MPEDA

Newsletter

VOL. XI NO. 2 MAY 2023

MPEDA at the Seafood Expo North America 2023, Boston

Print "Something Fishy": Exploring Possibilities of 3D Food Printing

MPEDA at Acharya Prafulla Chandra Roy Smarak Vigyan Mela O Pradarshani

Cuttlebone Availability & Characterization: How these Impact its Use in Traditional & Pharmaceutical Industries

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On the Platter

Mr. Dodda Venkata Swamy
Chairman

Dear Friends,

I am glad to announce that the marine products exports from the country have crossed US $ 8 billion mark during 2022-23 for the first time in its history as per the estimated figures released by the Commerce Ministry. It gives immense pleasure, because the sector has achieved this feat fighting so many odds in various markets. As per the provisional estimate, our exports to US, the principal market, has declined by 23% in the last financial year compared to the previous year. However, our exporters have quickly grabbed the opportunities in other major markets such as China, European Union, Southeast Asia and Japan, which to a great extent has compensated the shortfall in US market. Year on year the exports registered an incredible growth of nearly 4%. I appreciate all the exporters for their hard work and adaptability to market dynamics to hold our flags high.

Though we still battle antibiotic related trade barriers in EU, there is a renewed interest in EU about Indian seafood. MPEDA had participated in the recently concluded Seafood Expo Global held at Barcelona from 25th to 27th April 2023. The trade enquiries received underlie the fact that still European buyers look at India for a sustainable supply of seafood. A lot of enquiries have been received, especially for black tiger shrimps. I am sure that all the 29 co-exhibitors participated, along with MPEDA in the 460 sq. m. Indian pavilion at SEG Barcelona were benefitted from the participation in full. Indian pavilion was inaugurated by His Excellency Mr. Dinesh K. Patnaik IFS, Embassy of India to Spain who was in full praise of the arrangements. The cooking demo organized by MPEDA has attracted visitors and buyers alike.

MPEDA also had its first meeting of the newly constituted authority which has elected Mr. Jagdish Fofandi, National President of the Seafood Exporters Association of India (SEAI) as the Vice Chairman. It has also selected the members of its Executive Committee, Technical Committee and Export Promotion Committee. I congratulate them all on this occasion.

Mr. Sunil Barthwal IAS, Commerce Secretary and Mr. Peeyush Kumar IAS, Additional Secretary, Ministry of Commerce & Industry, visited MPEDA and has reviewed our activities. We are thankful to both the officers for their visit and valuable advice.

GACC of China has opened their CIFER window for 97 establishments, whose suspension was revoked by GACC, for renewal of their registration. It will help them to restart their exports to China.

Thank you.

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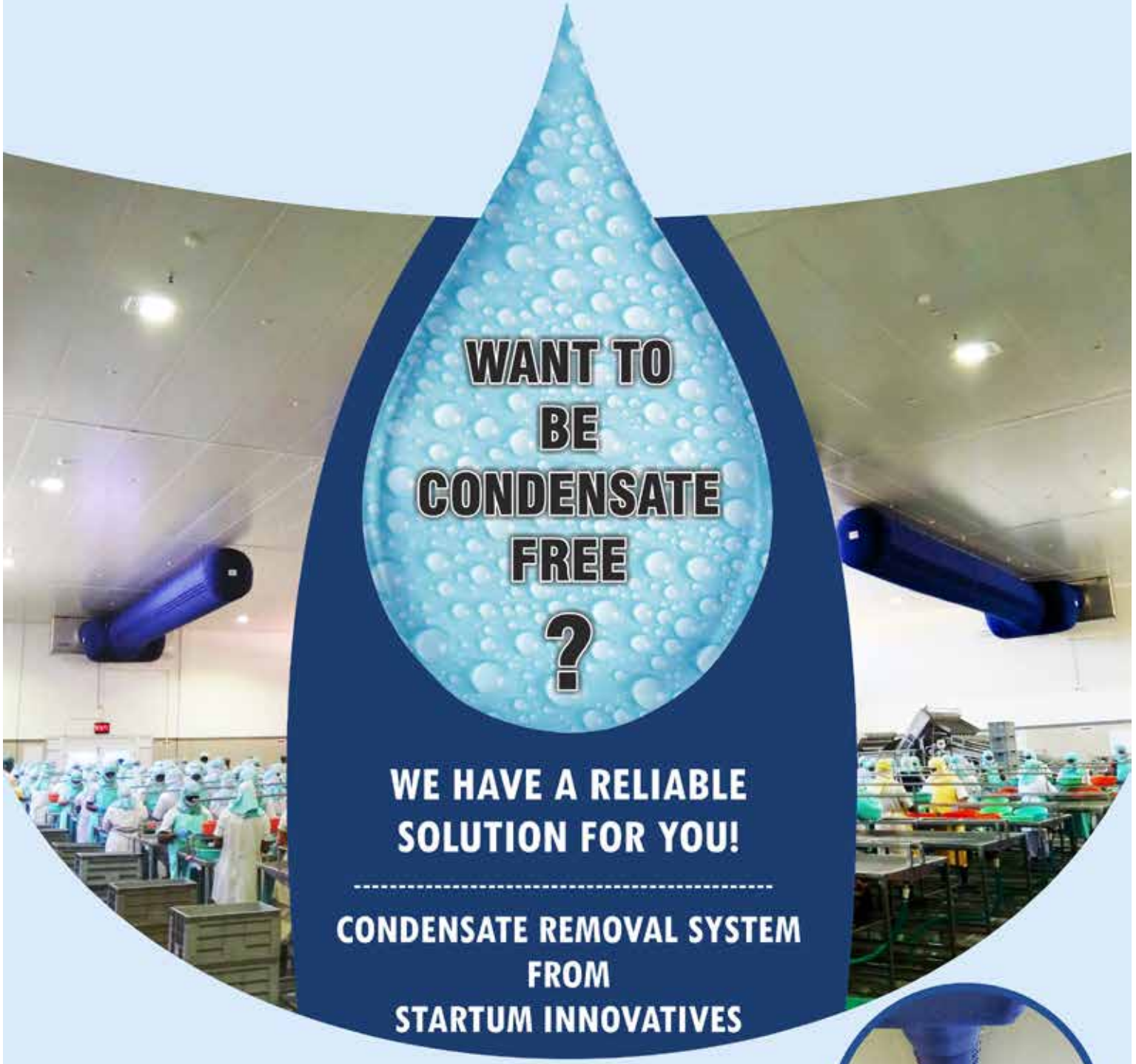
STRATUM INNOVATIVES

TRULY INNOVATIVE



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MPEDA participates in Seafood Expo North America 2023

Seafood Expo North America/Seafood Processing North America is America's largest seafood exposition. Thousands of buyers and suppliers from around the world attend the annual, three-day exposition to meet, network and do business. Attending buyers represent importers, exporters, wholesalers, restaurants, supermarkets, hotels, and other retail and foodservice companies. Exhibiting suppliers offer the newest seafood products, processing and packaging equipment, and services available in the seafood market.

This exposition gathers exhibiting suppliers from over 50 countries under one roof, year-after-year, with one goal in mind: provide North America's seafood buyers a one-stop-shop to access everything seafood, face-to-face. This includes discovering, sampling and sourcing products; meeting with current or new suppliers; networking with industry colleagues; and so much more! The fair, organized by Diversified Communications, has transformed into America's most important Seafood Show over the years. During this year 2023, in SENA a total of 894 exhibitors and 261 equipment/packaging/service companies participated.

Seafood Expo North America is instrumental for business promotional and networking success for seafood export into USA. More than 90 percent of seafood consumed in the U.S. is imported, making Seafood Expo North America a sizable sales opportunity for suppliers from everywhere to bring their products to buyers from restaurants, supermarkets, catering firms, seafood markets, hotels, airlines, cruise lines and more.

Attendees include owners, proprietors, executive purchasing managers, category managers, private label program buyers and equipment and packaging buyers from retail, foodservice, and other business categories such as airline, bar/club, cruise line, distributor, fast food, government/military, grocery, high-volume catering, hospital, hotel, import/export, manufacturer, processor, resort, restaurant, school, supermarket, wholesale etc.

View of SENA 2023

View of Indian pavilion

The India Pavilion

The India pavilion was organized in booth no. 2833 by MPEDA, by taking a space of 2,000 sq. ft.The India pavilion had 16 exporters as co-exhibitors, having 100 sq. ft. allotted to each co-exhibitor.

MPEDA participation

The USA has been the single largest market for Indian marine products for many years. Over the years, MPEDA has been participating in SENA with the primary objective to maintain India's leading position as major shrimp exporter to the USA and to increase seafood exports further from India by introducing new products and by introducing new exporters into the market.

Views of the MPEDA stall

Mr. Anil Kumar P. Joint Director (Marketing), MPEDA interacting with buyer

Mr. D. V. Swamy, Chairman, Mr. Anil Kumar P., Joint Director (Marketing), and Mr. Archiman Lahiri Deputy Director have organized MPEDA's participation and setting up of Indian Pavilion in Seafood Expo North America 2023. MPEDA theme for exhibition was value added products, sustainability and diversification. Various value added chilled/frozen and dried seafood samples arranged through MPEDA Regional/Sub Regional Divisions, air freighted by Regional Division, Mumbai was displayed in display freezer and convertible chiller at MPEDA stall. Various publicity materials viz., handbook on Indian fisheries, seafood product catalogue, commercial fish chart etc, were displayed in the MPEDA stall. A QR code for downloading the Co Exhibitors Guide, sea food recipes, Indian exports directory, etc., was also displayed in MPEDA stall for digitally inclined trade visitors. The products displayed in seafood booths were retail products especially ready to cook and ready to eat products.The United Nations has declared 2023 as an International Year of Millets (IYoM-2023) as per the proposal of Government of India considering the potential of Millets to provide nutritional food to the people and to create global demand for millets. Araku Valley, the highlands of the Eastern Ghats mountain range overlooking the Bay of Bengal, is brewing one of the best coffees in the world. During the show, MPEDA promoted the IYoM-2023 and Araku coffee.

Deputed officers attended various queries raised by the trade visitors on availability and seasonality of various fish and fishery products from India. A total of around 123 buyers visited the Indian pavilion. Live demo of various Indian cuisines arranged at the MPEDA Pavilion with the participation of an expert Chef was the centre of attraction for the trade visitors.

16 Co-exhibitors of India Pavilion in Seafood Expo North America 2023

1.M/s. Jeelani Marine Products, Ratnagiri
2.M/s. AlbysAgro Pvt. Ltd., Mangalore
3.M/s. Deva Seafood, Tuticorin
4.M/s.Seafood Innovations, Kochi
5.M/s. Continental Marines, Visakhapatnam
6.M/s. Pasupati Aquatics Private Limited, Kolkata
7.M/s. High Land Agro Food Private Limited, Bhubaneswar
8.M/s. NDM Seafood Processors and Exporters Private Limited, Kolkata

9.M/s. Coastal Corporation Limited, Visakhapatnam
10.M/s. Rameshwar Cold Storage, Veraval
11.M/s. Naga Hanuman Fish Packers, Visakhapatnam
12.M.s. New Faizan Foods, Veraval
13.M/s. Sashimi Foods Private Limited, Mangalore
14.M/s. Calcutta Seafoods Private Limited, Kolkata
15.M/s. Salet Seafood Private Limited, Porbandar
16.M/s. K.N.C Agro Limited, Kolkata

Inauguration of MPEDA stand

The MPEDA booth- 2833 at SENA Boston was inaugurated by Mr. Randhir Jaiswal, Consul General of India, New York in the presence of Mr. D. V. Swamy, Chairman, MPEDA, Mr. Manish Kulhari Consul (Trade), Consul General of India, New York, Mr. Anil Kumar P., Joint Director (Marketing), MPEDA, Mr. Archiman Lahiri, Deputy Director, MPEDA, the co-exhibitors and Indian delegates on 12th March 2023.

Inauguration of the MPEDA stall

Mr. Randhir Jaiswal, Consul General of India, New York visiting the Indian pavilion

Mr. Randhir Jaiswal Consul General of India, New York visited all the stalls put up by co-exhibitors at the India pavilion and had discussions with each of the participants. The Consul General appreciated the efforts taken by MPEDA to arrange the diverse forms of Indian seafood for display and the cooking demo.

Live cooking demo

A live cooking demo was arranged through a Michelin star chef Mr. Hemant Mathur from New York with the support of CGI, New York for carrying out the cooking demonstration of Indian seafood cuisine. Variety of Indian cuisines with shrimp, squid and fish was served to the visitors and buyers. The millet salad with shrimp was the true hit among all the cuisine.

Eminent food bloggers from Boston and New York were engaged for promotion of Indian seafood through different activities with the visitors. This was mainly for targeting the American buyers and consumers for promoting Indian seafood. The blogs published online had a good following and comments.

Seafood dishes served for tasting in the Indian pavilion

Visitors enjoying the taste of Indian seafood

MARKETING NEWS

Meeting with Consul General of India, New York

MPEDA officials at the office of Consul General of India, New York

The MPEDA team under leadership of Mr. D. V. Swamy Chairman, MPEDA called upon Mr. Randhir Jaiswal, Consul General of India and Mr. Varun Jeph, Deputy Consul General, New York on 15th March 2023 and discussed about the SENA fair and strategies for expansion of seafood to US in the presence of Mr. Manish Kulhari, Consul (Trade) at the Consulate General of India, New York.

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MPEDA participated in Acharya Prafulla Chandra Roy Smarak Vigyan Mela O Pradarshani

Inaugural function

MPEDA through its Regional Division, Kolkata participated in Acharya Prafulla Chandra Roy Smarak Vigyan Mela O Pradarshani at Belgachia Vigyan Kendra organized by the Department of Veterinary Physiology, WBUAFS in collaboration with Paschim Banga Vigyan Mancha from 16th to 18th March, 2023.

The activities of MPEDA, RGCA, NaCSA and NETFISH were showcased along with display of value added and high value marine products. Leaflets were distributed and MPEDA publications were sold in the MPEDA stall at the venue.

From the overall 78 exhibiting stalls, that of MPEDA was adjudged the best followed by Survey of India. Asiatic Society and Indian Wave of Amateur Radio jointly ranked third.

Visitors at MPEDA stall

MPEDA officials at the stall

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Marine landing report March 2023

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

NETFISH gathers real-time data on daily marine landings from approximately 100 major fishing harbours and landing centres across India, in order to support the traceability and catch certification system. The Harbour Data Collectors record and upload information about the fishing vessels arriving at the landing sites, as well as the species-wise quantity of catch landed by these vessels, on a daily basis to the MPEDA website. This report provides a summary of the trends in marine landings during March 2023, based on species-wise, harbour-wise and state-wise data.

I.Observations on catch landings

In March 2023, marine catch landing data was obtained from 91 landing sites in the 9 coastal states and a total catch of 70,636.71 tons was recorded during the period. The catch was comprised of 37,359.32 tons of pelagic finfishes (53%), 18,346.43 tons of demersal finfishes (26%), 7,250.94 tons of crustaceans (10%) and 7,680.03 tons of molluscs (11%) (Fig. 1).

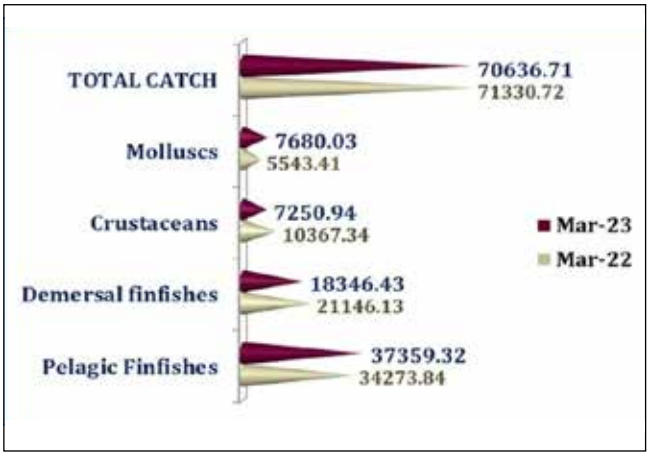

Fig. 1: Catch composition of marine landings (in tons) (March 2022 & March 2023)

A total of 252 species including marine finfishes and shellfishes were reported during the month, of which the major five contributors were *Rastrelliger kanagurta, Sardinella longiceps, Nemipterus japonicus, Uroteuthis duvaucelii* and *Lepturacanthus savala* (Table 1).

Table 1: Major five species landed during March 2023

Sl. No.	Common name	Scientific name	Qty. in tons
1	Indian mackerel	*Rastrelliger kanagurta*	10,240.97
2	Indian oil sardine	*Sardinella longiceps*	6,920.41
3	Japanese thread fin bream	*Nemipterus japonicus*	4,819.12
4	Indian squid	*Uroteuthis duvaucelii*	3,641.05
5	Ribbon fish	*Lepturacanthus savala*	2,999.56

Analysing the group-wise landing, Mackerels, Ribbon fishes, Sardines, Threadfin breams and Tunas were found as the major items landed during the period (Fig 2). Almost 51 % of the total catch was comprised of these five fishery items.

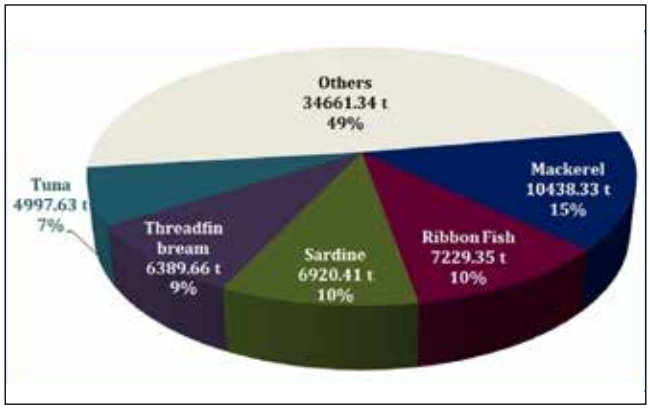

Fig. 2: Major five fishery items landed (March 2022 & March 2023)

Among Pelagic finfishes, the major items landed were Mackerels and Ribbon fishes whereas in the case of demersal finfishes the Threadfin breams and Croakers were the major items. Among Crustaceans, more than 65 % of the catch was comprised of different species of Coastal shrimps, in which the dominant species were *Poovalan* shrimp (1,421.03 t) and *Karikkadi* shrimp (1317.38 t). Squid and Cuttlefish were the major molluscan resources landed during the month.

State-wise landings: The highest landing was reported from Gujarat, which was to the tune of 16,163.94 tons (23 % of total catch). It was followed by Karnataka and Kerala with a share of 14,605.41 t and 11,545.78 t respectively (Fig. 3). The landings from west coast states had together formed 80 % of the total catch. The least marine landing for the month was reported from Andhra Pradesh.

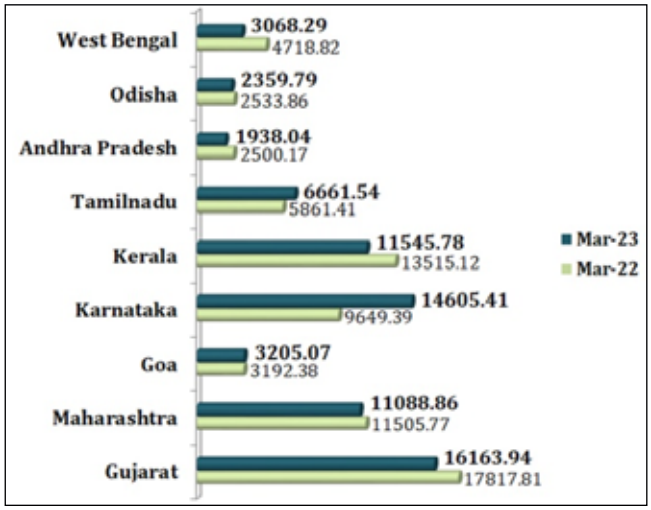

Fig.3: State-wise marine landings (in tons) (March 2022 & March 2023)

Harbour-wise landings: The Malpe and Veraval harbours had recorded the maximum fish landings during March. 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	4,175.25
2	Veraval	3,815.89
3	Ratnagiri	3,627.20
4	Porbandar	3,253.37
5	Vanakbara	3,113.08
6	New Ferry Wharf	3,101.90
7	Mangrol	3,050.97
8	Honnavar	2,780.96
9	Mangalore	2,774.61
10	Okha	2,492.86

II.Observations on boat arrivals

The number of fishing vessel arrivals reported from the 91 fish landing sites during March totalled to 35,012 nos. The highest number of boat arrivals had occurred in Gujarat and then in Kerala (Fig. 4). The state which reported least number of boat arrivals during the period was Odisha. Among the harbours, Veraval (1,875 nos.) and Mangrol (1,803 nos.) in Gujarat had topped the list in terms of highest number of boat arrivals.

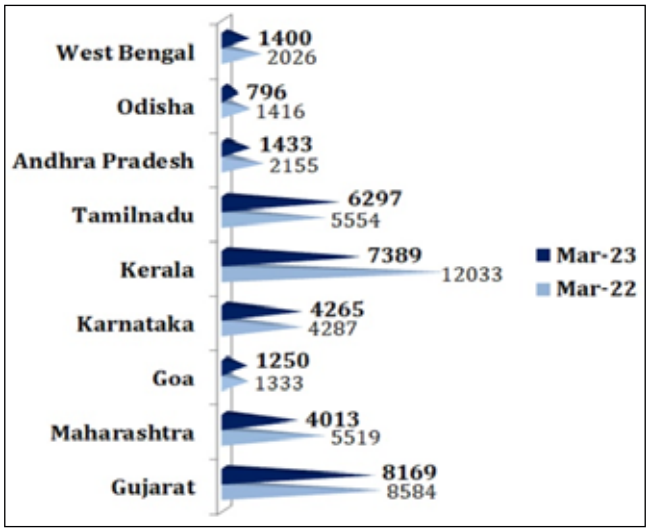

Fig.4: State-wise boat arrivals (nos.) (March 2022 & March 2023)

Summary: A total of 70,636.71 tons of marine fish landings and 35,012 boat arrivals were reported during March 2023 from the 91 major fishing harbour/ landing centres in India. After the declining trend in catch since November 2022, landings have shown an increasing trend in March 2023, with 4,738 tons more catch than February 2023. The number of boat arrivals has also increased by 1968 compared to previous month. Pelagic finfish resources remained the major contributor to the total catch, and Indian Mackerel was the most landed species of the month. Gujarat ranked top among the states in landing as well as on the number of boat arrivals.

Among the various landing sites, the Malpe harbour continued in the first position in terms of total catch landed, and the Veraval harbour had the highest number of boat arrivals.

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Monthly outlook forecast report

Ritesh Victor – Co-founder & Country Head – Myforexeye Fintech Pvt. Ltd.
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USD INR

The last month of the Indian financial year 2022–23 and also the end of the first quarter of 2023, were filled with a seesaw of events. From Fed's hawkish remarks to the major banking crisis in the US and UK, the Indian rupee continued to sway between the ranges of 81.60 to 82.80 against the US dollar. The very start of the month witnessed the rupee reach a high of 82.80 after the announcement of FOMC meeting minutes. It was soon enough that the rupee reached 81.965 as foreign institutional investments of 1.55 billion dollars were made. In the middle of the month, the world saw the fallout of Silicon Valley Bank and Signature Bank, followed by the major Credit Suisse conspiracy, leading to the market participants to rush for the safe haven currency, i.e., dollar, and pushing the rupee around 82.80.

As the end of the month approached, the Federal Reserve hiked the interest rate by 25bps, in anticipation to the market predictions, and gave an assurance of ending the monetary policy tightening. This did provide the rupee with some strengthening around 82.25. The fiscal year's conclusion gave the rupee more power to close at 82.17 against the US dollar, as corporations sold their dollars. Some important events in the upcoming month are the ISM Manufacturing PMI (Mar), Initial Jobless Claims, ISM Non- Manufacturing PMI (Mar), Interest Rate Decision, Unemployment Rate and Core PMI (Mar).

This month has proven to be a roller coaster ride for the USD INR pair as it started the month around 82.50 levels then declined to touch the monthly low of 81.69, once again it started it uptrend to make the monthly high of 82.80 and fell back to end the month at 82.17.

Two reasons supporting the dollar appreciation was there were unfilled gaps around 81.75-80 and usually such gaps don't exist in this pair whereas the other reason was increased safe heaven demand because of the ongoing banking crisis.

If you examine the daily candlestick chart for the USD INR pair, it is quite evident that the triple top resistance region i.e. from 82.85 – 83.29 still remains to exist. The MACD line (blue line) and signal line (orange line) switched position twice in March month. Currently, despite the fact that both lines are rather near to one another, the MACD line (blue line) has passed and is now below the signal line (orange line), which denotes the oversold region or the buying area. The SMA of 89-day (yellow line) and 144-day (Purple line) comes at 82.23 and 81.99 respectively.

Analyzing the USD INR pair movement, the dollar exporters got a lot of opportunities to hedge the exposures, now it is time for the dollar importers to play around and start hedging their exposure. To start with importers can hedge very-short term exposure and since we expect a further rise of the Rupee; they can then increase their pace below 82-levels.

EURUSD

EURUSD started the month on a positive note by opening at 1.0572. The pair gained about 3.4% during the whole month. The pair fell after Fed Chair Mr. Jerome Powell's hawkish remarks. The speech stated that the rate hikes would be accelerated to contain inflation in the United States. It lost more than 50 pips and dropped to 1.0524 after two months.

The fallout of Silicon Valley Bank and Signature bank affected the investor's sentiment as they rushed toward the safe haven. Fed increased its interest rates by 25 bps to prevent the liquidity crunch problem faced by the banks. ECB increased the interest rate by 50 bps to contain the sticky inflation. First Citizens Banc Shares' purchase of Silicon Valley Bank helped alleviate banking sector concerns, and the decline of the dollar index to 101.67; supported the pair's growth.

EUR/USD maintained a defensive position and closed at 1.0842, after regaining the weekly high of 1.0925 early in the day. Inflation in the Eurozone was 6.9% lower than anticipated. German Manufacturing PMI, ISM Manufacturing PMI (U.S.), JOLT's job openings, and U.S. Non-farm Payrolls will be watched closely for future cues.

EURUSD started the month at nearby 1.0550 and managed to recover almost 350 pips by the end of the month. The shared currency ended the month at 1.0840 after touching a month high of 1.0926 in the last week following a decline in the dollar index to 101.67. If the pair continues to rise, resistance can be seen at the 1.0910 mark. The support level needs to be at 1.0540 if the pair declines for any cause. The Relative Strength Index (RSI) reading on the four-hour indicator dropped towards 60, indicating a loss of bullish momentum. The EURUSD is currently facing more selling pressure as a result of prices failing to hold above the 1.09 mark after hitting an overbought area. The EURUSD needs to move above 1.0910 and use that level as support in order to pass 1.0926 (static level, March 23 high) and reach 1.1000. If a support at 1.0786 is breached by the Euro against the Dollar, a support at 1.0540 still stands and looks to be a crucial support.

GBPUSD

The cable pair continued to hold its upper position against the dollar for the fourth straight week and ended the month in green. During the week the pair made a high at 1.2423. In the first week, positive U.K. monthly GDP data indicated a British economic recovery, which raised market expectations for a rate hike by the BOE. On the other hand, due to inflationary pressure, it was expected that the fed will also tighten the monetary policy. However, in the second week, the sudden collapse of two powerful banks the SVB and Signature Bank caused the fed to slow down their rate hike by 25 basis points. During the month dollar strengthened as investors moved to safe haven currency after the evidence found against the credit Suisse bank failure due to a liquidity crunch, but the intervention by government authorities and dovish comments by Powell caused the dollar to lose ground. The cable pair was also favored by Brexit optimism. Similar to the fed rate hike the BOE also increased the

interest rate by 25 basis points but hawkish comments by Mr. Andrew Bailey increased the expectation of further policy tightening in order to control inflation in the future.

This was the third straight week where bulls remained heavy on the bears which helped the pair to end the month of March with strong gains. Pair was up by more than 300 pips during the month and closed near to 1.2340.

Looking at the momentum bulls are eying on 1.26 levels but this is the third time since mid-December pair couldn't go above 1.2425-30 region, this seems to be a strong resistance breaking of these levels could push the pair towards 1.26 region while on the downside 100 days moving average hovering near 1.2125 levels where pair could get the support comfortably breaking of that region might push the pair below 1.20 region and then towards YTD low 1.1802. On the daily time frame momentum indicator MACD giving mixed signals while RSI is trading around 58 which is considered to be an overbought zone.

USDJPY

The USDJPY began the month at 135.93 levels, and the US dollar fluctuated before settling on a slight

downtrend. While maintaining a very loose monetary policy, the BOJ repeatedly attempted to keep the yield on the 10-year note below 50 basis points. The pair went up after Federal Chair Mr. Powell said that strong data will probably require the central bank to raise interest rates more than expected.

After US authorities took action to limit the consequences of the sudden collapse of Silicon Valley Bank, the following week, gains were difficult to achieve as a result of bearish market sentiment.

Following the USDJPY's weekly low of 132.47, investors reacted to Union Bank Of Switzerland's acquisition of Credit Suisse, which weakened the dollar.

The decline in US treasury yields and the CPI data, which showed inflation at 3.3%, provided some support for the Yen. As a result, the past week saw a high of 133.594, which was made possible by decreasing concerns regarding the collapse of Deutsche Bank and continuing assurances of financial stability from regulators in the United States. The USDJPY finished the month at 132.830 on the 31st walking up 0.11 percent from the past meeting acquired by 2.48 percent throughout the course of recent weeks.

The USDJPY opened the month at 136.224; traded slightly upward at the beginning of the month but started falling from the second week and marked the low at 129.649 during the month; plunged by 2.49% and closed the month at the 132.830 level.

As the pair recovered some levels during the last week, it could trade above the 9-day EMA of 132.25. We can observe resistance at the 137.915 level in case the pair appreciates further.

If the pair depreciates for some reason, the support must be at the 130.718 level. In the weekly chart, the MACD line is moving below but towards the signal line, which may initiate the strengthening of the pair.

The pair ended the month at a lower level compared to the previous week's close, and the price behavior may drive a consolidation. The Relative Strength Index surged and moved above to its 14-day RSI's simple moving average which shows strength to the pair.

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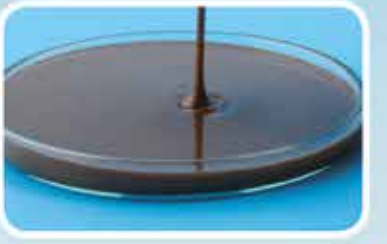

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The impact of cuttlebone availability and characterisation on its utilization from the traditional to pharmaceutical industry

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Abstract

Cuttlebone is the calcareous internal shell of a cuttlefish composed of calcium carbonate in its aragonite polymorph followed by an organic compound in the form of β-chitin and minerals. The cuttlebone is categorized as a byproduct of processing waste. Therefore, the estimates of cuttlebone resulting from this process are very abundant. Due to such properties of cuttlebone, it can be utilized to fulfill the demand for calcium and such minerals and used as an antacid or as an adsorbent. Over the period, cuttlebone is being utilized traditionally as a natural marine drug, for the benefit of birds and reptiles, mold-making material and lime production by the people of India. Due to its physical and chemical characterization; availability and immense medicinal properties, it has gained the interest of many researchers and provides much insight into the pharmaceutical industry.

Introduction

The most developed and swimming-adapted group of organisms is the class cephalopoda, which belongs to the phylum mollusc and comprises nautiluses, squids, cuttlefish, and octopods. The internal calcareous shell of cuttlefish belonging to the sepiidae family is known as a cuttlebone. It performs the dual roles of being the cuttlefish's buoyancy tank and the hard structural component of the body, minimizing the efforts needed to keep the cuttlefish vertical in the water (Birchall, 1983).

According to the handbook on fisheries statistics (2022), the total estimated marine fish landings for India in 2021 were 3.05 million metric tons, with 68,138 metric tons of cuttlefish landings, cuttlefish catch is mostly composed of *Sepia pharaonis, Sepia aculeata, Sepiella inermis* and *Sepia eliptica*. Major cuttlefish landing was observed in Gujarat with 0.3 lakh tons followed by Maharashtra with 0.25 lakh tons.

Cuttlebone availability

Processing of cuttlefish in India for export or household needs only uses the body, including the meat and the head; thus, the cuttlebone is categorized as a byproduct of the processing waste. As per the landings of cuttlefish in India, there is abundant availability of

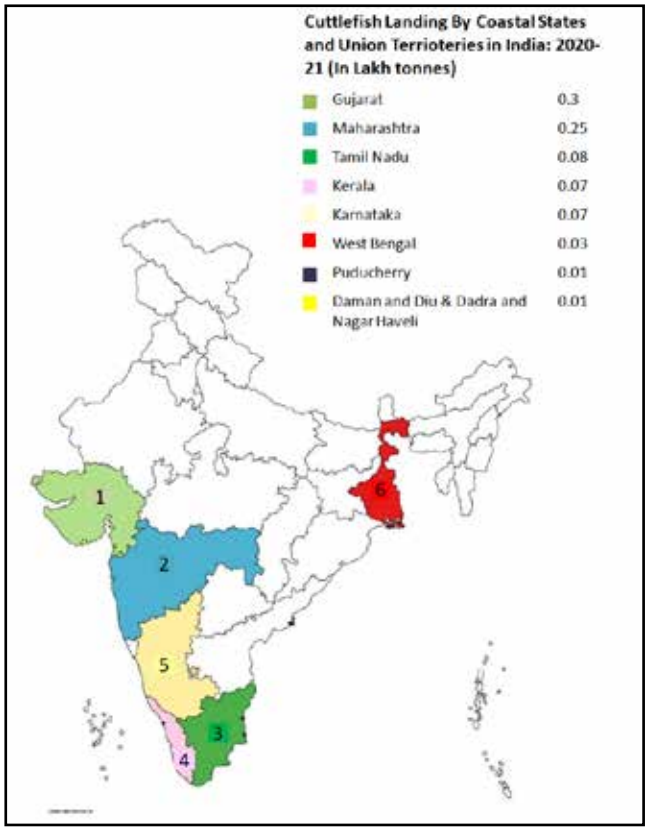

Fig. 1: Cuttlefish landings in India: 2020-21

cuttlebone waste generated by the processing of cuttlefish (Fig. 1). As per our study, the cuttlebone comprises approximately 4.2%-7% of the total body weight. Thus, the estimated yield of cuttlebone generated from the processing of cuttlefish in India should be approximately in metric tons per year as per the export of processed cuttlefish (Table 1).

Table 1: Export data of cuttlefish: 2021-22

Q: Quantity in M T, V: Value in Rs. Crore, $: US Dollar Million					
Cuttlefish (whole, whole cleaned, fillets, strips)			**Cuttlefish whole**		
		2021-22			2021-22
Gujarat	Q	16703	Gujarat	Q	3380
	V	620.44		V	101.39
	$	83.95		$	13.72
India	Q	57188	India	Q	24454
	V	2004.37		V	708.80
	$	272.20		$	96.13

Chemical composition of cuttlebone

Cuttlebone is dominated by calcium carbonate ($CaCO_3$) aragonite (as shown in Fig. 2) which is interpreted by high ash content while the organic compound is in the form of β chitin (Henggu, 2021).

Cuttlebone can be used as an inexpensive source of various trace minerals, such as calcium, magnesium, iron, and zinc (Table 2).

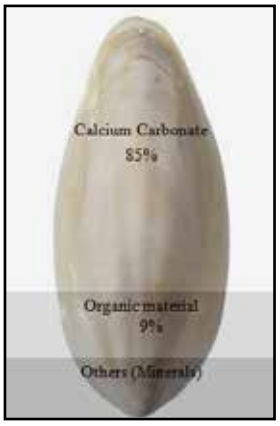

Fig. 2: Composition of cuttlebone

Table 2: Mineral composition of cuttlebone (Sepia sp.)

Mineral composition (mg/100g) dry basis			
Macro	Mean ± SD	Micro	Mean ± SD
Calcium	31.634 ± 0.04	Manga-nese	0.4 ± 0.05
Magnesium	86.1 ± 0.18	Iron	3.2 ± 0.02
Potassium	39.6 ± 0.10	Zinc	-2.1 ± 0.07
Phosphorus	8.424 ± 0.06	Sodium	716 ± 0.12
Source: Henggu (2021)			

Table 3: Heavy metals content of cuttlebone (caught area: India)

Heavy Metals	ppm
Mercury	0.03
Copper	0.33
Zinc	3.17
Lead	0.37
Cadmium	0.06
Source: Cho *et. al.*, (2001)	

Grading system of cuttlebone:

Cuttlefish bones are listed under HSN Code 05080040. It's important to note that the grading system for cuttlebone is not standardized, so there may be some variation in the grading criteria used by different suppliers. It's always a good idea to inspect the cuttlebone before purchasing to ensure that it's of the quality you desire. Cuttlebones are classified into grades based on their size and quality.

There are three main cuttlebone grades:

Grade A (select grade)

- Size: 25 cm and up (Total cuttlebone length - CL) (Fig. 3)
- This is the highest-quality cuttlebone, which is thick and large and has minimal defects or irregularities.

Grade A is typically used for larger birds, such as parrots.

Grade B (standard grade)

- Size: 15–25 cm (Total cuttlebone length - CL) (Fig. 3)
- This grade of cuttlebone is of medium quality and may have some imperfections, such as bumps or ridges. They are suitable for most small to medium-sized birds and reptiles, such as canaries or budgerigars. It may have slight imperfections and be smaller in size than Grade A.

Grade C (economy grade)

- Size: 5-14 cm (Total cuttlebone length - CL) (Fig. 3)
- This is the lowest-quality cuttlebone and is often thin, small, and irregular in shape. It may have visible defects such as cracks or holes and is typically used for small birds or for grinding into calcium powder for reptiles

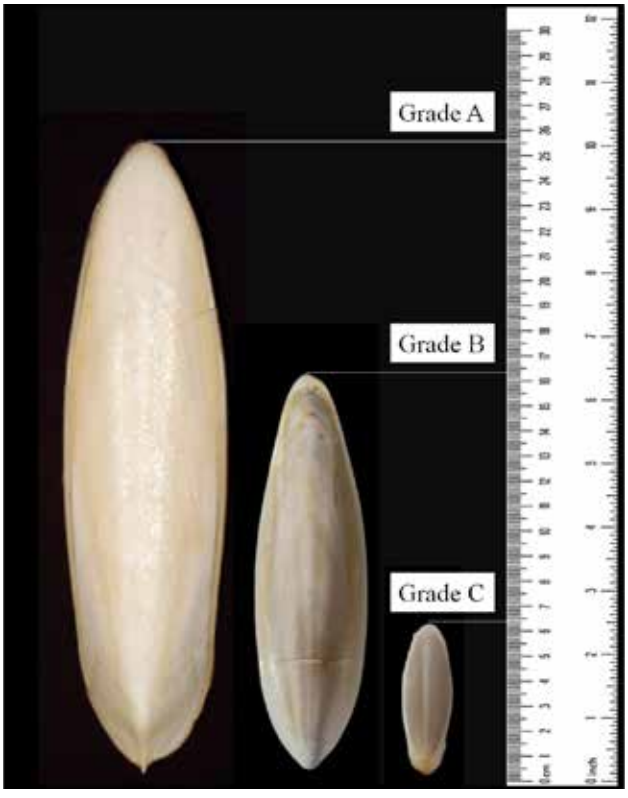

Fig. 3: Cuttlebone grades according to size

- **Cuttlebone is being utilized traditionally mainly in four ways:**

1. Medicinal purpose

Mother nature is one of the greatest givers of miraculous boons to all living beings on the planet; Kumar and Jadar (2013) stated that this is probably why 80% of the world's population still relies on traditional or natural sources of medicine.

Cuttlebone is one of the Earth's boons. In Sanskrit, cuttlebone is known as Samudra-phena. The bone of the cuttlefish floats on the seawater after the death of the fish. When a large number of bones float together over the surface of seawater, it looks like a froth of seawater from a distance. Hence the name samudra - phena; samudra indicates sea and phena indicate froth.

Ayurveda has utilized cuttlebone as a natural marine drug for a variety of ailments. The description of Samudra-phena (cuttlebone) in Ayurveda dates back to the Samhita period when it was primarily used for therapeutic purposes (Palbag *et. al.*, 2013).

However, its application in a specific condition is described in Brihatrayis (Kumar and Jadar, 2013). Its therapeutic utility is clearly stated in various texts.

It is considered a coolant, has a scraping property, is used in respiratory disorders and cholesterol and clot deposition in blood vessels, improves vision, is good for the eyes, and is useful in eye disorders.

Samudra-phena is prescribed for cases of pus discharge from the ears, eye disorders with discharge, toxic conditions, poisoning, bleeding disorders such as nasal bleeding, heavy periods, and so on; diseases of the spleen, splenomegaly; and throat disorders; and voice disorders. As previously stated, it has always been widely available in India. People in various Indian states have used it as a natural medicine over time.

2. For the benefit of birds and reptiles

Cuttlebone is the source of calcium in foodstuffs for birds and turtles. Battisti (2020) investigated that birds require calcium carbonate for their skeleton and egg development. Cuttlebone is an inexpensive source of calcium carbonate and other trace minerals for birds.

It is a natural product and doesn't contain toxins or contaminants. Similar to calcium, trace elements are crucial for both people and birds. The trace elements found within cuttlebone benefit birds as well. Iron aids

with red blood cell formation and function, potassium maintains normal heart and muscle activity, zinc helps with the immune system, and copper assists with proper circulation and healing.

Besides being an important dietary supplement, cuttlebone has a rough texture, making it an ideal tool to help support beak strength.

3. Mold-making material

As cuttlebone can withstand high temperatures and is easily carved, it serves as a mold-making material for small metal castings for the creation of jewellery and small sculptural objects.

4. Lime production

As a carbonate-rich biogenic raw material, cuttlebone has the potential to be used in the production of calcite lime (Ferraz *et. al.*, 2020).

- **Pharmaceutical Innovations**

In a modern context, scientists have discovered its physical and chemical nature to a large extent using modern language. As a calcium source, it has numerous pharmaceutical properties. It has gained the interest of many researchers towards the development of the pharmaceutical industry because of its availability and characterization.

Table 4: Utilization of cuttlebone in pharmaceutics: New findings by researchers

Findings	Pharmaceutical properties	References
Bioactive components (alkaloids, steroids, terpenoids, tannins, and glucosides)	As an anti-inflammatory source	Cadman *et. al.*, (2012)
Creating Biomaterials inspired by the microstructure of cuttlebone	Used in medical applications to support, enhance or replace damaged tissue	Cadman *et. al.*, (2010)
Source of the amino acids	Serine and Glycine	Xiao *et. al.*, (2005)
Antacid drug from cuttlebone,	Antacid drugs can relieve gastric disorders by neutralizing the acid in the gastric juice and increasing pH.	Mostoufi *et. al.*, (2018)
Chitin identified in cuttlefish shells	Potential for development as an adsorbent of heavy metal waste and dyes, preservatives, anti-fungal, cosmetic, pharmaceutical, flocculants, anti-cancer, and antibacterial properties	Henggu (2021)

Preparation of highly porous hydroxyapatite from cuttlefish bones as calcium precursors in hydroxyapatite synthesis,	Hydroxyapatite is an inorganic compound that is very important to be applied as a bioceramic-based human bone scaffold because it has good biocompatibility, bioactivity, and osteo conductive properties	Henggu (2021)
Ground cuttlebone as filler for natural rubber.		Poompradub *et. al.*,(2008)

Conclusion

The traditional Indian system of medicine has utilized cuttlebone as a natural marine drug for a while. Cuttlebones are widely available all along the Indian coast and India top the list for the export of cuttlebones.

As a rich source of calcium and other essential components, researchers have found potential uses for cuttlebone in the pharmaceutical industry towards innovations like biomaterials, hydroxyapatite, chitin and antacid drugs from cuttlebone. And being a byproduct of waste processing, utilizing cuttlebone has the advantage of highly cost-effective and easy to implement.

Acknowledgement

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Let's print "something fishy" by exploring the possibilities of 3D food printing

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"*Let food be thy medicine and medicine be thy food*", a famous quote by Hippocrates almost 2400 years ago is highly appropriate in the current era. Food is indeed one of the basic needs of life and many ailments can be prevented if the right food is taken in the right portion. The functional food industry is growing rapidly, owing to its capability to produce healthy foods with a variety of nutrients incorporated.

Though modern customers are highly aware of the health benefits of functional foods, there are some factors that pull them back from consuming these types of foods. Firstly, most of the functional foods have a bland taste and the industry lacks a proper technology to make these foods accessible to the customers. Moreover, in the processed food sector, the quest for novel foods exploring the possibilities of customization is a never-ending process.

The 3-dimensional (3D) printing of foods, which is one of the latest technologies evolved in the food industry, has the potential to create foods with customized designs and provide the customers with personalized nutrition as well. Foods can be modified both aesthetically and functionally through this technology. Though 3D printing technology was developed in 1980s to create prototypes using plastic and photopolymers, the technology has very recently been applied in foods. Apart from the food industry, this technology has found applications in fields like medicine, military, aviation, and so on.

In 3D food printing, we can fabricate food in infinite designs, shapes, and sizes as per our imagination. The shapes can be anything from basic geometric patterns to complex structures like the Taj Mahal and Eiffel Tower. In this technology, both the hardware and software work hand in hand. For printing, the desired designs are created using any 3D software, and the designs after converting to their STL files, are sliced to their respective G-codes or M -Codes. While slicing, the length, breadth, and weight of the final prints can be adjusted accordingly.

Though, there are different types of food printers, the most commonly used one for printing foods is the extrusion-based printer. A Food Bot 3D printer works on the principle of extrusion and it has a printer head, a barrel for loading the material to be printed, and a piston for pushing the material downwards. Formulations for printing are filled in specially designed cartridges before loading into the machine. Nozzles of different diameters can be fitted to the printer and the material flowing through the nozzle is deposited on a platform in layers, additively, to form the design. Post-printing treatments like frying, steaming or baking are done after printing. Post-printing treatments are chosen as per the customers' choices and also to preserve the print designs.

The ingredients used for printing have a key role in the extrudability of the formulation.The ingredients are of three classes. Natively printable materials are materials, which can be printed easily. Some of the examples of such materials are cake frosting, chocolates and cheeses. For these materials, post-printing treatments shall be avoided as these materials could retain their shapes very well.

Non-printable materials include foods like meat, rice, and fruits and they can be made printable/extrudable by way of adding hydrocolloids like gum and gelatin (Izdebska & Zołek-Tryznowska, 2016). The third class includes alternate ingredients like insect powders and protein powders, which are highly nutritious, as compared to conventional nutrient sources. These ingredients can be incorporated into foods to improve the functionality of the printed foods, without compromising on the taste (Lipton et. al., 2010).

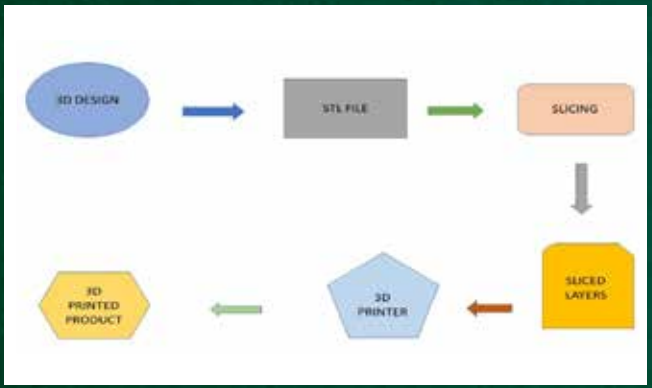

Fig. 1: Work flow of 3D food printer

It has been proven, from many studies that, all types of foods could be printed, whether it is fibrous or not, through the addition of suitable ingredients and also through the selection of proper nozzles. Studies have been reported on printing of products based on different cereal flours, eggs, fruits and vegetables, meat and meat products, milk products, probiotics, and even black fungus. Three-dimensional printing of fishes is one milestone to be achieved in the functional food industry, as fishes are considered as nature's “Super Food”, owing to the quantity as well as the quality of nutrients present in it.

The nutrients seen in fish are proteins that are easily digestible, poly-unsaturated fatty acids like eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), vitamins, minerals, and trace elements. However, during the processing of fish, nearly 40 to 45 % of waste is generated, which includes gut, gills, skin, scales, bones, etc. The management of this huge biological waste is a major problem faced by many countries including India.

Converting fishery waste to extract fish oil and calcium is one of the viable options to manage this waste. Moreover, fish oil and calcium extracted, when incorporated into foods, could be used as sources of essential fatty acids and calcium respectively. Thus, 3D-printed fish products can be developed through the incorporation of fish oil and bone powder extracted from fishery waste.

Essential fatty acids, when consumed, improve the functioning of brain and vision, and they also contribute to a healthy skin. They can also reduce the risks associated with cardiovascular diseases and various metabolic disorders like obesity. Calcium extracted from fish bone has very good bio-absorbability and is essential for maintaining bone health and preventing diseases like osteoporosis. Besides the development of functional fish products in 3D designs, this step will become a boon to the fishery industry, as the fishery wastes could be reduced considerably.

Fig. 2: 3D food printer

The 3D food printing technology satisfies the needs of modern customers seeking personalization in cuisine as well as the undernourished population suffering from deficiency disorders, by providing a nutrient-rich formula. The role of this technology in geriatric as well as childhood nutrition could not be neglected. As 3D printed foods are classified as soft foods owing to the high digestibility of 3D foods, their consumption reduces problems associated with dysphagia.

Fig. 3: 3D printed products

Studies reveal that around 40 % of the elderly population suffers from dysphagia, which is characterized by difficulty in swallowing foods (Singh & Raghav, 2018). The creation of foods in the shapes of their favorite cartoon characters or superheroes attracts children to these types of foods, irrespective of the content in them. Also, nutritious foods, which the kids are reluctant to eat like vegetables and fish, can be added as an ingredient in the 3D printed foods, even without their knowledge.

In a developing country like India, where malnourishment prevails to a large extent, hindering the development of the nation, this technology is worth promising. 3D printing of foods, which is still at the nascent stage, is evolving day by day, inventing more and more applications, thus revolutionizing the functional food industry.

Advantages of 3D food printing

• All types of food including fish and shellfish can be used after optimization.
Helps in better utilization of meat from underutilized and low-value fishery resources.

• Very appropriate for small-size fishery resources like Acetes spp., where it is difficult to utilize as a whole.

• Fortification can be done with essential nutrients.

• Products of different sizes, shapes, and colors can be prepared.

• Helps in reducing post-harvest loss and achieves complete utilization of resources effectively.

Challenges

Though 3D food printing has emerged to be highly beneficial, there are some challenges, which cannot be overlooked. The inadequate blending of components in the formulation can affect the printability. The copying of digital recipes might be a concern, as technology progresses.

The printing speed is another challenge, especially, when printing in bulk. The development of large-scale printers, at a lower cost and with a high degree of accuracy is another limiting factor of 3D food printing (Nachal *et. al*., 2019).

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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.

Knife fish or feather back (family: *Notopteridae*) originates from Asia and is one of the striking and interesting fishes in the ornamental fish trade. Their Latin name, *Notopterus*, means feather back. They are characterised by a long anal fin confluent with the small caudal fin, a small or absent dorsal fin and an elongated body in the shape of a blade, which explains its other name, knife fish. The body colour is silver grey and they lack large scales or bony plates. They are large fish and in general grow too large for the average community aquarium.

Knife fish are extremely aggressive towards other fish and are best kept alone or with other large fish. They are finicky eaters, preferring mostly live food. Though there are five species, *Notopterus chitala, N. notopterus, N. blanci, N. lopis* and *N. ornata,* only three species*, N. notopterus, N. chitala,* and *N. ornata*, are popular in the aquarium fish trade.

N. chitala, known as the clown knife fish or clown feather back in the trade, is a large predatory fish. It is found in Asia, mainly in the Indus and Ganges river systems in India. Their natural habitat is calm and swampy waters. They are highly aggressive and are very hardy. Their maximum attainable length is 4 ft. Silver grayish in colour, they are considered to be one of the more striking fish. Their body displays four to ten large distinct black spots or ocelli on the side, all ringed in white. The dorsal fin is small and set far back on the body while the anal fin is long and covers almost two thirds of the body.

They are carnivorous and must be fed on chunks of meaty foods such as chopped beef heart, prawns, live fish or fish meat. They are voracious feeders and hence require a good filtration system in the aquaria. They are best kept either singly or in a group of at least 3 in a large tank. Although the water chemistry is not critical, they prefer fairly soft waters with ideal pH slightly acidic to neutral (6.2 – 7.0). The temperature of the water could be 25-28°C. Spawning takes place in the spring when the female lays thousands of eggs on the substrate or a cleaned surface. Only the male of the species plays a role in caring for the eggs and fry. The eggs hatch in approximately two weeks. Spawning could be triggered by a rise in temperature, sometimes as high as 30°C.

N. notopterus, better known as the bronze feather back, is found all over Asia particularly Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Thailand and Vietnam. It is considered a food fish in most of these countries. They are very aggressive towards their own species but timid towards other larger species. The water parameters are soft with ideal pH ranging from 6.0 – 6.5, DH 3 - 8, with temperature between 24-28°C. The maximum size attainable is 60 cm. They require a very large well-planted aquarium. It is best not to keep more than one of these fishes in an aquarium. They prefer a decorated aquarium with lots of narrow hiding places among the rocks and plants.

They accept most live and frozen foods. Breeding is comparatively easy. The sexes can be distinguished by the shape of the genital papilla, which is cone-shaped in males and V-shaped filamentous protrusions in females. Spawning takes place during the night and they lay up to 200 eggs deposited on the bottom of the tank. The male guards the eggs until they hatch. The fry can be fed on artemia.

N. ornata, known as the clown feather back, originates from Southeast Asia and looks almost like the *N. chitala* in appearance. They originate from the Mekong basin in Laos, Thailand, Cambodia and Vietnam where they live in rivers and swampy areas. They are very aggressive but can be kept in a community aquarium along with other large calm species. They accept any kind of food and many will feed only during the night. The species is difficult to breed and only fully-grown specimens are reported to have been bred.

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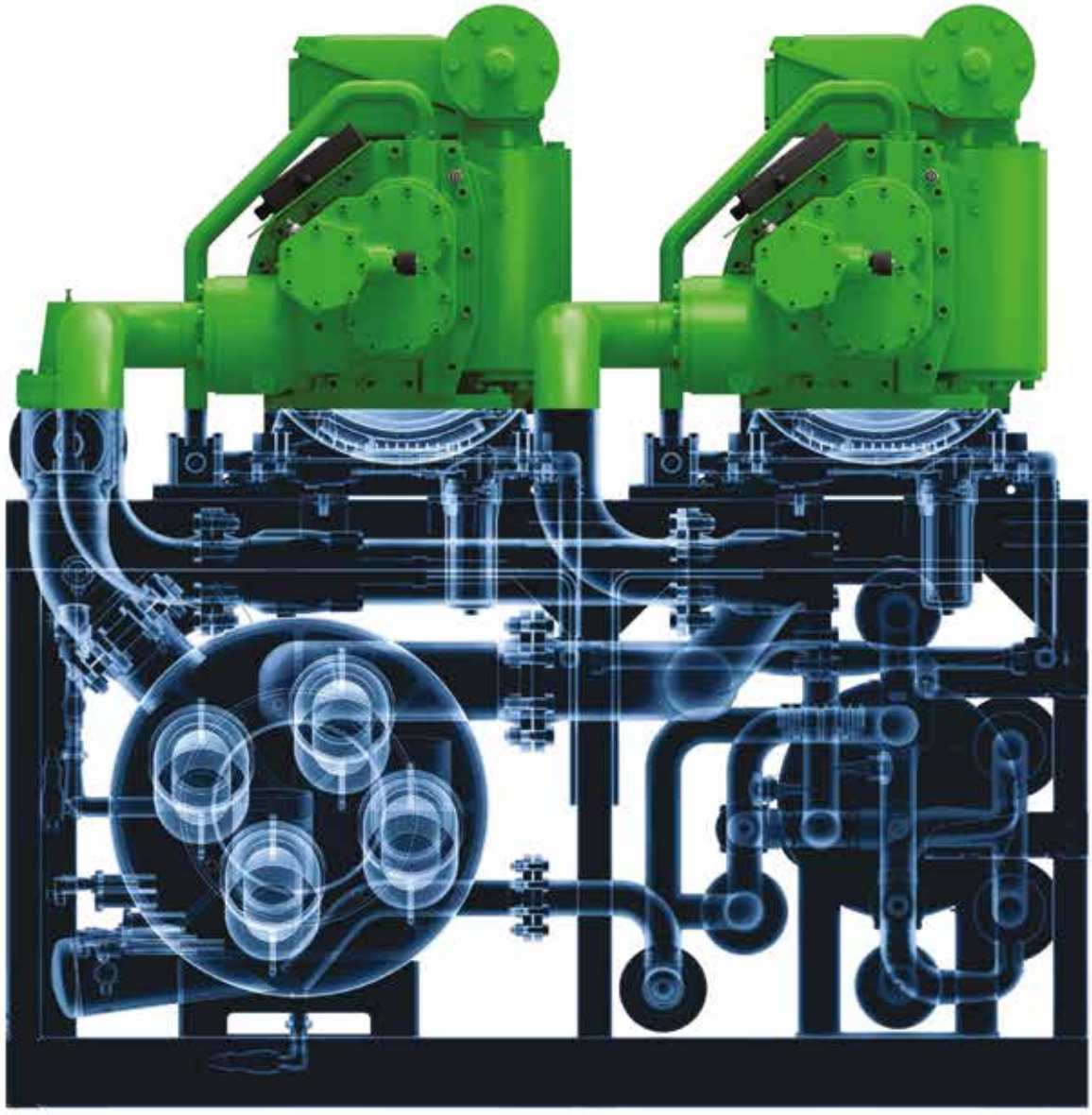

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Details of the SPF *L. vannamei* brooders imported & quarantined at AQF during March 2023

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 Sampat Vinayak Aqua Products Pvt. Ltd	Andhra Pradesh	Blue Genetics; Mexico	01.03.23	400	400	800
2	Sri Venkateswara Shrimp Hatcheries Pvt. Ltd	Andhra Pradesh	SIS; Florida	03.03.23	300	300	600
3	Bay Fry Pvt. Ltd	Andhra Pradesh	SIS; Florida	03.03.23	300	300	600
4	Seven Staar Aquatech	Tamil Nadu	SIS; Florida	04.03.23	200	200	400
5	TMR Bio Marine	Andhra Pradesh	SIS; Florida	04.03.23	300	300	600
6	NSR Aqua Farms Pvt. Ltd	Andhra Pradesh	SIS; Florida	04.03.23	300	300	600
7	Vaisakhi Bio Marine Pvt. Ltd - Unit III	Andhra Pradesh	SIS; Florida	08.03.23	600	600	1200
8	Sheng Long Bio-Tech (India) Pvt. Ltd	Tamil Nadu	SIS; Florida	09.03.23	350	350	700
9	Rama Shrimp Hatchery	Andhra Pradesh	SIS; Florida	09.03.23	300	300	600
10	Sapathagiri Hatcheries - Unit II	Andhra Pradesh	Kona Bay; Hawaii	10.03.23	220	220	440
11	Sapathagiri Hatcheries - Anakapalli	Andhra Pradesh	Kona Bay; Hawaii	10.03.23	616	616	1232
12	SVR Hatcheries	Andhra Pradesh	Kona Bay; Hawaii	10.03.23	330	330	660
13	Ravi Hatcheries LLP	Andhra Pradesh	Kona Bay; Hawaii	10.03.23	330	330	660
14	NSR Hatcheries	Andhra Pradesh	SIS; Florida	11.03.23	200	200	400
15	NSR Hatcheries - Prakasam	Andhra Pradesh	SIS; Florida	11.03.23	200	200	400
16	Shilpa Hatcheries LLP	Andhra Pradesh	SIS; Florida	12.03.23	570	570	1140
17	Jay Jay Gold	Tamil Nadu	SIS; Florida	15.03.23	290	290	580
				TOTAL	**5806**	**5806**	**11612**

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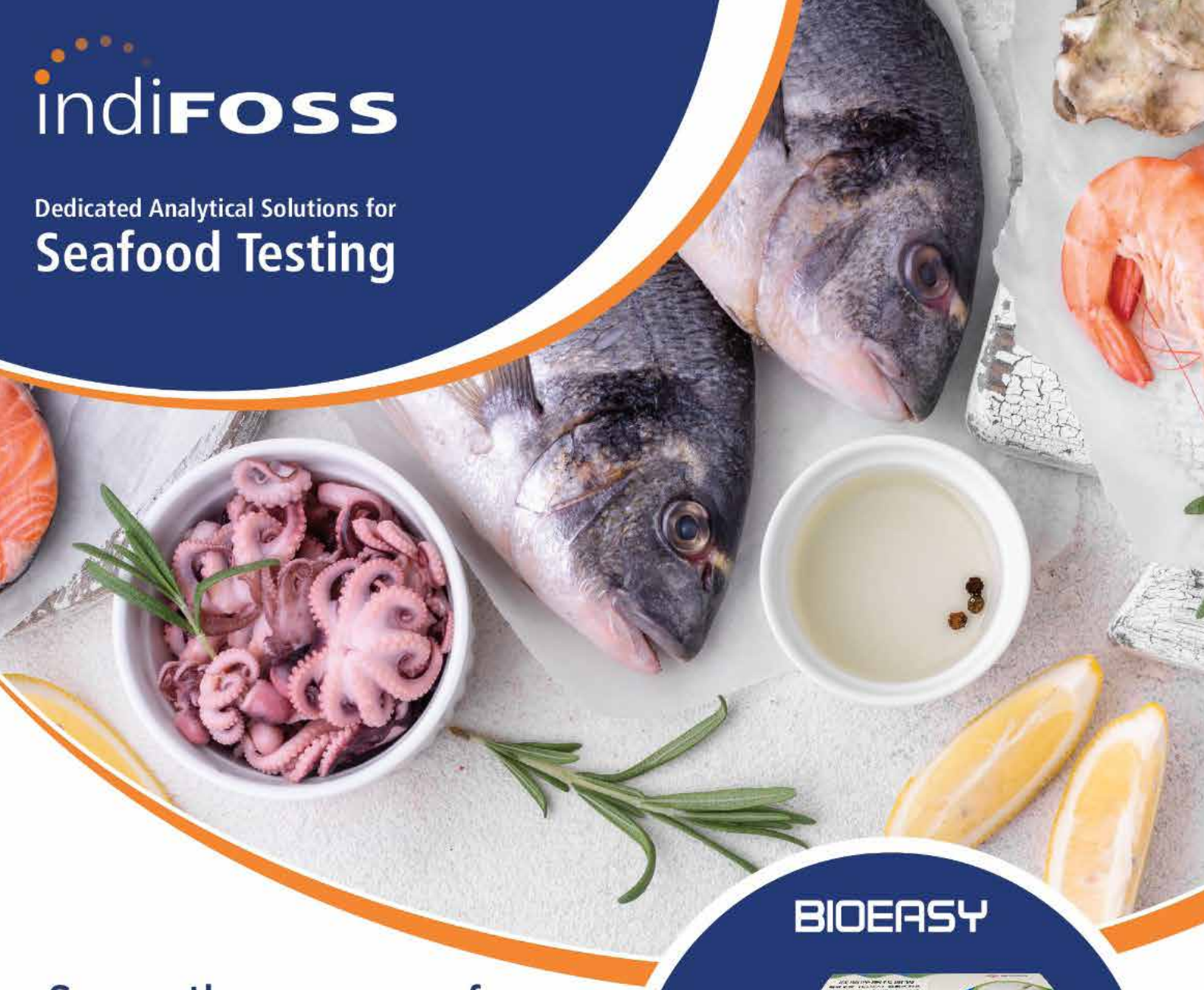

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Farmers meet & training

Karnataka

MPEDA Mangalore, organized a one day farmer's meet by associating the aqua farmers and other aqua entrepreneurs in Uttara Kannada district with an aim to promote diversified aquaculture in brackish water traditional as well as scientific farming areas with commercially important species like seabass, mud crab and pearl spot.

The meet was organized at Baad Village, Kumta taluk on 28th February 2023. A total number of 102 members participated in the programme.

Inaugural session of the farmers meet

Mr. Rajendra Naik, Lead Aqua Farmer, Kumta during his inaugural address

Technical session presented by Dr. V. N. Nayak Dean, Dept. of Marine Biology, Karwar

View of the participants

MPEDA Regional Division, Mangalore organized a three day training programme on 'Better Management Practices for sustainable aquaculture" for farmers at Mirjan village in Kumta taluk, Uttar Kannada district from 1st to 3rd March 2023.

Inaugural session

Dr. Vishnudas R. Gunaga, AD (Rtd.), MPEDA handling the technical session

Field visit for the trainees

Trainees with certificates

Maharashtra

MPEDA Regional Division, Mumbai conducted a training programme on "Sustainable shrimp farming and aquaculture of diversified species" at Phulambri, Aurangabad district from 17th to 21st March 2023 for Schedule Caste candidates.

Mr. Amol Magare, Branch Manager, HDFC, Phulambri during his inaugural address

Demonstration class of value added products

Participants and Mr. Ravi Goda, Regional Coordinator, NaCSA during training programme

Technical sessions

Field visit to vertical crab unit, Pesari in Raigad district

Field visit to soft shell crab farm in Shahapur, Raigad district

Distributing certificates to the trainees

Marine Products Export Development Authority, Regional Division, Mumbai organized Five days training programme on "Sustainable Aquaculture & Aquaculture of Diversified Species with one-day fish product demonstration" at Eklara and Taluka Ralegaon district Yavatmal from 16th to 20th March 2023 for benefit of entrepreneurs. The main aim of conducting the training programme was to create awareness amongst the farmers for sustainable aquaculture and promote diversification of species to get good income.

Inauguration of training programme

Training on value added product

Participants in training by MPEDA NETFISH North Maharashtra on hygienic fish maws processing

Participants with MPEDA & NETFISH officials

Value Added Products

Field visit to cage culture area

MPEDA Regional Division, Mumbai organized five days training programme on "Sustainable aquaculture & aquaculture of diversified species with one-day fish product demonstration" at Anav Taluka Kudal district Sindhudurg from 9th March 2023 to 13th March 2023 for the benefit of emerging aquaculture entrepreneurs. A total of 22 candidates attended the programme.

Field visit for the participants

AQUACULTURE SCENE

Kerala

MPEDA Regional Division, Kochi organized 3 - days general training programme on "Eco-friendly and sustainable aquaculture through species diversification" at Methala community hall, Kodungallur, Thrissur district from 8th – 10th March 2023.

The training was mainly oriented for a sustainable and diversified aquaculture production through adoption of Better Management Practices (BMPs).

Mrs. Shinija U. M., Chairperson, Kodungallur Municipality inaugurating the training programme

Mr. Johnson D' Cruz, Deputy Director, RD Kochi distributing certificate to the trainee

View of technical session

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Seafood food allergens: causes, mechanisms and measures

*Anand Vaishna and M. Bhargavi Priyadarshini**
Department of Fish Processing Technology and Engineering, College of Fisheries, CAU(I), Lembucherra, Tripura
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Introduction

Being a major source of protein on a worldwide scale, seafood is becoming more significant. Yet, seafood allergy is a widespread medical issue that degrades quality of life and even poses a threat to life. Fish and shellfish are considered to be seafood. The main allergens in the former are parvalbumin and tropomyosin in the latter. The development of a seafood allergy is a carefully controlled process involving several immune cells, cytokines, and other elements.

Adults and teenagers are more likely than small children to experience seafood allergies. One in every 100 persons are said to be allergic to seafood. Shellfish, Scaly fish, including molluscs such as mussels, oysters, squid, and crustaceans like prawns, crayfish, and lobster are among the sorts of seafood that might trigger allergies. Seafood can cause a variety of symptoms, from minor reactions to life-threatening allergic reactions (anaphylaxis).

The most typical sign is raised, red skin pimples (hives). Additional signs include asthma, breathing issues, cramping, nausea, and vomiting (Chang and Boyle, 2014). The best method for treating a seafood allergy is to avoid any items that include the species to which your body is allergic because food allergies may cause death.

What is allergy?

The World Allergy Organization (WAO) in 2004 defined “allergy” as “a hypersensitive reaction initiated by proven or strongly suspected immunologic pathway” (Johansson *et. al.*, 2004) or, according to the National Institute of Allergy and Infectious Diseases, a food allergy is "an unfavorable health consequence emerging from a specific immunological response that occurs reproducibly on exposure to a specified food" (NIH, 2010).

Symptoms of seafood allergies

The symptoms of seafood allergies can vary widely, from minor to severe, depending on the immunological system of the individual. Despite the fact that many food allergies may not result in significant symptoms, they should still be taken carefully because in some cases they can be life-threatening.

Milder allergic symptoms include: raised red bumps on skin, swelling of lips, tingling of the mouth and throat, skin rashes and itching, runny nose, tightening of the throat, stomach pain, vomiting (signs of anaphylaxis).
Severe allergic symptoms include: difficult or noisy breathing, tongue swelling, swelling or tightness in throat, difficulty in talking and a hoarse voice, persistent cough, persistent dizziness or collapse, paleness and floppiness in young children.

Causes of seafood allergies

The immune system responds to particular allergy triggers for all allergies (allergens). Human body's immune system creates antibodies that identify the allergen and trigger inflammatory reactions and the release of the chemical histamine. Hay fever, hives, and other allergy symptoms are brought on by histamine. Human body may become allergic to all foods that contain the specific molecule found in shellfish or fish that causes allergy. This molecule can also be found in a variety of other foods.

Some individuals who are allergic to one species of fish may also be allergic to other species of fish or may be allergic to a number of crustaceans, including prawns, crab, and lobster. Parvalbumins, a class of calcium-

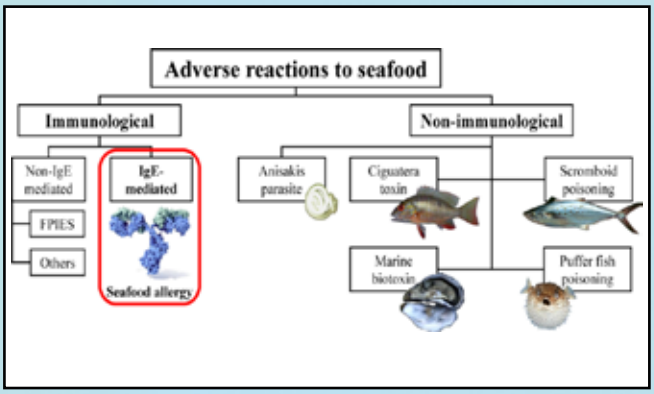
binding proteins, are the main factor behind fish allergies *(Ruethers et. al., 2018)*. Enolases, aldolases, and fish gelatin are other allergens that can result in a fish allergy. Muscle proteins known as tropomyosins are the main allergens in shellfish allergy (Liu *et. al.*, 2013). Hemocyanin, arginine kinase, and myosin light chain are other allergens associated with shellfish allergy.

Fishes and shellfishes associated with allergy

These include; in accordance with study findings reported in Frontiers of Immunology- Finfish; cod, flounder, halibut, herring, mackerel, pilchard, redfish, salmon, sea bass, swordfish, tilapia, barramundi, hake, snapper, trout, tuna, whiting and shellfishes; calamari, crayfish, cuttlefish, lobster, mussels, oysters, prawns, squid (Lehrer *et. al.*, 2003).

Mechanism of seafood allergy

The majority of allergic reactions happen in response to the above allergens being recognized by IgE antibodies, which are allergy antibodies. IgE antibodies, which are allergic to particular antigens like tropomyosin, are produced by the body after exposure. When exposed to allergens like tropomyosin, these particular IgE antibodies can bind to mast cells, a particular type of immune cell, as well. The mast cells' specific IgEs bind to the allergen, triggering an allergic immune response that causes the mast cells to release histamine and other inflammatory chemicals that result in allergy symptoms.



(Source: Ruethers et. al., 2018)

Methods to test seafood allergies

A fish allergy is frequently identified by the onset of symptoms shortly after eating or being exposed to fish. Two minimally invasive tests may be suggested by an allergist to establish that fish is the root of the problem:

Skin prick test - It involve injecting a tiny amount of a potential allergen just under your skin.You will experience a wheal, an inflamed bump within 15–60 minutes if your body is allergic to any of the test samples (Dong and Raghavan, 2022).

Blood antibody test - Your body creates anti-parvalbumin antibodies in reaction to a fish allergy, are detected in blood samples using antibody tests (Dong and Raghavan, 2022).

Alternative tests - There are various commercially available tests that promise to identify allergies, including:

- Vega testing – claims to be able to identify allergies by observing changes in your electromagnetic field.
- Kinesiology testing – claims to identify food allergies by examining skeletal movement.
- Hair analysis – claims to test a sample of your hair for food allergies before making a determination.
- Alternative blood tests (leukocytotoxic tests) – claim that "swelling of white blood cells" can be used to identify food allergies (Health Service Executive, 2023).

Treatment for seafood allergy

Typically, a seafood allergy does not outgrow itself and remains throughout life. Thus, strict abstinence from seafood is the first line of treatment.

Avoiding foods that could potentially be contaminated with seafood is a key component of this.

For instance, grocery stores or eateries where the food may be prepared with unexpected seafood derivatives such as in stocks or oils.

Asking the person preparing the food if there is a risk of concealed exposure is crucial. Additionally, food allergy sufferers should always have self-injectable epinephrine on hand to treat severe reactions to unintentional exposures.

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Experts argue need for GM crops in aqua-feed sector

Fisheries and biotechnology experts in India's aquaculture sector have emphasized the need to bust the myths associated with using genetically modified (GM) crops as feed ingredients.Speaking at an awareness workshop on the use of genetically modified (GM) crops and their derivatives for the aqua-feed sector – organized by the Biotech Consortium India Limited (BCIL) in association with ICAR-Central Marine Fisheries Research Institute (CMFRI) – the experts highlighted that GM crop-based products (mainly non-living genetically modified organisms) have huge scope in enhancing the supply of feed ingredients, thereby promoting growth, disease resistance and reduction of input costs in aquaculture production.The fisheries and biotechnology experts also emphasized that the introduction of GM crops in the aqua-feed sector would help reduce the mounting pressure on fishmeal and fish oil and maintain a sustainable aquaculture industry.

Dr. Vibha Ahuja, Chief General Manager of BCIL, said at the workshop that GM crops come with several desirable traits, such as insect resistance, disease resistance and herbicide tolerance, and using them would be beneficial to boost the yield. She continued by explaining that cost analysis showed that the use of dried distillers grains with soluble (DDGS) – a by-product from cereals in the distillery industry – can help reduce shrimp feed prices. However, she added, most of the DDGS produced globally are of GM-corn origin and Indian feed producers could capitalize on the economic benefits if they were open to using them as feed ingredients.

One of the primary benefits of GM crops in the aqua sector is their ability to increase the nutritional value of the feed. As Dr. A. Gopalakrishnan, Director of CMFRI, explained in a press release: "GM soybeans can be engineered to produce omega-3 fatty acids, which are important for the growth and health of farmed fish." He added that feed constitutes 50-55% of total input cost in aquaculture; therefore it is essential to develop streamlined regulatory efforts with careful considerations for the ethics and risks associated with using GM plant ingredients in aquafeeds.

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27	**Chan Park** Florida Purchasing Coordinator 2663 TradeportDr. Ste200 Orlando FL 32824 Ph.: +407 432 4844, +407 440 5683 Email: chan.kgifl@gmail.com Website: www.kgitrading.com *Frozen Shrimps*	28	**Chad Portier, Jr.** Owner/Operator Portier's Seafood LLC 5052 BayousideDr., Chauvin, LA 70344 Physical: 6583 Hwy 56, Chauvin, LA 70344 Ph.: +985 360-7013, +985 594-5574 Email: portierseafood@outlook.com *Shrimps- all varieties*
29	**Davide Barzaghi** Import Export Agency New Food s.r.l. Via Gadames 128-20151 Milano Ph.: +39 023087662, +39 3408428437 Email: davide.barzaghi@newfoodsrl.com *Frozen Shrimps*	30	**Steve Brunsting** Vendor Compliance & Sourcing Mgr NA Imports & Commodities Limson Trading, INC. 1300 Gezon Parkway SW Wyoming, MI 49509, US Ph.: +1 616 834-1589, +1 616 530-3127 Email: steve.brunsting@limsontrading.com Website: www.limsontrading.com *Frozen Shrimps*
31	**Jack Chan** Director Sea Ray Foods Ph.:+604-303-8788, +604-760-1821 Email: jackchan@searayfish.com Website: www.searayfoods.com *Frozen Shrimps*	32	**Ariston** Food concepts 802 Sabari Shikhar 434, R.C. Marg, Chembur Mumbai - 400 071. Ph.: +91 98210 56179 Email : info@ariston-foods.com /aristonspb@gmail.com Skype: reddypb website: www.ariston-foods.com *Frozen all varieties of Shrimps*

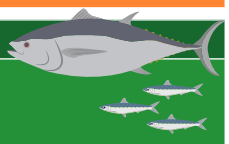
TRADE ENQUIRY

33	**Shenyu Li** Business Manager No. 23 Xidawang Road, Chaoyang Beijing Ph.: +1 614330-0182, +86 18610632191 Email: Harry.li@foodspath.com Website: www.Foodspath.com *Shrimps*	34	**Shuanghu** Manager of International Trading Dept. Cherry Ho Zhanjiang Shuanghu Food Co.,Ltd Ph.: +18813660668, +86-759-7711330 Email: cherry.h@zj-shuanghufood.com *Shrimps*
35	**Josh Metzman** Sustainable seafood marketer & entrepreneur Ph.: +610 945-8373 Email: josh@josh metzman.com Website: joshmetzman.com *All varieties of Shrimps*	36	**Puerto Plata Seafood** Diony Urena Ph.: +347-894-1603, +718-846-0863 Email: puertoplataseafoods@gmail.com Website: www.puertoplataseafood.com *Frozen Shrimps*
37	**Andre Freitas** Biotech Director Atarraya Inc Ph.: +1 317 665 8321, +52 55 6380 1139 Email: andre.freitas@atarraya.ai Website: www.atarraya.ai *Shrimps*	38	**NatchaSuradit-Angwara** CEO, RaminSuradit-Angwara CPO Paramee Group Ph.: +66 64-789-4546, +66 86-444-9789, +66 86-428-3123, +66 81-594-4888 Email: natcha@paramee.com, ramin@paramee.com *Shrimps*
39	**Tafazzal Chowdhury Salim** CEO KBF Inc. 36-21 22nd Street Astoria, NY 11106 Ph.: +1 646 220-5888, +718 706-8000 Email:info@kbf-inc.com Website: www.kbf-inc.com *Frozen Shrimps*	40	**Kengo Inagaki** Nippon Steel Trading Corporation Processed food products department Foodstuffs division Tokyo Nihonbashi Tower, 2-7-1 Nihonbashi, Chuo-ku, Tokyo 103-6025, JAPAN Ph.: +81-3-6772-5049, +81-80-3488-7566 Email: inagakiken742@nst.nipponsteel.com *Frozen Shrimps*
41	**Young S. Kang** VP/Sales & Purchasing Pacific American Fish Company, Inc. 5525 S. Santa Fe Ave. Vernon, CA 90058 Ph.:+323 319 1515, +323 319 1530, +213 494 0371 Email: yokang@pafco.net Website: www.pafco.net *Frozen Shrimps*	42	**Iker Erkan Ulke Muduru** Country Manager Trump Towers,MecidiyekoyYolu Cad. No:12 Kule:2, Kat:18, 34387 Sisli, Istanbul Turkey Ph.: +90 212 261 21 40,+90 532 353 08 68. Email: ilker.erkan@sharkseafoods.com Website: www.sharkseafoods.com *Shrimps*
43	**Truong ThiTuong Van** President Rays Outfitters INC 1254 Killarney Beach RD Lefroy-ON-LOL 1WO-Canada Ph.: +1-705-290-0297 Website: Raysfitters.com *Frozen Shrimps*	44	**Eric Buckner** Executive Vice President The Ren Group, Inc. 1201 W I-65 Service Rd N, Mobile, AL 36618 Ph.: +832-712-0119 Email: eric.buckner@therengroup.com *Shrimps*

TRADE ENQUIRY

45	**Ren Hui Liu** CEO Shanghai rsf trading Co.,Ltd Add:403 No.5 Nong 72, Haowen road Minhang district Shanghai China Ph.: +186 0450 2333, +021-3450 5035 Wechat: 18604502333 Email: 917935736@qq.com *Shrimps*	46	**Emrah Akman** General Manager Blue Aegean Marine Products Sultan Selim Caddesi B2 Blok Site No: 89/2/7 Ph.: +90 530 851 0418 Email:emrahakman@blueaegeanmarine.com Website: www.blueaegeanmarine.com *Shrimps*
47	**Sai Nanduri** Director - Global partnerships Riya Sea Foods 959, Route 46 East, Suite #303A, Parsippany, NJ 07054 USA Ph.: +1 609 779-2306 Email: sri@riyaseafoods.com Website: www.riyaseafoods.com *AFD Shrimp*	48	**Dirk de Meester** Director Business Development Phageguard Ph.: +316 4604 8503 Email: d.demeester@micreos.com *All varieties of Shrimps*
49	**Stephanie Kruse** Sourcing Manager Farmers Land Food GmbH An der Pönt 48 D-40885 Ratingen, Germany EU Ph.: +49 0 2102 74025 15, +49 0 2182 88 60 596 email:s.kruse@farmersland.de *Frozen Black Tiger Shrimp, Scampi*	50	**Ding Jian Liang** Import & Export Manager De Run Hai Yuan Foods Co.,Ltd Food industrial Park, Caofeidiandistrict,Tangshan Hebei, China Ph.: +86-18633322322 Email: dr18633322322@126.com Website: www.derunhaiyuan.com *Shrimps*

FISHES



1	**Qianwei Huang** Alimundo S.A. Tocumen Storage Complex Ofi-Bodega 2, Las MananitasAv. Joss Maria Torrijos, Panama City, Panama Ph.: +507 6029-8166 Email: willyhuang889@gmail.com *All varieties of Fishes*	2	**Richard Xiao** Manager Fortune Laurel LLC PO Box 812777 Wellesley, MA 02482 Ph.: +617-504-2125, + 617-481-0678 Email: richard@fortunelaurel.com Website: www.fortunelaurel.com *Frozen Tilapia- all varieties*

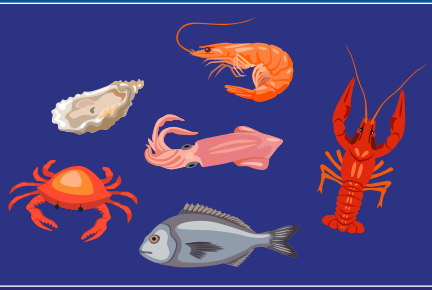
MIXED ITEMS / OTHERS

1	**Eliott D'Souza** Manager, Reefer Services Master Mariner, CITT DC & Reefer Operations-Canada Ocean Network Express Canada Inc. 5090 Explorer Drive, Suite 802, Mississauga, ON. L4W 4T9, Canada Ph.: +416-276-9135, +647-797-4123 Email: eliott.dsouza@one-line.com www.one-line.com *Dried Fishes and Shrimps*	2	**Austin Chen** Purchasing Manager Sunrise Food Trading, Inc. 163 Washington Valley Rd, Suite 103 Warren, NJ 07059 Ph.: +718 305-4388 Email: service1@sunrisefood1.com Website: www.sunrisefoodtrading.com *Frozen Shrimp, Octopus*

TRADE ENQUIRY

3	**Brian Leatherman** Director of Fresh Sales Associated Wholesale Grocers, Inc. Gulf Coast Division 63331 Old Military Road Pearl River, L. A. 70452 Ph.: + 901-287-9850, +985-863-1556 Email: brian.leatherman@awginc.com Website: www.awginc.com *All varieties of seafood, frozen Shrimp*	4	**Iwan Giwangkara** Commissioner Java Kayana Segara, Jl. Tugu Wijaya VII No. 7, Wijayakusuma Industrial Estate Semarang, Central Java Ph.: +62 817 611 123 Email: pt.javakayanasegara@gmail.com *Frozen soft-shell Crab (cleaned), Pasteurized Crab meat*
5	**Gonzalo Campos** Director of Global Integrated Sales Profand USA, INC., Stavis Seafoods, Worldwide Perishables Enterprises, Seafreeze Ltd. Ph.: +1 617-721-1699 Email: gcampos@profand.com *All Varieties of Cephalopods*	6	**Akiko Kato** Import Manager Tokyo Europe Trading Co., Ltd 2-9-30 5f Kitasaiwai, Nishi-Ku Yokohama-City, Kanagawa, Japan 220-0004, Ph.: +81 045 329 2390 Email: kato-ak@seijoishii.co.jp Website: URL:https://www.seijoishii.co.jp/ *Freeze dried Shrimps for super markets*
7	**Masayuki Sugino** Division President & CEO Texchem Food Level 18, Menara Boustead Penang, 39 Jalan Sultan Ahmad Shah, 10050 Penang, Malaysia Ph.: +604 229 6000 Ext. 505 , +6012 319 2740 Email: sugino@texchemfood.com Website: www.texchemgroup.com *Frozen Crabs*	8	**Michael Woon** Deputy General Manager of Foreign Trade Hainan Xiangtai Fishery Co., Ltd. Hainan Eternal Spring Fisheries Co., Ltd. –Ph.: +86 898 67489811, +86 13876091969 Email: mikwoon@esfish.com Website: www.hnxiangtai.com *Frozen Black tiger, all river Fish varieties*
9	**Jack Yang** Purchase Dept. Viseafood International Limited 3-2-202, No.7 Aomen Road, Qingdao 266000, China Ph.: +86 532-8077-3052, +86 18953207338 Skype: jack.yang84 Email: jack@viseafood.com *Shrimps, Fish varieties*	10	**Larry Huang** Managing Director Oceannova Seafood Reydelmar Limited Fuzhou Oceannova Seafood Co.,Ltd Room 22G, HuakaiFugui Block A, 8 Dongda Road, Fuzhou, China. Postcode: 350001 Cold Storage: Room 202, Southwest, Fuxin Cold Storage, 57 West Xinye Rd, Mawei District, Fuzhou, China Ph.: +86-13615030599 Email: Larrymlhuang@outlook.com Wechat: Larrymlhuang1208 *Shrimps and Fishes*
11	**Austin Chen** Purchasing Manager Sunrise Food Trading, Inc. 163 Washington Valley Rd, Suite 103 Warren, NJ 07059 Ph.: +718 305-4388 Email: service1@sunrisefood1.com Website: www.sunrisefoodtrading.com *Frozen Octopus*	12	**Subhakar Velaga** Sales & Purchasing Asian American Foods 24778 Crestview Ct Farmington Hills, MI – 48335 Wholesale Halal Food Distributors Ph.: +248 910-4843 Email: info@aafoods.us *Frozen Shrimp, river Fishes, Asian Sea Bass*

TRADE ENQUIRY

13	**May Zhang** CEO Shandong Hepco Foods Co., Ltd. Shandong Temin International Trade Co.,Ltd. Address: 2315, No. 77 Changjiang Road, Etdz, Yantai, Shandong Pilot Free Trade Zone,China Ph.: +0535-2160662, +0086-18615933119 Email: may@hepcofoods.com Website: www.hepcofoods.com *Frozen Shrimps, Fishes*	14	**Sidi Mohamed BADI** CEO BSM CompanyTrader/Exporter 2 AV Mokhtar daddah Nouakchott Mauritania Ph.: +222 27290048, +222 41781313, +1 857 397 3814 Email: bsm.company2@gmail.com, sidimohamed.badi@gmail.com *Frozen Shrimps, Cephalopods*
15	**Jenny Lou** Procurement Officer International Trade WH Group Limited 76028, Level 76. International Commerce Centre, 1 Austin Road West, Kowloon, Hong Kong Ph.: +1 617 388-4609 E-mail: jenny.lou@wh-group.com Website: www.wh-group.com *All varieties of seafood*	16	**Jen Crotty** Trader-Purchasing Intervision Foods 3050 Peachtree Rd. Nw, Suite 450 Atlanta, Georgia 30305 Ph.: +1 678-699-9710 Email: jennifer.crotty@ivfoods.com Website:www.ivfoods.com *Frozen Shrimps and Tilapia*
17	**Kevin Zhang** Marketing Manager Bright Asia Foods Co. Limited Room 1528, Wandaxinyu, Jinzhou district, Dalian China. Ph.: +86 185 0241 8528 Email: kevin@brightasia.cn *Frozen Shrimp, Octopus, all varieties of Fishes*	18	**Christian Fiallos** General Manager RorisLizzeth De Fiallos Plant Manager Bo. La Isla, Clle Del Estadio, Fte Al Estero, La Ceiba, Atlantida Honduras, Centro America Ph.: +00 5049943-8319, +00 5043181-6892 Email: azul.interexport@gmail.com, Website: lizzethfiallos2020@gmail.com *Frozen Shrimps- Headless& Head on varieties, Pangasius*
19	**Austin Chen** Purchasing Manager Sunrise Food Trading, Inc. 163 Washington Valley Rd, Suite 103 Warren, NJ 07059 Ph.: +718 305-4388 Email: service1@sunrisefood1.com Website: www.sunrisefoodtrading.com *Frozen Shrimps, Octopus*	20	**Neal Naito** President SURF/82 7125 Collingwood Court Elkridge, MD, 21075 USA Ph.: +1 443-803-8526 naiton495@gmail.com *Shredded Squid stripes for salads*
21	**Che Ku** Star ocean wholesale foods 1211 Pierce Butler Route Saint Paul, MN 55104 Ph.: +652 343-8193, +653 453-3217 E-mail : cku@staroceanfoods.com, staroceanfoods@yahoo.com *Shrimps, Cephalopods*		

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