opportunities on responsible aquaculture practices. Dubbed the Responsible Farming Practices, the two-year initiative is meant to bring more economic stability to farming communities challenged by a lack of infrastructure, capital, insurance, financial planning, market exposure and access to information on responsible aquaculture practices. Approximately 90 percent of the world's aquaculture farms are small-scale or family-owned. Initially, the initiative will focus on India and will be modeled in a way that can be applied beyond India.

The certificate-based initiative consists of four phases. The first phase is assessment and includes identifying infrastructure needs, analysing and prioritising challenges and identifying trainers and farmer participants. The second phase is the implementation of an education and training program using GSA's Best Aquaculture Practices certification standards as a framework. The third phase is outreach and includes growing the training program through increased participation and building marketplace support for the initiative. The fourth and final stage is graduating the farmer participants from the initiative.

UNIDO continues supporting aquaculture value chains in Indonesia

Pressing the launch button of GQSP Phase 2 From L-R: Ms. Triningsih Herlinawati (BSN), Mr. Widya Rustyanto (MMAF), Mr. Philipp Orga (SECO), Mr. Salil Dutt (UNIDO), Mr. Sudari Pawiro (NCTA GQSP Indonesia)

Indonesia – Global Quality and Standards Programme (GQSP) Indonesia Phase 2 was officially launched on 15 August at the Ministry of Marine Affairs and Fisheries (MMAF), Jakarta. The launch, jointly organised by UNIDO and MMAF, was attended by around 200 delegates (offline and online) from various representatives of national and regional government ministries/agencies, fisheries associations, the programme's partners, NGOs and other stakeholders. The GQSP Indonesia Phase 2 is part of the global programme implemented by UNIDO (United Nations Industrial Development Organization) and funded by the Government of Switzerland through its State Secretariat for Economic Affairs (SECO) in the area of trade capacity development involving seven countries including Indonesia, Vietnam, Albania, Colombia, Peru, South Africa and Ukraine.

GQSP Indonesia Phase 2 will cover three aquaculture value chains namely Shrimp, Milkfish and Seaweed, focusing on improving productivity and quality

of shrimp and milkfish from traditional/extensive shrimp farming integrated with mangrove rehabilitation in selected locations. Special emphasis will also be given to the development of new species of seaweeds for improving the livelihoods of coastal communities and to enhance the contribution of seaweeds to climate change mitigation and adaptation. The new programme runs from October 2023-Dec 2026 (39 months) and it has three Outcomes/Components, namely Strengthening Quality Infrastructure; Increasing Compliance Capacity of SMEs in the Selected Value Chains; and Conducive Policy and Culture of Quality. The MMAF and National Standardization Agency of Indonesia (BSN) are the main partners of the programme that will also involve private partners from selected value chain associations, farmer groups, cooperatives and companies.

The previous programme, GQSP Indonesia Phase 1 (2019-2023) was successfully concluded on 30 June 2023, achieving an average of 84% of the targeted 91 Key Performance Indexes (KPIs) of outputs, outcomes and impacts.

World's first recycled fish farming pen

Norway's AKVA Group, in partnership with Plasto and Oceanize, has announced the production of the first fish farming pen made entirely of recycled materials. It was manufactured using plastic from disused pens provided by Nova Sea and will undergo testing at Varpet, one of Nova Sea's locations. This project is a natural continuation of the long-standing collaboration between AKVA group and Nova Sea.

Freddy Bakken Braseth, General Manager of AKVA group said that "AKVA group is committed to reducing the use of virgin plastic, both to lower the carbon footprint and to contribute to more circular value chains. We use 7,000-8,000 tons of raw material per year and aim to incorporate as much recycled plastic as possible. The advantage of retired pens is that the plastic quality remains high and is well-suited for recycling."

FISHING

First LA country to ratify Subsidies Agreement

Peru – Peru deposited its instrument of acceptance of the Agreement on Fisheries Subsidies on 19 July, bolstering the ranks of leading marine fishing producers that have affirmed support for the historic agreement on ocean sustainability. Minister of Foreign Affairs Ana Cecilia Gervasi Díaz presented Peru's instrument of acceptance to World Trade Organization (WTO) Director-General Ngozi Okonjo-Iweala in Geneva, Switzerland.

Peru's Minister of Foreign Affairs Ana Cecilia Gervasi Díaz presented Peru's instrument of acceptance to Director-General Ngozi Okonjo-Iweala in Geneva, Switzerland.

"The ratification of this Agreement is an example of the responsibility of my country towards the multilateral trading system. We are honoured to be the first Latin American member to deposit the instrument of ratification of the Agreement on Fisheries Subsidies, and we trust that with this act we will motivate the rest of the membership towards a prompt entry into force of this Agreement", said the Minister.

Peru's instrument of formal acceptance is the 14th instrument received by the WTO. Over one third of the acceptances needed for the Agreement to enter into force are now in hand (Belize, Canada, China, EU, Gabon, Iceland, Japan, Nigeria, Seychelles, Singapore, Switzerland, UAE, USA). Acceptances from two-thirds of WTO members are needed for the Agreement to come into effect.

World Bank funds Pacific IUU program

The World Bank has announced USD 9 million (EUR 8.1 million) in funding for a program devoted to fighting against illegal, unreported, and unregistered (IUU) fishing in the Pacific Ocean. The funding will go to further the objectives of the Pacific Islands Regional Oceanscape Program (PROP), a regional collaboration supporting the Forum Fisheries Agency (FFA), representing 17 Pacific Island member countries in the Pacific, in its work on fisheries management in the region through strengthening surveillance and enforcement of regulations across the region's maritime borders.

"Fisheries are vital to the economies of Pacific countries, and in six FFA member countries are the source of more than 40 percent of government revenue," Pacific Islands FFA Director General Manu Tupou-Roosen said in a release. "We are so pleased to continue this important partnership with the World Bank to support FFA's efforts to strengthen monitoring and reporting tools, as well as to model and forecast economic and social impacts of developments in the Pacific fisheries sector."

The new project will work with the key regional fisheries management bodies to improve regional and national monitoring, control, and surveillance activities to reduce IUU. According to World Bank, it will immediately help improve the capacity and working conditions for national fisheries officials in Pacific Island nations.

In addition to helping the FFA fight IUU, the World Bank will also support the organisation in finding new low-carbon solutions for upgrading infrastructure. Member countries receiving support through the project include the Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

MARKETING

Second half of 2023 may be challenging

World – According to Rabobank, shrimp demand in the US and Europe has experienced a sharp drop in the last six months due to inflation and economic recessions. Meanwhile, in China – where it was predicted to soar, following the more recent removal of lockdown restrictions – it hasn't rebounded as much as anticipated, leaving suppliers stuck with stockpiled inventory. This suggests that continued low prices for shrimp, combined with a reduction in the availability of fishmeal, due to an El Niño-related slump in forage fish landings, is going to make margins extremely tight right across the aquaculture value chain in the second half of the year, with shrimp farmers likely to be hit the hardest.

As prices are likely to fall even lower, due to a further drop in demand from China, combined with the continued growth of Ecuador's production, the report suggests that the Asian shrimp sector could be facing its most challenging period since the initial outbreak of early mortality syndrome (EMS) hit the region in 2011. In Asia, according to the report, "virtually the entire industry is operating at a loss per kilogram sold. It's the worst year since 2020 due to the drop in demand. China propped up the world at the end of 2022 and Q1 of 2023, as 2023 rolled out it turned out the Chinese were spending less than predicted. The economy is not opening out as fast as we thought it would and they're experiencing deflation," the report's lead author, Gorjan Nikolik, explains.

Producers – especially in Asia – are heavily reducing their investments in broodstock and post-larvae.

"Indonesia, which targets the US market, has already cut production by 20 percent in H1; Vietnam – selling to Europe and the US – cut production by 20-30 percent; India hasn't reduced production – it seems they didn't get the message on time, but now broodstock imports have fallen by 40 percent – which could mean a collapse in India's shrimp production in H2," notes Nikolik.

Female sushi chef expands into Yakuzen salmon farming

Japan – Yuki Chidui, Vice-President of the Nadeshiko Sushi restaurant; Principal and CEO of the Nadeshiko Sushi School; and first female sushi chef in Japan was interviewed by the INFOFISH International in the May/June 2021 issue (https://bit.ly/3KrSKtR)

Yakuzen salmon, reportedly low in fat and helps to lower uric acid levels

Yuki has now embarked on salmon farming at a site in Hokkaido Island,

specifically producing Yakuzen salmon which is given feed containing medicinal ingredients to increase its nutritional value, and farmed using melted snow water from the Daisetsuzan Mountains. Yakuzen salmon is now being marketed as a food with functional claims as it contains anserine, which has been shown to lower uric acid levels. Salmon from the company's farm was the first in the industry to obtain a Food with Functional Labeling in the salmon aquaculture industry in Japan. Tokyo-based fishery firm BKTC Co. started shipments of Yakuzen salmon last autumn, in cooperation with fish farmers in the northernmost and central prefectures of Hokkaido and Shizuoka, respectively.

Antidumping order on Asian warmwater shrimp remains

USA – In a widely-expected decision, the U.S. International Trade Commission (USITC) has decided to maintain antidumping duties on frozen shrimp from India, China, Thailand, and Vietnam in its latest five-year review. After an expedited review of the filings it received, the US Department of Commerce (DOC) determined "that revocation of the orders would likely lead to a continuation or recurrence of dumping and that the magnitude of the dumping margins likely to prevail would be weighted-average margins up to 112.81 percent for China, up to 110.90 percent for India, up to 5.34 percent for Thailand, and up to 25.76 percent for Vietnam".

The US shrimp industry, including fishing groups, processors and others, had called for antidumping duties in the early 2000s because it felt imported product was being dumped on the US market at below-market value, harming the domestic industry's ability to compete with the cheaper imports.

More Chilean salmon bound for India

India/Chile – Following a milestone agreement reached between Chile and India, a reduction of import taxes will allow Indian importers to purchase Chile's fish at lower costs compared to salmon from other countries that have higher tariffs.

The agreement came after Chile's state aquaculture agency, Sernapesca, and the Food Safety and Standards Authority of India (FSSAI) reported that they have established the conditions for the official certification of frozen and refrigerated salmonid products and crustaceans sent to India, for processing establishments that are currently registered for the market.

"Getting this certification is the result of the coordinated efforts of various government and commercial entities, which have worked together to overcome the challenges and comply with the sanitary and regulatory requirements demanded by the Indian authorities," said Loreto Seguel, executive director of the Salmon Council, which represents four of Chile's top five Atlantic salmon producers- AquaChile, Cermaq, Australis, and Mowi – and coho salmon heavyweight Salmones Aysén. Chile is the world's second-largest producer of Atlantic salmon, after Norway. According to official data, exports of salmon and trout from Chile grew by 2% in volume and 2.1% in value in the first half of 2023, compared to the same period last year.

MSC label on McD's fish offerings

China – The McDonald's restaurant chain will now include the Marine Stewardship Council (MSC) ecolabel on the Filet-o-Fish sandwich, Double Fish burger and Kids Fish Fillet burger, served in more than 5 000 restaurants in China. According to a press release dated 15 June, nearly 3 500 tonnes of MSC-certified whitefish are sold in McDonald's China every year with McDonald's working with fish suppliers including Weidao and Tyson Foods together with the MSC. Recent consumer research suggests that Chinese consumers increasingly value the importance of sustainable seafood, with 'environmentally friendly or sustainably sourced' ranking fourth in factors motivating seafood purchase in China.

TRACEABILITY & SUSTAINABILITY

Partnerships in insect protein

Japan – Two of Japan's biggest trading companies, Marubeni and Sumitomo, have signed respective partnerships with two insect protein companies, Paris-based Ÿnsect and Nutrition Technologies (Singapore), aiming to both use and sell the alternative protein for aquaculture feed purposes in the country. Ÿnsect produces lesser mealworms *(Alphitobius diaperinus*, sometimes marketed as "buffalo mealworms") and yellow mealworms *(Tenebrio molitor)* in fully automated vertical farms.

"There are concerns about a supply-demand crunch of fishmeal such as

anchovy, which is an indispensable feed ingredient for the aquaculture industry ... due to long years of harvesting and increased global demand for aquaculture," Marubeni said. "There is a growing need for solutions to develop alternatives to imported fishmeal, the price of which is expected to continue to rise in the future".

BSF powder

Nutrition Technologies produces protein powder derived from black soldier flies (BSF) for use in pet food and animal feed Sumitomo plans to import and sell 30 000 tonnes of insect protein powder by 2030, which would be equivalent to about 7.5 percent of Japan's current imports of fishmeal.

Japan is the second-largest user of fishmeal in the world, with much of it imported from Peru for its yellowtail and sea bream aquaculture operations. But recently, prices for fishmeal have been rising, leading to interest in alternatives.

Thai Union unveils sustainability initiative

Thailand – The Thai Union Group has announced that it is committing the equivalent of its entire 2022 net profit of THB 7.2 billion (US$ 200 million) to improve "the entire seafood value chain on a global scale" by 2030. SeaChange 2030 represents the company's most extensive sustainability initiative to date, spanning 11 overarching objectives. It has the support of the Sustainable Fisheries Partnership, the Aquaculture Stewardship Council, IDH – the Sustainable Trade Initiative, and The Nature Conservancy.

These objectives include: Net zero emissions by 2050; Wild-caught seafood sourced responsibly or from a fishery in an improvement program and with responsible labour practices; Farmed shrimp is produced minimising ecosystem impact and meets current industry best practices in welfare and working conditions; Ecosystem restoration; Zero water discharge, zero waste to landfill and zero food loss at its five key global facilities; Safe, decent, and equitable work; All the sourcing vessels will work to prevent illegal, unreported and unregulated (IUU) fishing and modern slavery; All farms that Thai Union sources from will use best labour practices; Ocean plastics reduction; Nutrition & health; Sustainable packaging; and Corporate citizenship (giving back to the communities in which it operates).

WORLD

OECD-FAO Agricultural Outlook publication up to 2032

A July 6th publication by the OECD and FAO predicted that by 2032, the total global aquatic product production will increase from 181 million tonnes in 2020-2022 to 202 million tonnes per year. Most (96%) of this additional growth will be due to increased aquaculture production, which is expected to reach 111 million tonnes per year by 2032.

This growth figure is down from the increase of 33 million tons in the previous 10 years. According to the report, this is due to the fact that China, the world's largest aquaculture producer, is tightening regulations on the sustainability of the industry, and growth in aquatic product production will slow significantly. In terms of species, the share of common carp - the most produced farmed fish - is projected to decline over this period. The shares of shrimp and prawns are expected to increase, while the shares of tilapia and salmon will remain roughly stable.

The biggest challenges facing aquaculture will be "the incidence and extent of climate-induced temperature, precipitation, ocean acidification, hypoxia and sea-level rise, the availability of wild seeds, and increased competition for freshwater due to reduced precipitation". These changes will be greater in the tropics than in the temperate regions.

Global fund established for sustainable fisheries

World Wildlife Fund (WWF) and Finance Earth (FE) announced the launch of the Fisheries Improvement Fund (FIF) which aims to finance the transition to more sustainable fisheries worldwide and to catalyse more than US$100 million in investment in fisheries improvement by 2030. The Fund will be able to attract capital from a wider range of sources beyond philanthropy, reducing transaction costs and enabling funds to be deployed at speed and scale to target Fishery Improvement Projects.

Finance Earth is now seeking proposals for fisheries worldwide that may be interested in seeking funding through the new Fisheries Improvement Fund and is open to opportunities brought forward by any relevant stakeholder(s): including NGOs, local fishing groups, industry actors, off-take/trading companies, buyers/retailers, and local/national governments. The Fund can support both industrial and small-scale fisheries and is open to fisheries currently in a Fisheries Improvement Project (FIP) or not yet in FIP. Further information can be obtained from fif@finance.earth.

International Seminar on Facilitating Market Access of Fisheries and Aquaculture Products for the Bureau of Fisheries and Aquatic Resources (BFAR) 15 June 2023, Manila, Philippines

In June 2023, an international seminar on Facilitating Market Access of Fisheries and Aquaculture Products was organised in collaboration with the Bureau of Fisheries and Aquatic Resources, Philippines as part of INFOFISH support for its Member Countries. The objectives of the training were to gain better insights on international fisheries trade regulations, market access issues, and to discuss the current challenges faced by the industry. The seminar was held through a hybrid format and with a total of about 170 participants.

Among the topics covered in the seminar were on FAO Port State Measures Agreement and its Connectivity to International Fish Trade and Market Access delivered by **Mr Francisco Blaha**; International Regulatory Framework applicable to Trade of Fisheries and Aquaculture Products, the recent Trade and Production Flows and Market Trends by **Mr Marcio Castro de Souza,** Senior Fishery Officer, International Trade, FAO; Market Access, The Philippine Food Safety Management and Regulatory Framework to Facilitate Market Access and Trade by **Ms Amor Diaz,** Chief, Fisheries Industry Development & Support Services Division, Bureau of Fisheries and Aquatic Resources, Philippines; Certification and Traceability Requirements by **Ms Nada Bougoss,** Fishery Officer, FAO; Market Access: Food Safety and Border Rejections – Practical Examples by **Ms Giulia Loi,** Food Safety Advisor, FAO; The most important import requirements of fisheries and aquaculture products by **Mr William Griffin,** Market Analyst, FAO; Import requirements of the major import markets (US, EU, China, Japan, and South Korea) by **Ms Shirlene Maria Anthonysamy,** Director, INFOFISH; as well as Online Tools to Facilitate Analysis of International Trade of Fisheries and Aquaculture Products by **Mr William Griffin**, Market Analyst, FAO.

The seminar was instrumental in providing a platform for the industry to discuss challenges faced with respect to market access issues as well as international trade regulations. Among some concerns raised was the following: how does the "black market" impact the Port State Measures Agreement as well as affect fish trade and market access for developing countries. Discussions also focused on the experience of COVID-19 and how it will continue to impact the landscape of international trade and markets for fish and fishery products.

The seminar was held in conjunction with the Manila Food and Beverage Expo which took place from 14-18 June, 2023.

Day 1 (19 June 2023): ***Opening session***

INFOFISH organised a training workshop entitled ***Product Development and Export Promotion of Pangasius and Tilapia*** in collaboration with the Department of Fisheries under the Ministry of Fisheries and Livestock, Bangladesh and supported by Bangladesh Trade Facilitation Project (BTF), USDA, during 19-21 June 2023 at Jashore IT Park Hotel and Resort, Bangladesh.

Photo 1: Shirlene Maria Anthonysamy, Director of INFOFISH, handing over a token of appreciation to Mohammad Habibur Rahman (3rd and 4th from the left respectively) Chief Guest and Joint Secretary, Ministry of Fisheries Livestock (MOFL) during the opening. Firoz Ahmed, District Fisheries Officer, Jashore and Shyamol Das, (1st and 2nd from the left, respectively); Fuad K Hasan, Deputy Chief of Party, Bangladesh Trade Facilitation Project, USDA and Md. Serajul Islam, Senior Assistant Director, Department of Fisheries (1st and 2nd from the right, respectively).

Mohammad Habibur Rahman, Joint Secretary, Ministry of Fisheries and Livestock (MOFL), Bangladesh, inaugurated the three-day training workshop as the Chief Guest. The participants will get the opportunity to interact directly and exchange experiences with the experts regarding innovative product development and market compliance, he said. In her special address, Shirlene Maria Anthonysamy, Director of INFOFISH, said that "this training has been organised to address the existing challenges in pangasius and tilapia processing, new product development and market access. It is based on a request from the Department of Fisheries, Bangladesh and is the second physical training for INFOFISH Member Countries after the end of the COVID-19 pandemic". She expressed deep appreciation to the Ministry of Fisheries and Livestock, M.U. Seafood Ltd, Jashore and Jahanabad Sea Foods Ltd, Khulna for the support extended by offering the processing facility for the demonstration activities, as well as the USDA team from Bangladesh Trade Facilitation Project for supporting the training. Fuad K Hasan, Deputy Chief of Party, Bangladesh Trade Facilitation Project, USDA mentioned that "BTF is super excited to be part of this training. We will continue providing support regarding diversification of exports and improvement of cool chain facilities". Shyamol Das, Managing Director, M.U. Seafoods Ltd., highlighted that USD 2 billion worth of exports can be added to the fisheries sector's contribution by developing pangasius and tilapia-based products. Firoz Ahmed, District Fisheries Officer (DFO), Jashore chaired the inauguration ceremony.

There were more than 39 participants representing the private sector (farmers, processors, traders, exporters and importers, including the Bangladesh Frozen Foods Exporters Association), government fisheries officers (including headquarters and divisional subordinate offices under the Department of Fisheries) and development partners. The workshop included six technical presentations, as well as two practical sessions on development and demonstration of tilapia and pangasius-based products at the onsite seafood processing facility.

Technical presentation and practical session at M.U. Seafoods

Presentations were given by the invited international experts from Indonesia and Thailand; and one from Bangladesh Trade Facilitation Project respectively. Aditia Chandra Dewa from Ministry of Maritime Affairs and Fisheries, Indonesia presented on *'Pangasius Processing for Global Markets'*, while Watcharee Kongrat, Food Technologist, Fisheries Industrial Technology Research and Development Division (FTDD), Department of Fisheries, Thailand spoke on *'Key Production Steps in Tilapia Processing'*.

The practical session of the workshop started at the M.U. Seafoods premises located two kilometres away from the training venue. Pangasius Processing and Innovation Expert, Aditia Chandra Dewa, gave a step-by-step demonstration of raw material handling during pangasius processing which includes bleeding, filleting, skin removing (manually and with the skinning machine), trimming, grading and glazing. Ratchada Iddhibongsa and Watcharee Kongrat, Tilapia Processing and Product Development Experts, demonstrated the filleting of tilapia, removing of skin, chilling, slicing and mincing tilapia finely or coarsely to prepare ready-to-cook products including sweetened, seasoned and smoked fish.

Photo 2: Experts showing how to make pangasius and tilapia fillets

Photo 3: Some of the participants at the hands-on session, M.U. Seafoods, Jashore.

Day 2 (20 June 2023): Practical Session at Jahanabad Seafoods Ltd

The workshop participants travelled towards Khulna from Jashore to visit Jahanabad Seafoods Ltd. to continue with the practical session. It is about 70 kilometres away from the training venue. Ratchada Iddhibongsa and Watcharee Kongrat demonstrated more ready-to-eat tilapia products such as fish burgers, sweetened fish, seasoned fish strips, fish crisps and crispy fried tilapia skin. Mr Aditia Chandra Dewa exhibited how to make fish balls from pangasius.

Photo 4, 5 and 6: Participants were trained how to make tilapia burger patties

Photo 6, 7 and 8 : Experts showing how to make fish balls (pangasius)

Closing Day (21 June 2023):

Aditia Chandra Dewa provided some quick reviews on Good Manufacturing Practices (GMP), Standard Sanitation and Operation Procedures (SSOP), Hazard Analysis and Critical Control Point (HACCP) and Zero-Waste Production Strategy in pangasius processing. Ratchada Iddhibongsa and Watcharee Kongrat highlighted some value-added products available in Thailand. The session was followed by two presentations from INFOFISH entitled *Global Freshwater Production, Market Trends, Market Access and Certification* by Gemma Meermans Matainaho, Trade Promotion Officer and *Equipment and Supplies in Pangasius and Tilapia Processing* by Sujit Krishna Das, Technical Officer respectively. They expressed the hope that the participants will develop at least one pangasius and one tilapia product for the local market in the near future. A brief closing ceremony was held where Dr Md Mahmudur Rahman, Senior Technical Advisor, Bangladesh Trade Facilitation Project, USDA; Shyamol Das, Managing Director, M.U. Seafoods Ltd.; Md. Jahangir Alam, Deputy Director, Khulna Division; and Sujit Krishna Das (on behalf of INFOFISH) were present. The ceremony was led and presented by Serajul Islam, Senior Assistant Director, Department of Fisheries, Dhaka. Certificates of participation were distributed to the participants at the closing of the training workshop.

Photo 9: Group photo of some of the participants after attending hands-onsession at Jahanabad Seafoods, Khulna

INFOFISH, in collaboration with the National Oceanic and Atmospheric Administration (NOAA) Fisheries, organised a virtual information-sharing session on **'U.S. Section 609 and the Turtle Excluder Devices (TEDs) Regulations'** on 18 July 2023 at 18.00 Hours Malaysia Time, reflecting that NOAA Fisheries and INFOFISH have common objectives with regard to trade promotion of fishery products. The webinar was conducted in response to requests from INFOFISH Member Countries with a view to enhancing capacity on the requirement, development, implementation and monitoring of TEDs; enabling market access of wild-caught shrimp to the US market; and improving international trade of fishery products. More than 17 participants representing Bangladesh, Malaysia, Pakistan, Sri Lanka and Thailand, including officials working with fish inspection and quality control, fisheries trade promotion and National Liaison Officer (NLOs) attended the technical webinar.

The webinar started with opening remarks by Shirlene Maria Anthonysamy, INFOFISH Director, followed by three technical presentations from **Mr Jared R. Milton,** Section 609 Program Manager, Office of Marine Conservation, Bureau of Oceans and International Environmental and Scientific Affairs, U.S. Department of State; and **Mr Jeff Gearhart,** Branch Chief, Gear Research Branch, Fisheries, Assessment, Technology, and Engineering Support Division, NOAA Southeast Fisheries Science Center, Pascagoula, Mississippi. The topics covered in the webinar were on *Section 609: Shrimp-Turtle Law and Turtle Excluder Devices; Turtle Excluder Devices (TEDs): A review of development and implementation in the Southeastern shrimp fishery;* and *TEDs: Summary of basic requirements and Gear Monitoring Team (GMT)*. The floor then opened for experience-sharing and questions. Both speakers addressed some of the questions raised by the participants. Sujit Krishna Das, Technical Officer at INFOFISH who facilitated the webinar, concluded with the hope that INFOFISH Member Countries will now be able to understand Section 609 better, implement and monitor regulations on TEDs efficiently. As a result, the international trade of fishery products, especially wild-caught shrimp to the US market, will be improved.

Group photo of some of the virtual participants during the session.

POSTHARVEST LOSSES IN THE MULTIDAY FISHERIES SECTOR OF SRI LANKA: INSIGHTS FROM A RECENT FISH LOSS ASSESSMENT

By K.W. Sujeewa Ariyawansa, K. B.Chandrani Pushpalatha, Omar Riego Peñarubia, and Ansen Ward

This article presents a summary of a comprehensive study conducted in Sri Lanka to assess postharvest losses from harvesting to unloading at fishery harbours in the multiday fisheries sector. Multidimensional solutions are proposed, including implementing supportive policies and regulations, investments in fleet development and infrastructure, capacity-building programs, improved market linkages and value addition activities. These solutions offer a pathway towards improving fish quality, minimising losses, and promoting sustainable fisheries, thereby enhancing food security and supporting the country's economic and social development.

Conducting the assessment at the fishery harbour in Mirissa, Sri Lanka

Sri Lanka, an island situated in the Indian Ocean, highly relies on its fisheries sector due to its significant contributions to employment, food security, and foreign exchange generation. This sector plays an indispensable role in the country's economy, accounting for approximately 1.1% of the Gross Domestic Production. Fish products hold great importance as they provide around 60% of the country's animal protein intake.

More than 40% of marine fish production in Sri Lanka is derived from multiday deepsea fishing, which primarily employs longline fishing, gillnet fishing, and ring net fishing techniques to catch species such as tuna *(Katsuwonus pelamis),* and tuna-like fish species *(Auxis thazard, Euthynnus affinis,* and *Rastrelliger kanagurta),* as well as Indian scads *(Decapterus russelli),* in the deep waters off the Sri Lankan coast. Marine fisheries production reached 331 675 tonnes in 2021, consisting of coastal water and offshore/deepsea water catches of 178 260 tonnes and 153 415 tonnes, respectively. The multiday fishing fleet consisted of 5 364 boats in the year 2021 where about 1 194 boats were operating on the high seas.

Food loss and waste (FLW) are significant issues in Sri Lanka's fishing industry. A significant portion of the fish caught is not of the best quality due to various factors such as poor handling and storage practices, lack of processing and preservation technology, and inadequate infrastructure. These losses occur at various stages of the value chain, starting from the time of harvesting and continuing through subsequent stages such as processing, transportation, distribution, storage and marketing, until consumption. The FLW in fish value chains not only reduces overall yield but also has negative economic consequences and impact on the livelihoods of fishing communities, contributing to food and nutrition insecurity.

Paucity of data hinders effective interventions

In Sri Lanka, the lack of data on fish losses makes it difficult to develop effective fisheries management policies and solutions. Many studies have not been systematic in measuring losses at all stages of the value chain, hindering efforts to identify potential areas for intervention. However, such assessments are costly and time-consuming, which has limited the number of full-chain assessments conducted thus far. To bridge this

knowledge gap, it is necessary to conduct a comprehensive FLW assessment at the stage in the fish value chain where the most significant loss occurs. Understanding the extent of FLW in Sri Lanka's fishing industry and implementing interventions to reduce it are crucial steps towards improving the industry's sustainability. This can benefit both industry and the country's overall economic and social development.

In this context, the NORAD-funded GCP/GLO/352/NOR project on responsible use of fisheries and aquaculture resources for sustainable development has been implemented to tackle these challenges by conducting a comprehensive FLW assessment. This project is a critical milestone in identifying effective interventions to reduce losses and waste in multiday fisheries, thereby promoting more sustainable and efficient use of the resource.

A preliminary study aimed to assess the magnitude and characteristics of fish losses at various stages or nodes in the fish value chain. The results indicated that multiday fisheries experienced the highest losses compared to other stages. Consequently, a subsequent survey focused specifically on the stages encompassing fish capture at sea and the unloading process at fishery harbours in multiday fisheries within Sri Lanka. In the context of Sri Lanka, multiday fisheries play a crucial role due to several factors: the presence of significant quality losses, a substantial volume of fish caught, their contribution to exports, the employment of a large number of individuals in fishing and post-harvest activities, their impact on food security, and the Government's prioritisation of this sector.

Assessment methodology

The assessment employed a systematic approach, combining interviews, field observations, data collection and analysis to capture a comprehensive understanding of post-harvest losses in the multiday fisheries. It encompassed the various aspects of multiday fishing operations, starting from the capture of fish to the final unloading process at fishery harbours. The data was collected using the Exploratory Fish Loss Assessment Method (EFLAM) and Questionnaire Loss Assessment Method (QLAM).

The assessment covered eight fishery harbours which were selected based on the large number of multiday boats operated and geographically-dispersed locations in Sri Lanka. It was conducted during the period from November 2022 to January 2023. Data was collected using a pre-tested online questionnaire (Google form), administrated to the multiday boat skippers. Fish loss percentages were calculated using the SDG 12.3 Food Loss Index method.

Distribution of assessed multiday boats across selected harbours in Sri Lanka

Credit @ NARA

Results of the assessment

The data collected during the survey pertained to 1 502 fishing trips carried out in multiday fisheries, and the results are based on this sample size. Based on the sample survey, species such as skipjack tuna *(Katsuwonus pelamis),* Indian scad *(Decapterus russelli),* and yellowfin tuna *(Thunnus albacares)* collectively constituted 75% of the total catch. Among the total catch, skipjack tuna accounted for 35%, making it the largest contributor; following closely was Indian scad, which contributed 27% to the total catch. Yellowfin tuna constituted 13% of the total catch. In Sri Lanka, the three primary fishing gears employed in the multiday fisheries are longline fishing, gillnet fishing, and ring net fishing. Based on the data it can be observed that the catch obtained from various types of fishing gear was not uniform. Ring net was found to be the most frequently used fishing gear followed by gillnet, while longline showed the least usage among the three main gears considered in this study. The catch obtained from gear combinations was minimal.

Highest losses from ring net fishing

The postharvest quality loss of fish catch was evaluated, and it was found that the quality loss percentage or the portion of the catch below Grade 1 averaged 60.3%. In the case of ring net fishing, 68% of the total catch was below Grade 1, indicating a high level of quality loss. In fact, among the eight

fishery harbours assessed, the highest percentage of quality loss was observed at sites where ring nets were used as the primary fishing gear. Similarly, 61% of the total catch from gillnet fishing was below Grade 1, which also resulted in a considerable quality loss. Conversely, the longline method yielded the smallest catch quantity of low-grade (28%) fish in the sample. Longline fishing has been found to yield the highest percentage of Grade 1 fish (72%), whereas the lowest percentage of Grade 4 and 5 (<1%) fish has been observed in the same type of fishing. This indicates that longline fishing may result in a lower quality loss compared to ring net fishing.

The outcomes of the study indicate that the approaches utilised in ring net fishing and the subsequent storage procedures may require reassessment and refinement to mitigate the extent of quality deterioration. Therefore, it is essential to handle and store fish appropriately to ensure that the highest possible proportion of fish is maintained in the Grade 1 category. This approach will help to minimise quality loss and increase the overall value of the catch.

When considering the overall quality loss across the three main gear types, the quality loss value percentage was found to be 15% in the sample. This highlights a significant economic loss resulting from fish quality deterioration in multiday fisheries in Sri Lanka, from the time of catch to unloading. In terms of quantity, the results of the assessment indicated that the total loss for the sample was 1.78%, and the primary cause of this loss was identified as predatory attacks during the harvesting process by multiday fishing vessels. These losses not only affect the economic viability of fisherfolk and traders but also have implications for food security, considering the importance of fish as a source of protein and essential nutrients for the Sri Lankan population.

Factors that contribute towards losses in fisheries

Multiple factors contribute to post-harvest losses in the fisheries sector of Sri Lanka, as highlighted by the survey. Despite the substantial quantity of ice brought on board in these Sri Lankan multiday fishing vessels, the study found that fish quality loss is still prevalent. This could be attributed to poor on-board handling techniques and inadequate insulation in fish holds, leading to the melting of ice. Additionally, extended fishing trips and high rates of ice melting can exacerbate the problem. These factors likely contribute to the inability to maintain the recommended 1:1 ice to fish ratio, and subsequently impact the quality of the fish caught.

Other key factors contributing to fish quality loss include extended soaking time in nets, prolonged fishing trip duration, inadequate fish handling equipment and facilities at fishery harbours and landing sites, inadequate infrastructure, including insufficient cold storage facilities, subpar preservation and processing facilities, limited knowledge on fish quality preservation, inadequate guidance for fishers, limited use of modern technologies in capture fisheries (such as low performance fishing gears), utilisation of low-quality inputs like contaminated water and ice, exceeding recommended fish storage levels, insufficient cold chain management during transportation, and inadequate enforcement of regulations. Additionally, the lack of appropriate transportation systems and poor market linkages were identified as other challenges leading to quality losses.

Fish auction center, Negombo fishery harbour, Sri Lanka

The fishing industry is a significant contributor to the Sri Lankan economy, employing over 500 000 people and generating approximately USD 250 million in foreign exchange earnings annually. Fish losses can significantly impact the industry's productivity, resulting in decreased revenue, job losses, and reduced foreign exchange earnings. It can also have several negative impacts on the fishing industry, the environment, public health, market price, and cause financial losses. Reduced customer satisfaction is another consequence of low-quality fish. Additionally, the industry's decline can have broader economic implications, such as food insecurity for the nation.

A multidimensional approach is needed

Addressing postharvest quality losses in the fisheries sector is crucial for promoting sustainable fisheries and ensuring food security in Sri Lanka. By reducing losses, the country can enhance the income and livelihoods of fisherfolk, reduce resource waste, and support the sustainable management of fish stocks. Furthermore, preserving fish quality and minimising spoilage contributes to the availability of nutritious seafood for local consumption and reduces the reliance on fish imports.

Therefore, it is crucial to take measures to reduce the loss of fish quality to avoid these consequences and ensure the sustainability of the fishing industry. After analysing the assessment findings, it became evident that a multi-stakeholder approach is necessary to address the identified challenges, and therefore a Multidimensional Solutions (MDS) strategy within the country is recommended. This

approach should combine suitable policies and regulations, the application of appropriate technologies, the enhancement of skills and knowledge, the development of infrastructure and services, the promotion of social and gender equity, and the creation of effective markets and linkages.

Based on the assessment findings, several recommendations are proposed to mitigate postharvest losses in the multiday fisheries sector. Investments in multiday fishing fleet development and infrastructure development, including the establishment of adequate cold storage facilities and improvement of transportation systems, are essential to maintain fish freshness and prevent spoilage. Implementing robust capacity-building programs targeted at fisherfolk, traders, and other relevant stakeholders is also crucial in mitigating quality losses. By equipping them with comprehensive knowledge and skills pertaining to proper handling, processing, and storage practices, significant advancements can be made in reducing losses throughout the supply chain. These capacity-building initiatives will empower individuals involved in the industry to adopt best practices and effectively preserve the quality and freshness of their products, thereby minimising waste and maximising economic returns.

In addition, facilitating market linkages and encouraging value-addition activities play a vital role in enhancing market access and minimising postharvest losses. By establishing strong connections between producers, traders, and consumers, market linkages enable smoother and more efficient distribution of products, reducing the chances of spoilage or waste. Furthermore, promoting value-addition activities such as processing, packaging, and branding, adds value to the products and expands their market potential. These activities not only enhance the marketability of the goods but also increase their shelf life, ensuring longer periods for selling and consumption. Thus, by actively fostering market linkages and promoting value addition, the overall resilience and profitability of the sector can be significantly improved while curbing postharvest quality losses.

In conclusion, by implementing recommended measures such as infrastructure development, capacity-building initiatives and market linkages, supported by enabling policies and regulatory environment, Sri Lanka can foster sustainable fisheries and maximise the efficient utilisation of its fish resources, benefiting both the economy and the well-being of its population. Given the significant challenges faced by the fishing industry in the country regarding fish quality loss, it is essential to address these issues through a collaborative approach involving all relevant stakeholders. This includes active participation and involvement from the government, fishers, processors, and the private sector. By collectively working towards improving fish quality and reducing quality loss, the industry and the economy as a whole can reap the benefits. Moreover, such efforts will have a positive impact on food security and contribute to the well-being of the Sri Lankan population.

Acknowledgement

This fish loss assessment in Sri Lanka is an activity under *Component 5: Enhance the sustainable utilization of fisheries and aquaculture products and its contribution to livelihoods and food security* of the global project "Responsible use of fisheries and aquaculture resources for sustainable development" funded by the Norwegian Agency for Development Cooperation (NORAD). It is being implemented by FAO in close collaboration with the National Aquatic Resources Research and Development Agency (NARA) in Sri Lanka. Further information on the project can be found at: https://www.fao.org/flw-in-fish-value-chains/projects/en/

Sujeewa Ariyawansa *is a Principal Scientist at the National Aquatic Resources Research and Development Agency (NARA), Sri Lanka. She has around 27 years of working experience in the field of fish post-harvest technology.*

Chandrani Pushpalatha *is the National Project Coordinator of Component 5 of the NORAD-funded GCP/GLO/352/NOR project on "Responsible Use of Fisheries and Aquaculture Resources for Sustainable Development". Prior to joining the project, she worked in the Aquaculture Development Authority of Sri Lanka as a Director (Extension). She has more than 28 years of working experience in the field of fisheries and aquaculture.*

Omar Riego Peñarubia *is a Fishery Officer (NFIMV) of the Food and Agriculture Organization of the United Nations. He is working on projects and programmes related to fish post-harvest processing and technology and food loss and wastes.*

Ansen Ward *is a Post-Harvest Fisheries Specialist working for the Food and Agriculture Organization of the United Nations. He has over thirty years of long and short-term assignment experience in fisheries development. He has wide-ranging experience in fish handling, processing, food safety, trade, value chain development, capacity development, research and policy guidance.*

MASS PRODUCTION OF SIS SEED TO PROMOTE NUTRITION-SENSITIVE INLAND AQUACULTURE IN ASIA

Sourabh K Dubey, Francois Rajts, Kalpajit Gogoi, Rashmi Ranjan Das and Ben Belton

Persistent malnutrition in Asia necessitates innovative solutions. This article explores the potential of nutrient-rich small indigenous fish species (SIS) to combat undernutrition and promote nutrition-sensitive aquaculture in South Asia. Integrating SIS into carp polyculture systems has great potential to increase the micronutrient productivity of traditional aquaculture, but, until very recently, a lack of techniques for hatchery-based mass production and distribution of SIS seed was a key bottleneck hampering the widespread adoption of SIS aquaculture. This article draws attention to significant new breakthroughs in hatchery-based seed production for multiple SIS in India, and their implications for scaling up nutrition-sensitive aquaculture throughout the region.

Mola carplet (Amblypharyngodon mola) (left) and Pool Barb (Puntius sophore) (right) are two popular and nutrient-dense SIS in India and Bangladesh

Undernutrition has been an enduring challenge throughout Asian history. Asia is home to more than two-thirds of the world's poor, and over 60% of its undernourished people[1]. Most of them are found in South Asia, where nearly half a billion people grapple with undernourishment and food insecurity. Micronutrient deficiencies, especially in vitamins A and D, iron, iodine, and zinc, are widespread in the region. Food-based interventions that enhance dietary quality and diversity to encourage greater consumption of nutrient-rich foods, and increased energy and macronutrient intake can play an important role in addressing this problem.

Small indigenous fish species (SIS) from freshwater ecosystems are an important part of the diets of many fish-dependent populations in South Asia. SIS possess an impressive reproductive capacity, characterised by short lifespans that enable them to multiply rapidly. Regarded as natural 'superfoods,' SIS often surpass larger farmed fish such as carps and tilapias in terms of their micronutrient composition. SIS sourced from capture fisheries were historically critical to food and nutrition security in these countries, but the diversity and abundance of SIS in Asia are now threatened by habitat degradation and conversions, introduction of exotic species, agricultural intensification, industrial pollution, and climate change. The increasing scarcity and rising prices of SIS have made them increasingly inaccessible for lower income people, depriving them of both nutrition and cultural significance.

Paradigm shift: harnessing aquatic foods to combat undernutrition

Despite their high nutritional value, SIS were once considered undesirable in aquaculture and often removed from ponds. However, integrating SIS into polyculture systems has proven to be a smart strategy in boosting overall pond productivity and micronutrient supply, without any reduction in yields of larger species such as carps and tilapia. Unfortunately, the commercial cultivation of SIS has been largely overlooked. The presently high market value of many formerly cheap

[1] *FAO and UNICEF. 2021. Asia and the Pacific – Regional Overview of Food Security and Nutrition 2021: Statistics and trends. Bangkok, FAO. https://doi.org/10.4060/cb7494en*

and abundant SIS provides new opportunities for farmers to produce SIS for profit that can be used to buy a more diverse diet, as well as for direct consumption by household members. The time is therefore ripe for scaling up SIS aquaculture, but a lack or reliable techniques for the mass production and distribution of SIS seed constitutes a significant impediment to scaling up nutrition-sensitive carp-SIS cultivation.

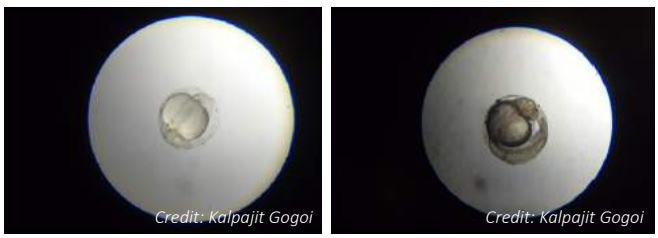
Expensive SIS (top) and cheap large farmed fish (bottom) on sale in a Bangladesh supermarket: the SIS sell for around three times more per kg than the tilapia

To overcome this critical technical bottleneck, WorldFish is implementing a project named "Taking Nutrition-Sensitive Carp-SIS Polyculture Technology to Scale" in India (2021-2024)[2]. The project is financially supported by the German Federal Ministry for Economic Cooperation and Development (BMZ). One of its central objectives is to develop easily scalable methodologies for the mass seed production of some important SIS through the standardisation of a hatchery-based breeding approach.

2 Project webpage: https://worldfishcenter.org/project/taking-nutrition-sensitive-carp-sis-polyculture-technology-scale

Pioneering potential: identifying ideal SIS candidates for mass production

The selection process for incorporating SIS into carp-based polyculture requires meticulous attention to factors such as nutrient composition, species compatibility, feeding and breeding behaviours, as well as harvesting techniques. The project primarily focused on developing hatchery-based breeding protocols for mola carplet *(Amblypharyngodon mola),* a most popular SIS in India and Bangladesh and considered as a champion species for nutrition-sensitive aquaculture. Mola is a primary consumer, eating phytoplankton, the base of the aquatic food web. Consequently, mola is among the cheapest fish to produce. It boasts elevated levels of essential nutrients like vitamin A, vitamin B12, iron, and calcium, which contribute to its significant market demand. While certain hatcheries have demonstrated successful captive breeding of mola, large-scale seed production has yet to be widely adopted.



Microscopic view of mola (left) and pool barb (right) early-staged hatchling

The other candidate species selected for mass seed production in this project are as follows:

(i) Pool Barb *(Puntius sophore):* Commonly referred to as 'puti' in South Asia, pool barb has a primarily herbivorous diet and contains high amounts of calcium and polyunsaturated fatty acids (PUFAs). Like the mola, achieving mass seed production for the pool barb remains challenging;

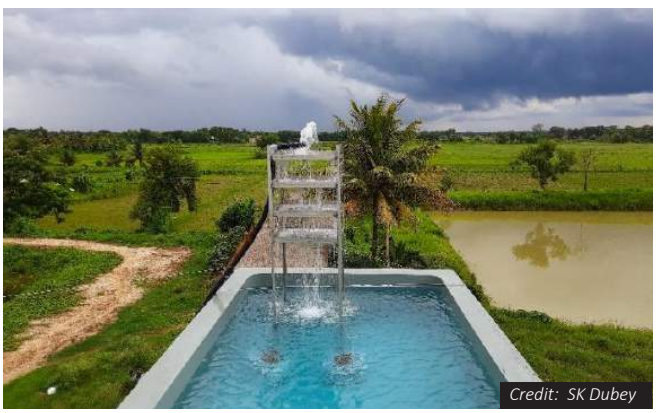
(ii) Reba Carp *(Cirrhinus reba):* Reba, a minor carp, sustains itself on plankton, detritus, and insect larvae. It has elevated levels of calcium, and vitamins A and D. Its unique flavour makes it highly demanded in the market. Although there have been instances of induced breeding, large-scale seed production for reba is still in the experimental stages; and

(iii) Tengara Catfish *(Mystus tengara)*: Tengara catfish feeds on zoobenthos and insect larvae and has high levels of calcium, selenium, and vitamin A. Induced breeding successes have been achieved with closely related species, but comprehensive seed production for the tengara catfish is still pending.

Recent innovations in SIS seed production and scalability

Mass production of SIS seed is difficult due to their small size and delicate nature, making conventional hatchery techniques inappropriate for large-scale production. Consequently, successful SIS breeding requires new methodologies and techniques. Recent research by WorldFish in India has overcome this bottleneck to develop comprehensive seed production protocols for several SIS, including mola and pool barb.

The technique developed combines hormone administration using synthetic GnRH analogue with environmental manipulation to stimulate seed production. For optimising mola breeding, a precise hormone dosage regimen has been devised, with males receiving 0.25 ml/kg of body weight and females receiving 0.5 ml/kg. Due to the high viscosity and minimal dosage required for SIS, the hormone dose is diluted 15 times. The inducing solution is introduced into the peritoneal cavity of mola broodfish using a 1 ml capacity insulin diabetic syringe with 40 graduations. For 1 kg of female mola brood, 8 ml of inducing solution (0.5 ml hormone + 7.5 ml 0.65% NaCl solution) is employed.



Aeration tower – a simple innovation of the project that solves the water quality problems in the hatchery

Custom-designed tanks, equipped with a dual hapa arrangement, are used for mola breeding. Continuous infusion of oxygen-rich water through an aeration tower improves breeding efficiency and the survival of larvae. Employing these methods has enabled partner hatcheries in Odisha and Assam to collectively produce nearly 10 million mola seeds and counting since July 2022. Depending on factors such as season, water temperature, and brooder maturity, the protocol allows 1.5-3.0 kg mature female mola brooders in a 1:2 female-to-male ratio to yield approximately 1 million hatchlings in a single batch. These are ready for the market within 3-4 days of hatching. To illustrate the mass seed production of mola through induced breeding, the project has formulated a straightforward 8-step practical guide for farmers[3]. Hatchery-produced seed can be conditioned and packed in clean well-oxygenated water before delivery to farmers, reducing mortalities during transport and stocking.

Applying a similar protocol with slight substrate modifications, the project achieved a second breakthrough by producing a substantial quantity of pool barb *(Puntius sophore)* seed in Assam. To initiate the reproductive cycle, male brooders were administered a hormone dose of 0.25 ml/kg of body weight, while females received 0.5 ml/kg. The eggs were then deposited into the substrate. This research protocol enabled the production of around 1 million hatchlings from 2.5-3.0 kg mature female pool barb in a 1:1 female-to-male ratio.

Following successes with mola and pool barb, the project has extended mass seed production techniques to reba carp *(Cirrhinus reba)* and tengara catfish *(Mystus tengara)*, employing similar hormonal doses. In the case of tengara catfish, the fertilised eggs exhibit high stickiness, while reba carp eggs are non-sticky and transparent. For tengara catfish, approximately 2.5 kg female brooders are required to yield 1 million hatchlings, while 2.5-3 kg mature female reba can produce the same quantity in a single batch.

The hatchery-based induced breeding protocol developed for multiple SIS within the project is straightforward, easily reproducible, and can be adopted by small-scale hatchery owners. The project is also currently experimenting with other nutrient-rich SIS, such as the flying barb *(Esomus danrica),* banded gourami *(Trichogaster fasciata)*, and dhela *(Osteobrama cotio)*, with the development of breeding protocols underway.

Nurturing future success: the vital role of broodstock and nursery rearing methods

Rearing and maintenance of broodstock play a pivotal role in the induced breeding of SIS. Maintaining brood under conditions of optimal stocking density and water quality, and providing protein-rich supplementary feed are imperative to ensure a supply of healthy and fecund brood fish. When collecting SIS broodstock from the wild, it is preferable to source from multiple places within the same watershed, particularly from sizeable permanent water bodies. Most SIS are renowned for their prolific breeding tendencies, making it vital to segregate males and females to avert spontaneous breeding.

[3] *Gogoi K, Rajts F, Das RR, Dubey SK, Padiyar A, Rajendran S, Belton B and Mohan CV. 2023. Induced breeding of mola carplet (Amblypharyngodon mola) for mass seed production: A practical guideline. Penang, Malaysia: WorldFish. Guideline: 2023-23. https://hdl.handle.net/20.500.12348/5552*

One-month-old mola (left) and Reba carp fry (right) after successful nursery rearing

Successful nursing of SIS fry hinges upon multiple factors, including pond preparation, the introduction of selectively cultured plankton in nursery ponds, and maintenance of appropriate stocking densities. During the initial 3-4 days of nursery rearing, hatchlings require an abundant supply of small zooplankton, primarily consisting of protozoans and rotifers. Mola hatchlings are particularly susceptible to predation from copepods and certain insects and insect larvae, such as backswimmers and dragonfly larvae. Therefore, management strategies must be implemented to selectively eliminate harmful zooplankton while fostering the growth of beneficial protozoans and rotifers.

To curb copepod predation during stocking, introducing hatchlings into nursery ponds within 3-4 days of water filling is recommended. During the initial rearing stages, hatchlings should be fed microencapsulated chicken eggs. Daily organic fertilisation using mustard oil cake is crucial for maintaining a stable plankton population. To counteract disease outbreaks due to plankton shortages, it is advisable to harvest the fry after three weeks of culture. Subsequently, they can be stocked in a carp polyculture grow-out pond at a rate of 5-10 individuals per square metre. In order to disseminate knowledge, the project has developed a simple guideline on nursery rearing of mola seed and stocking protocols into polyculture ponds[4].

From knowledge to action: dissemination and capacity building for expansive impact

Efforts to propagate mola seed distribution and catalyse carp-mola polyculture have gained momentum through strategic collaboration with private sector partner hatcheries. These hatcheries have undertaken the role of marketing and supplying mola seed to a diverse range of beneficiaries, including local farmers, women self-help groups, and indigenous seed growers. Notably, the hatchery based in

For the first time in India, hatchery produced mola seed was sold from Odisha

Oxygen-packed mola seed bag with clean and oxygenated water reduces stress and increases survival during transportation

The project's partner hatchery from Odisha supplied 400 000 mola seed to Goa state through cargo flight in August 2023

Odisha has achieved remarkable success by selling 2.5 million mola hatchlings and 100 000 mola fry, adopting a pricing scheme aligned with carp rates up to August 2023.

Illustrating the tangible impact of these initiatives, consider the example of Asish Kumar Nayak. As a small-scale carp farmer, Nayak took the proactive step of stocking 200 000 mola hatchlings into his homestead pond (three acres) during the previous year. In a span of twelve months, nearly 50 kg of mola catered to his household's consumption. Further, Nayak capitalised on his success by selling close to 200 kg at the farmgate, commanding an average selling price of 160 INR per kilogram. Furthermore, with an estimated surplus of 200 kg still thriving within his pond, Nayak's success story continues to unfold.

Concurrently, the project has orchestrated hands-on training sessions on SIS induced breeding. These training programs have successfully engaged hatchery owners, seed cultivators, farmers, government officials, and researchers. The resulting outcomes are manifold. Besides providing direct training on SIS induced breeding, it strengthens partnership and cooperation between the Department of Fisheries and solidifies the government's commitment to actively participate in the Scaling-SIS project. This approach increases awareness of the availability of mola seed from partner hatcheries as well as shares insights regarding mola seed production

[4] *WorldFish (2022). Stocking of hatchery produced mola seed (Amblypharyngodon mola): A guideline for farmers. https://worldfishcenter.org/sites/default/files/2022 10/Mola%20seed%20stocking%20guideline_English_0.pdf*

and farming techniques through local media outlets. Furthermore, this approach facilitates interaction between farmers and government representatives. By capitalising on this two-way exchange, the project amalgamates information dissemination, capacity development, and community engagement into a cohesive strategy to promote nutrition-sensitive aquaculture.

Empowering change: Government's indispensable role in scaling nutrition-sensitive aquaculture

The pivotal role of government commitment cannot be overstated when it comes to elevating public awareness about the importance of nutrition-sensitive approaches. Governments can wield a transformative influence by championing and disseminating these innovative practices. A prime example of this synergy is evident in WorldFish's successful advocacy, which has led to policy shifts within the State administrations of Odisha and Assam. This advocacy has paved the way for the adoption of nutrition-sensitive carp-mola polyculture on a substantial scale across both states. These policies will stimulate a growing demand for mola seed among those who are embracing the government-endorsed carp-mola polyculture program. The surge in demand underscores the need for a robust supply chain of SIS seed to support the expanding adoption of this approach.

Asish Kumar Nayek sold 200 kg mola in the past year and consumed 50 kg to cater to the dietary needs of his household

The project conducted different batches of on-farm training sessions with significant numbers of women participants

The project trained government officers and researchers on SIS induced breeding for large-scale dissemination of the technology

Furthermore, the synergy of a proactive bureaucracy with a grassroots, bottom-up approach is quintessential for the effective scaling and sustainable maintenance of this innovative practice. By focusing on both income enhancement and nutritional enrichment, this strategy is poised to usher in a new era of aquaculture practices that align with contemporary dietary requirements and economic aspirations.

Note: *This project is funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) commissioned by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) through the Fund International Agricultural Research (FIA).*

Dr Sourabh K Dubey *is a Project Coordinator at WorldFish India.*

Francois Rajts *is a Consultant at WorldFish.*

Kalpajit Gogoi *is a Technical Coordinator at WorldFish India.*

Dr Ben Belton *is a Research Fellow with the International Food Policy Research Institute in Dhaka, Bangladesh, and Associate Professor with the Department of Agricultural, Food and Resource Economics, Michigan State University, USA.*

Rashmi Ranjan Das *is a Technical Coordinator at WorldFish India.*

FISH INFOnetwork NEWS

INFOPESCA • INFOFISH • INFOPECHE • INFOSAMAK • EUROFISH • INFOYU

https://www.fao.org/in-action/globefish/background/fishinfonetwork/en/

EUROFISH

EUROFISH INVITES DELEGATES FROM ITS MEMBER COUNTRIES TO ATTEND WEFTA

The 51st Conference of the Western European Fish Technologists Association (WEFTA) will be held on 16-20 October 2023 in Copenhagen, Denmark. The association is a network of universities and organisations from 17 European countries that work within fisheries and aquaculture focusing on seafood technology, fish processing, safety and quality; and the health benefits of seafood consumption, among other topics.

The conference is held annually and is a valuable occasion for scientists, students, and the seafood industry to meet and present recent research achievements and to share experiences. The theme for this year's event "Sustainable utilization of aquatic resources—changing the way we Seafood" will be addressed through six research topics including sustainable aquaculture and its link to seafood quality; micro and macroalgae and their applications in food; exploiting side streams from food and non-food production to reach zero waste production; safety and authenticity; processing and quality of seafood; and consumer attitudes, societal challenges and seafood products.

The conference is organised jointly by DTU (Technical University of Denmark), Royal Greenland, and WEFTA, and because it is being held in Copenhagen, Eurofish is inviting representatives from its member countries to participate in the event. In addition, Marco Frederiksen, the Eurofish director, is a DTU alumnus and gave his first international presentation at a WEFTA conference many years ago. For the Eurofish member countries, the conference offers an opportunity to learn about the latest research in several topics in which they are deeply interested. For more information about the conference, visit https://wefta2023.com/.

INFOPESCA

GRENADA'S PRODUCE CHEMIST LABORATORY RECEIVES EQUIPMENT TO STRENGTHEN THE CAPACITY OF THE FISHERIES AND AQUACULTURE SECTOR

INFOPESCA is participating as a service provider in the 11th European Development Fund (EDF) Sanitary and Phytosanitary (SPS) Measures Project, funded by the European Union, which seeks to increase compliance by CARIFORUM countries with international SPS measures, standards, and procedures to improve international and regional market access. Under this framework, one important component of the project aims to build the SPS capacity of the fisheries sector, and ensure the safety of fish and fisheries products.

This project started two years ago with a first stage which involved a process of interviews to identify laboratories for receiving training and technical assistance to improve their monitoring and testing capabilities, and also purchasing needed equipment. One of the selected laboratories was the Produce Chemist Laboratory of Grenada, which, on June 7th, hosted a ceremony to hand over the equipment.

According to media releases, Mr. Gregg Rawlins, IICA Representative in the Eastern Caribbean States (ECS), highlighted that the equipment will contribute to strengthening the national food safety testing capacity to ensure that fisheries products fulfill high standards with respect to hygiene and consumer safety. "Ultimately, this will contribute to Grenada meeting the SPS requirements for regional and international trade."

Meanwhile, the Caribbean Regional Fisheries Mechanism (CRFM), which is implementing the Fisheries component of this Project, was represented by Dr. Sandra Grant, Deputy Executive Director of Secretariat. Dr. Grant stated, "The CRFM welcomes the contributions of the project to strengthen the Grenada Produce Chemist Laboratory's capacity to analyse food, water, and environmental samples, which is essential for environmental monitoring and residue testing for the fisheries and aquaculture sector. SPS compliance in this sector is crucial, and improvements like these help us to ensure food safety and advance marketing and trade of fish and fisheries products. Given the mandate by the CARICOM Heads of Government to reduce the region's food import bill by 25% by 2025, this investment also promises to bolster intra-regional trade."

The Chief Analytical Chemist, Grenada Produce Chemist Laboratory, Mr. Erwin Henry, further reiterated thanks on behalf of the Laboratory for the equipment received and highlighted the potential impact this intervention will have on improving export capacity in Grenada.

Note 1: Grenada's fisheries sector is a major source of employment and income and a significant contributor to food supply and food security, as well as a key foreign exchange earner. It contributes more than 30% to agricultural output. In order to expand its global fish and fisheries product market share, exporters must meet stringent international food safety standards to ensure that their exports are not only safe for consumption but also free from harmful microbial and heavy metal contamination.

Note 2: INFOPESCA executed training sessions providing guidance/recommendations, first to laboratory staff and then to different stakeholders of the selected countries focused on the requirements to export seafood to the EU. The training concentrated on those fisheries products that are actually exported and those products, such as value-added fishery products, that might have potential for export to that market. The project now continues with the

FISH INFOnetwork NEWS

INFOPESCA • INFOFISH • INFOPECHE • INFOSAMAK • EUROFISH • INFOYU

https://www.fao.org/in-action/globefish/background/fishinfonetwork/en/

installation of the equipment in the two selected laboratories (the other one is from Belize) and training by the company in terms of calibration and use.

Additional information: www.edfspscariforum.online/media/media-releases

Handing over of Laboratory Equipment, from left: Erwin Henry, Chief Analytical Chemist, Grenada Produce Chemist Laboratory; Aaron Francois, Permanent Secretary, Ministry of Agriculture and Lands, Fisheries & Cooperatives, Government of Grenada and Gregory Delsol, Technical Specialist, IICA Grenada Delegation

Gregg Rawlins, IICA Representative in the Eastern Caribbean States (ECS), IICA Delegation in Saint Lucia, delivered opening remarks at the equipment handover ceremony

Virtual attendance to the ceremony

The Microwave Sample Digestion System

INFOFISH

TAB 2023: THE 36TH INFOFISH TECHNICAL AND ADVISORY BOARD MEETING 2023

The 36th INFOFISH Technical and Advisory Board Meeting (TAB 2023) was successfully held from 11 to 14 July 2023 at Jazz Hotel, Penang, Malaysia as a hybrid event. The 3-day meeting was chaired by Hajah Zarina binti Abd Latiff, Director of the Fish Landing Regulations and Enforcement Division of the Fisheries Development Authority of Malaysia (LKIM). The TAB 2023 had participation from ten INFOFISH Member Countries, with Fiji, Philippines, Malaysia and Papua New Guinea as physical attendees while Bangladesh, Cambodia, Maldives, Pakistan, Sri Lanka and Thailand were present as virtual delegations. The Board advises the Governing Council on all technical and economic aspects of INFOFISH activities.

The Opening Address was delivered by Hajah Zarina binti Abd Latiff in her capacity as Acting Deputy Director General of LKIM on behalf of Malaysia as the host country of the meeting.

Hajah Zarina said that Malaysia has a sophisticated National Agrofood Policy, 2021-2030 (NAP 2.0) which focuses on fishermen's livelihoods, enhancing productivity with technology and modernisation, as well as strengthening its commitment and cooperation with the private sector and industries, in order to sustain food security, as well as boost economic growth in the fisheries sector in the near future. She expressed hope for continuous cooperation between all stakeholders in order to enhance global fisheries, and with the strong involvement of INFOFISH Member Countries.

A field trip visit was organised for the delegates on the second day of the meeting to the Centre for Marine & Coastal Studies (CEMACS) and WorldFish Headquarters. CEMACS is one of the research and training centres belonging to the University of Science Malaysia, one of the top public universities in the country, which is focusing on biodiversity and conservation of marine ecosystems, coastal forest ecosystems, mariculture, and marine mammal ecology.

Field visit to Centre for Marine & Coastal Studies (CEMACS, Penang

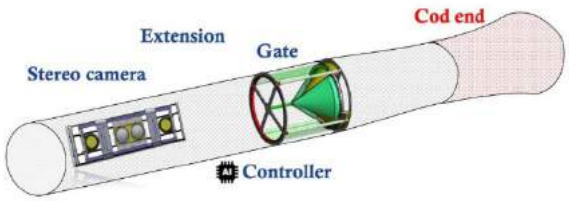
On the last day, a short visit was organised to a fish feed miller on special request by Papua New Guinea delegates. The visit was to the Green Islands Feed Mills' operational factory and facilities located at Seberang Perai, Penang.

Delegates visted the operational factory and facilities of the Green Islands Feed Mills in Penang.

AI TECHNOLOGY FOR THE OCEAN

AI is assisting scientists in many ways, such as the collection of ocean data and discovery of new insights to create solutions to sustainable fishing, saving coral reefs, helping to reduce plastic dumping and bycatches, as well as identify and track marine species. In this issue of the INFOFISH International, we present details on some of the innovative uses and applications of AI in keeping our oceans safe and productive.

Preventing marine bycatch



The Smartrawl is currently undergoing trials at sea

Credit: SVS

An underwater robotic sorting device which helps fishing trawlers prevent bycatch by identifying and sizing fish and other marine life in real-time is being developed by researchers from Heriot-Watt University in partnership with Fisheries Innovation & Sustainability (FIS) and funded by the UK Seafood Innovation Fund.

Smartrawl uses AI-technology to determine the individual size and species of marine life captured inside a trawl net using images taken by an underwater stereo camera. It then releases or retains each marine animal depending on whether it qualifies against a trawler's intended catch using a computer-controlled robotic gate.

The sorting device is able to fit into existing nets of all sizes of vessels and requires no additional cables due to the device's patented gate system which works with the force of the water to rotate between open and closed states. Fishers will be able to programme trawls to catch specific marine animals according to their size and species, market conditions and allotted quotas, resulting in no discards or bycatch.

Paul Fernandes, the inventor of Smartrawl, is scientific lead for the project. He is a professor of fisheries science and technology at the Lyell Centre and Heriot-Watt Bicentennial Research Leader. He said: "Current methods used on trawlers are unable to distinguish between different species and animals or give skippers enough information to build an accurate understanding of the size of individual fish prior to capture."

Ocean information platform for aquaculture

A collaboration between two AI technology companies (Cognizant and Tidal) aims to develop an ocean information platform for use in aquaculture. In brief, Tidal has developed a digital technology solution that utilises innovations in underwater perception, machine learning, AI, and automation to gather and analyse data. Cognizant will use its software and systems integration expertise to bring the Tidal platform to the broader aquaculture market.

Longer term, Cognizant and Tidal will explore additional ways to apply the platform to make an impact on industries that depend on ocean insights, including blue transportation; blue energy, and blue carbon. Together with aquaculture, part of blue food, these sectors of the blue economy represent a significant opportunity to decarbonize large ocean-based industries. This collaboration focuses on sustainable solutions that create business opportunities for companies that are dependent on a healthy ocean.

Data science to protect coral reefs in Micronesia

Coral reefs are essential to the survival of marine life, and for the people of Micronesia, they are a crucial resource that supports their economy and way of life. However, they are increasingly threatened by climate change. As the ocean warms due to global warming, reefs are experiencing more heat waves that cause coral bleaching.

The Reef Monitoring App helps to monitor coral reefs

Credit: Appsilon

The Micronesia Challenge, a conservation initiative created to mitigate these negative impacts, was started by local leaders of five island nations of Micronesia, who made a commitment to conserving at least 50 percent of their local marine resources by 2030. They embarked on the mission to set up a widespread Reef Monitoring Network to keep a close eye on the health of their local coral reefs. To do that effectively and see if their conservation efforts are working, they needed two things – a standardised system for data collection and an analytical tool, which would provide quick and easy access to data; hence the development of a Micronesia Reef Monitoring App by the University of Guam in cooperation with Polish data analytics company Appsilon.

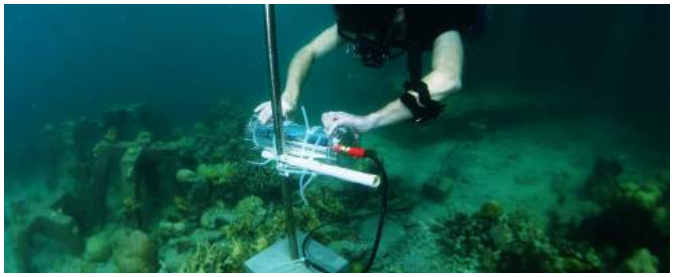
The Micronesia Reef Monitoring App shows details on the number and types of fishes that inhabit certain sites and allows users to look at changes over time and comparisons with other locations, including analysing how well management measures (e.g. fishing restrictions in protected areas) perform. It displays complex sets of data in an easy-to-understand way, informing conservation efforts. It also helps spot potential issues endangering local coral reefs. It is a unified, safe, and accessible platform to hold the growing regional datasets, gathered by hundreds of people within the Micronesia Reef Monitoring Network.

CORail

In similar fashion to the Micronesia Reef Monitoring App mentioned above, Accenture, Intel and the Philippines-base Sulubaaï Environmental Foundation developed a solution in 2019 called CORaiL, powered by artificial intelligence (AI) to monitor, characterise and analyse coral reef resiliency.

Engineers from the three organisations implemented an artificial, concrete reef — called a Sulu-Reef Prosthesis (SRP) — to provide support for unstable coral fragments underwater. The SRP was designed by Sulubaaï and placed in the reef surrounding the

Pangatalan Island in the Philippines. Fragments of living coral were planted on it and will grow and expand, providing a hybrid habitat for fish and marine life.



The underwater camera detects, photographs and classifies reef fish

The engineers then placed intelligent underwater video cameras, equipped with the Accenture Applied Intelligence Video Analytics Services Platform (VASP), to detect and photograph fish as they pass by. VASP uses AI, powered by Intel Xeon, Intel FPGA Programmable Acceleration Cards and Intel Movidius VPU, to count and classify the marine life. The data is then sent to a surface dashboard, providing analytics and trends to researchers on the ground in real-time, enabling them to make data-driven decisions that will help the reef progress.

Cleaning up the oceans

Ocean Cleanup is a non-profit organisation which uses AI tools to help clean oceans by extracting plastic pollution. The fundamental challenge of cleaning up the ocean garbage patches is that the plastic pollution is highly diluted, spanning millions of square kilometers. The Ocean Cleanup solution is designed to first concentrate the plastic in a limited area for removal.

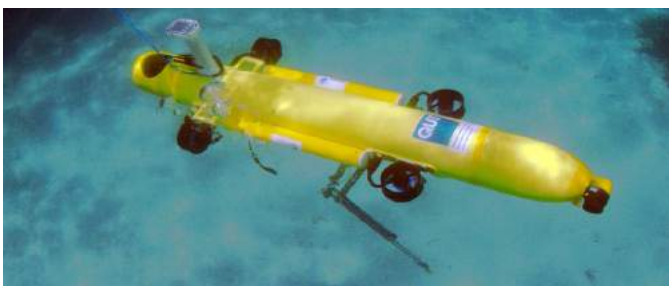
Credit: Ocean Cleanup

In brief, circulating currents in oceanic garbage patches move the plastic around, creating natural ever-shifting hotspots of higher concentration. Computational modelling predicts where these garbage hotspots are, which makes it easy to place the cleanup systems in these areas. The system is comprised of a long U-shaped barrier that guides the plastic into a retention zone at its far end. After fleets of systems are deployed into every ocean gyre, combined with source reduction, the Ocean Cleanup projects are expected to be able to remove 90% of floating ocean plastic by 2040.

Underwater robots have become more sophisticated

Simple underwater drones with cameras have given way to sophisticated autonomous underwater vehicles, or AUVs that can operate independently of a pilot, carrying out tasks as needed. They inspect ships, repair underwater structures, map the oceans, perform scientific research, and even clean up oil spills, controlled by high speed internet controls and autonomous navigation with minimal human input. AI allows robots to solve problems with programmed logic, for example instead of returning an error, an AI-powered machine would look for causes and solutions to that error.

Examples of underwater robots include the soft robotic fish (SoFi) developed by MIT researchers as a potentially powerful tool to study ocean life; the Robot Jellyfish developed by Florida Atlantic University (FAU) and the U.S. Office of Naval Research scientists, the WasteShark that can eat up to 15.6 tons of waste debris in the ocean each year, developed by RanMarine; and the COTSbot, an autonomous underwater drone developed by Queensland University of Technology (QUT) to kill destructive starfish in the Great Barrier Reef off the north-east coast of Australia.



The features of the COTSbot (Crown-Of-Thorns Starfish robot) include real-time and on-board automated image-based detection of COTS, autonomous injection of bile salts into detected COTS, and autonomous navigation within shallow coral reefs.

Deepsea ocean exploration

No review of AI and Cloud technology could be complete without mentioning Microsoft. One of the many ways in which Microsoft is involved in understanding and protecting the oceans is through its "AI for Earth" initiative launched in 2017. The program empowers individuals and organisations to develop innovative solutions to the way Earth's natural systems are monitored, modelled, and ultimately managed, by using grants, technology, and access to data.

AI for Earth has partnered with Columbia University and Queens College to support the analysis of data from the Oceans Observatories Initiative (OOI). Paired with Pangeo's big data analysis and cloud-based solutions from Microsoft Azure, OOICloud gives oceanographers, scientists, and educational institutions access to vast datasets which will help improve our understanding and management of the oceans and help address climate change.

A hydrothermal vent in the Atlantic *Credit: OOICloud*

AQUACULTURE: AUTOMATED OYSTER FARMING

Rolling system controls emergence/ immersion cycles

A new French startup called Seaducer has developed the Roll'Oyster system, which it says is a low-maintenance, automated and energy-efficient way to farm oysters in sheltered coastal areas. The system aims to improve the quality and survival rate of pre-fattened oysters as they reach market size. As its name suggests, it is a rolling automated system which can be programmed to alter the duration and frequency of emergence/immersion cycles.

It artificially reproduces tides, wind and currents while alternatively submerging and rising the oyster baskets. Each module contains 16 oyster baskets, with a maximum capacity of 10 kg each. The technology can also be combined with other tools to create an overall automated system. These include remote connection, a sustainable energy source (solar panels), oxygen and temperature sensors, anemometer, air-lifts and paddle wheels that generate water movement and recirculation to provide better water quality and stability.

All of these technologies can be regulated from the air-room, which is a small structure – 120 x 80 x 70 cm – located besides the pond that can be controlled remotely. One air-room can control 16 Roll'Oyster modules – ie 256 oyster baskets, or 2.5 tonnes of oysters per cycle. France is the world's fifth producer of oysters behind China, Korea, Japan and the USA.

Further information: https://seaducer.fr/seaducer_en-version/

Flip 'N' Grow

An Australian company, Zapco Aquaculture, has created the first cost-effective commercially available floating mesh bag system designed for farming of single seeded oysters. Each 6-bag cage is manufactured using 95% environmentally friendly marine grade re-compounded recycled material, and is easily assembled in 10 to 15 minutes.

Further information: https://www.zapcoaquaculture.com/

PROCESSING: CANNING & PEELING

Complete canning lines

Hermasa, with more than 30 years of experience behind it, is offering complete semi-automatic and automatic processing lines for sardine and tuna, from preparation to packing and including addition of oils and seasoning.

(Above) This stage is for cleaning the cooked product, elimination of skin, bones and dark parts of the fish. (Below) The product is fed into the automatic Tunipack machine for canning.

The Tunipack is marketed as the fastest and most popular tuna canning machine in the world, its Density Control system allowing it to adjust the product weight in each can to automate the process. The canner also allows for different can heights without having to modify the format.

Further information: https://hermasa.com/en/

Shrimp peeling expert

Since 1955, Gregor Jonsson has built up a name for peeling shrimp of all kinds and species: warm water shrimp, wild or pond raised, fresh or thawed. Jonsson machines automatically adjust to each shrimp, gently peeling and deveining it in the style selected. Each shrimp is held by a clamp, the shell is cut and vein removed, pins pull the shrimp from the shell, the peeled shrimp are deposited in one location, and the clean shell is then discharged elsewhere.

The machines also adjust to the sizes of the shrimp, from as large as 10 counts (10 shrimp per pound) to as small as 71/90 counts. The company says that a single Jonsson machine can peel up to 6,000 shrimp per hour.

Further information: https://jonsson.com/

PACKAGING: SOME GREEN OPTIONS

The choice of packaging for seafood is continually evolving with rising industry demand for options which are environmentally-friendly, low carbon emission, recyclable, and biodegradable. Most wholesalers and retailers in Europe, for example, are ultimately aiming for net-zero carbon emissions, in line with the European Green Deal. In the aquaculture sector, the most important contributors to the carbon footprint are feed ingredients and energy usage. In the fisheries sector, the biggest contributors are the fuel used by fishing vessels and the energy used to freeze or cool the fish on board the vessel. For processors and traders, it is the energy used by plant machinery and to transport the fish to clients.

Some environmentally-friendly packaging options are depicted below:

Credit: Stora Enso (Sweden)

EcoFishBox™ – a climate-friendly and leak proof packaging alternative for fish and shellfish

Credit: Solidus (The Netherlands)

Modified Atmosphere Packaging (MAP) solution) from paper-based materials

Credit: Sway (USA)

Packaging made from seaweed from which the polymers are extracted and blended with renewable starches and sugars. After use, the packaging can be composted

Credit: Notpla (UK)

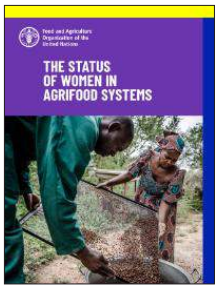
These packaging solutions use Notpla, a non-chemically modified, polysaccharide-based material made from seaweed and plants that disappears naturally

Credit: Go Green (USA)

Go Green polypropylene trays have a reduced carbon footprint compared to conventional thermoforming

Credit: Ranpack (USA)

Paper is one of the most easy to recycle of all sustainable packaging materials. These are recyclable and biodegradable packaging



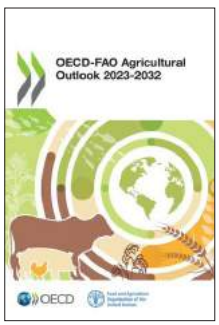
FAO. 2023. The status of women in agrifood systems. Rome.

The Status of Women in Agrifood Systems report uses extensive new data and analyses to provide a comprehensive picture of women's participation, benefits, and challenges they face working in agrifood systems globally. The report shows how increasing women's empowerment and gender equality in agrifood systems enhances women's well-being and the well-being of their households, creating opportunities for economic growth, greater incomes, productivity and resilience.

The report comes more than a decade after the publication of *The State of Food and Agriculture (SOFA) 2010–11: Women in agriculture – Closing the gender gap for development.* SOFA 2010–11 documented the tremendous costs of gender inequality not only for women but also for agriculture and the broader economy and society, making the business case for closing existing gender gaps in accessing agricultural assets, inputs and services. Moving beyond agriculture, the status of women in agrifood systems reflects not only on how gender equality and women's empowerment are central to the transition towards sustainable and resilient agrifood systems but also on how the transformation of agrifood systems can contribute to gender equality and women's empowerment.

It provides a comprehensive analysis of the available evidence on gender equality and women's empowerment in agrifood systems that has been produced over the last decade. The report also provides policymakers and development actors with an extensive review of what has worked, highlighting the promise of moving from closing specific gender gaps towards the adoption of gender-transformative approaches that explicitly address the formal and informal structural constraints to equality. It concludes with specific recommendations on the way forward.

The publication can be downloaded at no cost at: https://doi.org/10.4060/cc5343en



OECD/FAO (2023), OECD-FAO Agricultural Outlook 2023-2032, OECD Publishing, Paris

The OECD-FAO Agricultural Outlook 2023-2032 provides an assessment of the ten-year prospects for agricultural commodity and fish markets at national, regional, and global levels in a context of continued economic risks, uncertainty, and high energy prices. The report is a collaborative effort between the OECD and FAO, prepared with inputs from Member countries and international commodity organisations. This year's Outlook provides improved estimates for food consumption by incorporating analytical methods to calculate food loss and waste. They contribute to the measurement efforts needed to devise evidence-based policies in support of the SDG 12.3 target to halve per capita food waste at the retail and consumer levels, and to reduce food losses within production and supply chains by 2030.

The medium-term projections in the Outlook are based on the assumption that current policies will remain in place, and that consumer preferences and production technology will evolve on-trend. These assumptions are subject to uncertainties with respect to environmental, social, geopolitical and economic developments, e.g. a prolonged period of high inflation or a global recession would alter the projections. The scenario analysis presented in this report provides indications as to the magnitude of such impacts.

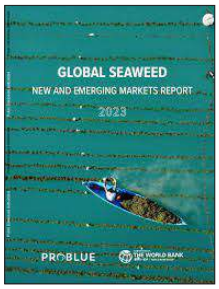
The publication can be downloaded at no cost at: https://doi.org/10.1787/08801ab7-en

LEAN MANAGEMENT IN AQUACULTURE: A PRACTICAL GUIDE FOR SMALLHOLDER FISH FARMERS

Lawrence TK, Steensma JT, Oyebola OO, Akuwa EI, Rhea CL, Subasinghe RP, Nukpezah J and Siriwardena SN. 2023. Lean management in aquaculture: A practical guide for smallholder fish farmers. Penang, Malaysia: WorldFish. Manual: 2023-18.

Lean management is a powerful approach that can significantly benefit the aquaculture industry. By minimizing waste and maximizing value, businesses can improve the quality of their products and increase their profits while reducing their environmental impact. The practical guide will help solve the problem of inefficient processes, wasteful practices and low profitability in your aquaculture business.

The publication can be downloaded at no cost from: https://hdl.handle.net/20.500.12348/5551



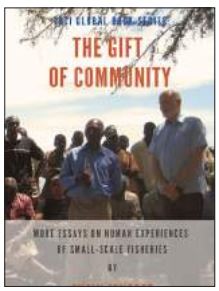
GLOBAL SEAWEED: NEW AND EMERGING MARKETS REPORT 2023

The Global Seaweed New and Emerging Markets Report 2023 provides an analysis of the commercial opportunities for new high-growth seaweed market applications that could increase the scale of seaweed cultivation and enhance value-added seaweed processing. The report assesses realism and readiness-to-scale of technologies needed to grow more seaweed, extract increasingly valuable compounds, and create quality products for a range of markets. It assesses the potential for the industry to provide optimal socioeconomic and environmental benefits and guide entrepreneurs, investors, and policy makers towards ensuring the seaweed sect or fulfills its potential now and into the future.

The report focuses on 10 relatively new and emerging seaweed applications that have the greatest market opportunities outside the established agar, alginate, carrageenan, food and aquaculture feed sectors. It examines the ecosystem service side of the seaweed sector, providing case studies from emerging projects, along with predictions relating to whether – and how – these services could one day be monetized.

Information was gathered through interviews with key players in the sector, supported by scientific literature and market data. The interviews covered a range of topics including the applications that present the greatest opportunities for seaweed; when seaweed-based products are likely to become cost-competitive; and the challenges the seaweed sector needs to overcome.

The publication can be downloaded at no cost from: *https://drive.google.com/file/d/1xC3m7hkaOV3YTSL3LU-eC1pPdjmNHu53/view?usp=drive_web*



THE GIFT OF COMMUNITY: MORE ESSAYS ON HUMAN EXPERIENCES OF SMALL-SCALE FISHERIES

Svein Jentoft. 2023. The Gift of Community: More Essays on Human Experiences of Small-Scale Fisheries. TBTI Global Publication Series, St. John's, NL,Canada.

This book is a follow up, or a continuation rather, of the one I published by the author in 2019 as part of the Too Big To Ignore (TBTI) Global Book Series, titled 'Life Above Water: Essays on Human Experiences of Small-Scale Fisheries'. The design and purpose of the current book are the same. All chapters focus on small-scale fisheries as a socio-economic and cultural activity, as a social scientist would write them. Small-scale fisheries are all those things, and they are intricately connected and played out in a community setting. The aim of the book is to explain how they come together and must be seen as a whole. The author discusses what this means for the way small-scale fisheries work and how they must be governed.

This e-publication can be downloaded at no cost from: *https://tbtiglobal.net/wp-content/uploads/2023/06/The-Gift-of-Community_S.-Jentoft_TBTI_s.pdf*

LEGAL FRAMEWORKS FOR SUSTAINABLE AQUACULTURE

FAO. 2023. Legal frameworks for sustainable aquaculture. FAO Legislative Study No. 117. Rome.

The aim of this study is to identify the essential elements of a legal framework for sustainable aquaculture. For the fact is that in many countries the growth of aquaculture appears to have outpaced the development of the legislation and legal frameworks to govern aquaculture (FAO, 2020b).

This study is intended both to act as a guide to the complexity of legal frameworks for aquaculture and also to serve as the background or resource document for the "Aquaculture Legal Assessment and Revision Tool" (ALART). The ALART has been developed as a detailed analytical tool for systematically assessing national legal frameworks for aquaculture in order to identify potential gaps, weaknesses and issues for possible reform with a particular focus on environmental protection and animal and plant health. The ALART is intended to be universally applicable while at the same time recognizing that the style and form of legislation varies from country to country depending on legal tradition.

This publication can be downloaded at no cost from: *https://doi.org/10.4060/cc6018en*

2023

SEPTEMBER

6-7
Pacific Tuna Forum (PTF)
Port Moresby, Papua New Guinea
http://infofish.org

11-13
Seafood Expo Asia (SEA)
Singapore
https://www.seafoodexpo.com/asia/

14-15
ANFACO TUNA CONFERENCE
Vigo, Spain
https://anfaco.es/eventos/

15-17
China International Guangzhou Fishery and Seafood Exposition 2023
Guangzhou, China
http://www.chinafishex.com/?lang=en

18-21
Aquaculture Europe
Vienna, Austria
http://www.marevent.com/AE23_VIENNA.html

27-29
VI GLOBAL FISHERY FORUM & SEAFOOD EXPO RUSSIA
Saint Petersburg, Russia
https://seafoodexporussia.com/en/

OCTOBER

3-5
24th INTERNATIONAL FROZEN SEAFOOD EXHIBITION
Vigo, Spain
https://www.conxemar.com/en/feria-2023/

10-12
DANFISH International
Aalborg, Denmark
https://danfish.com/en/

25-27
CHINA FISHERIES & SEAFOOD EXPO
Qingdao, China
https://chinaseafoodexpo.com/

NOVEMBER

1-3
BUSAN INTERNATIONAL SEAFOOD & FISHERIES EXPO
Busan, Republic of Korea
https://seafoodshowasia.com/

7-8
CANADIAN SEAFOOD SHOW
Montreal, Canada
https://seafoodshowmontreal.ca/?lang=en#top

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

DECEMBER

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

2024

FEBRUARY

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

MAY

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

EDITORIALPLAN 2023

INFOFISH

ISSUE	SMALL-SCALE SECTOR	FISHERIES & AQUACULTURE	PROCESSING & MARKETING	INNOVATIONS	SDG GOALS (2, 5, 14)
1/2023 (Jan/Feb) **Deadline: 15 Nov 2022**	• Backyard culture enterprises: benefits and challenges	• Women in the WCPO tuna fisheries	• Winning Asia for Norwegian seafood	• Leveraging digital infrastructure tools to improve e-commerce and supply chains	• Sustainability of marine ingredients and the way forward
2/2023 (Mar/Apr) **Deadline: 15 Jan 2023**	• Mangrove crab trade and marketing in South and SE Asia	• Adding value to FIPs	• Tuna dark meat in food products • Domestic market for seafood in the Philippines	• Fish farming in the desert	• Blue Food Revolution • SDG 2: Fisheries and aquaculture in a zero-hunger world • Social Responsibility and Alignment with SDG14b: How can companies meet human rights challenges whilst ensuring social equity for small-scale fisheries?
3/2023 (May/June) **Deadline: 15 March 2023**	• Challenges and Opportunities for small-scale fisheries in PNG	• WTO fish subsidies agreement, implementation and potential impacts for the tuna sector • Climate inaction: impact on the fishery industries of the Asia-Pacific	• Plant-based seafood • Europe: Business resilience in the new global context • Consumption trends for seafood in Brazil	• Seaweed and value addition to diversify markets and products	• Fisheries and people in the context of social accountability • How social protection can support people and sustain fisheries
4/2023 (July/Aug) **Deadline: 15 May 2023**	• Issues and challenges of cockle farming • Small-scale fisherfolk in the Pacific and the Blue Economy • Resilient Rivers: Counting fish from forests	• Growing concerns among financial institutions' drive for better scrutiny of fishing investments	• Middle East and North Africa tuna market • Minimising fish loss and waste in Indonesia	• Ecolabelling of fish and fishery products • Ecolabelling in the future: will it matter?	• Restorative aquaculture for people and oceans • The cost of overfishing; small-scale fisheries in Japan — how tradition and sustainability need to be supported
5/2023 (Sep/Oct) **Deadline: 15 July 2023**	• The small-scale fisheries industry in Bangladesh - status and prospects	• Aquaculture high-tech development, PNG	• Reduction of food loss and waste in aquatic food value chains in Sri Lanka	• FlipFarm: Robust innovation in Oyster farming • The road to 2030: How technical innovation and renewable energy improves the carbon footprint of the one-by-one tuna fleets in order to achieve the 2030 Agenda	• Empowering youth for the ocean we need/ ocean literacy
6/2023 (Nov/Dec) **Deadline: 15 September 2023**	• Small-scale seaweed production and trade: factors influencing success	• Ornamental fish farming in Malaysia • Super intensive in-door farming for whiteleg shrimp	• Tilapia processing and value-addition	• Guidelines for sustainable aquaculture development	• Nutrition-sensitive aquaculture for inland rural communities • Building support for fisheries through communication • Microplastics in fisheries and aquaculture

Guidelines for authors: *Word count* ***2000 - 2500****, accompanied by photographs/ illustrations, short abstract of article, and author's photo & brief biography.*

For advertisers: *please check out our advertising guidelines and rates at www.infofish.org*

A joint publication of the
GLOBAL FISH INFONETWORKS
INFOPESCA • INFOFISH • INFOPECHE • INFOSAMAK • EUROFISH • INFOYU

18th INFOFISH WORLD TUNA TRADE CONFERENCE & EXHIBITION

20-22 MAY 2024

Bangkok, Thailand

For more info:

REGISTER TODAY FOR A SPECIAL 5% REBATE!

Jointly organized by:

INFOFISH

Department of Fisheries
Ministry of Agriculture and Cooperatives

TTIA
สมาคมอุตสาหกรรมทูน่าไทย
Thai Tuna Industry Association

www.tuna.infofish.org