MPEDA

Newsletter

VOL. XI NO. 4 JULY 2023

Chairman, MPEDA visits Varanasi & Mirzapur, Exploring Possibilities of Diversified Aquaculture

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On the Platter

Mr. Dodda Venkata Swamy
Chairman

Dear friends,

MPEDA, along with the Department of Commerce, had organised a *Chinthan Shivir*, a two-day Consultative Workshop with state governments for enhancing seafood exports at Goa on 15th and 16th June 2023. Further, MPEDA, along with CAA and with the support of NFDB, organized a one-day consultative workshop named "Way forward for enhancement of seafood exports from India" on 17th June 2022 at Chennai involving state fisheries departments and other stakeholder organizations. Subsequently, MPEDA has also prepared an Action plan for coastal states focusing on policy interventions required to enhance fish production.

The *Chinthan Shivir* of 2023 was a follow-up to the previous workshop. It aimed to bring out actionable agenda points to enhance seafood production and exports without losing focus on sustainable development. The Department of Fisheries, Government of India, has projected a marine products export achievement of ₹ 1.00 lakh Cr by 2024-2025, which was announced during the Union Budget 2020-21 also.

Department of Fisheries, CAA, NFDB, ICAR-CIFT, SEAI and Fisheries Departments of all coastal states and UTs were represented in the workshop besides the stakeholders such as farmers, exporters etc. The purpose of the workshop was to sensitize the states on the issues that plague Indian seafood production and exports and to chalk out an action plan to address those issues, paving the way to an increase in seafood exports as projected. Certain inland states which have immense potential in the fisheries and aquaculture sector, such as Punjab, Haryana, and Rajasthan, were also invited to be a part of the workshop.

The meeting was inaugurated by Mr. Piyush Kumar IAS, Additional Secretary, Department of Commerce. The Concluding session of the workshop was chaired by Mr. Sunil Barthwal IAS, Commerce Secretary. The two-day sessions had presentations on various topics and were followed by deliberations on the way forward to implement the suggestions. Based on that, MPEDA is preparing a document on the action plan to be put forth to achieve the set goals.

In addition, a Central Steering Committee under the chairmanship of the Additional Secretary, Department of Commerce, also has been formed to monitor the progress of implementation of the actionable points. Five topic-specific Sub Committees have been formed under the Central Steering Committee involving central and state Government organisations and stakeholders to work out the modalities to clear the pathway for development and to press upon the concerned for immediate action. The meetings of the Sub Committee are slated for July 2023.

The 144th meeting of the MPEDA authority was held on 30th June 2023 at Kochi, and the annual action plan MPEDA for FY 2023-24 was discussed and approved. It also has approved the financial statements of MPEDA and the annual report for 2022-23. The authority has also approved the formation of the sub-committees under the *Chinthan Shivir* action plan.

MPEDA organised a 4 - days Seafood HACCP training programme for the seafood technologists working in the industry at Kochi as a part of its annual Seafood HACCP training calendar. The programme was attended by 28 personnel.

Thank you.

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Chairman, MPEDA visits Varanasi and Mirzapur to explore the possibilities of implementing diversified aquaculture

MPEDA is promoting marine products export from various maritime states of India and during 2022-23 the achievement was US$ 8.09 billion worth of seafood exports.

However, inland aquaculture also is gaining momentum due to the farming community's interest in diversified aquaculture species such as GIFT Tilapia, Scampi etc. in freshwater aquaculture for export as well as domestic market. The ornamental fish sector is notified as a revenue generating sector for self help women groups. MPEDA is aiming for exploring the possibilities of aquaculture development in hinter-land areas in non coastal states.

In Uttar Pradesh, Varanasi and Mirzapur districts have a scope for development of aquaculture projects in freshwater areas, mainly for a variety of species like GIFT Tilapia, Scampi, Seabass and Pangasius. The major varieties farmed at present in these regions are Indian Major Carps (Catla, Rohu, Mrigal) and Pangassius, mainly for domestic consumption.

MPEDA-RGCA conducted an initial survey at Pareri village, Mirzapur, Lucknow, Varanasi along with fisheries officials of Uttar Pradesh found that most of the areas can be utilized for the diversified species in freshwater aquaculture.

Chairman, MPEDA Mr. D. V. Swamy IAS along with MPEDA-RGCA officials visited Mirzapur and Varanasi on 15th May 2023. The fisheries officials of Uttar Pradesh coordinated the programme along with the district administration of Mirzapur.

Visit to the fish farm at Varanasi

Chairman, MPEDA and RGCA members visited M/s Namami Gange Farmer Producer Company Limited, Loharadih, Kapsethi Sewapuri, Varanasi managed by Mr. Kailash N. Singh, CMD. This farmer is cultivating Pangassius species with the financial assistance of the Govt. of Uttar Pradesh. An indoor nursery with RAS (Recirculating Aquaculture System) facilities and an outdoor grow-out for Pangasius have been established and have successfully been cultivating for the past 20 years.

The farmer is running the company successfully by integrating agriculture and aquaculture.

Mr. D. V. Swamy IAS, Chairman, MPEDA visits Pangassius farm having RAS facility and interacts with Mr. Kailash N. Singh, CMD of M/s Namami Gange Farmer Producer Company Limited, Varanasi

Meeting with farmers at Mirzapur

A meeting was organized by the Dept. of Fisheries, Govt. of Uttar Pradesh and district administration of Mirzapur, which was attended by around 25 farmers.

Mr. D. V. Swamy IAS, Chairman, MPEDA along with District Administration and Fisheries officials at aquaculture farmer's meeting in Mirzapur

Meeting with Divisional Commissioner, Mirzapur

The Chairman, MPEDA had an interaction with Dr. Muthukumaraswamy B. IAS, Divisional Commissioner, Mirzapur regarding the implementation of aquaculture projects for exports in Varanasi & Mirzapur.

It is decided to hold a farmer's meet and training programme in these divisions by inviting the officials from Ministries of DoF, DoC and district administration.

Mr. D. V. Swamy IAS, Chairman, MPEDA interacts with Dr. Muthukumaraswamy B. IAS, Divisional Commissioner, Mirzapur

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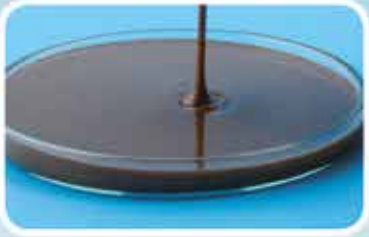

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MPEDA organize Virtual Buyer Seller Meets

Japan

MPEDA organized a Virtual Buyer Seller Meet (VBSM) on 1st June 2023 with M/s. Marine Foods of Japan. The company was represented by Mr. Muroi Yosuke (Leader, strategy development office, M/s. Marine Foods Japan). The company required value added products, especially Nobashi shrimp. The VBSM was attended by an Indian exporter, M/s. Shree Dutt Aquaculture Farms Pvt. Ltd. The exporter presented their products, sizes they can offer and the facilities available in their unit to the buyer.The meeting was moderated by Mr. Hakkim V. I., Deputy Director (Development), MPEDA Head Office and Dr. T. R. Gibinkumar, Deputy Director, Regional Division, Mumbai.

Romania

Another Virtual Buyer Seller Meet (VBSM) was organized by MPEDA with FishCo Store Ltd., Romania on 13th June 2023. FishCo Store Ltd., Romania was represented by Mr. Nicolò Paggio (Purchaser) and was primarily looking for shrimps from India, mainly - IQF shrimps (25% glaze), packaged in 1kg rider bags and 10kg master box having sizes - 16/20 PDTO, 16/20 CPDTO, 31/40 PDTO, 31/40 CPDTO, 100/200 cooked PUD. Mr. Nicolò Paggio was also interested in Surimi.

5 exporters participated in the meet and showcased their credentials to the buyer through power point presentations and videos. Dr. V. N. Biju, Assistant Director (Market Promotion), MPEDA Head Office moderated the VBSM.

The meeting concluded with a Q&A session in which Mr. P. Anil Kumar, Joint Director (Marketing), MPEDA resolved the doubts of the buyer regarding the tax information for imports in Romania, clarification on the HS codes of particular products etc.

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Marine landing report May 2023

Dr. Afsal V. V. & Dr. Joice V. Thomas
MPEDA-NETFISH

NETFISH collects up-to-date information on the daily marine landings from around 100 main fishing harbours and landing centres throughout India. Its primary objective is to bolster the traceability and catch certification system.

The Harbour Data Collectors document and upload crucial details regarding the incoming fishing vessels and the quantity of catch landed by each vessel, categorized by species. This data is promptly made available on the MPEDA website on a daily basis. The following report presents an overview of the patterns observed in marine landings during the month of May 2023, encompassing species, harbors and states.

I. Observations on catch landings

During May 2023, data on marine catch landings was gathered from 70 landing sites across the 6 coastal states. The total recorded catch during this period amounted to 47,182.91 tons. This catch encompassed various categories, with pelagic finfishes accounting for 26,299.55 tons (56%), demersal finfishes comprising 12,385.96 tons (26%), crustaceans contributing 3,931.26 tons (8%), and molluscs making up 4,566.14 tons (10%) (refer to Fig. 1).

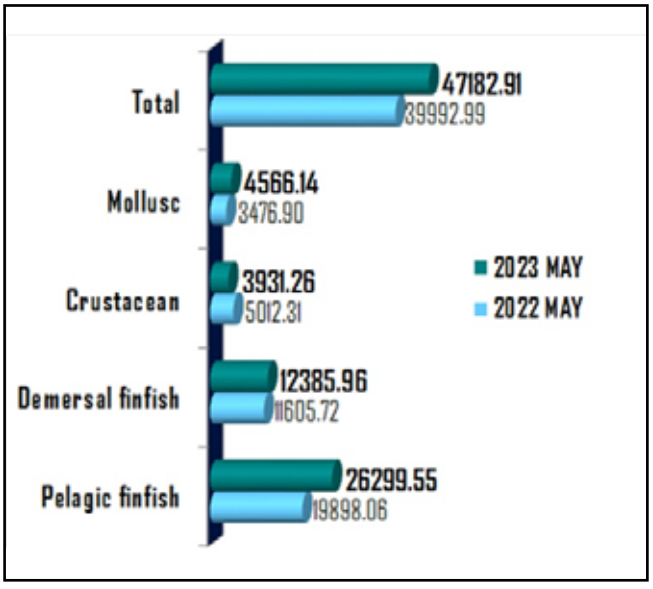

Fig. 1: Catch composition of marine landings (in tons) (May 2022 & May 2023)

Throughout the month, a comprehensive tally of 214 species, including both marine finfishes and shellfishes, was documented. Among these, the five significant contributors were *Sardinella longiceps, Rastrelliger kanagurta, Nemipterus japonicus, Uroteuthis duvaucelii* and *Stolephorus indicus* (refer to Table 1).

Table 1: Major five species landed during May 2023

Sl. No:	Common name	Scientific name	Quantity (tons)
1	Indian oil sardine	*Sardinella longiceps*	7357.81
2	Indian mackerel	*Rastrelliger kanagurta*	6245.12
3	Japanese thread fin bream	*Nemipterus japonicus*	4595.75
4	Indian squid	*Uroteuthis duvaucelii*	2034.56
5	Indian anchovy	*Stolephorus indicus*	1767.18

Upon analyzing the landing data based on different groups, it was observed that Sardines, Mackerels, Threadfin breams, coastal shrimps and Ribbon fishes emerged as prominent items landed during the specified period (see Fig. 2). These five fishery items collectively accounted for approximately 53% of the total catch.

Within the category of pelagic finfishes, the primary items landed were Sardines and Mackerels. Among demersal finfishes, Threadfin breams and Croakers were the major catches. Coastal shrimps constituted over 77% of the total crustacean catch, with the dominant species being *Metapenaeus dobsoni* (*Poovalan* shrimp) with 1,240.83 tons. Squid and Cuttlefish were the main molluscs resources landed during the month.

State-wise landings: Kerala recorded the highest landing, with 12,427.59 tons, and accounted for 26% of the total catch. Karnataka followed closely with a share of 12,413.54 tons. Maharashtra with 10,992.59 tons is in third position (refer to Fig. 3). Collectively, west coast

states contributed 96% of the total catch. No landing was reported from Andhra Pradesh, Odisha and West Bengal due to the fishing ban on the East coast.

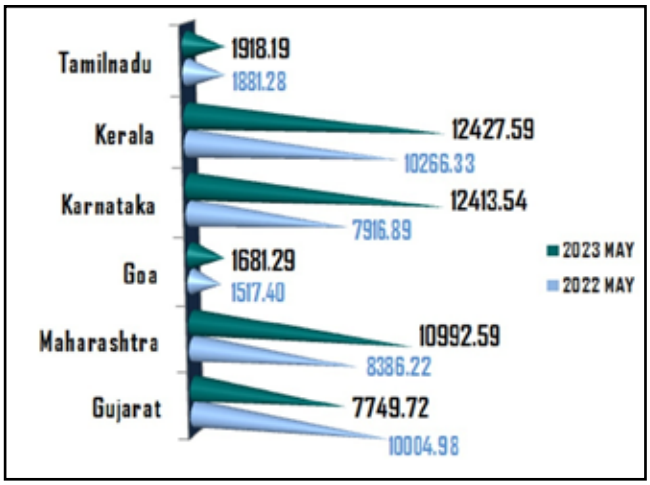

Fig. 3: State-wise marine landings (in tons) (May 2022 & May 2023)

Harbour-wise landings: The Malpe harbour had recorded the maximum fish landings during the month. The major ten harbours in terms of total catch quantity landed are given in table 2.

Table 2: Top ten harbours based on catch landings

Sl.No:	Harbour	Quantity (tons)
1	Malpe	5396.52
2	New Ferry Wharf	3452.07
3	Mangalore	3071.04
4	Veraval	2955.68
5	Sasoon Dock	2367.41
6	Thoppumpady	2247.70
7	Munambam	2205.80
8	Ratnagiri	2125.86
9	Honnavar	1860.10
10	Beypore	1733.72

II. Observations on boat arrivals

During May 2023, a total of 26,232 fishing vessel arrivals were reported in 70 designated fish landing sites. Kerala witnessed the highest number of boat arrivals, followed by Gujarat (Fig. 4).

When considering specific harbours, Veraval and Porbandar in Gujarat are the frontrunners with 2,106 and 1,278 boat arrivals respectively.

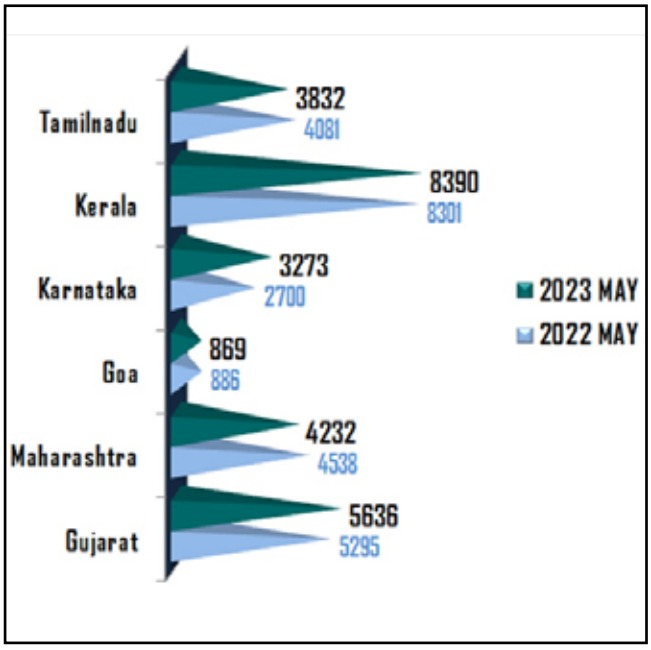

Fig.4: State-wise boat arrivals (nos.) (May 2022 & May 2023)

Summary:

In May 2023, the major fishing harbours and landing centres in India reported a total of 47,182.91 tons of marine landings and 26,232 boat arrivals. There was a significant decrease in the catch, amounting to approximately 10,000 tons compared to April 2023.

Furthermore, there was a decrease of approximately 3,000 boat arrivals compared to previous month. This decline in catch and boat arrivals can be attributed primarily to the implementation of fishing ban on the east coast.

Pelagic finfish resources remained the primary contributor to the overall catch, with Indian Oil Sardine being the most landed species of the month.

Kerala emerged as the frontrunner both in terms of total catch landed and the highest number of boat arrivals among all the states. Among the various landing sites, Malpe harbour maintained its top position in terms of total catch landed, while Veraval harbour secured the first place in terms of the highest number of boat arrivals.

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Monthly outlook forecast report

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USD INR

It was a complete uptrend for USDINR pair in the May Month. It entered the month opening at 81.75 broke the 82-level mark on 11th May, continued its uptrend to make a monthly high of 82.8525 where the RBI intervention was seen to protect the Rupee and closed at 82.7225. Dollar was seen getting stronger throughout the May month initially because of the safe-haven buying amid the ongoing talks about the US Debt Ceiling issue which raised the worries in the market.

Towards the later part of the month the spotlight was shifted from the issue of US Debt ceiling to the rising expectations of another 25bps hike by the Fed in the June meeting. The continuous strong and robust economic data coming from the US economy made the Fed think again of increasing the interest rates to tame inflation.

The increased probability of a rate is clearly visible through the US 2-year bond yields as it touched 4.60%, a level which was last seen 2 months back in March. For sure it will not be an easy call for the Fed this considering the recent banking crisis. Some of the Fed policymakers accepted being comfortable in pausing this time but the interest rate decision solely depends on the upcoming data from US economy.

India's FX reserves touched 600 billion dollars this month but also fell by 5 billion dollars to protect the rupee from marching towards 83 levels. Few Key events for the upcoming month are RBI's interest rate decision, Fed's interest rate decision, Indian CPI (YoY) (May), Nonfarm Payrolls (May), CPI (MoM) (May) and Core Retail Sales (MoM) (May).

In the month of May we saw a major fall in our beloved Rupee. Local unit decline more than 1% in the previous month and closed at 82.72 amid US debt ceiling uncertainty aided dollar index to gain throughout the month. Though previous month didn't work in favor of the Rupee but the first day of this month remained positive for the local unit.

On the daily candlestick chart, pair couldn't break the downward moving trend line. Again region of 82.90 – 95 played a role of vital resistance. On the first day of the month we saw a gap down opening in the pair from 82.7225 to 82.51 and gaps in USD INR usually fills up. However downward trend has started in the pair but we could see a move towards recent gap in the upcoming days. On the daily time frame momentum indicator MACD giving bearish signal while RSI trading in neutral zone.

Our view is of Rupee recovery, we could see a move towards 144 days SMA near to 82.20 afterwards 82.00 levels are not too far. We hope dollar exporters increased their hedge ration above 82.70, in case missed they can increase their hedge near 82.60. For the importers they can wait for 82 mark to start their hedging. Vanilla options are a better instrument if mandated to hedge

EURUSD

The EURUSD pair tried to gain momentum in the month of May but experienced losses, only to hold off some losses at the end of the month as the US Debt agreement reached a conclusion. The European Central Bank (ECB) raised interest rates by 25 bps, but did not clearly indicate future rate hikes. The EURUSD failed to recover despite ECB President Lagarde's hawkish comments, as investors sought safety amid selloffs in US regional bank shares. The ECB emphasized its readiness to modify monetary policy and adopted a data- dependent strategy. Concerns about the US debt ceiling and its impact on the banking system affected market sentiment.

The Euro remained subdued due to lackluster economic indicators, including a decline in industrial production and a marginal gain in GDP. The US dollar gained demand as it was supported by positive local data, causing uncertainty over the Fed's future actions. In contrast, European data pointed to a fragile economic situation, with a downward revision in German GDP. Overall, the EURUSD faced challenges in May, with the

ECB's stance met with caution and economic indicators influencing the currency pair's performance. Some key events to follow this month include ECB Interest Rate Decision (Jun), CPI (YoY) (May), and Deposit Facility Rate (Jun).

GBPUSD

The cable pair started the month strong at 1.2550 levels making a high of 1.2670 in the initial days itself but couldn't held onto its gains for a longer time even after BOE again increasing the interest rates by 25bps. GBPUSD initially started coming down as dollar started to gain due to safe-haven buying amid the ongoing worries of US Debt Ceiling issue which now seems to be gone as the concluded upon it by postponing it to 2025. Till the time the issue of US Debt ceiling was resolved, the talk began regarding the renewed expectations of another rate hike by the Fed of 25bps to fight inflation. Due to this the dollar rally continued throughout the month pushing the cable pair down to make a monthly low of 1.2310.

These renewed expectations were due to the strong economic data coming in from the US economy which signals towards high inflation and made the US 2-year bond yield to climb till 4.60% which is almost a 2-month high. This time it won't be a cake walk for the Fed as the banking crisis fears could step in again. Towards the end of the month pound got support from higher than expected CPI and Retail Sales numbers to close at 1.2440 levels.

USDJPY

USDJPY started the month on a positive note by opening at 136.16. The dovish comments of BOJ and their decision to maintain the interest rates at 0.1% with no changes to YCC policy initially helped the pair's advances. However, USDJPY immediately gave back its gains as the dollar index dropped as a result of worries over the U.S. debt ceiling and the resurgence of banking concerns. The Fed raising interest rates by 25 basis points as anticipated. The U.S. CPI came lower at 4.9% against the expectation of 5.0%. But the dollar index recovered afterward due to positive U.S. economic data and the Fed's hawkish narrative. The Dollar index reached a level of 104.69, which is a 2-month high. Against a 2.5% projection, Japan's National CPI increased to 3.5%.

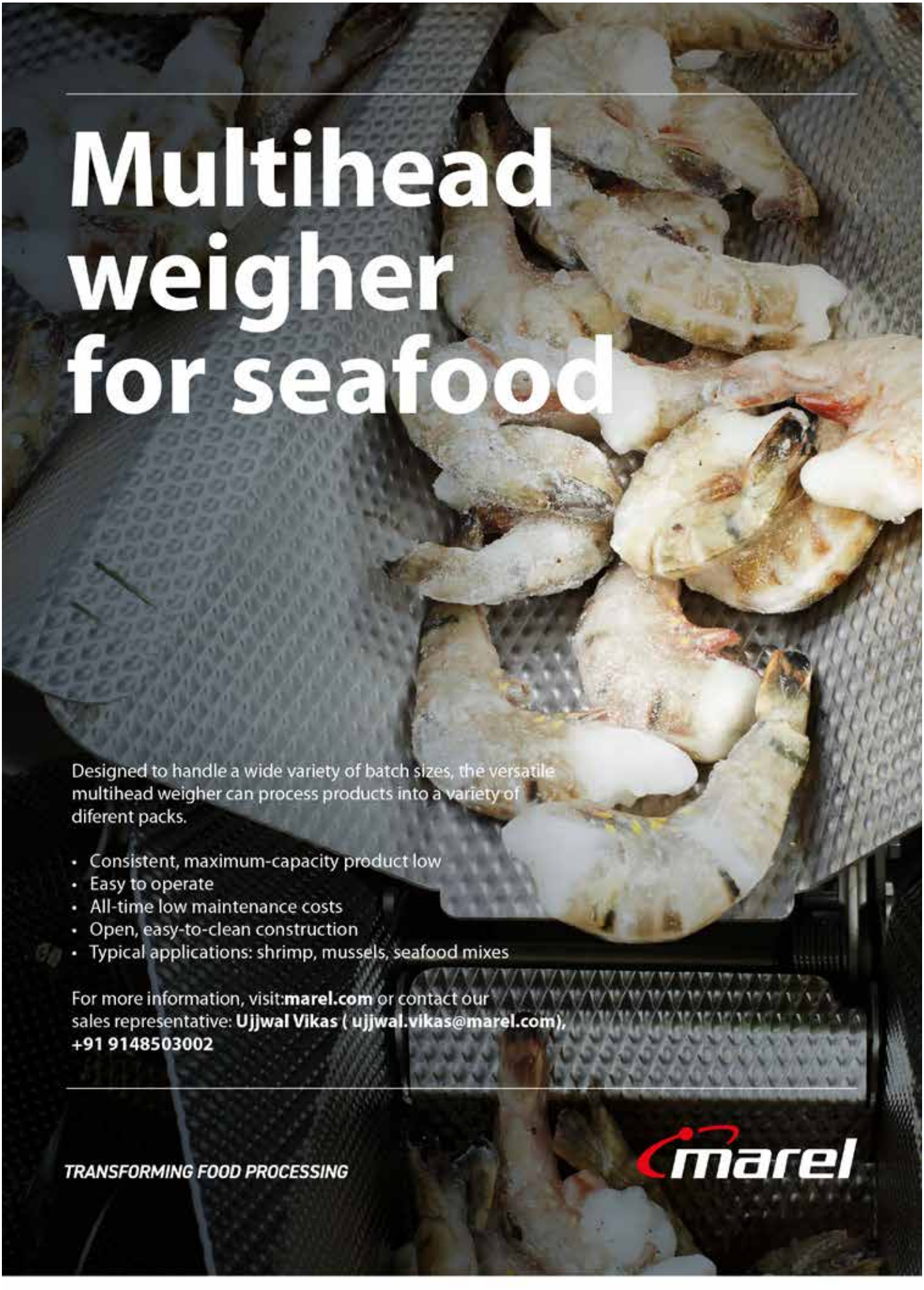
The US economy's first-quarter GDP increased from 1.1% to 1.3%. The yen fell to 140.93, which is the lowest level in the last 6 months. Bank of Japan (BoJ) Governor Kazuo Ueda has confirmed that the central bank's bond-buying activities will continue to maintain inflation consistently above 2%. The pair ended the month at 139.33, as the safe-haven JPY gains from a softer risk tone.

WORLD

Global equity markets fell in May as it was constantly buffeted by the twin issue of hawkish Fed talk and doomsday scenario of US defaulting on its debt. The current month however starts of a more positive background based on the fact that the US House of

Representatives passed the Debt bill and the same is likely to be now cleared by the weekend, enabling the US President to sign the bill before the June 5th default date set by the US Treasury.

It is not a done thing as of this moment officially, but we are very unlikely to see any major surprise from the Democrat controlled Senate. With that threat off the table, focus will now turn solely to the Fed's action at its upcoming meet. Market and even Fed officials seem to be equally divided whether we will see a small hike or pause at the next meeting. More important will be the Fed's statement which could throw some light on the path going forward. Inflation, though fading a bit globally, still remains high and specially in US, remains much above the Fed's target level. Even if this time the Fed pauses, the threat of hikes at future meetings remains high as most economic data over the last few weeks show the US economy and the job market doing well, signaling that the further slowdown in inflation will be a slow process. The Ukraine war, though still capable of throwing some negative surprises, is fading as a major issue for the global equity markets and with crude prices not shooting up, any major slide of the equity markets till the Fed June meeting is unlikely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Ensuring trust and sustainability: Unveiling the journey of seafood from ocean to plate through labelling

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Introduction

Trust is the most fundamental and influential factor in the development of any trade. It empowers consumers to have faith in the quality and safety of the food products they purchase.

The product label serves as the primary means of communication between the supplier and the consumer, and the information provided on the label should instill trust in the customer regarding both the product and the supplier. In this digital era, the customer is knowledgeable and aware of the food safety and sustainability of the resources used to prepare the product.

The seafood industry has substantially contributed to the global economy, with fish and seafood product exports reaching $151 billion in 2020 (FAO 2022). The marine capture fisheries contributed approximately 78.8 million tons of marine fish, including finfish and shellfish in 2020. Unlike other food sectors, seafood relies primarily on natural fish resources and over 85% of fish stocks are either overfished or fully exploited (FAO, 2012).

Therefore, product labelling should provide complete information about the product that can be used as a proxy to formulate management measures for wild fish stocks and provide authentic information to consumers. This article aims to provide comprehensive information on the requirements for seafood labelling and methods to achieve them to ensure trust among consumers and the sustainable exploitation of resources.

I. Requirements for labelling

1) Species name

Seafood labelling deserves special attention among different food products due to the uniqueness of fisheries. Unlike livestock and poultry, fisheries offer a variety of edible fish species (~200) that differ in taste, texture, and nutrients. Therefore, accurate labelling of fish products, including the fish species' names, is essential to provide authentic information to customers. Furthermore, marine fishery resources are limited and need to be sustainably exploited. In the case of livestock and poultry, edible species have been domesticated, breeds / strains have developed, and farming practices have been standardized to produce enough animals/birds to meet consumer demand.

However, when it comes to marine fish and shellfish, most species have not been domesticated, culture practices are not standardized, and the demand is met by wild stocks (Fig. 1). This could lead to the over exploitation of wild germplasm and the collapse of fisheries. Often, instead of the species name, most traders provide the common fish names on the product label. However, common names of fish can sometimes be vague and may refer to a group of species rather than a specific one. Thus, including the fish species name (scientific or Latin name) on the product label could help in assessing the stocks and preventing illegal, unreported and unregulated (IUU) fishing. By providing accurate information, seafood labels empower consumers to make informed choices about the fish species they purchase.

However, accurate identification of fish species and subsequent labelling can be challenging due

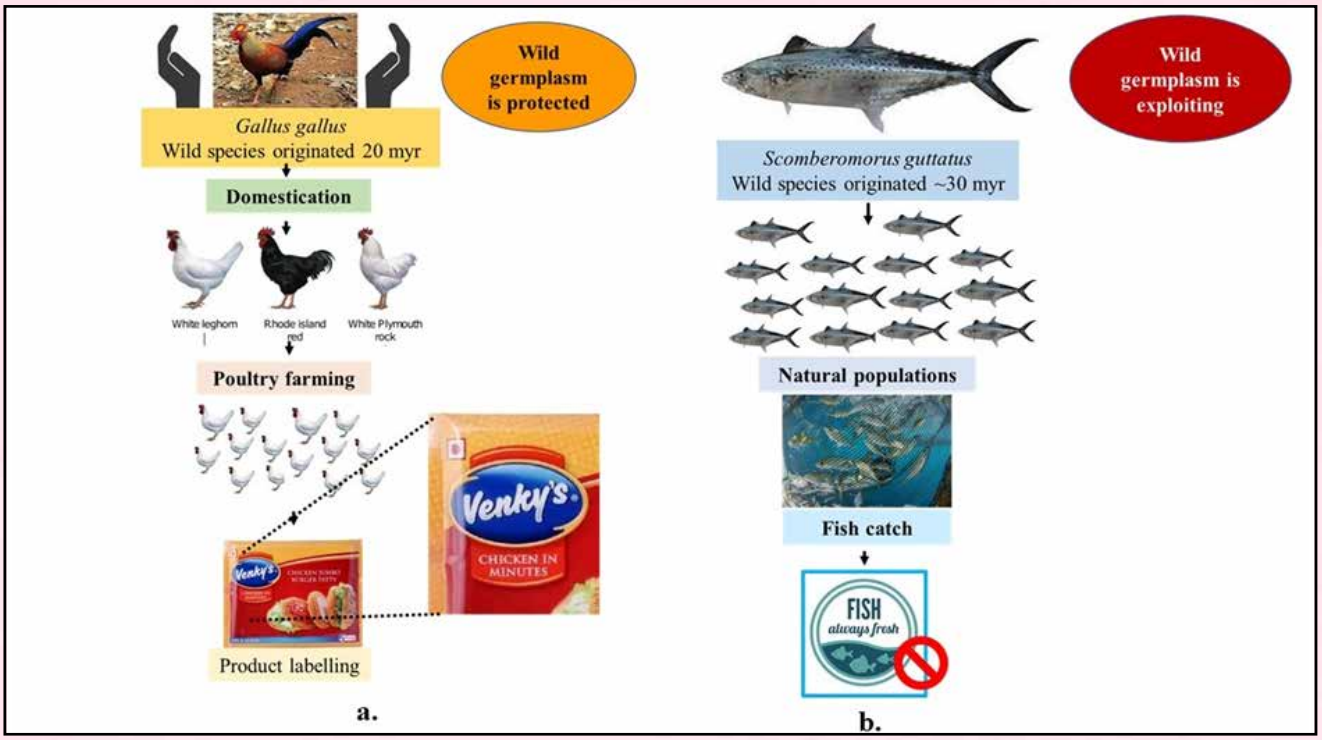

Fig. 1: Illustration of reasoning on why seafood labelling should be different from other meat products. a. illustrates the domestication and breed development in poultry, b. illustrates the exploitation of wild germplasm of marine fish

to morphological ambiguity among species or the loss of external morphological characteristics during processing.

It results in seafood mislabelling or species substitution with an intention or inadvertently. Globally, on average around 8% of the traded seafood items have been reported to be mislabelled, posing a serious threat to consumer confidence in terms of product cost and the sustainability of fisheries resources (Luque and Donlan 2019).

Additionally, the seafood industry operates globally, resulting in a highly complex supply chain where traceability becomes difficult (Roebuck *et. al*., 2017). In response, the European Union, USA, Japan and other countries revised the guidelines of seafood labelling (Table 1).

Table 1: Seafood labelling requirements by major importing countries

Parameters	European Union	U S A	Canada	Japan	China*	Saudi Arabia**	U A E
Common name	✓	✓	✓	✓	✓	✓	✓
Scientific name	✓	✗	✗	✗	✓	✓	✗
Production method (farmed/wild/caught)	✓	✓	✓	✗	✓	✓	✗
Harvest method (for wild/caught)	✓	✗	✗	✗	✗	✗	✗
Geographic origin	✓	✗	✗	✗	✗	✗	✗
Country of origin/last major processing	✓	✓	✓	✓	✓	✓	✓
Name, registration & address of all facilities involved in production	✗	✓	✓	✓	✓	✓	✗
Name & address of importer	✓	✓	✓	✗	✓	✓	✓
Batch number	✓	✓	✓	✓	✓	✓	✓

*All information must be provided in both English and Chinese languages; Destination to be marked as People's Republic of China.
**All information must be provided in both English and Arabic languages

1 a. Methods for species authentication

DNA Barcoding and associated techniques

Advancements in DNA barcoding and related molecular techniques have brought about a revolutionary change in seafood authentication. The DNA barcoding approach involves amplifying and sequencing a specific part of the mitochondrial DNA called the cytochrome c oxidase subunit I. Comparison of the resultant COI sequence with the NCBI (National Center for Biotechnology Information) or BOLD (Barcode of Life Data Systems) reference database would allow identifying the species accurately, detecting mislabelling, and combating fraud. Reference DNA barcodes for commercial species have been generated and are available in public databases.

Recognizing the significance of this technique in identifying fish species regardless of the processing method, the International Organization for Standardization (ISO) has developed a standard (ISO/DIS 17174) for species identification using molecular/DNA biomarkers. It is crucial for testing labs to adopt this standard and obtain NABL accreditation to certify the species' name on seafood labels.

However, DNA barcoding requires sophisticated equipment such as DNA sequencers, which many labs cannot afford. As an efficient alternative, associated technologies like DNA mini-barcodes and High-resolution melting (HRM) profile analysis have emerged. DNA mini-barcodes are short sections (~150 bp) within the partial COI region that exhibit enough nucleotide variation to distinguish the species. This variation can be detected through HRM analysis, where mini-barcodes from different species produce distinct melting curves.

2.Traceability

The product label should provide information to trace the product's journey from its origin to the consumer through the supply chain, including harvesting, processing and distribution. The following information is essential to trace the product to ensure sustainable utilization of the resources.

a) Country of origin

Food safety regulations, inspection procedures, and quality standards differ among countries. By identifying the country of origin, consumers and regulators can assess whether the seafood product has been produced and handled in compliance with the necessary safety measures. This information helps to determine whether the seafood has been sourced from well-managed fisheries or sustainable aquaculture operations.

b) Production method

This information is essential to know whether the fish/fish product is obtained from wild stocks or cultured farms. If it is from capture fisheries, the data may also contain the type of net /catching method used. The information should include whether the cultural practices are certified if it is from a culture farm.

c) Harvest date

Including the harvest date or production date on the label enables tracing the age and freshness of the seafood product. It helps determine the timeline of its journey through the supply chain.

d) Country of processing

Fish caught in one country are often sent to another for processing for lower production costs and advanced technologies. Further, some countries may have preferential trade agreements or duty-free access to specific markets. Thus, exporters often process seafood within those countries to benefit from trade regulations and facilitate market entry. Indicating the country of processing helps to trace the processing steps and ensures accountability in case of any quality or safety concerns.

e) Lot number or batch code

Assigning a unique lot number or batch code to each seafood product allows precise tracking and identification. This number or code can be linked to specific information, such as the source, processing details, and distribution records.

f) Certifications or eco-labels

The Marine Stewardship Council (MSC) Fisheries Standard is the leading international standard for sustainable fishing and has been used globally to assess fisheries sustainability. Suppose the seafood product has obtained Marine Stewardship Council (MSC) or Aquaculture Stewardship Council (ASC) certification; in that case, the supplier should include information on the label. These certifications validate sustainable practices and enhance traceability and credibility.

g)Traceability codes or QR codes

Including traceability codes or QR codes on the label allows consumers to scan and access detailed

information about the product's journey through the supply chain. It can provide information about the fishing vessel, harvest location, processing details, and other relevant traceability data.

2 a. Methods to achieve traceability in seafood supply chain

» *Documented Chain of Custody*

It involves recording and maintaining comprehensive records at each stage of the supply chain, including information about the product, its origin, handling, processing, and distribution. It includes capturing data on fishing vessels, aquaculture farms, processors, and distributors involved in the supply chain.

» *Unique Identifiers*

Assigning unique identifiers to each seafood product helps to track its movement and enables easy identification throughout the supply chain. These identifiers can be in the form of barcodes, QR codes, or RFID tags. They link the associated information, including the origin, species, and production details.

» *Electronic Data Capture*

Employing digital technologies and electronic data capture systems can enhance traceability. These systems can capture data in real-time, facilitating accurate and efficient information recording at various stages of the supply chain. It reduces the reliance on manual paper-based documentation, minimizes errors, and streamlines data management.

» *Technology-enabled tracking*

The exporters advanced technologies, such as GPS (Global Positioning System), satellite tracking, and electronic tagging, can be used to track the movement and location of fishing vessels or aquaculture facilities. This information can be integrated into traceability systems to provide real-time visibility of the product's journey from source to market.

» *Data sharing and integration*

Collaboration and data sharing among supply chain stakeholders are crucial for traceability. Integration of data systems and sharing information through secure platforms enable real-time access to data, ensuring accurate and up-to-date traceability information for all stakeholders involved.

» *Blockchain technology*

Blockchain technology has gained attention for its potential to enhance traceability in various industries, including seafood. It provides a decentralized and immutable ledger that can securely record and track every transaction and movement in the supply chain. Blockchain can ensure transparency, trust, and tamper-proof records, enabling seamless traceability.

» *Third-party verification and certification*

The Organization for International Standardization (ISO) has developed standards for the traceability of marine capture finfish (ISO 12875:2011), molluscs (ISO 18539:2015) and crustaceans (ISO 18537:2015). Third-party verification and certification of the firms for the above standards would help traceability efforts. Independent auditors or certifying bodies can assess and verify compliance with the above criteria.

Conclusion

In conclusion, seafood labelling is a powerful tool that bridges the gap between suppliers and consumers, enabling trust and promoting sustainability. Accurate species identification and comprehensive traceability provide consumers with the information to make informed decisions and support responsible practices. As the seafood industry continues to evolve, adopting effective labelling practices will be instrumental in ensuring the long-term viability of fishery resources and the satisfaction of conscientious consumers.

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V. K. Dey

V. K. Dey has over three decades of experience in diverse sectors of seafood industry in Asia- Pacific region. He was the Deputy Director of MPEDA and then associated with INFOFISH, Malaysia. As part of INFOFISH, he was involved in several studies related to seafood industry in the Asia-Pacific region and beyond, including setting up of Aqua-technology Park for ornamental fish. MPEDA has published Living Jewels, a collection of his articles on ornamental fish.

Found in small streams and oxbow lakes throughout tropical South America, dwarf cichlids are a colourful attraction in any aquarium. With sizes ranging from 2.5 – 11 cm, they have rightfully earned the title of dwarf cichlids. Since they inhabit overgrown, rainforest streams and lakes, heavy vegetation should be included in the aquarium with many hiding places. Most of these fishes inhabit soft acidic black water. Water temperature should be between 24 and 29°C with pH 5.5 - 6.8 and hardness 0 - 8 dH. Although some species can tolerate wider variations, nearly all are sensitive to changes in water chemistry. They can be combined with small schooling fish of the upper swimming levels and require a varied diet including live foods such as brine shrimp, infusoria, mosquito larvae, tubifex and blood worms. Some species may accept flakes. The eggs are deposited on the underside of rocks and hatch in 2 - 5 days. The young ones become free-swimming within 4 - 6 days and feed on small *Daphnia, Artemia* nauplii and rotifers. The female will guard the young. Since they are highly sensitive to water pollutants and medication, it is important to make frequent partial water changes. With more than 50 species, the largest genus of dwarf cichlids is *Apistogramma*. Although there are many other genera of dwarf cichlids, *Apisthograma* assumes great market significance due to its varied colouration. Most *Apistogramma* form harems, thus it is necessary to keep one male with several females. They can be combined with other small fish that can tolerate black water conditions.

RAINBOW IN A BOWL

With elongated and moderately compressed sides, *Apistogramma agassizi*, commonly known as Agassiz's Dwarf Cichlid, originates from the tributaries of the Amazon in Bolivia and Brazil. They show several colour variations, depending on their habitat. Males are much more colourful than females. The caudal fin is highly elongated and comes to a point in males while it is rounded in the female. The upper back is red and forehead yellow. Below these areas, the back is green and parallels a wide, horizontal, black band that extends from the tip of the snout back through the eye and to the tip of the caudal fin. The lower parts, just below this band, may range from gold to green to blue. The belly is usually yellow. The face is usually marked with green or gold markings. The dorsal fin is a fiery orange-red colour coming to a sharp point. The other fins are often blue to green. On the caudal fin, a white to blue set of lines come to a point near the end of the fin. A black stripe extends from the eye down to the corner of the gill cover. Males may reach 9 cm in length while females are only 6 cm. Water temperature should be 23 - 27°C with pH 6.4 and dH 6. They are peaceful, but are territorial. Males defend a large territory in which several females may guard their eggs. The female may lay up to 150 eggs which hatch in 3 – 4 days. The young may be first fed with infusoria and later with *Artemia* nauplii. Breeding of this fish is difficult and the eggs are sensitive to fungus.

Found in shallow swampy regions along rivers in South America; *Apistogramma borellii* is known as Yellow Dwarf Cichlid among hobbyists. It has a laterally compressed and less elongated body than *A. agassizi.* The caudal fin is fan-shaped in the male, while the dorsal and anal fins meet at a point. The head and the area just behind the gill cover are golden-yellow. The middle of the body is pale blue as are the dorsal, pelvic, and front parts of the anal fins. The dorsal and pelvic fins are gold-tipped. The caudal and most of the anal fin are golden-yellow. Often a red area develops on the caudal peduncle. When a fish is excited, several transverse markings develop on its sides. Males attain a maximum length of 7 cm and the female 5 cm. *A. borellii* is a difficult fish to breed. The ideal water temperature ranges from 25 - 27°C with pH 6.5 and hardness dH 4. They feed on live crustaceans, insects, insect larvae, flakes, pellets, tablets and finely chopped meat. They lay fewer eggs than *A. agassizi*.

Apistogramma cacatuoides, better known as Cockatoo Dwarf Cichlid, inhabits clear water bodies of the Yavari River along the border of Brazil and Peru. Males have highly developed fins. They are among the hardest of all *Apistogramma* species. The dorsal fin's first 3 - 5 rays are elongated and stand out. The dorsal tip comes to a sharp, elongated point. The caudal fin is forked and the anal fin's tip comes to a point. Females, by contrast, have less elaborate fins. The colouration of the male depends on its population and is thus varied. The most common variety has a brown to grey body color. The belly is golden-brown as are the anal, pelvic and dorsal fins.

The anal fin is edged with a blue-green fringe, as are the pelvic fins. The pointed dorsal rays are tipped with orange that becomes green before reaching the main part of the fin, which is gold in color. The body is marked with one lateral stripe that extends from the eye to the caudal fin. The eye is marked with a stripe that extends down to the corner of the gill cover. The tail is green with a series of red spots on the upper lobe. Females have a much duller color. Males will attain a length of 9 cm and the females 5 cm. Water parameters are pH 6.7, dH 10 and temperature 24 - 27°C. Breeding is fairly difficult and males are pugnacious during spawning and may attack other fish in the tank including the females. Males develop the characteristic 'peacock' crest and are larger and more colorful during spawning. The female lays up to 100 eggs and guards the eggs. The eggs hatch after 3 - 4 days. They require frequent partial water changes in order to flourish.

Apistogramma trifasciata, commonly known as the Three-Stripe Dwarf Cichlid, is very beautiful and the smallest among the *Apistogramma,* reaching just over 5 cm for the male and under 4 cm for the female. Males have a brilliant blue iridescence on their bodies and tall red-orange rays on the leading edge of the dorsal fin, similar to *A. cacatuoides*. Females are smaller and yellowish-grey, but turn bright yellow during breeding. They are found in the rivers of Paraguay, Argentina, Bolivia, and southern Brazil, especially the Rio Paraguay and the Rio Salado. Ideal water conditions are pH 6.5, dH 3, and temperature 26 - 29°C. They are moderately difficult fish to breed. They should be kept in a ratio of 3 - 4 females to each male. Males form harems. While caring for the brood the female may develop a bright yellow body color. The female lays up to 100 eggs which are very carefully guarded. The young ones are fed with *Artemia* nauplii. As this species is very sensitive to changes in water conditions, frequent partial water change should be done.

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"Herbs and herbal medicines: A prominent source for sustainable aquaculture"

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Introduction

Aquaculture is the fastest growing food producing sector, with an average annual growth rate of 6.7% in the period 1990-2020 (FAO, 2022). The total increase of world fish production has reached up to 177.8 Mt, from which 90.3 Mt comes from capture fisheries and remaining 87.5 Mt comes from aquaculture industry during 2020 (FAO, 2022).

Therefore, the aquaculture industry represents a very much valuable source of animal protein and essential nutrients. Since, the growth of aquaculture is directly linked with culture intensification. Thus, previously semi-intensive fish farming has transformed into a more intensive culture, which generates a high stress environment, overcrowding, poor water quality, increased disease outbreaks and mortality. This stressful condition, in turn, increases the susceptibility of numerous infectious diseases in fish (Harikrishnan *et. al.*, 2011), which lead to the partial or complete loss of production.

In earlier times, antibiotics were used to control various infectious diseases. However the use of large amounts of antibiotics poses serious risk, not only for the environment but also for humans. Vaccination is another most effective method to control disease outbreaks. But, vaccines are expensive and also it is extremely difficult to develop multiple strain vaccines. Therefore, alternatives have been sought over the last few years, which could sustainably replace antibiotics, and herbal plants could be one such alternative.

Herbs and herbal medicines have been a vital source of drugs from ancient times. They are rich constituents of secondary metabolites of phytochemicals such as tannins, alkaloids, terpenoids, saponins, phenolics, steroids and flavonoids (Ravikumar *et. al.*, 2010). Medicinal plants play an important role in disease control due to their antioxidant and anti-microbiological activities (Prasad and Variyur Padhyoy, 1993). They serve to be cheaper, eco-friendly and more sustainable alternatives to antibiotics in aquaculture.

1. Medicinal plant species used in aquaculture

The medicinal plant species that most widely used in aquaculture are Ginger *(Zingiber officinale)*, Onion *(Allium cepa)*, Tulsi *(Ocimum sanctum)*, Garlic *(Allium sativum)*, Bermuda grass *(Cynodon dactylon)*, Pomegranate *(Punica granatum)*, Indian ginseng *(Whitania somnifera)*, Neem *(Azadirachta indica)*, Kalmegh *(Andrographis paniculata)* and Bhringaraj *(Eclipta allea)*.

2. Evaluation of plant parts used in aquaculture

Majority of studies based on the usage of herbal medicine utilized 37% plant leaves, 22% whole plant (powder, oil or extract), 18% roots, 8% seeds, 6% barks, 6% fruits and 4% flowers in aquaculture as shown in figure 1.

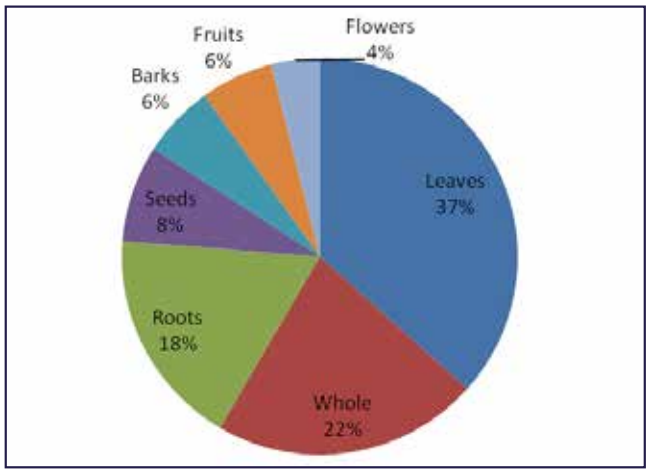

Fig. 1: Plants parts used in aquaculture. Source: (Reverter et. al., 2017)

1. Preparation and extraction of active compounds from medicinal plants

Several parts of medicinal plants are used to extract their active compounds which include leaves, seeds, fruits, roots, rhizome, bark, and bulbs.

These active compounds are mostly extracted with methanol, ethanol, chloroform, petroleum ether, ethyl acetate, and water.

2. Role of medicinal plants against fish diseases

The diseases are a major problem for fish production either in the culture system or in wild conditions. Fishes are suffering from a wide variety of diseases such as epizootic ulcerative syndrome (EUS), tail and fin rot, and other fungal, bacterial, parasitic infections.

Gill lesions caused by F. Columnare

Epizootic Ulcerative Syndrome (EUS)

Therefore, prevention and control of fish diseases is very important to overcome huge financial loss. Medicinal plants have been used for treatment of various infectious diseases and thus it proved to be a potentially beneficial alternative for aquaculture. Indian almond, *Terminalia catappa*, and garlic, *Allium sativum* have been used to treat fish ectoparasites, *Trichodina sp.* infections in Nile tilapia, *Oreochromis niloticus* fingerlings. *Aloe vera* has been found to have disease suppressing agents in juvenile rockfish.

1.1. Medicinal plants act as antibacterial agents

Fish are susceptible to a wide variety of bacterial pathogens that cause a variety of bacterial diseases in fish. Medicinal plants contain various antibacterial active principles which may lyse cell walls, block the protein and DNA synthesis, inhibit enzyme secretions and interfere with the signaling mechanism of the quorum sensing pathway.

Indian almond *(Terminalia catappa)* extracts is widely used as an antibacterial remedy against tilapia bacterial pathogens, *Aeromonas hyrophila*. Harikrishnan *et. al.* (2011) found that extracts of *Lactuca indica* have antibacterial properties to control *Streptococcus iniae* infection in Kelp grouper *(Epinephelus bruneus)*.

1.1. Medicinal plants act as antiviral agents

The most important viruses that cause high mortality rates in aquaculture are infectious pancreatic necrosis virus (IPNV), infectious hematopoietic necrosis virus (IHNV), yellowtail virus, iridovirus, white spot syndrome virus (WSSV), etc. The active compounds from medicinal plants inhibit transcription of virus, reduce its replication in the host cell and thus increase innate immune response of the host.

Indian medicinal plants which include *A. sativum, T. indica, Aristolochia indica* and *Azadirachta indica* showed strong antiviral activity against WSSV in the form of benzene, chloroform, ethyl acetate, ethanol and methanol extractions (Parida *et. al.*, 2002)

1.2. Medicinal plants act as antifungal agents

Fungal diseases are the fourth most infectious disease that damage tissue on the exterior of the fish. The extraction of medicinal plants may lyse fungal cell wall, altering its permeability, affecting metabolism and RNA and protein synthesis which causes death of fungal pathogen.

Adigüzel *et. al.* (2005) controlled fungal pathogens, *Fusarium oxysporum* and *Aspergillus flavus,* through in vitro by the ethanol, hexane and methanol extracts from *O. basilicum*.

1.3. Medicinal plants act as antiparasitic agents

The most important parasitic diseases that pose significant threat to fish population are *Ichthyophonus, Nanophyetus salmincola, Ichthyophthirius multifiliis, Dactylogyrus, Gyrodactylus* and whirling diseases. Medicinal plants have antiparasitic effects against fish ectoparasities. Herbal plants such as *Galla chinensis*, *Carica papaya* and *Macleaya cordata* exhibit good therapeutic efficacy and preventive effect against *Ichthyophthirius multifiliis* (Zhang *et. al*., 2013).

5. Mode of administration and dosage of medicinal plants in aquaculture

Administration of medicinal plants include either whole plant or its part (leaf, seed, root, fruit) which can be used as fresh or prepared extracts with different solvents (water, cholorform, methanol, ethyl acetate) (Van Hai, 2015). Also, appropriate dosing plays an important role to obtain desirable effects because inappropriate doses exhibit toxic effects in fish (Kavitha *et. al*., 2012). Treatment length is the second most important requirement in medicinal plants because it directly influences treatment effectiveness.

Administration of medicinal plants in aquaculture includes oral administration, immersion or baths, as well as intraperitoneal or intramuscular injection (Putra *et. al*., 2013).

Intraperitoneal injection of herbal extract has proved to be the most rapid and efficient method of administration. This technique is more demanding for high value specimens, not for operating on large production. The method's disadvantage is that it creates stressful conditions for fishes, especially for young ones (Yoshida *et. al*., 1995).

Bath techniques also exhibit positive results. Immersing the fishes into different medicinal plant extracts can treat various bacterial and fungal pathogens (Hu *et. al.,* 2014). The method's disadvantage includes the releases of exogenous molecules into marine environments (Umeda *et. al*., 2006), fish have to be taken out of the water for treatment which leads to stress.

Oral administration seems to be the most suitable method for aquaculture. Supplementation of medicinal plants into fish diet can treat various bacterial diseases (Reverter *et. al*., 2014). They also added into the fish feed for stimulating growth and prophylaxis purposes (Rico *et. al*., 2013). The method's disadvantage is that their absorption within the gastrointestinal tract can vary in different fish species and also some of the bioactive compounds considered antnutritional or toxic for fishes.

Conclusion

The expansion of the aquaculture sector is directly linked with culture intensification. But infectious diseases are major problems for semi-intensive and intensive culture that diminish entire production of aquaculture. Antibiotics have been used to control various infectious diseases but it led to adverse effects such as development of antibiotics resistance and accumulation of its chemical compounds into the environment and in fish tissue which ultimately reflect on human health. On the other hand, medicinal plants are gaining success in aquaculture, because they are cheaper, eco-friendly and have minimal side effects that proved to be the most promising alternative for antibiotics in the treatment of various infectious diseases. Biological activity of medicinal plants stimulates antibacterial, antiviral, antiparasitic, antifungal, and antistress activities in aquaculture. Therefore based on present review it can be concluded that medicinal plants create a prominent opportunity for sustainable aquaculture.

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Lab grown cell based seafood: A novel approach to seafood production

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Introduction

Seafood, which includes fish, crabs, and molluscs, provides 17% of the world's demand for animal protein (Costello *et. al.*, 2020). By 2050, the demand for fish is expected to reach 140 metric tons due to the expected increase in human population and income (Costello *et. al.*, 2020). Given the state of seafood output in aquaculture and wild-capture fisheries, there will be a significant imbalance between the supply and demand of seafood in the near future (World Bank 2014).

The COVID-19 pandemic also highlighted the importance of resilient and sustainable techniques for producing animal protein as well as the threats to the safety of the American and global food systems (Éliás *et. al.,* 2021; Mardones *et. al.,* 2020). This indicates the urgent need for an entirely new method of seafood production to develop a strong, efficient, and flexible business in the face of current and future problems. Cellular agriculture, also known as the production of seafood from fish cell and tissue cultures, is a new tactic that can assist assure food security in the context of the growing global population, climate change, and competition for natural resources. Fisheries that are caught in the wild and aquaculture both promote the production of sustainable seafood.

What is cell based meat

It is the idea of manufacturing meat products through tissue engineering technology. The main purpose of this technology is to produce animal meat without using an actual animal. Also called as Victimless meat, Cultured meat, Shmeat, Hydroponic meat and Test-tube meat.

Drawbacks of conventional meat production

- Risk of Nutrition related diseases
- Food borne pathogens found in meat
- Zoonotic diseases (swine flu)
- Ethical - Many animals are raised in pens and cages without room to turn around or even move their wings. Many animals live in their own excrement.

Basic methodology for cell-based seafood production

Cell-based seafood consists of the following integrated elements:

- Appropriate cell type(s) - from the tissue of interest;
- A growth media - to provide nutrients to proliferating and differentiating cells,
- A bioreactor - to provide the closed environment to support the growth.

For three dimensional tissues, a scaffold would be needed to provide structure

Characteristics of native fish muscle tissue for cell culture

In Teleost and Elasmobranch fish, there are three muscle types:

Red muscle

- Highly vascularized
- Comprised of slow twitch fibers with a high density of mitochondria and a rich supply of capillaries for slow, sustainable swimming speeds
- Relies on aerobic metabolic pathways

White muscles

- Fast twitch
- Tightly packed with myofibrils and primarily utilize anaerobic metabolic pathways.
- Used for burst-swimming and fast starts.

Pink muscle

- Shares some of the characteristics of both white and red muscle

Factors affects cell based seafood production

Oxygen requirements

Hif-1-alpha is a transcription factor that is present under hypoxic conditions–when molecular oxygen is present the protein becomes hydroxylated and subsequently

degraded by the ubiquitin system. Analysis of ice fish mRNA revealed that the functional domains of Hif-1-alpha are highly conserved, indicating continued selective pressure exerted by hypoxia.

pH considerations

The well documented relationship between intracellular acidification and cell death and because reduction of extracellular pH from 6.8 to 6.3 can render cells quiescent pH control of bioreactor systems requires fine tuning to optimize cell growth. Shifting the pH can also be used as an optimization tool, as changes in pH can affect protein production and glycosylation however altering pH to increase protein production and process performance usually reduces cell growth and metabolism.

Temperature requirements

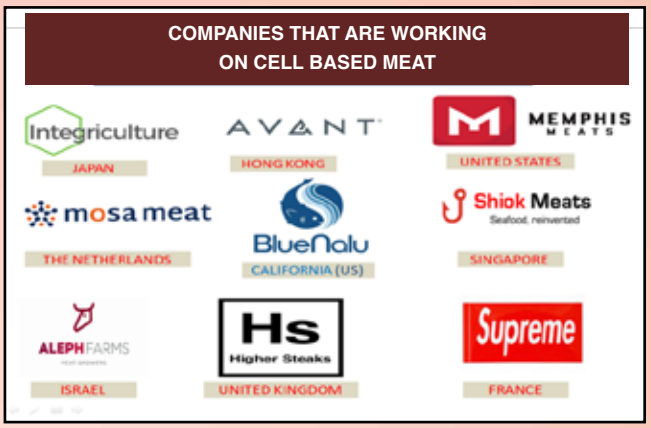
Fish vary widely in their adaptation strategies. Fish cell culture conditions typically mirror those of their typical habitats, with culture temperatures varying from 15 to 30°C. Some fish cell lines can vary their rate of metabolism within a 5°C temperature range, with the cells metabolizing more quickly at higher temperatures

Cell-based seafood products regulations and labeling

The United States Department of Agriculture's Food Safety and Inspection Services (USDA-FSIS) and the Food and Drug Administration (FDA) decided to create a combined regulatory framework for cell-based meat in 2019. The FDA would be in charge of cell banking, cell growth, and cell differentiation, while the USDA would be in charge of the manufacture and labelling of meat made from the cells of animals and birds. However, the FDA is the only regulatory body in charge of cell-based seafood (apart from species of catfish) and has requested public input on the best way to label it (FDA 2020).

Challenges and opportunities for the cell-based seafood industry

Integration of social sciences is crucial for a successful food production system that appeals to customers in addition to addressing technological issues. Finding reliable information that can influence customer and producer acceptability is one of the major issues the sector is currently experiencing. There will surely be a shift in cultural and societal attitudes towards animal care when a comparable option is available, which will have an effect on all facets of conventional animal husbandry. A cellular agriculture industry, which does not yet exist, also requires a reform of education and training from high school to undergraduate, graduate, and present employees.



Conclusion

A new type of seafood production that offers opportunities for cellular fisheries is the production of seafood from marine cell cultures. For marine cell culture, there are a number of research gaps, as well as a number of opportunities that make filling these research gaps worthwhile. The moment is ideal to look into the production of seafood without the use of marine creatures, especially with the increased interest in cellular agriculture as a way to create meat, milk, eggs, and other animal proteins from cell cultures.

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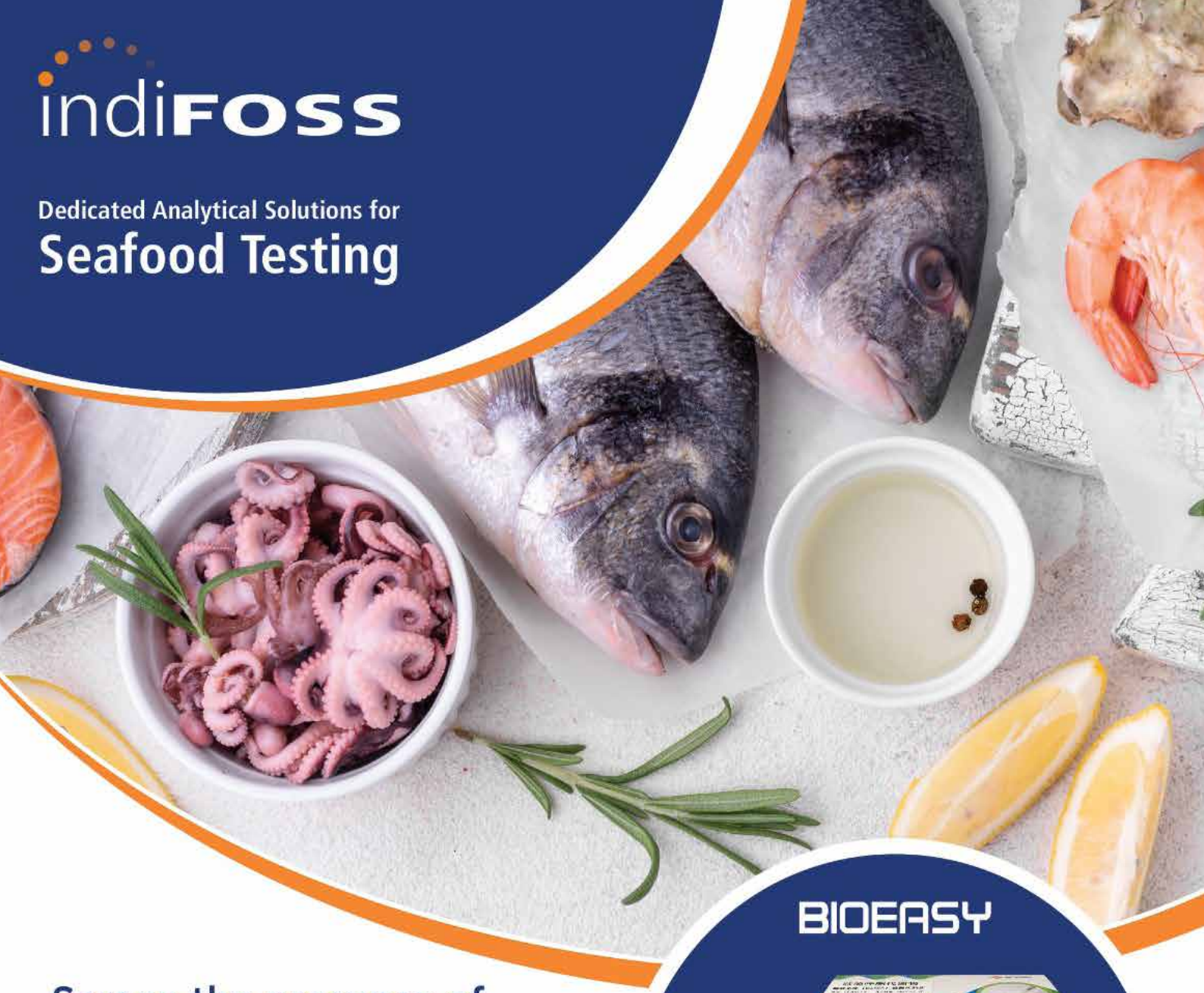

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Details of the SPF *L. vannamei* brooders imported & quarantined at AQF during May 2023

Sl. No	Name of the stakeholders	State	Country of origin/ supplier	Date of receipt of the lot at AQF arrival	Broodstock imported (nos)		
					Male	Female	Total
1	Royal Hatcheries	Tamil Nadu	Sea Products Development, Texas	01.05.23	300	300	600
2	Sandhya Aqua Exports Pvt. Ltd	Andhra Pradesh	Sy Aqua Americas	01.05.23	300	300	600
3	Sri Mahalakshmi Hatcheries - Nellore	Andhra Pradesh	Inc., Florida	01.05.23	300	300	600
4	B Tech Hatcheries	Andhra Pradesh	SyAqua Americas	03.05.23	400	400	800
5	Sun Glow Marine	Tamil Nadu	Inc., Florida	04.05.23	200	200	400
6	Raj Hatcheries Madras Pvt. Ltd	Tamil Nadu	SIS, Florida	04.05.23	200	200	400
7	Sri Manjunadha Hatcheries - Phase II	Andhra Pradesh	SIS, Florida	06.05.23	300	300	600
8	Krishna Godavari Aquatech Pvt. Ltd	Andhra Pradesh	SIS, Florida	11.05.23	300	300	600
9	MSR Aqua Pvt. Ltd	Andhra Pradesh	SIS, Florida	12.05.23	500	500	1000
10	Star Aqua Hatchery	Tamil Nadu	SIS, Florida	13.05.23	165	170	335
11	Varun Shrimp Hatchery Pvt. Ltd	Andhra Pradesh	SIS, Florida	13.05.23	200	200	400
12	Sai Gnaneswary Hatcheries	Andhra Pradesh	Sy Aqua Americas Inc., Florida	15.05.23	200	200	400
13	Pavani Hatcheries	Tamil Nadu	Sy Aqua Americas Inc., Florida	15.05.23	200	200	400
14	Bindu Hatcheries	Andhra Pradesh	Sy Aqua Americas Inc., Florida	15.05.23	200	200	400
15	Regal Bio Marine Hatchery	Tamil Nadu	SIS, Florida	17.05.23	200	200	400
16	BMR Exports - Tindivanam	Tamil Nadu	Sy Aqua Americas Inc., Florida	19.05.23	500	500	1000
17	BMR Shrimp Hatcheries	Tamil Nadu	SIS, Florida	20.05.23	400	400	800
18	Shree Kanak Matsya Hatcheries	Odisha	SIS, Florida	24.05.23	200	200	400
19	Jay Jay Aqua Farms	Tamil Nadu	Blue Genetics, Texas	25.05.23	250	250	500
20	Sarada Hatcheries - Unit II	Andhra Pradesh	SIS, Florida	26.05.23	250	250	500
21	KPR Hatchery	Andhra Pradesh	SIS, Florida	26.05.23	200	200	400
22	BKMN Aqua	Andhra Pradesh	SIS, Hawaii	27.05.23	300	300	600
23	SVR Hatcheries	Andhra Pradesh	SIS, Florida	27.05.23	200	200	400
24	Ravi Hatcheries	Andhra Pradesh	American Penaeid, Florida	28.05.23	300	300	600
25	Sai Marine Exports Pvt. Ltd - Unit II	Andhra Pradesh	Sy Aqua Americas Inc, Florida	29.05.23	250	250	500
26	Srinidhi Biotechnologies	Andhra Pradesh	Sy Aqua Americas Inc, Florida	29.05.23	250	250	500
TOTAL					**7065**	**7070**	**14135**

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HACCP training programme organized by MPEDA, Regional Division, Kochi

With the objective of equipping the quality control wing in the seafood processing establishments in Kerala for effective implementation of the HACCP and HACCP based food-safety programme, a four days' training programme was organized by MPEDA Regional Division Kochi. The training programme was conducted in Head Office from 20th June 2023 to 23rd June 2023.

he training programme began with an inauguration session on 20th June 2023. Mr. S. Asok Kumar, Deputy Director Regional Division Kochi welcomed all dignitaries and participants to the training programme. Mr. D.V. Swamy IAS, Chairman, MPEDA inaugurated the training programme by lighting the traditional lamp. In his inaugural speech, Chairman MPEDA emphasized the importance of implementation of the HACCP system in the processing units and he also mentioned the key role of the quality control personnel in doing HAZARD analysis.

Dr. M. Karthikeyan, Director MPEDA chaired the session and in his presidential address, he requested trainees to spread the concept of HACCP among their colleagues, so that it can be adopted effectively by the processing units.

Dr. Ram Mohan M. K., Joint Director (Quality Control) & Course Director, MPEDA, Mrs. Sherbi P. A., Deputy Director, EIA Kochi and Mr. Alex Ninan, Regional President SEAI Kerala offered felicitations.

Mr. Anil Kumar P., Joint Director (Marketing) was also present during the session.

The inaugural function ended with a vote of thanks by Mr. Johnson D'Cruz, Deputy Director, Regional Division Kochi.

Twenty five candidates from different processing facilities in Kerala participated in the training programme. The updated version of HACCP training curriculum 2020 and Fish and fishery products Hazards and Controls Guidance June 2022 Edition were distributed to all participants.

The technical sections were handled by the HACCP faculty team led by Mr. V. Vinod, Deputy Director (QC), Mrs. Anju, Assistant Director, Mrs. Preetha Pradeep, Technical Officer (QC), and Dr. Biji K. B., Junior Technical Officer (QC).

The training programme ended with a valedictory function held on 23rd June 2023, in which e-certificates were distributed to the successful participants by Mr. K. S. Pradeep, IFS, Secretary, MPEDA in presence of Dr. Ram Mohan M. K., Joint Director (QC) and Course Director.

Mr. D. V. Swamy IAS, Chairman MPEDA inaugurates the HACCP training programme

View of the training session

Mr. K. S. Pradeep IFS, Secretary MPEDA distributing e- certificates to the trainees

Participants with MPEDA officials

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National workshop held at ICAR-CIBA, Chennai

Mr. Thiru. S. Annadurai, CLS, Director, Tribal Welfare Department, Govt. of Tamil Nadu releasing handbook on success stories of coastal and tribal women

The voices of coastal and tribal women were heard in the form of their success stories of aquaculture based livelihood development at a workshop on "Listening to the voices of coastal and tribal women and their success stories and awareness on livelihood opportunities including rural and aqua Tourism" on 23rd June 2023 organized by the ICAR-Central Institute of Brackishwater Aquaculture (ICAR-CIBA) jointly with the Tamil Nadu Tourism Development Corporation.About 150 number of coastal and tribal women engaged in aquaculture based livelihoods from Tiruvallur, Kancheepuram, Cuddalore and Chengalpattu districts of Tamil Nadu and officials from development departments, financial institutions and NGOs participated in the workshop.

Mr. Thiru. S. Annadurai, CLS, Director, Tribal Welfare Department, Govt. of Tamil Nadu was the chief guest for the inaugural session.

Dr. Kuldeep Kumar Lal, Director, ICAR-CIBA in his inaugural speech articulated that ICAR-CIBA being a research institution developing the skill sets of the coastal women and tribal folk through its technology assessment and front-line demonstration programmes under the Scheduled Tribal Component. ICAR-CIBA is making efforts to link these women and tribal groups with the development departments of the states for taking up aquaculture based livelihoods through their schemes, he emphasized.

Participants presenting their success stories during the technical session

Subsequently in the technical session about 16 coastal and tribal women presented their success stories with their mentor scientists in their own language and interacted with the fellow women folk which were the unique events of the workshop.

Later in the valedictory session, chief guest Dr. Soumya Swaminathan, Chairperson, M. S. Swaminathan Research Foundation (MSSRF), Chennai honored the women presenters. The event ended with the vote of thanks by Dr. C.V. Sairam, Principal Scientist & Officer-in-Charge, PME, ICAR-CIBA.

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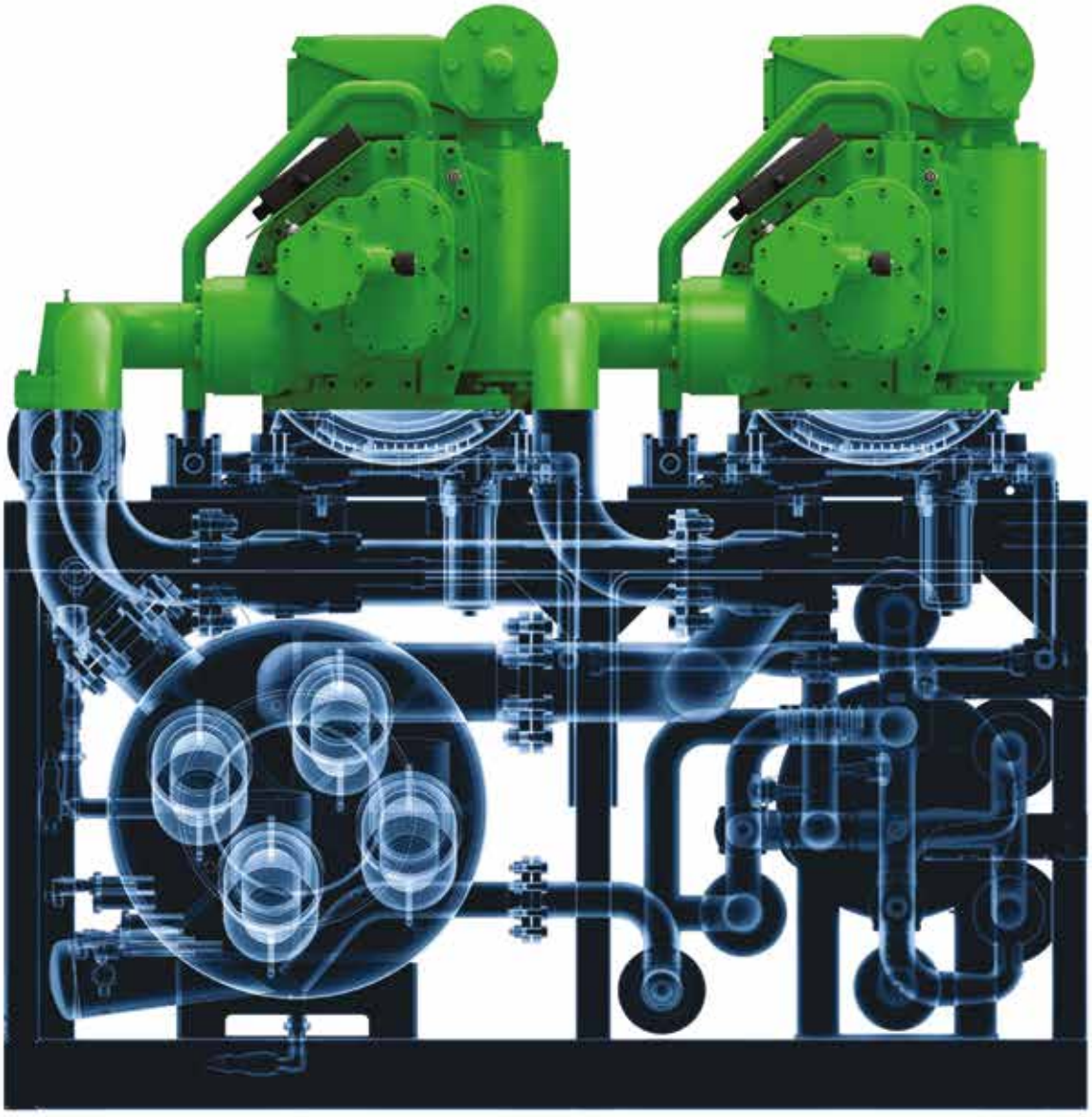

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New genome research helps fisheries battle the climate crisis

Researchers have found some candidate genes that could help fish tolerate warmer and saltier water have been identified, potentially providing a vital resource to guide breeding programmes in freshwater aquaculture. The study's findings were just published in 'Genomics.' The Nile tilapia, Oreochromis niloticus, is a popular freshwater aquaculture species that provide essential nutrients and protein. Their aquaculture popularity has skyrocketed, largely due to their adaptability to various water conditions and production systems.

As global warming reduces water quality and availability, these findings can be used to breed more resilient fish and protect a vital food source for millions of people. Fish farms - and the people who rely on them for food - urgently need strains that can still thrive despite the higher salinity and increased water temperature.To address this issue, researchers at the Earlham Institute, the University of East Anglia, and the University of Stirling have explored the tilapia genome to locate advantageous changes responsible for increased tolerance to changing water conditions. They then identified genetic differences at gene regulatory regions in the Nile tilapia and 27 other tilapia species.The team optimised a genome sequencing approach that reveals the activity of potential transcription factor binding sites and genetic switches for turning expression on and off. Their approach identified regions of the genome they believe are responsible for controlling the activity of certain osmoregulatory genes, which in turn influence the function of the gills and how the fish responds to changing water conditions.

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