MPEDA

Newsletter

VOL. XI NO. 1 APRIL 2023

India at Gulfood 2023, Dubai

Microplastics in Fish & Shellfish: An Analysis

MPEDA at the Global Investors Summit 2023

Japan Tapping into AI to Solve Fish Farming Challenges

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On the Platter

Mr. Dodda Venkata Swamy
Chairman

Dear Friends,

As mandated, MPEDA is keen to thrust upon its promotional efforts for Indian seafood in various markets through all possible steps. Showcasing Indian seafood products in major international fairs is one of the most promotional activities. The Seafood Expo North America held annually in Boston as well as Seafood Expo Global hosted at Barcelona in Spain are very important exhibitions for seafood business, where all global players assemble and transact business. MPEDA along with a handful of Indian seafood exporters are regular in these exhibitions.

We had a very successful participation in the recently concluded Seafood Expo North America, wherein 16 exporters were a part of the 2000 sq. feet Indian pavilion set up by MPEDA. A marked shift in the product portfolio was also noticed in Boston show this time, with major space taken away by convenience products. We had active discussions with Seafood Nutrition Partnership, Global Seafood Alliance, US Soybean Export Council and Turkish Embassy on trade affairs.

Though the US is a solid market for Indian shrimp, of late, Ecuador started making inroads into our market share. India still holds an advantageous position, thanks to our sustained production and quality of the shrimp offered. The decline we see in our shrimp exports to US compared to the previous year is mostly because of a high inventory situation there coupled with sluggish forward movement. Atleast for some time, we need to shift our focus to European and East Asian markets to sustain and keep the growth buoyant. , also have to be reviewed and re-designed to make policy according to the preferences of these markets.

The final report by the EU Mission, which had inspected India in September 2022, observes that there is still free availability and un-controlled use of banned antibiotic substances in hatcheries and farms in India. MPEDA has been constantly making efforts to educate farmers and also to mobilize interventions by the concerned registering authorities including the states to curtail this menace. However there is still a long way to go and we seek wholehearted co-operation from all the stakeholders in putting an end to these issue atleast in 2 years from now.

Saudi Arabia has earlier restricted the import of aquaculture shrimps from India citing the presence of white spot virus in our farms. Early March, Saudi has banned sea caught shrimps also, indicating that they have found white spot virus in the consignments of sea caught shrimp varieties exported from India. MPEDA and EIC are in touch with Saudi Arabian authorities through Indian Mission in Saudi to get more details and also to initiate a dialogue to lift this ban.

While we are able to ensure pathogen free status right from import SPF shrimp broodstock to pathogen free seed supply from hatcheries, it is imperative to strengthen biosecurity measures in our farming systems. Precautionary measures will also help to avoid disease outbreaks and use of inputs, which are contaminated with banned drugs. Hence, our shrimp farmers have to adopt appropriate measures to ensure procurement on quality seed as well as farming under proper biosecurity conditions to support the export value chain in overcoming such restrictions.

Thank you.

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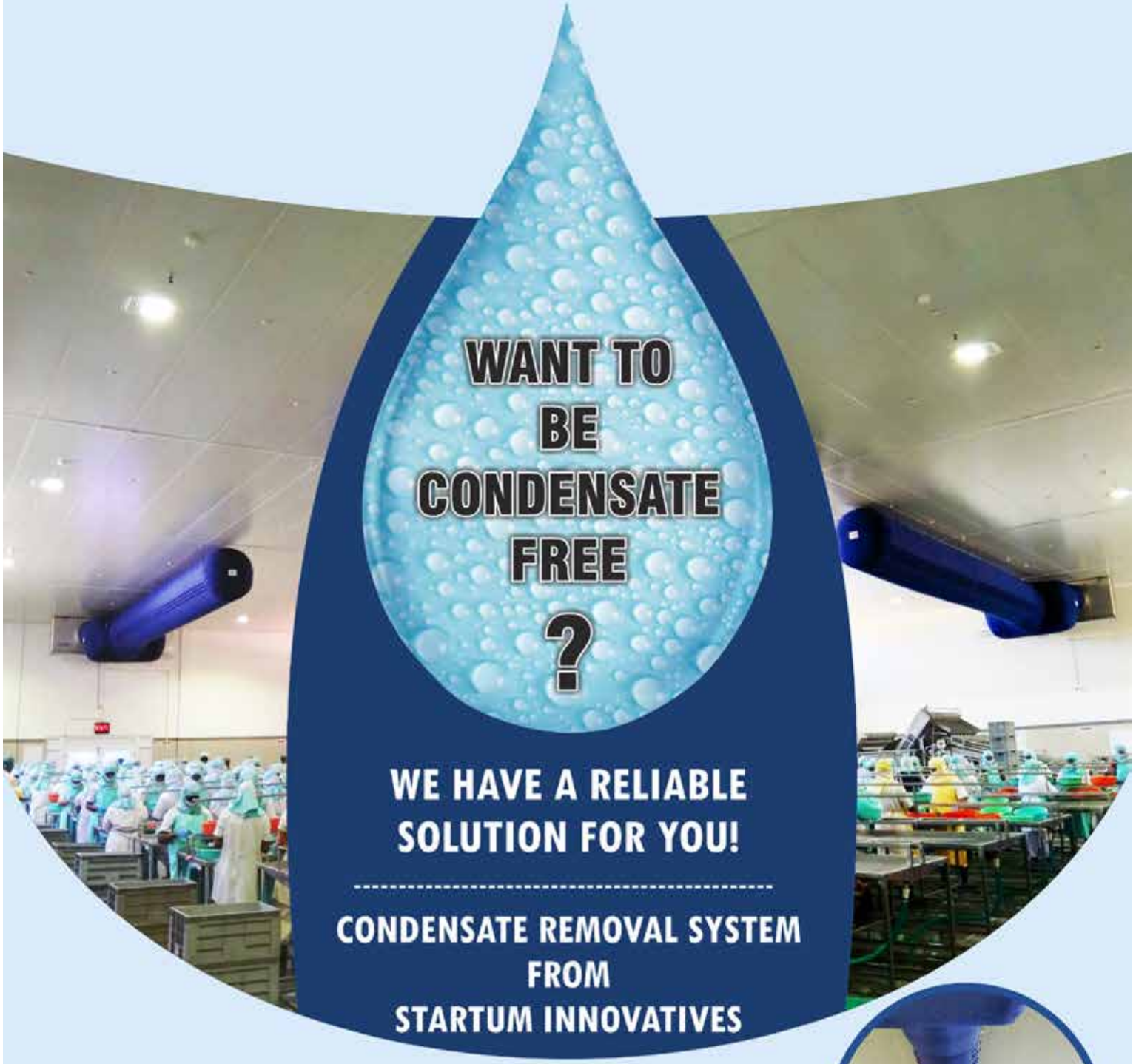

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India participates in Gulfood 2023

Seafood trade with UAE

Dubai city situated on the outskirt of the capital on the coastal area of Persian Gulf and is a hub of business center of the world for trading and there are high demand of seafood in fresh, frozen, dried in Dubai. Dubai (U.A.E) seafood imports total $162.84 Million in 2021-22. The nation currently has Free Trade Agreements within the GCC countries, New Zealand, Singapore, EFTA countries (European Free Trade Association includes Iceland, Liechtenstein, Norway and Switzerland) and Greater Arab Free Trade Area Agreement (GAFTA) to Saudi Arabia, Kuwait, Bahrain, Qatar, Oman, Jordan, Egypt, Iraq, Lebanon, Morocco, Tunisia, Palestine, Syria, Libya, and Yemen.

While UAE imports fish and seafood from over 120 plus countries including ETA & GAFTA, most of the supply comes from India, followed by Norway, Vietnam, and China, and UAE is reliant on import to meet 70% of its seafood demand. The UAE consumes more than 220,000 tons of fish per year and it has a seafood consumption per capita of 28.6 kg/year, which is higher than the global average (FAO, 2021).

Frozen/ chilled fish, frozen shrimps and salmons are the top products Dubai imports from the World. The two fastest-growing products in the top ten imports to Dubai are frozen shrimps and prawns, fresh and chilled salmon, preserved tunas, frozen cuttlefish and squid.

The country depends more on imports to meet its increasing seafood demand, as there are constraints on increasing domestic production. Imported products that offer value, quality, nutritional benefits, new tastes and convenience products are showing strong growth in the market.

Seafood is imported into UAE from about 127 different countries. India has been the top exporter to the region with a value share of 28.9% followed by Norway and Vietnam.

There is significant scope for enhancing our seafood exports to Dubai and increasing our market share as Indian constitute the largest ethnic communities among the expatriates.

UAE seafood market trends

In the United Arab Emirates, more than 67% of the seafood is consumed through the on-trade channel, which includes restaurants and food services. In 2021, the highest per capita consumption of 25.5 kg/capita was recorded in the Middle East. In the United Arab Emirates, around 40% of seafood consumers dine out at least 2-3 times per week due to a variety of options available at restaurants.

Seafood sales increased by 14.1% from 2016 to 2021. The market is projected to grow at an average Y-o-Y growth rate of 2.63% during the forecast period. The UAE government is also focusing on aquaculture projects due to the increasing demand for seafood, as it is a viable source of improving the region's food security, which is a major concern in the country because the nation relies on imports for around 75% of its demand.

UAE distribution channel of seafood market in e-commerce and e-retailers through convenience stores, online channel, supermarkets, hypermarkets and others.

The top 10 retailers/ supermarket app based food delivery in Dubai are:

- Jumeirah Fish Market
- Mina Market
- Far East Seafood Market
- Talabat
- Careem (Uber Eats)
- Deliveroo
- Noon_Food
- EatEasy
- Eat Clean
- Munch: On

Seafood Souq, is a new B-2-B e-commerce platform in Dubai to bridge the gap between International suppliers and local buyers and distributors in the region.

Mobile app based payment services like Freshcatch, Arabind, Fresh to home, Anacartare some examples of marketing and online payment platform for fresh seafood which is used in Dubai. The consumer receives products within days or hours during online purchase. Most people prefer home delivery within an hour in the case of perishable items like seafood/ grocery.

India's seafood exports to UAE

U.A.E. is India's one of major Seafood market with an export of 28,199 MT valued at US$ 162.84 million during 2021-22.

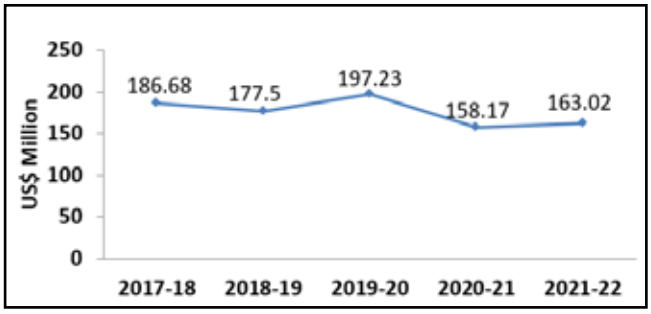

Fig. 1: Export of marine products from India to UAE in US$ value

Frozen shrimps and frozen fish constitute major item groups exported from India to Dubai, followed by frozen squid and chilled items (Fig. 1). The top 5 major export items to UAE from India are frozen shrimp, chilled items, frozen fish, frozen squid and others (Fig. 2).

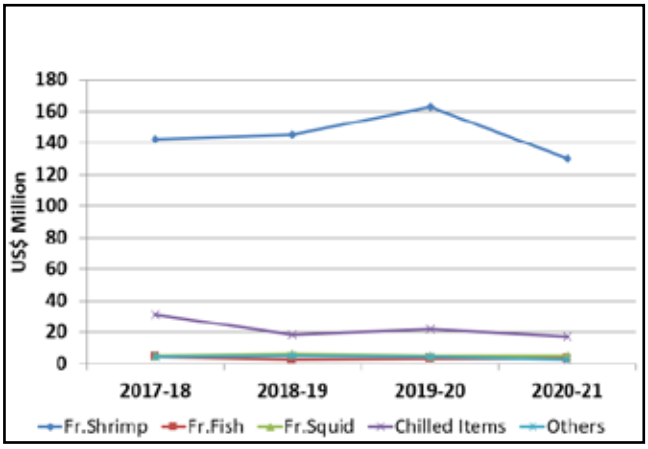

Fig. 2: Export trend of major items from India to UAE in US$ value

Gulfood 2023

The 28th edition of Gulfood 2023 was held from 20th to 24th February 2023 at World Trade Centre in Dubai, UAE. Gulfood in one of world top food trade fairs and the largest in UAE. The event was hosted by Dubai World Trade Centre and co-organized by Comnet Exhibitions Pvt. Ltd. (A division of Exhibitions India Group).

A total of 5000 exhibitors from 125 countries participated in Gulfood 2023. The event also had a footfall of more than 2-3 lakh visitors for the whole session/ shows.

Exhibition Content

The exhibition at GULFOOD 2023 hosted business promotion of different segments in the seafood value chain, including the promotion of various seafood items, fresh dried agricultural allied, top tables site for various products, fruits, vegetables, beverages, poultry & Meat, Fat and Oils etc.

India's participation in GULFOOD-2023

The Marine Products Export Development Authority participated by taking a space of 56 sq. m area in Hall No.HP-E18 and 7. Indian seafood exporters participated as co-exhibitors in the Indian Pavilion. The backdrop of the India pavilion was designed in a manner to promote the Indian Seafood brand globally. The India pavilion was placed strategically, ensuring that all visitors entering the hall visited the pavilion.

View of MPEDA officials interacting with buyers from different countries

MPEDA stall showcased the diverse frozen and ready to eat/serve value added seafood items. Publicity materials like co-exhibitors guide featuring the details of the participating exporters, product catalogue, commercial fish chart, Jute bag of MPEDA logo etc. were displayed and distributed among authentic buyers. Mr. Mahesh G., Deputy Director and Dr. K. Pau Biak Lun, Assistant Director represented the MPEDA delegation. Mr. Praveen Kumar, Director (EP-MP) Ministry of Commerce, Govt. Of India visited MPEDA stall and interacted with exporters and officials.

Mr. Praveen Kumar, Director (EP-MP), DOC, GoI interacts with co-exhibitors in the MPEDA pavilion

More than 90 buyers visited the Indian pavilion. The MPEDA officers briefed the buyers about the Indian seafood industry and replied their queries. The trade enquiries received is placed in the concerned segment of this newsletter.

Co-exhibitors

Seven seafood exporters from India participated as co-exhibitors in the MPEDA pavilion.

1.M/s. Karunya Marines Pvt. Ltd.
2.M/s. Green Asia Impex Pvt. Ltd.
3.M/s. Monsoon Bounty Food Manufacturing Pvt. Ltd.
4.M/s. Seahath Canning Company
5.M/s. Megaa Moda Pvt Ltd.
6.M/s. Marines Canning Industries
7.M/s. Jeelani Marine Products

As per the feedback received, the average business generated by each co-exhibitor ranges from US$ 10-15 Million with number of buyers met ranging from 50-80 visitors.

View of MPEDA pavilion with co-exhibitors and sample display at Gulfood, 2023, Dubai

Visit to Water Front Fish Market, Dubai

As part of the event, the deputed officials visited the Dubai International fish market. Visit was also undertaken to the Waterfront Seafood Market in Dubai, a world famous market for fresh fish, chilled fish & live crustaceans seafood to take away at the informal stalls. It is one of the largest seafood market in Dubai. Almost all seafood items were available in chilled condition and live condition.

The market was located in a hyper supermarket two storied building, which had parking facilities, recreation facilities and restaurant facilities order and take away stall. The market is well maintained with proper hygiene and sanitation in seafood and dried fish market area. The variety of seafood available in the market and the rush in the market indicates the demand for live & fresh seafood in Dubai.

View of water front seafood market

Water front dried fish market, Dubai

Seafood samples displayed in Al-Mustaqbal Gulfood Plus hall in the vicinity of MPEDA stall in Gulfood, 2023 Dubai

Conclusion

Shrimps, which has been the mainstay of Indian seafood exports has been able to capture only 1.87% share of the total shrimp imports by UAE, whereas Vietnam is having a share of 49.85%. Indian seafood competes with Middle East nations in supply of seafood. As the market is very quality conscious, Indian exporters have to comply with the regulations and gain confidence of the importers. Our exporters may also try out export of high value items such as chilled seafood and value added products, as there is a good demand for these items. Active brand promotion and repeated participation in exhibitions such as GULFOOD will definitely help in improving access to UAE seafood consumers.

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Microplastic in fish and shellfishes: An alarm to the Indian seafood industry

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Annually 5 to 13 MT of plastic, accounting 1.5 to 4% of global production, enter the oceans. India ranks 12th in the generation of mismanaged plastic waste. This plastic waste breaks down into very small particles, turns into fibres, known as micro and nanoplastics. In aquatic environments, they can absorb toxic chemicals found in the water, such as pesticides, dioxins etc, which increases the toxicity.

These microplastics along with toxins translocate up the food chain until they are served to humans. Sufficient data on the micro and nanoplastic in Indian fishes is not available to formulate regulations. This article highlights the importance of increased research on this emerging contaminant in fish and fishery products and gives emphasis to seafood exports regarding its importance on its awareness.

Plastic is miracle material as long as it is used judiciously with proper plan for its recycling. of late, plastic has become our planet's greatest environmental challenge due to its rampant use and its discard into the environment including oceans and other water-bodies. At a global level, 5 to 13 million tons of plastics, accounting for 1.5 to 4% of global plastic production, enter the oceans every year (Jambeck *et. al.,* 2015).

Low- and middle-income countries generate the largest volume of plastics entering the environment and India ranked the 12th among 192 countries in the generation of mismanaged plastic waste by producing 0.60 MMT per year (Jambeck *et. al.,* 2015). India's waste generation rate is measured as 0.34 kg/ppd of which 3% accounts to plastic waste.

Nearly 87% of the plastic waste generated is mismanaged in India. As plastic waste breaks down in our environment, it becomes smaller and smaller and turns into fibers which are commonly known as micro and nanoplastics. Microplastics are usually defined as plastic items which measure less than 5 mm in their longest dimension, this definition includes nanoplastics also, which are particles less than 100 nanometres (nm) in their longest dimension.

Apart from degradation of larger plastic waste, releases from clothing microfibers, exfoliating micro beads, and wear and tear of vehicle tyres are the other major micro and nanoplastics sources which may enter aquatic environments through different pathways. These smaller size plastic materials can absorb toxic chemicals found in the water, such as pesticides and other toxic chemicals. These micro and nanoplastics then enter the food chain including fish, as organisms consume them, transferring these toxins into their bodies.

These toxins translocate up the food chain until they are served to humans. Studies by Daniel *et. al.*, (2022) indicated that the heavy rain followed by flood in Kerala during 2018 caused a significant increase in the abundance of MPs in surface waters and beach sediments compared to bottom sediments. In comparison with the pre-flood period, the MP concentration increased 3-fold in surface water and 1.5-fold in beach sediments during the post-flood period. This high amount of MPs will subsequently enter the food chain.

Currently fish consumption in India is 5 to 6 kg per person per annum and GOI has set a target to double the domestic fish consumption by 2024 (GoI, PMMSY). Ensuring the safe fish to consumers from all the contaminants including micro and nanoplastic becomes highly important to ensure the health of fish consumers. This can be achieved by policy interventions with sufficient information on the prevalence of micro and nanoplastic contamination in Indian food fishes.

Research on the microplastic in fish and fishery products is on rise. In 2010, only 31 research studies were published on microplastic in fish which increased to over 6300 in 2021 (Fig. 1). This shows an increasing importance received by this emerging contaminant. In India also, the research on the microplastic is increasing. Joshy *et al*. reported incidence of microplastics (MPs) three commercially important bivalves (green mussel *(Perna viridis)*, edible oyster *(Magallana bilineata)* and black clam *(Villorita cyprinoides*) from the southwest coast of India (Joshy *et. al.,* 2022).

Regional discrepancy was noted in microplastic contamination of bivalves and microplastics were detected highest in the digestive gland (22.8/g) and gill (29.6/g) in the clams from Periyar River. Another study reported about occurrence of microplastic in all the yellow clam *(Meretrix casta)* samples collected from the Northwest Indian coast, where most of the MPs isolated were fibres and fragments and of size group below 250 μm (Naidu *et. al.,* 2022).

MPs were also observed in demersal fish species, *Johnius dussumieri*, from the north eastern coastal waters of the Arabian sea (Debbarma *et al.* 2022), where the GI tract and gills of fish contained 6.6 ± 1.7 and 6.2 ± 1.7 items, respectively. Daniel *et al* (2020) reported MPs in 41.1% of the fishes in their inedible tissues compared to only 7% of fishes in their edible tissues. The quantity of microplastics in inedible tissue was significantly larger in filter feeders than compared to others. Daniel *et al* (2020) reported an average of 2.7 microplastic particles kg^{-1} of edible tissue of shellfishes. In most of the reports, MPs in edible tissue is reported.

However, the data on the occurrence of micro and nanoplastics in Indian fishes are not sufficient to formulate regulations or for making policy. Most of the reports, though very sparing reports, studied the microplastic content in the gut of fishes. There is very limited reports on the presence of microplastic in different organs including in meat of fish and shellfishes.

Although the risk of micro and nanoplastic is reported to be very low on human beings as most of the fishes gut or intestine is removed before consumption, but the risk is still not estimated properly as many fishes

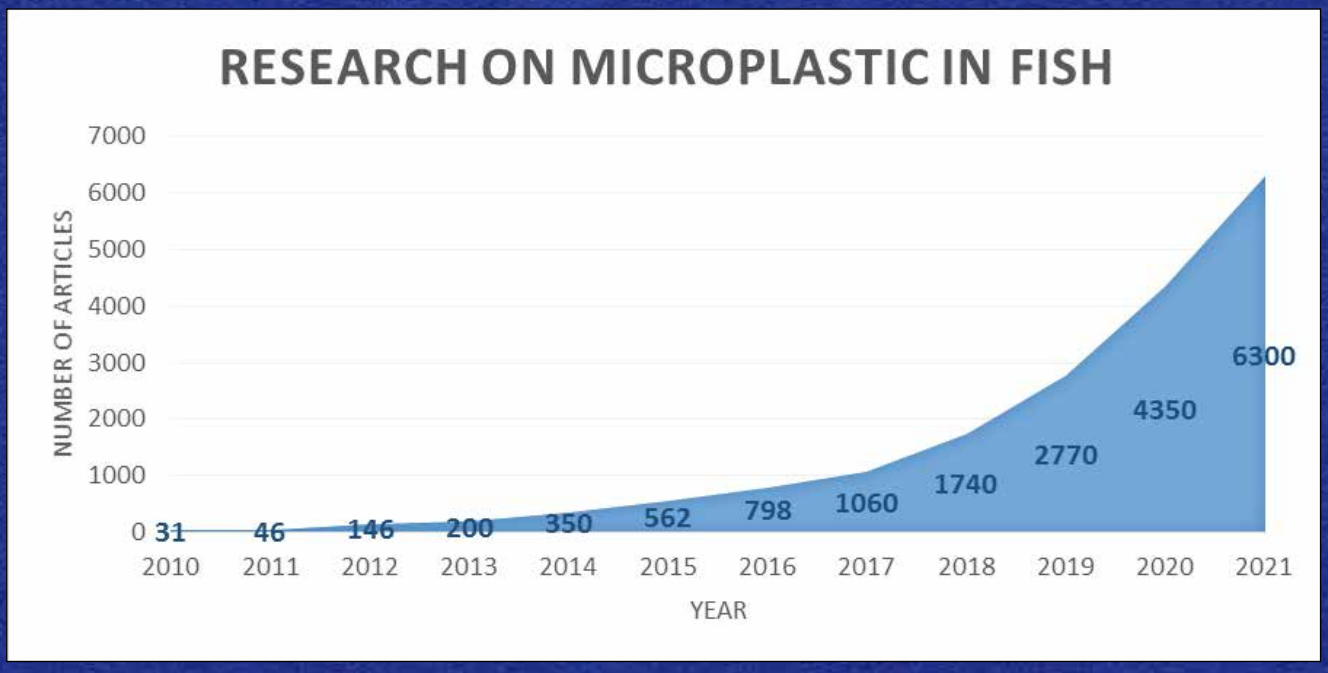

Fig. 1: Research reports on microplastic in fish

including small variety of fishes like anchovies, silver bellies, small riverine and reservoir fishes, small size sardines, shrimps and prawns, mussels, clams etc. are consumed without removing the gut.

Apart from this, ethnic products like smoked and fermented fish products from small variety of fish are prepared from whole fish and is commonly consumed in North-Eastern hill states of India. An estimate from FAO (2017) suggests consumption of 225g of mussels would lead to ingestion of 7µg of plastic and if the microplastic is contaminated with toxic chemicals, its toxicity to human increases many folds. Also, there is no data on the fate of micro and nanoplastic during processing viz., chilling, freezing, smoking, curing and drying, thermal processing in metal cans and retortable pouches etc.

This is particularly important when whole fish is used for obtaining mince like in the case of Surimi preparation which is widely used for the preparation of various value added analogue products which is very famous in many countries. India is also one of the important manufacturer and exporter of such analogue products apart from its marketing for domestic consumption.

Mince is also one of the major processed fish commodity produced and consumed within India in the form of various value added products viz., sausage, fish ball, cutlet, fish finger etc. Mince preparation is usually carried out in the machineries, in which the entire whole fish is crushed to squeeze maximum quantity of mince. In doing so, the intestines damaged and there is very high probability of contaminating mince with the micro and nanoplastic.

These reports suggests that there is proven incidence of microplastic in fish and shellfishes and implies regulatory implications in the near future, which is of importance to the seafood industry.

Consolidated research studies are needed in India to study wide spread prevalence of this emerging contaminant in fish and shellfishes of different habitat to assess its risk for both aquatic fauna and flora and to the human beings.

This will ensure the safe supply of nutrient rich fish products to consumers. The studies will also help in formulating strategies and measures to overcome from this upcoming menace to the seafood industry.

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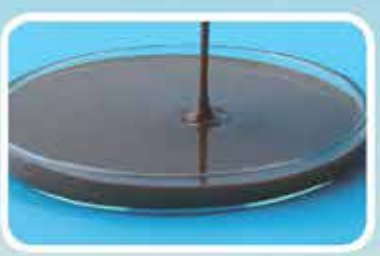

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Marine landing report - February 2023

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

NETFISH collects the real-time data on marine landings on a daily basis from about 100 major fishing harbours/landing centres in India, facilitating traceability and catch certification. Details of fishing vessels arriving at the landing sites and the species-wise catch quantity landed by these vessels, are recorded and uploaded into the MPEDA website on a day to day basis by the Harbour Data Collectors. A summary on the species-wise, harbour-wise and state-wise trends in marine landings during February 2023 is presented in this report.

I.Observation on fish catch landings

In February 2023, marine catch landing data was obtained from 91 landing sites in the 9 coastal states and a total catch of 65,898.70 tons was recorded during the period. The catch was comprised of 34,263.99 tons of pelagic finfishes (52%), 17,337.79 tons of demersal finfishes (26%), 7,650.70 tons of crustaceans (12%) and 6,646.23 tons of molluscs (10%) (Fig. 1).

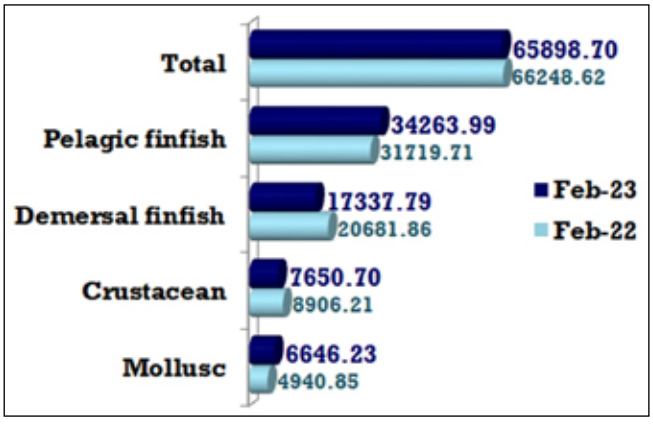

Fig. 1: Catch composition of marine landings (in tons) (Feb. 2022 & Feb. 2023)

A total of 259 species including marine finfishes and shellfishes were reported during the month, of which the major five contributors were *Rastrelliger kanagurta*, *Lepturacanthus savala*, *Sardinella longiceps*, *Nemipterus japonicus* and *Otolithes ruber* (Table 1).

Table 1: Major five species landed during February 2023

Sl. No.	Common name	Scientific name	Qty. in tons
1	Indian mackerel	*Rastrelliger kanagurta*	9317.85
2	Ribbon fish	*Lepturacanthus savala*	5909.50
3	Indian oil sardine	*Sardinella longiceps*	4978.42
4	Japanese thread fin bream	*Nemipterus japonicus*	4481.15
5	Tigertooth croaker	*Otolithes ruber*	2444.13

Analysing the group-wise landing, mackerels, ribbon fishes, sardines, threadfin breams and coastal shrimps were the major items landed during the period (Fig. 2). Almost 50 % of the total catch was comprised of these five fishery items.

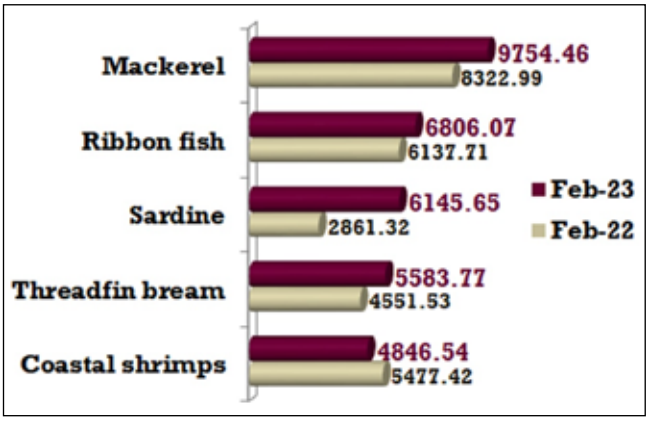

Fig. 2: Major five fishery items landed (Feb. 2022 & Feb. 2023)

Among pelagic finfishes, the major items landed were mackerel and ribbon fish whereas, among demersal finfishes the threadfin breams and croakers were the major items. Among crustaceans, more than 63 % of the catch was comprised of different species of coastal shrimps, in which the dominant varieties were *Poovalan* shrimp (1403.48 t) and *Karikkadi* shrimp (1256.75 t). Squid and cuttlefish were the major molluscan resources landed.

State-wise landings: The highest landing was reported from the Karnataka, 13,306.05 tons (20 % of total catch), followed by Kerala and Gujarat with 13,057.70 t and 12,733.88 t respectively (Fig. 3). West coast landings formed 78 % of the total catch. The least landing was reported from Odisha.

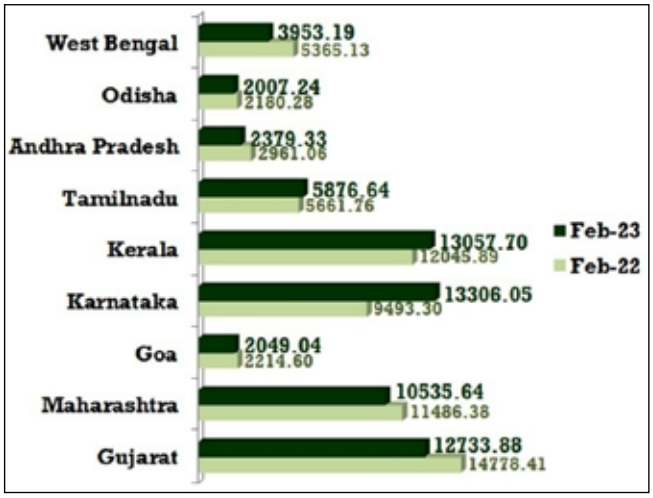

Fig. 3: State-wise Marine Landings (in tons) (Feb. 2022 & Feb. 2023)

Harbour-wise landings: Malpe and New Ferry Wharf harbours had recorded the maximum fish landings in February. The major ten harbours in terms of total catch quantity landed are given in table 2.

Table 2: Top ten harbours with highest landings

Sl. No:	Harbour	Quantity (tons)
1	Malpe	4002.19
2	New Ferry Wharf	4001.63
3	Mangalore	3911.58
4	Ratnagiri	2908.45
5	Veraval	2758.95
6	Porbandar	2689.30
7	Mangrol	2533.94
8	Okha	2435.63
9	Sakthikulangara	2382.15
10	Munambam	2340.30

II.Observation on boat arrivals

33044 fishing vessel arrivals reported from the 91 fish landing sites during February. The highest number of boat arrivals were in Kerala and then in Gujarat (Fig. 4). The state which reported least number of boat arrivals was Odisha. Among the harbours, Veraval (1569 nos.) and Mangrol (1532 nos.) in Gujarat had the highest boat arrivals.

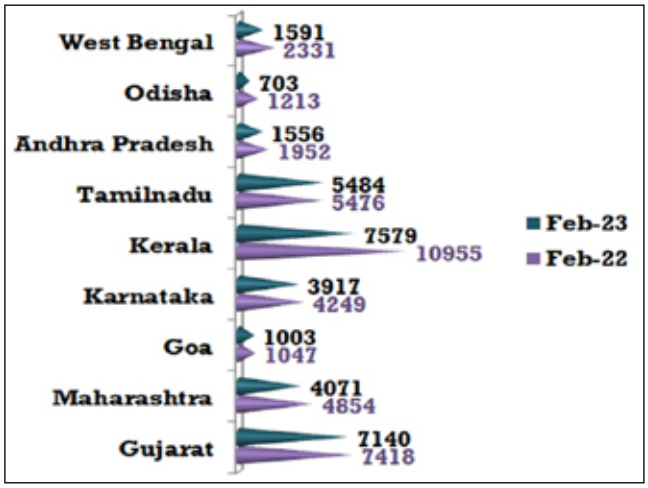

Fig. 4: State-wise Boat Arrivals (nos.) (Feb. 2022 & Feb. 2023)

Summary: 65,898.70 tons of marine landings and 33,044 boat arrivals were reported during February 2023 from 91 major fishing harbour/landing centres in India. A declining trend in catch observed since November 2022, which continued in February as well, registering a decrease by 13,118.90 tons compared to January. The number of boat arrivals too dropped, by 4691 no.s.

Pelagic fishes landed the most and Indian Mackerel was the topmost species landed. Karnataka topped list in total catch landed while Kerala had the highest boat arrivals. Malpe harbour had landed the maximum catch, and Veraval harbour had highest number of boat arrivals.

Monthly outlook forecast report

Ritesh Victor– Co-founder & Country Head – Myforexeye Fintech Pvt. Ltd.
Email-id: sales@myforexeye.com

USDINR

USDINR remained in a static movement throughout the February month. It entered the week opening at 81.77 and continued to gain till 82.31 for the remaining 3 days of the first week of the month. On the very first day of the next week (6th Feb) USDINR rose around 10 paisa to open at 82.41 and since then till the end of the month it remained almost static as it mostly traded in the range of 82.85 on the higher side and 82.60 on the lower side. The Federal Reserve also increased the interest rate by 25bps this month as the previous inflation numbers came to be higher than projected.

Not only the previous inflation data but in February month also we had various economic data from the US economy which mostly came in green and thus, indicated that inflationary pressure is still high in the economy which made the need of interest rate to be this year and currently, there are no expectations for rate cuts. The dollar index also strengthened over the month, opening at 102.12, making a monthly high of 105.36 and ending at 104.97. The future view tends to be on the rupee recovery as till now it has only recovered by 2% and rest of the major currencies have recovered more than 6%. In the coming month we have CPI (YoY) (Feb) and Manufacturing Output (MoM) (Jan) to be released.

Tight range bound trades in USDINR has become the norm. Since 6th February 2023 the amplitude (high low range) has been a meagre 55.75 paisa with a low of 82.34 and high of 82.8975. This is despite a more than 2% jump in the dollar index (and corresponding weakness in the Asian currencies).

On the daily USDINR candlestick chart, observe the converging Upper and Lower Bollinger Bands (highlighted by the blue lines). Narrowing of the Bollinger Bands indicate reducing price volatility. Periods of low volatility is usually followed by a bout of high volatility. Notice how the bands had converged in end December early January and was subsequently followed by a rapid spell of rupee gains (high volatility) in January. If history is an indicator of things to come,

another week of range trades will make for a strong case of increased currency volatility in March or April. A down gap is formed at 82.81 (27th Feb'23) and 82.7525 (28th Feb'23), underscored by pink horizontal lines. Triple top resistance region of 82.90 – 83.29 continues to hold.

Dollar exporters should carry on with their efforts to increase their hedge ratios at spot above 82.70. Forwards to be the preferred hedging instrument. Should certainly look to diversify risk with some vanilla options. USDINR volatility is close to its multi-month bottom and hence option premiums (costs) are going to be very cheap. Dollar importers have barely had any opportunity to hedge this month – they should use vanilla options to hedge rather than obligatory forwards.

EURUSD

The EURUSD was trading on the downside from Feb. 1 at 1.10 to close at 1.0572 on the last trading day of the month. After nearly hitting its seven-month high of 1.10 levels, the EURUSD lost almost 400 pips in the past month. The economic calendar was packed with US data, which kept the EURUSD pair in a struggling range towards the downside.

Following the release of the Federal Open Market Committee (FOMC) Meeting Minutes in the later part of the month turn the tables on the side of the greenback; the US Dollar continued to advance with a hawkish slant. More relevant, all participants agreed more rate hikes are required to meet the inflation target. Finally, participants predicted that the ongoing labor market tightness would keep inflation under pressure. The US Dollar took advantage of the hot PCE inflation data that was published the same day and kept the EURUSD under bearish pressure. Investors will keep a close watch on the following upcoming events: CPI (YoY) (Feb), Deposit facility rate, and ECB Interest Rate Decisions.

The shared currency struggled to regain the upward and rally above 1.0640 has left the risk aversive to the downside. It is expected that in the daily chart the technical indicators are slowly turning south within downside levels while the asset continues to maintain a bearish bias below 20SMA The 100 Simple Moving Average (SMA) remains firm in its upward slope at around 1.0460, providing relevant support. The breach of which could find support at 1.0515, the 50% Fibonacci retracement of the 2022 yearly slump.

Coming to the hourly chart the 4-hour chart provides a mixed tone. EUR/USD is mildly gripping above a flat 20 SMA, while the longer moving averages persistently heading towards south well above the current level, portraying a strong bearish interest. The Momentum indicator inched mildly higher, but the Relative Strength Index (RSI) indicator turned south and currently stands at 47, hinting at another leg lower.

Resistance: 1.0640, 1.0695, 1.0745.

Support: 1.0560, 1.0515, 1.0460.

GBPUSD

The cable pair entered the month of February by opening at 1.2318. It lost around 3.04% in the whole month. GBP/USD volatility reached its highest point in the first week, when it reached 1.2042 on the lower side and 1.2265 on the upper side. As the Bank of England's (BoE) decision to raise interest rates by 50 basis points, bringing them up to 4% which is the highest since 2008. The Monetary Policy Committee (MPC) members' votes were split 7-2 in favor of the increase.

The positive data from the US non-farm payroll also caused the sterling to lose ground against the US currency. UK inflation slowed more than anticipated in January, with the reading falling from the predicted 10.3% to 10.1%, as per the data released in the third week. As a result, the pound plunged sharply. In the same week, the sterling gained as all three data releases Manufacturing PMI, Services PMI, and Composite PMI were all in green. After the hawkish FOMC minutes were released, the Cable experienced a significant sell-off. More importantly, everyone agreed that more rate hikes are necessary to achieve the inflation target. Finally, participants anticipated that the ongoing tightening of the labor market would maintain inflation pressure. Investors will keep a close watch on the following upcoming events: Service PMI, Claimant Count Change, and BOE Interest Rate Decisions.

Sterling fell almost 2.5% in the previous month, bears remained heavy on bulls since the start of month though buyers tried to push the pair higher in the mid of month but couldn't sustain there for much time. Might pair continue to find support near 1.2000 levels as it is an psychological level breaking of these numbers could push the pair towards 200 days moving average which is near 1.1930-35 region, Market participants pays close attention towards 200 days SMA as it is a long term indicator. A convincing break below that could make the pair test levels of 1.1840 which is YTD low set in January. While on the upside near term resistance for the pair is 1.2100 mark above that bulls could make a fresh attempt to challenge the 50-day SMA, currently around the 1.2150 area. On the daily time frame momentum indicator RSI trading in a neutral zone while MACD giving bullish signals.

USDJPY

The USDJPY pair, which started the month at 130.098, extended its recovery above 136.224 in February. Weakness in the Japanese Yen as a result of policymakers at the Bank of Japan believing that the current expansionary monetary policy is necessary to confidently maintain the target inflation rate of 2%. Japan's national consumer price index (CPI) has risen to a multi-decade high of close to 4.2%.

However, rather than significant wage increases or any resilience in domestic demand, higher import prices are the main cause of the elevated inflation. Therefore, in order to achieve the pre-pandemic growth levels, BoJ policymakers are pushing for more economic stimulus. Following the dovish remarks made by BoJ Governor Nominee Kazuo Ueda, BoJ Deputy Governor RyozoHimino advocated for the continuation of easy monetary policy to boost overall demand in the

Japanese economy. While more rate hikes from the Federal Reserve are widely anticipated to increase its ability to combat stick US inflation, the risk profile is also not supporting the risk-sensitive assets. The US Dollar Index (DXY) is strengthening and is expected to soon extend its upward momentum above 104.60. The US ISM Manufacturing PMI data release is anticipated to be followed by a power-pack action on the USD Index. The contraction spell is expected to continue in the near future.

The USDJPY started the month at 130.098; moved upward and marked a higher at 136.920 level during the month with a 4.71% surge and closed at the 136.224 level. If the pair turns downward it could fall to the 50-day Moving Average of 133.60 levels. The support must be at the 129.803 level in case the pair weakens. If the pair continues to strengthen the resistance level must be at 137.50. The MACD line continued moving upward parallel to the signal line, and it seems moving further along parallel to the signal line in the upward direction which may increase the divergence. The pair closed at a higher level compared to the previous month's close and the price behaviour steered to trade in the upward direction. The Relative Strength Index continued moving upward to its 14-day RSI's simple moving average which continues indicating strength to the pair.

MPEDA participated in Global Investors Summit 2023

Government of Andhra Pradesh conducted a "Global Investors Summit (GIS) 2023" at Visakhapatnam on 3rd and 4th of March 2023. The venue was at Andhra University, College of Engineering, Visakhapatnam, Andhra Pradesh. The main objective of the summit was to showcase the strengths of the Andhra Pradesh, engage with the global investor community, and find mutually beneficial opportunities. The state of Andhra Pradesh highlighted its excellent infrastructure, large manufacturing base, talented youth, and business-friendly environment during the summit. The theme for the Global Investor Summit 2023 was "Advantage Andhra Pradesh- Where Abundance meets Prosperity".

The summit presented the information about Andhra Pradesh through an exclusive state pavilion that showcased the strong industrial base, robust presence of MSMEs and startups, and investor-friendly atmosphere.The 2-day summit offered an all-inclusive platform to International and domestic investors, policymakers, diplomats from various countries across the globe, country business delegations, influencers, industry associations, and trade bodies to explore opportunities, and forge partnerships. Business-to-Business (B2B) and Government-to-Business (G2B) meetings, keynote speeches, sector-specific plenary sessions, and exhibits were arranged alongside the 2-day summit. Additionally, the state organised activities for international partners to experience local culture, art, and cuisine giving everyone a holistic experience of the state.

Focus Sectors for GIS are:

Aerospace & Defence
Agri & Food Processing
Automobile & Electric Vehicles
Electronics & IT
Healthcare & Medical Equipment
Industrial & Logistics Infrastructure
MSME and Startups & Innovation
Petroleum & Petrochemicals
Pharmaceuticals & Life Sciences
Renewable Energy
Skill Development & Education
Textiles & Apparel
Tourism & Hospitality

Dr. T. R. Gibinkumar, Deputy Director delivering presentation

Speakers and session heads with Embassy of Vietnam officials

Dr. T. R. Gibinkumar, Deputy Director, MPEDA made a presentation on "Export potential of sea food products and role of MPEDA" in the session titled "Investment Opportunities in Value Addition of Aqua/Marine products in Andhra Pradesh for exports".

Dr. Do Thanh Hai, Minister Counsellor, Deputy Chief of Mission and Mr. Do Duy Khanh, First Secretary from Embassy of Vietnam in India, Mr. Siva Prasad Vempuluru, CEO, Matrix Sea Foods India Limited, Mr. P. Koteswara Rao, Additional Director of Fisheries & Principal, State institute of fisheries Technology, Kakinada also spoke during the session. The session was concluded by Mr. Dola Sankar IOFS, former Director Marketing of MPEDA and Managing Director of Leather Industries Development Corporation Of Andhra Pradesh Limited.

Details of the SPF *L. vannamei* brooders imported & quarantined at AQF during February 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	Sri Mahalakshi Hatcheries - Vizag	Andhra Pradesh	SIS; Florida	02.02.23	300	300	600
2	Neeva Aero Solutions	Andhra Pradesh	SIS; Florida	03.02.23	400	400	800
3	Amaze Shrimp Hatchery	Tamil Nadu	SIS; Florida	03.02.23	300	300	600
4	BMR Exports - Kancheepuram	Tamil Nadu	Syaqua Americas Inc; Florida	04.02.23	400	400	800
5	Sri Manjunadha Hatcheries	Andhra Pradesh	SIS; Florida	04.02.23	200	200	400
6	Vaisakhi Bio-Marine Pvt. Ltd - Unit IV	Tamil Nadu	SIS; Florida	08.02.23	290	290	580
7	Balaji Aqua & Agro Products Pvt. Ltd	Andhra Pradesh	Kona Bay; Hawaii	10.02.23	660	660	1320
8	Sri Sai Hatchery & Prawn Culture Pvt. Ltd	Andhra Pradesh	SIS; Florida	10.02.23	300	300	600
9	Royal Hatcheries	Tamil Nadu	SIS; Florida	10.02.23	300	300	600
10	KPR Hatchery	Andhra Pradesh	SIS; Florida	11.02.23	275	275	550
11	Sarada Hatcheries - Unit I	Andhra Pradesh	SIS; Florida	11.02.23	275	275	550
12	Golden Marine Harvest - Unit III	Tamil Nadu	Syaqua Americas Inc; Florida	11.02.23	400	400	800
13	BMR Marine Products Pvt. Ltd - Unit II	Andhra Pradesh	SIS; Florida	15.02.23	300	300	600
14	CP Aquaculture (India) Pvt. Ltd - Nellore	Andhra Pradesh	American Penaeid; Florida	16.02.23	300	300	600
15	Anjaneya Marine Hatcheries	Andhra Pradesh	Syaqua Americas Inc; Florida	16.02.23	250	250	500
16	Ananda Foods	Andhra Pradesh	SIS; Florida	16.02.23	270	300	570
17	Samudra Hatcheries Pvt. Ltd	Andhra Pradesh	SIS; Florida	17.02.23	125	125	250
18	Sai Marine Exports Pvt. Ltd - Unit II	Andhra Pradesh	SIS; Florida	18.02.23	300	300	600
19	Ananda Foods	Andhra Pradesh	Syaqua Americas Inc; Florida	18.02.23	200	200	400

20	Aqua Star Shrimp Hatchery	Tamil Nadu	SIS; Florida	18.02.23	200	200	400
21	Snehitha Hatcheries - Unit II	Andhra Pradesh	SIS; Florida	18.02.23	300	300	600
22	Sai Lalitha Hatchery	Andhra Pradesh	Syaqua Americas Inc; Florida	18.02.23	250	250	500
23	Sri Manjunadha Hatcheries - Phase II	Andhra Pradesh	Blue Genetics; Mexico	19.02.23	220	220	440
24	CPF (I) Pvt. Ltd	Tamil Nadu	American Penaeid; Florida	23.02.23	300	300	600
25	CP Aquaculture (India) Pvt. Ltd - Mukkam	Andhra Pradesh	American Penaeid; Florida	23.02.23	300	300	600
26	Srinidhi Biotechnologies	Andhra Pradesh	SIS; Florida	24.02.23	600	600	1200
27	Vaisakhi Bio-Resources Pvt. Ltd	Andhra Pradesh	SIS; Hawaii	26.02.23	300	300	600
28	BKMN Aqua (379)	Andhra Pradesh	SIS; Hawaii	26.02.23	275	275	550
29	Meenakshi Hatcheries Pvt. Ltd	Andhra Pradesh	SIS; Hawaii	26.02.23	275	275	550
30	The Water Base Ltd	Andhra Pradesh	SIS; Hawaii	26.02.23	150	150	300
31	Sandhya Aqua Exports Pvt. Ltd	Andhra Pradesh	Benchmark Genetics; Florida	26.02.23	250	250	500
TOTAL					9265	9295	18560

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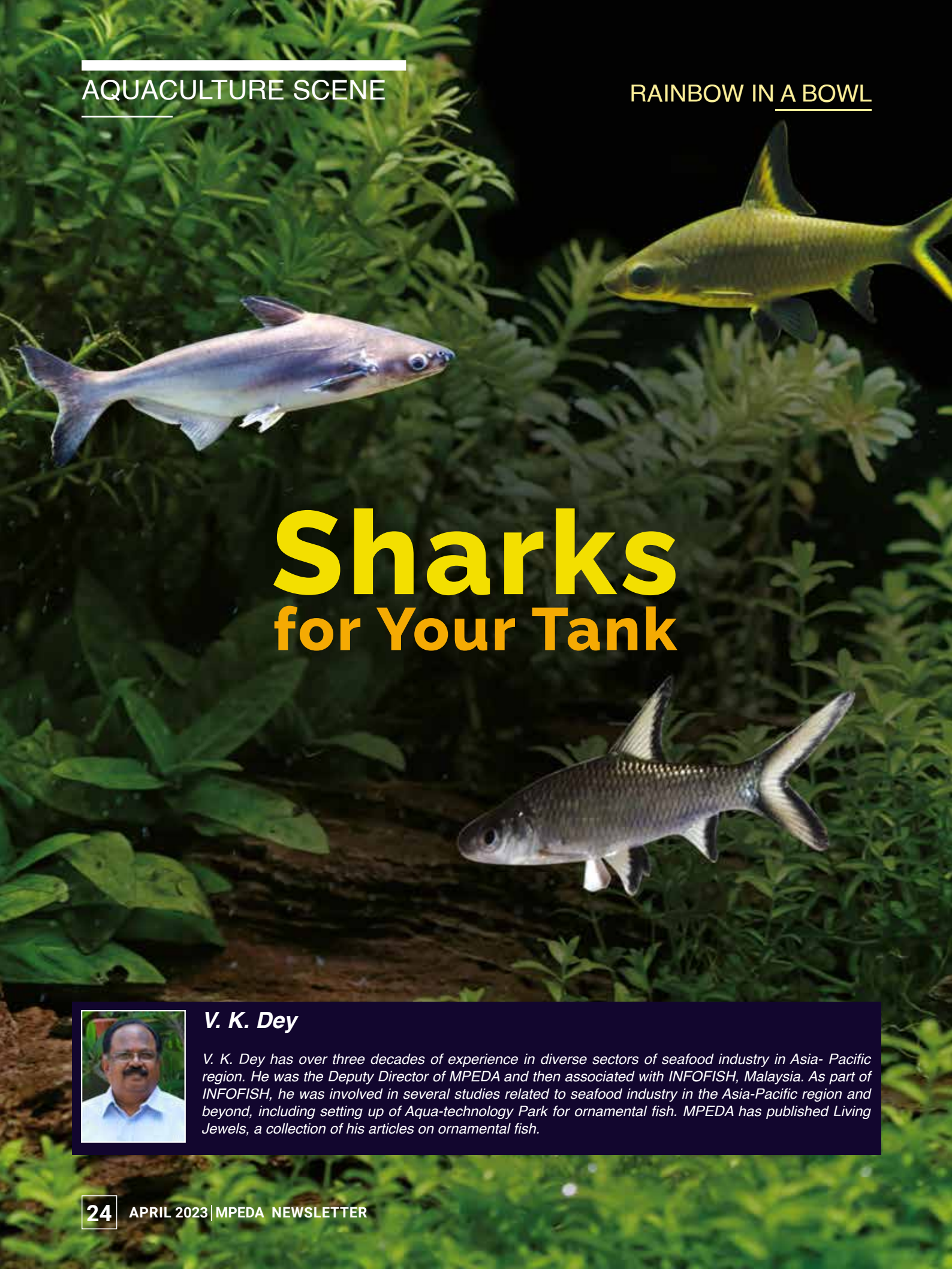


Sharks
for Your Tank

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.

RAINBOW IN A BOWL

Freshwater sharks are different types of minnows, belonging to four genera, *Balantiocheilos, Epalzeorhynchos, Labeo* and *Luciosoma*, under the *Cyprinidae* family. They are commonly referred to as freshwater sharks in the hobby market. These minnows are widely distributed over Southeast Asia, the Malay Archipelago, Indonesia, and parts of the Middle East and Africa. These fishes display a wider tolerance to water quality under aquarium conditions than they do in the wild. The genus *Balantiocheilos* have one single type of freshwater shark, *Balantiocheilos metanopterus*, commonly known as bala sharks while the genus *Epalzeorhyncho* have four types of fresh water sharks, *E. bicolor, E. frenatus, E. kalopterus*, and *E. munense*. The genus, *Labeo* has over a hundred species of which two species, *Labeo chrysophekadion* and *L. cyclorhynchus* are popular in the aquarium trade. The genus, *Luciosoma* has five species of which one, *L. siplopleura,* is popular in the hobby. Red-tail, rainbow and red-finned sharks are bred commercially in Southeast Asia with hormonal manipulation to induce gamete production and reproductive behaviour.

Balantiocheilos melanopterus, commonly known as bala shark or silver shark or tri colour shark, is a native of Laos, Thailand, Malaysia and Indonesia. It can attain a maximum size of 40 cm. The ideal water conditions are pH ranging from 6 to 7.7, dH 6 to 12 with temperature 23 to 28°C. They are considered to be endangered.

Epalzeorhynchos bicolor, popularly known as red-tailed black shark or red-tailed labeo in the aquarium trade, is a native of Thailand. They are elongated with a slight laterally compressed body, belly profile slightly curved and the back very convex. The mouth faces downward with two sets of barbels. The main body colour is black, which provides an impressive contrast with the striking bright red tail. They can attain a maximum size of 15 cm. In the wild, they are found in clear and muddy rivers with wood and stones. In Thailand, they are found in the Me Nam Chao Praya basin to Paknampo region in central Thailand. They can be kept in community tanks. It would be desirable to provide multiple hiding places with caves, wood, roots and rocks. The tank should be well planted with robust plants with fine gravel or sand substrate and have dim lighting. A dark soil is considered to enhance the colouration of the fish. The best water conditions are pH ranging from 6 to 7.5; hardness from soft to medium (dH 5 to 18), and temperature ranging from 23 – 28°C. They are omnivorous and feed on all types of feeds, algae, insect larvae and tubifex worms. The female is less colourful, more grayish and a bit larger in size while the males are deep black. They are difficult to breed and often not bred in captivity because of their aggressive nature towards their own species. However, breeding in captivity is accomplished in peat-filtered water with pH 6.8 under dim light. They spawn in rocky caves and the fry hatch after 30 to 60 hours, The fry are free swimming after four days and start to feed on small live feeds, changing colour from silver to silvery brown, then to brown and finally black. The red tail develops after 7 to 10 weeks. There are mutations of this species including albinos.

E. frenatus, better known as rainbow shark, red finned shark or ruby shark, is found in the Mekong, Chao Phraya and Xe Bangfai river basins of Southeast Asia. The water conditions range from pH 6 to 7.7 with dH 6 to 12 while ideal temperature is between 24 to 26°C. There are different mutant varieties available in the trade including long fin and albino varieties and a cross breed between this species and *E. kalopterus*.

E. kalopterus, known as flying fox in the trade, is distributed in Thailand, Malaysia and Indonesia. They attain a maximum length of a little over 15 cm. The ideal water temperature could be 24 to 26°C with pH ranging from 6.5 to 7 and dH 5 to 8.

E. munense, known as rainbow shark or red-finned shark in the trade, is often sold interchangeably with *E. frenatum*. The difference is noticeable by the position of the dorsal fin, the base of which starts ahead of the pelvic fins as against just at the pelvic fins in E frenatus. The maximum attainable length is under 12 cm.

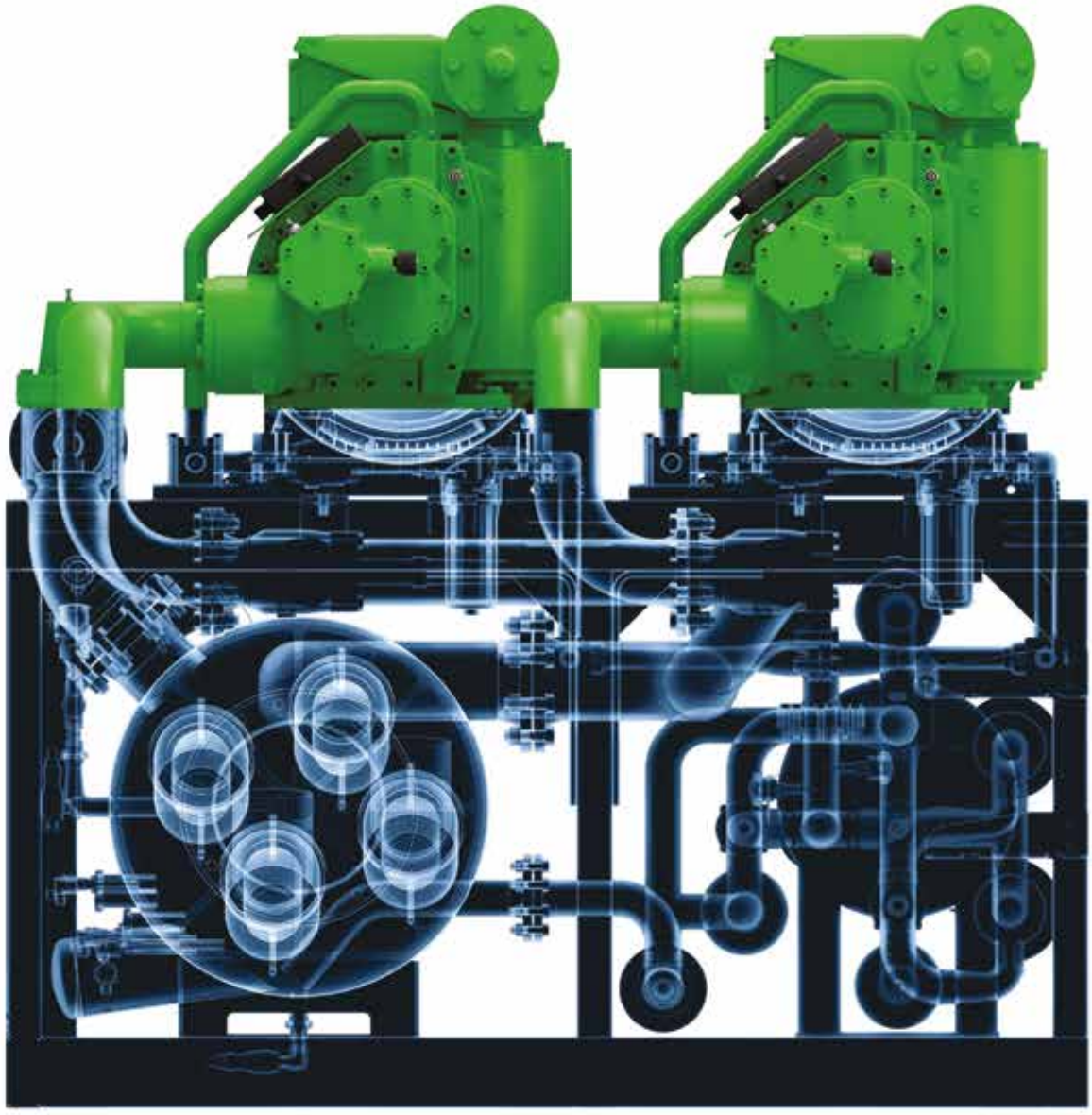
Labeo chrysophekadion, known as black shark or shark minnow, is reported in Asia and Malay Archipelago. The largest specimen of this species is reported to be over 65 cm. The ideal water temperature could be 24 to 27°C with pH ranging from 6.5 to 7.5 and dH 8 to 15.

L. cyclorhynchus, known as the variegated shark or Harlequin shark minnow, is found in Central Africa especially in the Congo ad Ogowe river systems. The water temperature reported is 21 to 27°c and the maximum size 15 cm.

Luciosoma spilopleura is found in Thailand, Indonesia and Malaysia. The ideal water temperature could be of 24 to 27°C with pH ranging from 6.5 to 7 and dH 5 to 8. In aquaria, they are kept individually in most cases.

Bitzer

DAS HERZ DER FRISCHE



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Training programme by MPEDA

Kerala

MPEDA Regional Division, Kochi organized three days general training programme on "Eco-friendly and Sustainable Aquaculture through Species Diversification" at Anchal in Kollam district during the period from 22nd February 2023 to 24th February 2023. The training programme was mainly aimed to benefit new farmers to promote sustainable and diversified aquaculture production by adopting BMPs. 19 numbers of farmers in the locality benefited through the training.

Training Certificate distribution by Mr. Johnson D' Cruz, Deputy Director, MPEDA Kochi

View of inaugural session

Mrs. Radha Rajendran, Block Panchayth President, addressing the trainees

View of technical session

Field visit organised to the aquaponics unit

Farmers meet

MPEDA Regional Division, Kolkata conducted a farmers meet on " Mud crab farming" on 10th March 2023 at Gopalpur, Haroa, North 24 Parganas district.

Total 106 participants attended the programme. The main objective was the promotion of diversified aquaculture species in reference to Mud crab farming and export.

Technical sessions

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Thermal processing of seafood

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The major source of energy for all of us is food. The main cause of diseases in humans is consumption of unhealthy or spoiled food. So, to reduce this food has to be preserved in various forms. Food preservation is the technique used to prevent food spoilage, food poisoning, and microbial contamination in food. For maintaining food for long duration preservation of the food has to be achieved. Several preservation techniques are used, so seasonal food can be consumed throughout the year. Fish preservation means making the fish fit for human consumption for few days to few months. These preservation techniques are designed such a way that the shelf life extension is done by inhibiting activity of spoilage bacteria and the metabolic changes that result in the loss of fish quality and maintaining the nutritive value of the product.

Processing stages

Seafood undergoes several processing stages immediately after catch before it is consumed. There are of 2 types of processing stages primary processing includes washing, cleaning, heading, gilling, scaling, gutting, grading, filleting, de-boning, skinning, chilling and freezing and secondary processing includes the production of 'value-added products' such as salting, drying, smoking, canning and packaged ready to eat foods

Major preservation techniques for fish

Low temperature	Chilling, Refrigeration, Freezing
High temperature	Pasteurization, Thermal processing, smoking
Reduced water availability	Salt curing, spray drying, freeze drying
Chemical based preservation	Organic acids, natural extracts from plants Microbial product based Bacteriocins
Irradiation	

Thermal processing

One of the most effective means of preserving our fish supply is thermal processing which is commonly referred as heat processing or canning. Preservation through thermal processing will be achieved by application of high temperature treatment for sufficient time. Prolonged heating in hermetically sealed

Steps included in thermal processing are

Washing ➡ Dressing ➡ Blanching ➡ Filling Fish Pieces Into Containers ➡ Filling Content Or Medium ➡ Exhausting To Remove Air ➡ Sealing ➡ Loading Into The Retort Or Autoclave ➡ Sterilization ➡ Cooling ➡ Drying ➡ Labelling And Storage

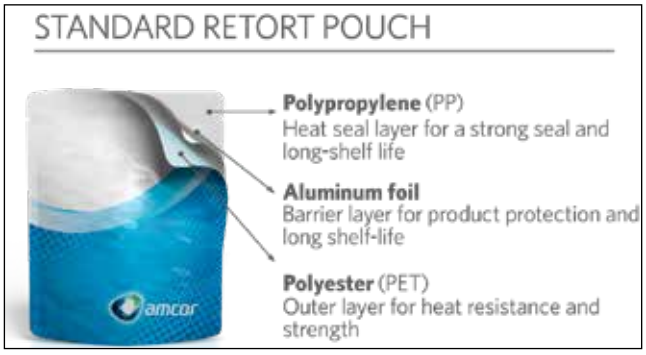
containers such as cans or retortable pouches is done in thermal processing, so the container has a suitable environment which does not support the growth of spoilage type microorganisms. In thermal processing, public health and spoilage concern microorganisms are destroyed.

In thermal processing main concern was given to *C. botulinum* which is a highly heat resistant mesophilic gram positive, rod shaped spore-forming anaerobic pathogen that produces the toxin botulinum. Botulinum cook means application of required time–temperature to inactivate spores of *C. botulinum*. For this, the center of pack (called as cold point) should get a temperature of 121.1°C for 2.52 min.

The thermal processing can be carried out by using steam retort or water immersion retort. Thermal process lethality time is termed as F_0 value which means the time in minute at a specified temperature that gives the same thermal lethality as at 121°C in one minute. F_0 value recommended for fishery products is 5-20 min. In thermal processing three types of the heat transfer occurs convection, conduction and combination of both.

Packaging materials for thermal processing are glass containers, metal containers, tinplate cans, retort pouches.

The product is said to be commercially sterile when the thermal process under normal conditions is sufficient to fulfill the criteria of safety and prevention of spoilage.



Retort pouch processing

Retort pouch consists of 3 ply laminate materials an outer layer of polyester, a middle aluminum foil, and an inner layer of polypropylene. The outer layer protects the foil, provides strength and also surface for printing details of the contents. The aluminum layer functions as a moisture, odour, light and gas barrier, while, the

inner layer is the heat seal and food contact material. These pouches are advantageous than can because of its flatter shape compared to the round shape of a can which helps in maintaining uniform and low heat requirement to reach the cold spot.

Advantages of thermal processing

- Provides easily digestible protein with rich essential amino acid content
- Provides essential nutrients like vitamin B12, D and A leading to the metabolism improvement
- The canned product offers health benefits including improvement eye sight, reduced risk of depression, increased immunity
- Increases bone strength
- Preservation of food for longer duration
- Ready-to-eat (RTE) food products
- Room temperature storage
- Easy process

Disadvantages of thermal processing

Regarding the nutritional quality of thermally processed food there is an effect on essential nutrients since, some water-soluble vitamins are heat-sensitive, e.g. vitamins C, B1, B2, B6, and folic acid a decrease in essential nutrients by heat treatment thus reduces the nutritional value of certain foods. The destruction of many aroma compounds and pigments are also observed. The instrumental texture analysis showed that product become soft after thermal processing.

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Plasma Activated Water: An innovative technology for increase the shelf life of seafood

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Introduction

Seafoods such as fish, crustaceans and molluscs are a good source of high-quality proteins, healthy lipids, vitamins, and minerals in the human diet. Particularly, they serve as the principal dietary source of the precious long-chain omega-3 polyunsaturated fatty acids (LC-omega-3-PUFA), which have a variety of physiological functions vital to human health (Abdelhamid *et. al.,* 2020).

Worldwide, dietary guidelines recommend the inclusion seafood in a balanced diet at least twice a week for good health. Seafood is highly perishable susceptible to chemical, microbiological, and enzymatic activity because of its high nutritional composition, water content, and pH (Yu *et. al.,* 2020). Fish spoilage causes an off-odor, an off-flavor, and a variety of toxic compounds, which necessitates the need to preserve fish for consumer safety.

Various non-thermal processing technology recently have been used to address these issues, such as plasma activated water (PAW) in which Water that has undergone a plasma treatment is referred to as plasma activated water (PAW).

It is more eco-friendly than some conventional chemical disinfectants, such as chlorine-based chemicals, whose by-products may be harmful to the environment (Wu & Rioux, 2010). The bactericidal capability of PAW can last for a few days depending on the storage conditions which provides opportunities for scale-up applications (Shen *et. al.,* 2016).

PAW generation and physicochemical properties

When the plasma is in contact with water, reactive oxygen and nitrogen species (RONS) produced by plasma discharge transfer from plasma to the liquid at the gas–liquid interface, interact with water molecules and each other to produce a various primary and secondary species that are crucial to PAW's decontamination activity (Zhao *et. al.*, 2020a). RONS in PAW include long-lived species such as hydrogen peroxide (H_2O_2), nitrate (NO_3-), nitrite (NO_2-), and ozone (O_3) as well as short-lived species such as hydroxyl radicals (*OH), superoxide (O_2-), singlet oxygen ($^1O_2$), nitric oxide (NO*), peroxynitrite (ONOO-) and peroxynitric ($OONO_2$).

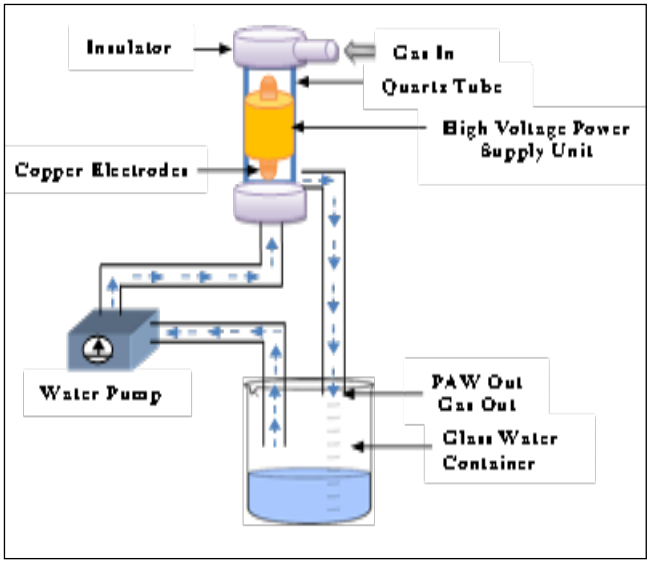

Fig. 1: Schematic diagram of the plasma reactor for water activation

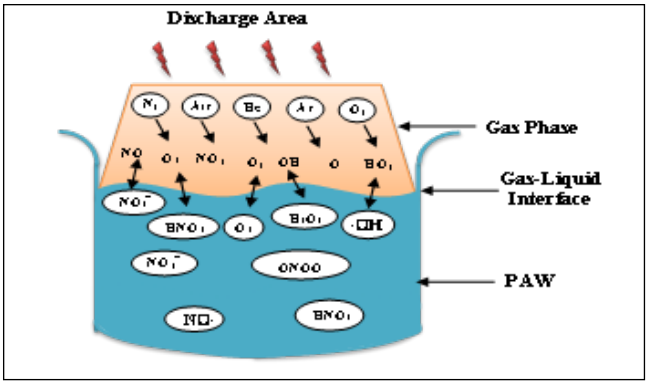

Fig. 2: The interactions of plasma in the gaseous phase with water in the liquid phase during PAW generation

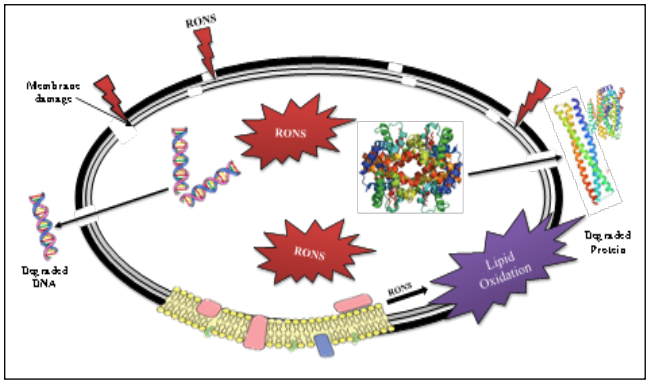

Fig. 3: Antimicrobial mechanisms of PAW

Antimicrobial mechanisms of PAW

Since, Kolikov *et. al.* (2007) published the first in vitro study of PAW, several studies have been conducted to investigate the antibacterial properties of PAW. However, the most efficient inactivation agents are still a topic of contention, due to the difficulty in identifying them. The microbial cell's membrane is disrupted after exposure to PAW, and the intracellular contents are degraded (Xiang *et. al.*, 2018). A cell membrane rupture caused by RONS in PAW can occur as a result of lipid peroxidation induced due to oxidative stress (Zhang *et. al.*, 2013). Furthermore, it has been demonstrated that PAW generates extremely high-intensity electrical fields, which makes membranes more permeable and produces temporary pores that allowing reactive species into cells (Thirumdas *et. al.,* 2018). Reactive species interact with one another and break down the internal structures of cells, including proteins, DNA/RNA, ribosomes, and mitochondria, when they infiltrate a cell (Perinban *et. al.*, 2019). Proteins and nucleic acids degraded intracellular components are then released (Huixia Chen *et. al.*, 2010; Tian *et. al.*, 2014). Additionally, it has been proposed that water molecules may potentially enter through cells following membrane leakage, causing swelling and eventual cell death (Zhou *et. al.*, 2020).

Application of Plasma Activated Water (PAW) in seafood

Table 1: Effects of plasma activated water on seafood safety and quality.

Country	Seafood Product	Conditions of PAW generation	Chemical composition and physicochemical properties of PAW	Maximum log reduction	Impact on quality attributes	References
China	Shrimp	Dielectric barrier discharge (DBD), 30 W, 5 mm distance, 10 min	Ice, pH: 3.04, ORP: 485 mV, EC: 427 ms/cm, H_2O_2: 2.15 mg/L, O_3: 8.60 mg/L, NO_3: 78.2 mg/L	TVC: 2.1 log, 8 days extended shelf life	Delayed in protein degradation, No noticeable changes in color	Liao *et. al.*, 2018
China	Grass carp	Dielectric barrier discharge (DBD), (30, 40, 50, 60, 70 W), (3, 5, 0) min	-	*L.monocytogenes* ~1.21 log, *S. typhimurium* ~ 1.44 log	No noticeable changes in color	Esua *et. al.*, 2020
Ireland	Mackerel cubes	Plasma jet, 30 kV, air, 8 cm distance, 15 min	-	*P. fluorescens* ~ 0.4 log in 30 min	Not assessed	Zhao *et. al.*, 2020b

Ireland	Mackerel fillets	Plasma jet, 300 W, 20 kHz, air (11 L/min), 10 min	pH: 3.11 ORP: 561.0 mV EC: 365.0 μS/cm H_2O_2: 13.43 μM NO_2: 420.0 μM NO_3 : 300.0 μM	Mesophilic aerobic bacteria ~ 0.2 log Psychrotrophic bacteria ~ 0.2 log *E. coli* ~ 0.2 log *L. innocua* ~ 0.2 log *P. fluorescens* ~ 0.3 log in 10 min	No noticeable changes in color. Lipid oxidation was induced	Zhao *et. al.*, 2021
China	Carp fillets	Plasma jet, 750 W, 5 kV, air (30 L/min), 5 mm distance, 2 min	-	*S. putrefaciens* ~ 1.0 log in 6 min	No significant changes in pH, hardness, springiness and cohesiveness. Sensory attributes were affected. Lipid oxidation was induced	Liu *et. al*, 2021
Taiwan	Shrimp	Piezoelectricdirect discharge plasma (PDDP),60–70 W, air (20 L/min), 1 cm distance, 20 min	-	TVC: 5.69 log, 9 days extended shelf life	No significant changes in colour, firmness, pH, TVBN and TBARS value	Herianto *et. al*, 2022

Challenges and future prospective

In several types of seafood, PAW has shown potential application as a microbial decontaminant. It is considered as non-thermal environment friendly method. However, the whole reaction process is still remained unclear because of its complexity nature.

Since, PAW interact with other food constitute, application in real seafood products has shown slightly less effectiveness than in vitro studies. The quality of some seafoods is also affected by different treatment conditions. Therefore, for a full understanding of the process, information of the exact antimicrobial mechanism and its reaction with other food constitute is crucial.

Therefore, finding the best treatment condition for a variety of foods without affecting the quality and safety of the food will be challenging.The study of the efficacy of PAW on seafood quality is still limited. More studies are required to clearly understand the underlying process and to justify the previous results. Future studies should focus on finding whether PAW forms any toxic substances that violate food safety because it contains a many reactive elements.

Although, PAW has been studied for a several years, as far as we are concerned, recognized organizations such as the World Health Organization (WHO) have not approved it for seafood applications, and regulatory standards have not yet been developed. Prior to its practical implementation in the seafood industry, we should focus on developing a low-cost method of scaling up PAW production.

Conclusion

PAW has received a lot of attention recently as a decontamination method. Numerous studies have been conducted evaluate the efficacy of PAW in various seafoods. According to the available information, PAW can be employed to ensure seafood safety and quality while functioning as a microbial decontaminant. However, there is insufficient information on quality attributes after PAW treatment. The most of these findings revealed that PAW enhanced seafood quality, while some also showed negative effects. Further studies are needed to pinpoint the cause of these effects, which are still unclear. Additionally, more studies need to be performed to optimize PAW parameters to best utilize its effectiveness without affecting seafood quality.

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MPEDA HACCP training programme at Chennai

The Regional Division of MPEDA organized 4 days, HACCP training for the technologists from seafood processing units at Chennai from 7th to 10th March 2023. There were 25 trainees from the processing units of Chennai and Nellore.

Faculty members for the training were Dr. Ram Mohan M. K, Joint Director (QC), Mr. V. Vinod and Dr. Ansar Ali. A, Deputy Directors and Mr. Vaniya Kishor Kumar, Assistant Director, SRD Porbandar.

Besides the session on HACCP principles, there were training sessions also on US Seafood Regulations, National and EU standards. Dr. M. Karthikeyan, Director, MPEDA handed over certificates to the successfully course completed trainees.

Inauguration of the training programme by Mr. K. V. V. Mohanan, Regional President (SEAI- Tamil Nadu) in presence of Dr. Ram Mohan M. K., Joint Director (QC), MPEDA and Dr. Avhik Bishnu, Assistant Director (Inspections), EIA Chennai

Dr. M. Karthikeyan, Director, MPEDA addressing the trainees during the valedictory function

Dr. Ram Mohan M. K, Joint Director (QC), MPEDA handling the technical session

MPEDA officials with the trainees

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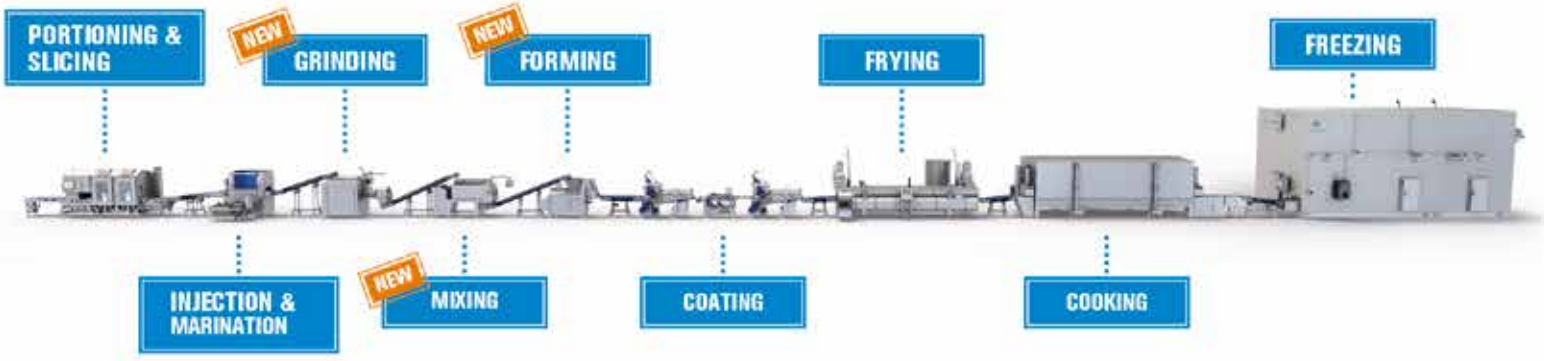

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Japanese companies are tapping into Artificial Intelligence technology to solve fish farming challenges

Japanese companies are increasingly looking to artificial intelligence (AI) for solutions for fishing and fish farming challenges.Early last year. Umitron began selling its fish feeder Umitron CELL to Kura Osakana Farm, a subsidiary of Japan's leading revolving sushi chain Kura Sushi. Fast forward to December 2022, and Kura Sushi's farmed "AI Sumagatsuo" – eastern little tuna or mackerel tuna in English – made its debut at Kura Sushi's restaurants across Japan. The species is currently farmed at a contracted site of Kura Osakana Farm.

By working with Umitron, Kura Sushi's goal is to reduce production costs, in particular feed, and ensure a stable supply of fish, while encouraging more fish farmers to adopt AI. The company also hopes to help customers appreciate the value and taste of Sumagatsuo, according to a recent press release.

"In order to continue providing delicious sushi to consumers, Kura Sushi needs to ensure that it has a stable supply of high-quality fish," said Akiko Sato, manager at Umitron. "To achieve this, it's vital to enhance fish farmers' working environment and refine their operational and production costs and overall industry management, something that can be accomplished using Umitron CELL."

Umitron CELL's automatic feeding feature is powered by the Fish Appetite Index (FAI), Umitron's AI algorithm that analyzes fish school appetite by monitoring swimming behavior and gives farmers the ability to remotely control the smart feeder from their office PCs or phones. It can also control the amount and speed of feeding by calculating feed requirements. This contributes to a reduction of labor and less environmental impact as uneaten feed does not go to waste.

Sumagatsuo has only recently begun to be produced in Japan, and farmers are still trying to work out how best to rear the species. In this sense, the ability to remotely check on the fish at any time via real-time video and feed them in line with data, such as feed amount and feeding duration, is extremely beneficial.

"Umitron CELL can also help in other ways," said Sato. "For example, it can contribute to reducing the number of boat trips to offshore pens and subsequent fuel costs, and it improves farmers' working environment. Some say that they have been able to spend more time with their families because they can feed their fish from home whenever they want, and wherever they are."Sumagatsuo is a unique species in that it only takes six months from hatching to reach harvest size (around 1kg). Although it's not yet clear whether AI can help the fish grow more quickly, it does have a certain effect on improving feeding efficiency. Sato also points out that in the case of other fish species, the growth period of red sea bream reared with Umitron CELL decreased by up to four months, in comparison to the same species grown with a regular feeder.

With Japan's aquaculture facing problems such as labor shortages and high management costs, Sato believes that AI can address a host of issues.

"Farmers have to go back and forth to feed their fish every day in all kinds of weather," she said. "This is hard work, especially for older farmers and women,

and young people don't want to do it. Instead, they move elsewhere, and the depopulation of rural areas that are home to aquaculture is a serious problem in Japan. Even when new people are hired, farmers find it challenging to teach them what they have learned over the years and employees soon quit due to the difficult working environment. There is also a lot of pressure on aquaculture management. For example, in red sea bream farming, the cost of feed accounts for 50 to 60 percent of total production costs. But we can address these issues with Umitron CELL and FAI.

"From AI and the Internet of Things (IoT) to remotely operated vehicles and remote satellite imagery, new technologies are being increasingly leveraged in aquaculture with their promise of better efficiency and insights into fish farming. Umitron and Kura Sushi are currently discussing the use of Umitron CELL to provide customers with an even better variety of sushi, while this year Umitron is looking to play a prominent role in the global expansion of technology-grown fish through imports and exports.

"This will attract new global consumers and producers, and be a good opportunity to get them interested in ocean sustainability," said Sato. "When Umitron was founded in 2016, many farmers in Japan could not picture how technologies like AI and IoT could be incorporated in aquaculture. However, partly due to the Japanese government's current push for digitalization, more and more fish farms are likely to introduce technology to improve their production efficiency and working environment. In 2022, there were many positive examples and results of AI applications in the Japanese news. This is an incentive for fish farmers to incorporate successful cases on their own farms and I believe that in 2023 we will see much more of this."

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5	Alaa Alamoudi Mustafa Al-Amoudi Sons Jordan Ph.: +962 795639300 Email : Amoudi_co@hotmail.com *Pomfret*	6	Jacky Chen Sales Manager Zhangzhou TAN Fujian, China Ph.: +861 3607577087 Email: jackychenvip@vip.sina.com Website: www.tanco.com.cn *Sardine and Tuna*
7	Yelda Can Foreign Trade Manager YURT KONSERVE Istanbul, Turkey Ph.:+90 5063631792, +90 2128614343 Email: yelda@yurtkonserve.com.tr Website: www.yurtkonserve.com.tr *Tuna and Pomfret*		

TRADE ENQUIRY

MIXED ITEMS/OTHER			
1	Dato Francis Ng CEO House of Sea Food Singapore Ph.: +65 9322 9899, +65 6444 9000 Email: francis@houseofseafood.com.sg Website: www.houseofseafood.sg *Mud crab*	2	Van Angelo B. Pineda Junior Buyer Bonifacio Global City,1634 Taguig City, Philippines Ph.: +663 9176373199 Email: vpineda@snrshopping.com Website: www.snrshopping.com Indian seafood, Frozen shrimp, Whole fish, *Crabs and Fillet*
3	Oceamer Ltd. Director Mauritius Email: aviarns@gmail.com *Shrimps, Octopus and Lobster*	4	Ramez Yahia Mohammad Fresh food Merchandise Manager Majid Al Futtaim Retail Riyadh11321, Soudi Arabia Ph.:+966 566088395,+966 112534611 Email: rmohammad@mafcarrefour.com *Shrimp, Squid & Fish*
5	M. Salar Sheikha CEO Emak Kozar Co. Kurdistan, Iraq Ph.: +075 01592552 Email: salarsheikha@yahoo.co.uk *Prawns, Black tiger and Seabass*	6	Fazal Mondani General Manager Mondani For Food Trading L.L.C Al Ras, Deira, Dubai Ph.: +971 52 577 3442 Email: mondani@mondani-trading.com *Seafood*
7	Respect Mega Trade Director Israel Ph.: +972547857110 Email: admincontact1@gmail.com *Shrimp, Squid*	8	Mueen Purchase Manager SAF Group Int. Kuwait Ph.: +965 55034705 Email : safgroup.kwt@gmail.com Website: www.safgroupint.com *Mackerel, Fish fillets and Shrimps*
9	Son Hoang Manager QUOC DAT Company Ltd Vietnam Ph.: +84971061996 Email: sonhoang.quocdatltd@gmail.com *L. vannamei*	10	Hassan Khalaf CEO HASSAN KHALAF FOR FISH IMPORT AND EXPORT Cairo, Egypt Ph.: +201 2112555 03 Email: ali@hassankhalaf.com *Shrimp and Crab stick*
11	Andrei Rostovskii Importer Dubai Ph.: +971 527561678 Email: anrost@live.ru Website: www.sorgynfood.com *Shrimps*	12	Valeria Rysinova Fresh Food Import Division Head d42 trading Dubai Ph.: +971 505290858 Email: valeria.rysinova@d42.ae *Frozen fish and other seafood*

TRADE ENQUIRY

13	Yuliia Pavliuchenko Owner INTERFRUITS UG Hamburg, Germany Ph.: +491 5124095649 Email : yuliia.interfruits@gmail.com *Fish and Shrimp*	14	Wisam Jwar Sales and Marketing Manager Takin Fine Foods Sydney, Australia Ph.: +02 96096779,+04 37887774 Email: sales@takin.com.au Website: www.takin.com.au *Pomfret, Rohu, Tilapia and Squid*
15	Samir El Bour Trade Manager PESCA MAR FISHS Seafood Export and Production Morocco Ph.: +212 665271955 Email : pescamar@qualityfoods.ma *Shrimps and Squid Tube*	16	Roula Takla Managing Partner Netaj Trading W.L.L Doha, Qatar Ph.: +974 66581581, +974 44441640 Email: roula@netaj.qa *Mackerel and Pangasius*
17	Ming Sy Operation Manager Myles Savour Ltd San Po kong, Hong Kong Ph.: +852 56199960 Email: myles@mylessavour.com *Seafood and Prawn*	18	Javed A. Hamdulay Category Manager Alyasra foods Kuwait Ph.: +965 69398009, +965 22249131 Email: J.Hamdulay@alyasra.com Website: www.alyasra.com *Squid*
19	Salmanul Faris Purchase Officer Sealand Ajman, UAE Ph.: +971 507152880, +971 67480761 Email: purchase@ yurtkonserve.com.tr Website: www.yurtkonserve.com.tr *Shrimp, Black Pomfret, Cuttlefish, Octopus and King Fish*	20	Yasser Khalaf Marketing Director FROZEN FOOD HOUSE Amman, Jordan Ph:+962 795523889,+962 65532951 Email: Yasser@frozenfoodhouse.com Website: www.frozenfoodhouse.com *Shrimp, fish and fish fillets*
21	Magdi Ahmed General Manager The Rich Trade For Import And Export Cairo, Egypt Ph.: +201 013157788 Email: Therichtrade@gmail.com Website: www.therichtrade.com *All types of Seafood*		

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