MPEDA

Newsletter

VOL. VIII NO. 11 FEBRUARY 2021

Institute of the Month:
Fishery Survey of India (FSI)

Intensive Pond Aquaculture Technology : A Perfect Way for Sustainable Aquaculture

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MPEDA
VOL. VIII / NO. 11 / FEBRUARY 2021 Newsletter

On the Platter

K. S. Srinivas IAS
Chairman

Dear Friends,

The increasing number of trade barriers put forth by major markets of Indian seafood is challenging the traceability and testing mechanisms implemented in our country. It demands for enhanced testing facilities with sophisticated equipments to ensure that the analytical parameters are detected to the prescribed levels in order to avoid contamination of the cargoes. Under this scenario, MPEDA is equipping its QC Lab as well as ELISA laboratories to get their analytical procedures & protocols accredited by the NABL. During the month, MPEDA QC Lab Bhubaneswar and ELISA labs at Ongole and Nellore got NABL accreditation.

To extend testing services for seed and pond parameters, MPEDA has set up an Aquatic Animal Disease Diagnostic and Microbiology Lab at its Multispecies Aquaculture Complex at Vallarpadam in Kochi. This laboratory was dedicated to the aqua farming community on 25th February 2021 by the District Collector of Ernakulam.

In order to support the fishing and farming clusters through various assistance schemes, MPEDA has entered into a Memorandum of Understanding with National Cooperative Development Corporation for mutual cooperation. I am hopeful that through this MoU, the schemes operated by NCDC will be channelized through MPEDA to the target groups for their benefits.

Two webinars on the Europe market as well as a virtual buyer seller meet was organized by MPEDA with assistance of Indian Missions in Rome and Brussels. The virtual buyer seller meet was organized along with Assoitica Italia, the seafood importers association in Italy. The registered exporters of MPEDA had very fruitful interactions with the importers for understanding the current market situations and future demands.

As more countries move towards vaccination of the Covid-19, we are hopeful that the pandemic situation may ease in the coming months, accelerating the global economy and boosting up the seafood trade.

Thank you.

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FAO Series Part-2: Code of Conduct for Responsible Fisheries

INTRODUCTION

Fisheries, including aquaculture, provide a vital source of food, employment, recreation, trade and economic wellbeing for people throughout the world, both for present and future generations and should therefore be conducted in a responsible manner. The Code of Conduct for Responsible Fisheries sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity. The Code recognises the nutritional, economic, social, environmental and cultural importance of fisheries, and the interests of all those concerned with the fishery sector. The Code takes into account the biological characteristics of the resources and their environment and the interests of consumers and other users. States and all those involved in fisheries are encouraged to apply the Code and give effect to it.

FISHERIES MANAGEMENT

Management objectives

• Recognizing that long-term sustainable use of fisheries resources is the overriding objective of conservation and management, States and subregional or regional fisheries management organizations and arrangements should, inter alia, adopt appropriate measures, based on the best scientific evidence available, which are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing countries.

• States should assess the impacts of environmental factors on target stocks and species belonging to the same ecosystem or associated with or dependent upon the target stocks, and assess the relationship among the populations in the ecosystem.

Data gathering and management advice

• When considering the adoption of conservation and management measures, the best scientific evidence available should be taken into account in order to evaluate the current state of the fishery resources and the possible impact of the proposed measures on the resources.

• Research in support of fishery conservation and management should be promoted, including research on the resources and on the effects of climatic, environmental and socio-economic factors. The results of such research should be disseminated to interested parties.

• Studies should be promoted which provide an understanding of the costs, benefits and effects of alternative management options designed to rationalize fishing, in particular, options relating to excess fishing capacity and excessive levels of fishing effort.

• States should ensure that timely, complete and reliable statistics on catch and fishing effort are collected and maintained in accordance with applicable international standards and practices and in sufficient detail to allow sound statistical analysis. Such data should be updated regularly and verified through an appropriate system. States should compile and disseminate such data in a manner consistent with any applicable confidentiality requirements.

• In order to ensure sustainable management of fisheries and to enable social and economic objectives to be achieved, sufficient knowledge of social, economic and institutional factors should be developed through data gathering, analysis and research.

• States should compile fishery-related and other supporting scientific data relating to fish stocks covered by subregional or regional fisheries management organizations or arrangements in an internationally agreed format and provide them in a timely manner to the organization or arrangement. In cases of stocks which occur in the jurisdiction of more than one State and for which there is no such organization or

arrangement, the States concerned should agree on a mechanism for cooperation to compile and exchange such data.

• Subregional or regional fisheries management organizations or arrangements should compile data and make them available, in a manner consistent with any applicable confidentiality requirements, in a timely manner and in an agreed format to all members of these organizations and other interested parties in accordance with agreed procedures.

Implementation

• States should ensure that an effective legal and administrative framework at the local and national level, as appropriate, is established for fisheries resource conservation and fisheries management.

• States should ensure that laws and regulations provide for sanctions applicable in respect of violations which are adequate in severity to be effective, including sanctions which allow for the refusal, withdrawal or suspension of authorizations to fish in the event of non-compliance with conservation and management measures in force.

• States, in conformity with their national laws, should implement effective fisheries monitoring, control, surveillance and law enforcement measures including, where appropriate, observer programmes, inspection schemes and vessel monitoring systems. Such measures should be promoted and, where appropriate, implemented by subregional or regional fisheries management organizations and arrangements in accordance with procedures agreed by such organizations or arrangements.

• States and subregional or regional fisheries management organizations and arrangements, as appropriate, should agree on the means by which the activities of such organizations and arrangements will be financed, bearing in mind, inter alia, the relative benefits derived from the fishery and the differing capacities of countries to provide financial and other contributions. Where appropriate, and when possible, such organizations and arrangements should aim to recover the costs of fisheries conservation, management and research.

• States which are members of or participants in subregional or regional fisheries management organizations or arrangements should implement internationally agreed measures adopted in the framework of such organizations or arrangements and consistent with international law to deter the activities of vessels flying the flag of non-members or non-participants which engage in activities which undermine the effectiveness of conservation and management measures established by such organizations or arrangements.

Financial institutions

Without prejudice to relevant international agreements, States should encourage banks and financial institutions not to require, as a condition of a loan or mortgage, fishing vessels or fishing support vessels to be flagged in a jurisdiction other than that of the State of beneficial ownership where such a requirement would have the effect of increasing the likelihood of non-compliance with international conservation and management measures.

FISHING OPERATIONS

Fishing gear selectivity

• States should require that fishing gear, methods and practices, to the extent practicable, are sufficiently selective so as to minimize waste, discards, catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species and that the intent of related regulations is not circumvented by technical devices. In this regard, fishers should cooperate in the development of selective fishing gear and methods. States should ensure that information on new developments and requirements is made available to all fishers.

• In order to improve selectivity, States should, when drawing up their laws and regulations, take into account the range of selective fishing gear, methods and strategies available to the industry.

• States and relevant institutions should collaborate in developing standard methodologies for research into fishing gear selectivity, fishing methods and strategies.

• International cooperation should be encouraged with respect to research programmes for fishing gear selectivity, and fishing methods and strategies, dissemination of the results of such research programmes and the transfer of technology.

Energy optimization

• States should promote the development of appropriate standards and guidelines which would lead to the more efficient use of energy in harvesting and post-harvest activities within the fisheries sector.

• States should promote the development and transfer of technology in relation to energy optimization within the fisheries sector and, in particular, encourage owners, charterers and managers of fishing vessels to fit energy optimization devices to their vessels.

Protection of the aquatic environment

• States should introduce and enforce laws and regulations based on the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78).

• Owners, charterers and managers of fishing vessels should ensure that their vessels are fitted with appropriate equipment as required by MARPOL 73/78 and should consider fitting a shipboard compactor or incinerator to relevant classes of vessels in order to treat garbage and other shipboard wastes generated during the vessel's normal service.

• Owners, charterers and managers of fishing vessels should minimize the taking aboard of potential garbage through proper provisioning practices.

• The crew of fishing vessels should be conversant with proper shipboard procedures in order to ensure discharges do not exceed the levels set by MARPOL 73/78. Such procedures should, as a minimum, include the disposal of oily waste and the handling and storage of shipboard garbage.

Protection of the atmosphere

• States should adopt relevant standards and guidelines which would include provisions for the reduction of dangerous substances in exhaust gas emissions.

• Owners, charterers and managers of fishing vessels should ensure that their vessels are fitted with equipment to reduce emissions of ozone depleting substances. The responsible crew members of fishing vessels should be conversant with the proper running and maintenance of machinery on board.

• Competent authorities should make provision for the phasing out of the use of chlorofluorocarbons (CFCs) and transitional substances such as hydrochlorofluorocarbons (HCFCs) in the refrigeration systems of fishing vessels and should ensure that the shipbuilding industry and those engaged in the fishing industry are informed of and comply with such provisions.

• Owners or managers of fishing vessels should take appropriate action to refit existing vessels with alternative refrigerants to CFCs and HCFCs and alternatives to Halons in firefighting installations. Such alternatives should be used in specifications for all new fishing vessels.

• States and owners, charterers and managers of fishing vessels as well as fishers should follow international guidelines for the disposal of CFCs, HCFCs and Halons.

Harbours and landing places for fishing vessels

States should take into account, inter alia, the following in the design and construction of harbours and landing places:

• Safe havens for fishing vessels and adequate servicing facilities for vessels, vendors and buyers are provided;

• Adequate freshwater supplies and sanitation arrangements should be provided;

• Waste disposal systems should be introduced, including for the disposal of oil, oily water and fishing gear;

• Pollution from fisheries activities and external sources should be minimized; and

• Arrangements should be made to combat the effects of erosion and siltation.

States should establish an institutional framework for the selection or improvement of sites for harbours for fishing vessels which allows for consultation among the authorities responsible for coastal area management.

Abandonment of structures and other materials

States should ensure that the standards and guidelines for the removal of redundant offshore structures issued by the International Maritime Organization are followed. States should also ensure that the competent fisheries authorities are consulted prior to decisions being made on the abandonment of structures and other materials by the relevant authorities.

Artificial reefs and fish aggregation devices

• States, where appropriate, should develop policies for increasing stock populations and enhancing fishing opportunities through the use of artificial structures, placed with due regard to the safety of navigation, on or above the seabed or at the surface. Research into

the use of such structures, including the impacts on living marine resources and the environment, should be promoted.

• States should ensure that, when selecting the materials to be used in the creation of artificial reefs as well as when selecting the geographical location of such artificial reefs, the provisions of relevant international conventions concerning the environment and safety of navigation are observed.

• States should, within the framework of coastal area management plans, establish management systems for artificial reefs and fish aggregation devices. Such management systems should require approval for the construction and deployment of such reefs and devices and should take into account the interests of fishers, including artisanal and subsistence fishers.

• States should ensure that the authorities responsible for maintaining cartographic records and charts for the purpose of navigation, as well as relevant environmental authorities, are informed prior to the placement or removal of artificial reefs or fish aggregation devices.

To be continued in next issue

CCRF:AQUACULTURE DEVELOPMENT & INTEGRATION OF FISHERIES INTO COASTAL AREA MANAGEMENT
Courtesy: www.fao.org

January 2021 registers better exports, but overall figures still in red

Exports continue to fall, but the rate of decline has slowed

As per the provisional estimates collected, the export of marine products during January 2021 has showed a decline of 3.18% in Quantity, 0.76% in Rupee value and 4.78% in US$ earnings, compared to January 2020.

The cumulative export during April to January in FY 2020-21 also showed a decline of 19.93% in quantity, 12.85% in Rupee value and 16.60% in US$ earnings compared to the same period last year.

Table-1: MONTH WISE EXPORTS

		JANUARY 2020	JANUARY 2021 (PROVISIONAL)	GROWTH (%)
Qty. in Ton	Q:	89,292	86,450	-3.18
Value in Rs. Cr.	V:	2,999.23	2,976.51	-0.76
US$ (Million)	$:	427.41	406.97	-4.78
CUMULATIVE EXPORTS				
		APRIL- JANUARY 2019-20	APRIL- JANUARY 2020-21 (PROVISIONAL)	GROWTH (%)
Qty. in Ton	Q:	11,20,367	8,97,040	-19.93
Value in Rs. Cr.	V:	40,904.95	35,649.89	-12.85
US$ (Million)	$:	5,868.90	4,894.71	-16.60

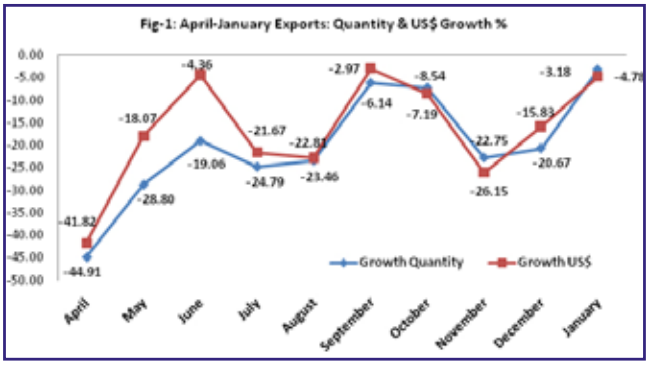
Month-wise export performance during April – January 2019-20 and same period 2020-21 is given in Table 2 below.

Table 2: Month - wise export performance: April -January 2019-20 v/s April – January 2020-21

Qty in MT, Value Rs. in Cr, US$ in Million

	Unit	2019	2020*	Growth %
April	Q	114413	63029	-44.91
	V	3344.55	2122.04	-36.55
	$	490.14	285.18	-41.82
May	Q	108507	77257	-28.80
	V	3633.61	3223.22	-11.29
	$	525.54	430.56	-18.07
June	Q	98059	79369	-19.06
	V	3589.95	3669.03	2.20
	$	521.74	498.98	-4.36
July	Q	100782	75794	-24.79
	V	4123.59	3448.12	-16.38
	$	605.33	474.17	-21.67
August	Q	96121	73575	-23.46
	V	4230.40	3321.13	-21.49
	$	609.93	470.79	-22.81
September	Q	121623	114161	-6.14
	V	4561.54	4510.88	-1.11
	$	644.86	625.72	-2.97
October	Q	144497	134108	-7.19
	V	5144.54	4736.43	-7.93
	$	729.42	667.10	-8.54
November	Q	130322	100674	-22.75
	V	4869.54	3764.30	-22.70
	$	689.65	509.31	-26.15
December	Q	116751	92623	-20.67
	V	4408.01	3878.23	-12.02
	$	624.88	525.93	-15.83
January	Q	89292	86450	-3.18
	V	2999.23	2976.51	-0.76
	$	427.41	406.97	-4.78

**April – November 2020: MPEDA HO Module ported data, December 2020 & January 2021: Provisional export figure from field offices*



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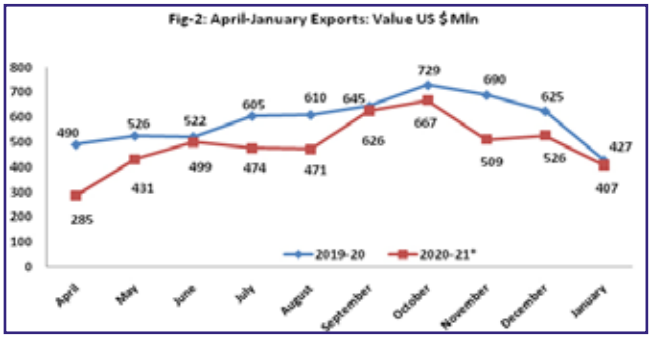

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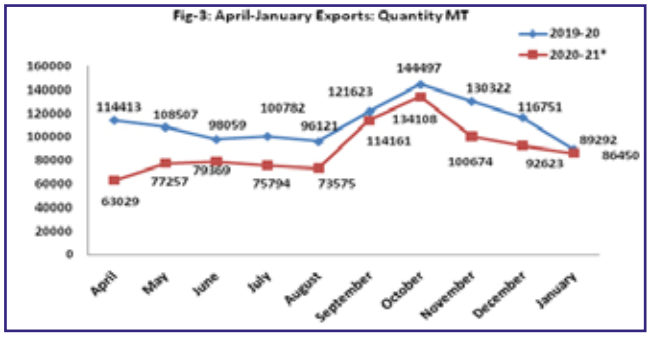


**April – November 2020: MPEDA HO Module ported data, December 2020 & January 2021: Provisional export figure from field offices*

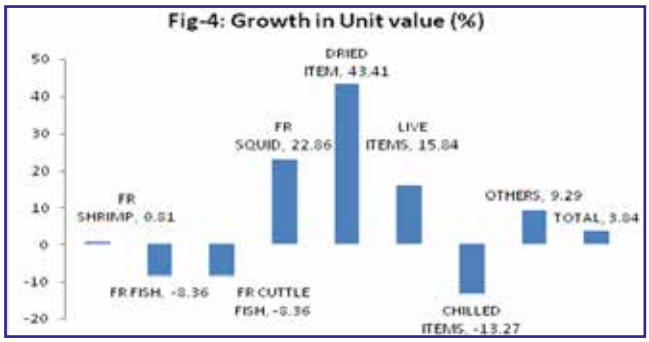
In Table-3, the item-wise unit value in terms of US$ per kg is provided. A cushioning effect in US$ dollar earnings was observed due to increase in unit value for all products except frozen fish, frozen cuttlefish and chilled items. There is an overall growth in the unit dollar value realization by 3.84% in the figures for April – December 2020 compared to the same period in 2019. An illustration the same is given in Fig-4.

Table 3. Item –wise unit value comparison: April – December 2020

UV $: Unit Value US$ per Kg

ITEM		Apr- Dec-2020*	Apr-Dec-2019	Growth (%)
FROZEN SHRIMP	UV$:	7.53	7.47	0.81
FROZEN FISH	UV$:	2.25	2.46	-8.36
FR CUTTLE FISH	UV$:	3.69	4.02	-8.36
FR SQUID	UV$:	4.38	3.57	22.86
DRIED ITEM	UV$:	2.47	1.73	43.41
LIVE ITEMS	UV$:	7.34	6.33	15.84
CHILLED ITEMS	UV$:	3.87	4.46	-13.27
OTHERS	UV$:	3.05	2.79	9.29
TOTAL	**UV$:**	**5.48**	**5.28**	**3.84**

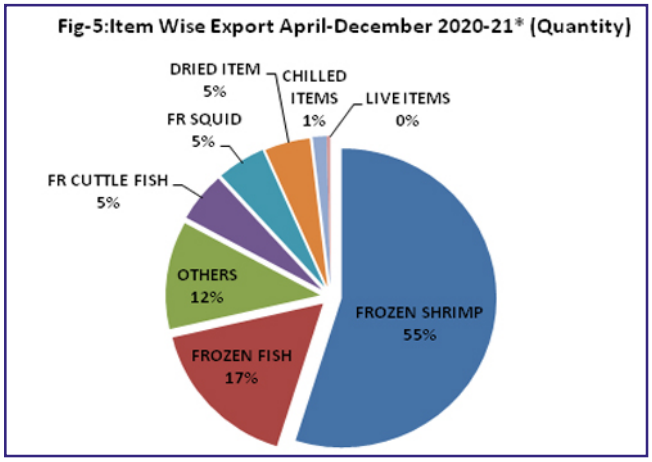
**April – December 2020: MPEDA HO Module ported data*

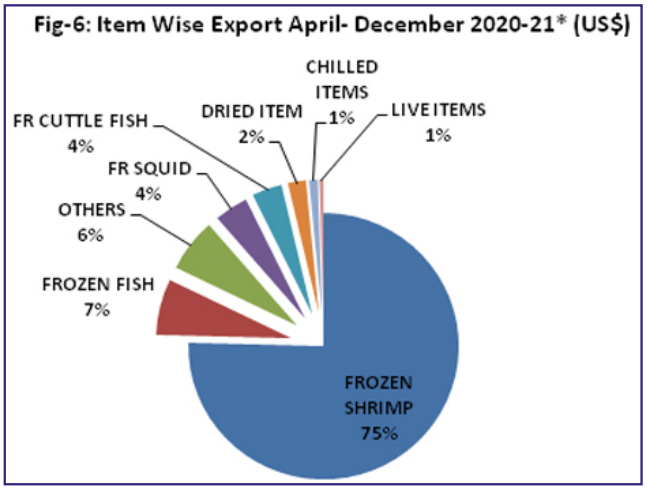


Major item - wise exports: April to December 2020

Fig-5 shows the percentage of various products contributed to exports during this period in quantity. As usual, frozen Shrimp contributed 55%, frozen Fish 17%, others 12% (contribute mainly by Surimi, Surimi Analogue products and other value added items), frozen Cuttlefish 5%, frozen Squid 5%, dried items 5%, chilled items 1% and small quantity of Live Items.

In terms of US$ value, frozen Shrimp contributed 75%, frozen Fish 7%, others 6% (Surimi, Surimi Analogue products and other value added items), frozen Squid 4%, frozen Cuttlefish 4%, dried items 2%, chilled items 1% and live Items 1% (Fig-6).

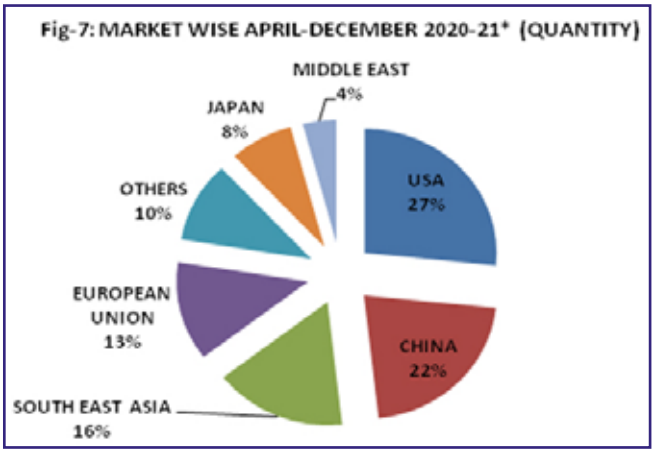


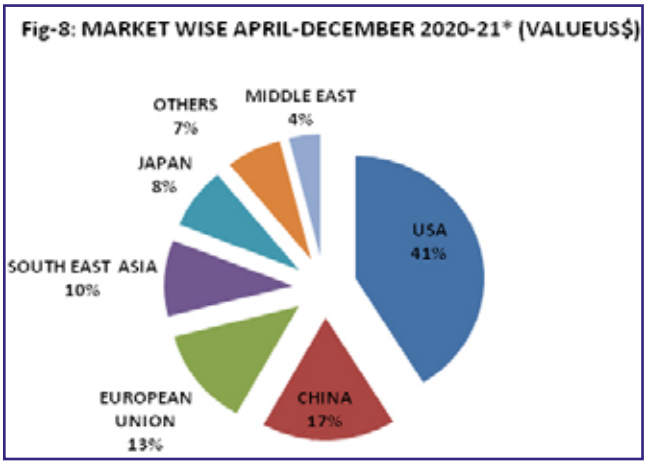


*April – December 2020: MPEDA HO Module ported data

Market - wise exports: April to December 2020

Fig-7 shows the performance of various markets in terms of quantity and Fig-8 shows the performance of various markets in terms of US$ value. In terms of quantity, USA leads with 27% followed by China (22%), SE Asia (16%), EU (13%), Japan (8%) and Middle East (4%). It is pertinent to note that the exports to other countries (10%) are improving because of the increased exports to countries like Canada & Russia. In terms of US$ value also, the USA leads with 41% share, followed by China (17%), EU (13%), SE Asia (10%), Japan (8%) and the Middle East (4%). The rest (7%) was covered by other markets.





*April – December 2020: MPEDA HO Module ported data

Probable reasons for the decline in exports

A. Production & logistics:

Similar to December, the scarcity of containers at seaports and hike in freight charges has affected exports in January 2021 also. This uncertainty has affected the procurement by exporters and made the landing prices volatile. This in turn has reduced the fishing efforts too. Export of chilled and live products were drastically down

due to the limited cargo flight availability and escalated logistic costs. The aquaculture production seems to be not affected by large, but logistics bottleneck has again affected the uptake. Many exporters have stopped raw material purchase citing the fullness of their cold storages.

B. Market situation:

The increased Covid-19 scrutiny in China has impacted container movement and created scarcity. Coupled with, there is suspension of processing units and reduced advance payments. The inventory levels are also very high in China affecting the seafood intake. The inventory is also reported to be high in the USA, and the demand in the food service segment is still sluggish. Scarcity of empty containers makes it difficult to execute orders in time.

In the EU market, major countries announced the lock down or movement restriction making the retail, restaurant, supermarkets and hotel consumption sluggish. Ecuador and Vietnam got a competitive advantage over India aided by their respective FTAs with the EU. Market conditions are normal in Japan, but the scarcity of empty containers is pushing down the execution of orders. Chilled fish export is affected adversely due to disruption of international flights. Sri Lanka has put a temporary ban on export of dry fish, which has affected the dry fish exports.

C. Item demand:

The price for large size shrimps especially Black tiger in EU has reduced, which are mainly consumed in the food service segment. Price of products like HeadLess Shell On, easy peel shrimps also has declined as Ecuador has diverted most of their exports at low prices to the US due to Covid-19 related issues with China.

Conclusion

The scarcity of reefer containers which started from early November is still creates a bottleneck in the revival of seafood exports from the country. It is high time we should start trying to achieve self-sufficiency in producing containers to alleviate such concerns in the future. If the situation persists, it will not be unrealistic to state that the seafood exports from Indian will not be crossing the 6 billion mark in 2020-21.

Want to be an exporter of marine products?

Export Sector: In the last five years, Indian seafood export has grown from Rs. 30,420 crores in 2015-'16 to all time high value of Rs. 46,663 crores in 2019-'20 (Fig-1). The export earnings also increased from USD 4688 million in 2015-'16 and reached USD 6679 million in 2019-'20. All time high performance in terms of USD was achieved during 2017-'18 with a record foreign exchange earning of USD 7082 million (Fig-2).

The export quantity also grown from 9.46 lakh MT in 2015-'16 to 12.9 lakh MT in 2019-'20. In quantity also the all-time high record is 13.77 MT achieved during 2017-'18 (Fig-3). Details given in Table-1.

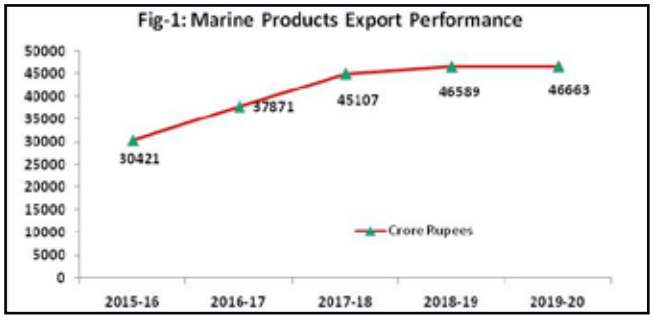
Table-1: Marine Products Exports during last five years

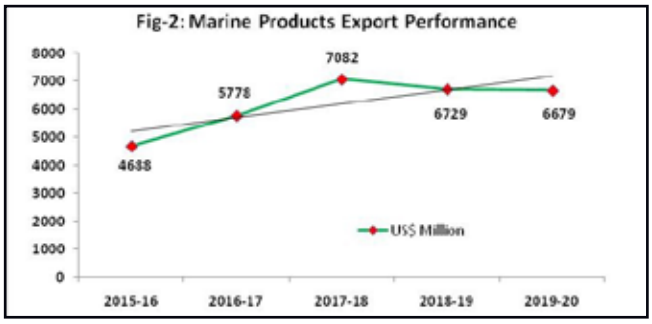
	2015-'16	2016-'17	2017-'18	2018-'19	2019-'20
Q: MT	9,45,892	11,34,948	13,77,244	13,92,559	12,89,651
V: Rupees Crore	30421	37,871	45,107	46,589	46,663
$: USD Million	4688	5778	7082	6729	6679

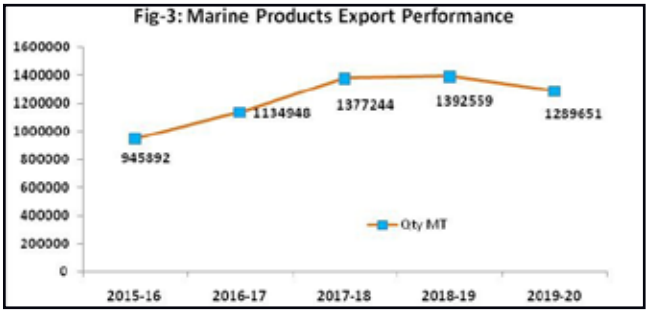
In US$ wise Frozen shrimp is the major export commodity followed by frozen fish, Fr Cuttle fish, Fr. Squid, Other items, Dried, Chilled & Live items (Fig-4). USA is the major market for Indian seafood, followed by China, European Union, SE Asia, Japan & Middle east.

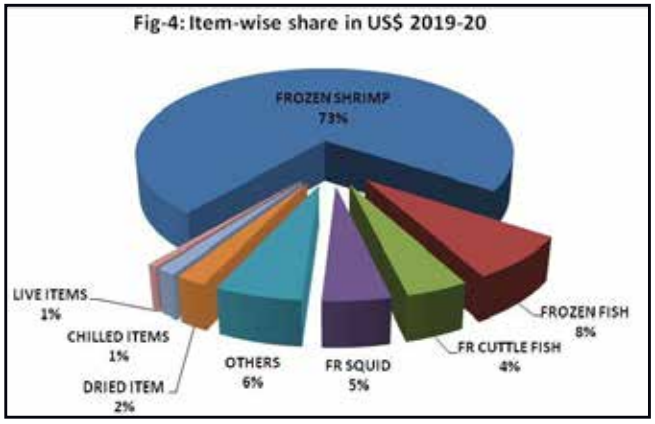
India's seafood exports, which has been dominated by the conventional block frozen products in bulk packages, is witnessing a transition to high-end value addition. Efforts are being made to double the current share of value-added products in exports from 6 per cent.

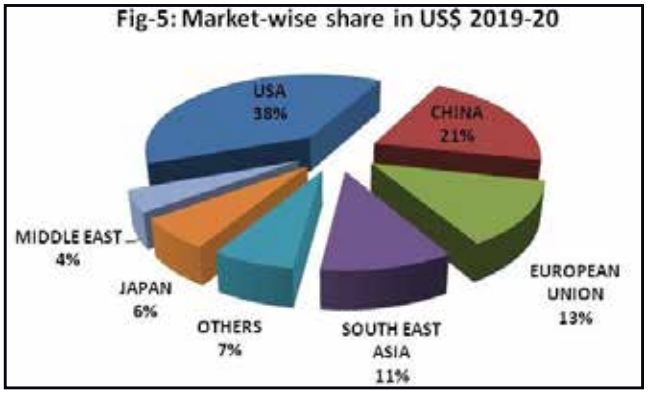
India is the 4th largest seafood exporter in the world for the past few years. The first, second and third positions are held by China, Norway and Vietnam respectively. The other major players in the field are Chile, Netherlands, Canada, Thailand, Ecuador etc.











India's Export performance among the Top 20 countries

India exports marine products to more than 120 countries.

The top 20 countries held a share of 93.75 per cent of the total exports in USD terms in 2019-'20. However, it is interesting to note that the share of Indian seafood is minimal in majority of these countries, when their individual imports of seafood is considered (Table-2). This may be considered as an additional potential available for Indian exporters with our major trading partners.

Table-2: Top 20 export countries during 2019-'20, their imports and India's export share

	Country	Export from India	Total seafood Import	% Share of India
1	USA	2562.54	23062.45	11.11
2	China	1311.51	15749.25	8.33
3	Japan	422.24	14763.07	2.86
4	Viet Nam	310.33	1605.47	19.33
5	Thailand	211.73	3598.87	5.88
6	United Arab Emirates	197.25	765.80	25.76
7	Spain	151.09	7912.72	1.91
8	Canada	133.26	2936.36	4.54
9	United Kingdom	131.33	4417.82	2.97
10	Italy	127.21	6526.36	1.95
11	Belgium	123.25	2086.27	5.91
12	Russian Federation	102.93	2177.67	4.73
13	Netherlands	99.51	3177.42	3.13
14	France	75.33	6564.16	1.15
15	Taiwan	63.40	Data not available	
16	Hong Kong	63.12	3449.01	1.83
17	Portugal	46.89	2394.21	1.96
18	Malaysia	46.35	1089.00	4.26
19	Bangladesh	43.26	89.02	48.59
20	Greece	38.58	604.71	6.38
	Others	417.62	47740.96	0.87
	Grand Total	**6678.70**	**150710.58**	**4.4**

Production - Aquaculture Sector:

The aquaculture sector shows an average growth rate of more than 10 per cent in the last five years. From 4.98 lakh MT in 2015-'16, it has reached 7.57 lakh MT in 2019-'20 (Fig-4). An overall 55 per cent increase in production was observed during the above period. Though the area under culture was increased only by 13 per cent, the average productivity has increased from 3.5 MT/ha/yr to 4.8 MT/ha/yr, resulted in the massive increase in production (Table-3).

Table-3: Aquaculture Production during the last 5 years						
Species		2015-16	2016-17	2017-18	2018-19	2019-20
Tiger Shrimp	AUC in Ha	68846	58851	59099	58,359	58,653
	EP in MT	81452	58163	57691	54,902	35,437
Vannamei	AUC in Ha	59116	87252	93496	75494	100206
	EP in MT	406018	501297	622327	618678	711674
Scampi	AUC in Ha	12706	6151	-	-	-
	EP in MT	10152	3377	9983	7222	9540
Total	EP in MT	497622	562837	690001	680802	756,651

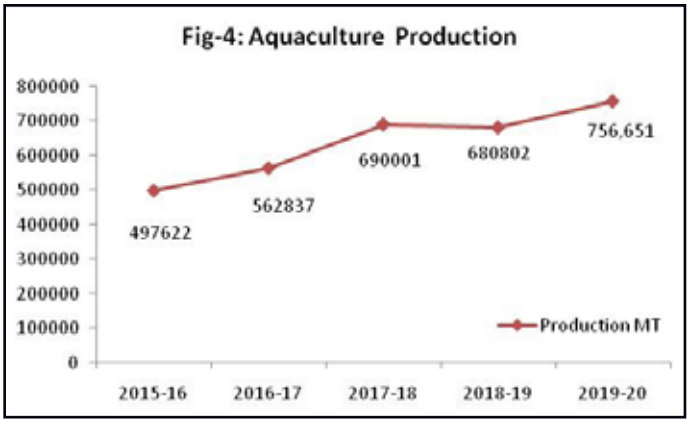


Table-4: Potential available in brackish water aquaculture			
State	Area suitable for culture (Ha)	Total Area under culture (Ha)	Total Production (MT)
West Bengal	90000	57494	58961
Odisha	31600	13186	48147
Andhra Pradesh	174000	64561	512244
Tamil Nadu	56000	8393	45022
Kerala	65000	3061	2623
Karnataka& Goa	11800	1129	1229
Maharashtra	12500	1328	5625
Gujarat	90000	9709	73842
Total	**530900**	**158863**	**747694**

The potential area available for brackish water aquaculture in India is around 5.3 lakh ha, and currently the utilized area is less than 30 per cent of the potential (Table-4). So, there is ample scope for increasing the aquaculture production by expanding the culture to more areas along with increasing the productivity and bringing diversity in cultured species.

Production – Marine Sector:

India has about 8118 Km. of coastal line and nearly 2 million Sq Km of Exclusive Economic Zone (EEZ) and half a million Sq Km. of Continental Shelf.

The estimated Indian marine fish resource potential is estimated at 4.41 million MT and as per the latest figures of marine capture fisheries landings, the harvest level is almost 84 per cent of the estimated potential. So, better fisheries management policies need to be adopted at the earliest to sustain the current level of production. Marine sector, including capture fisheries contributes 1.1 per cent of GDP and 5.15 per cent of Agriculture GDP.

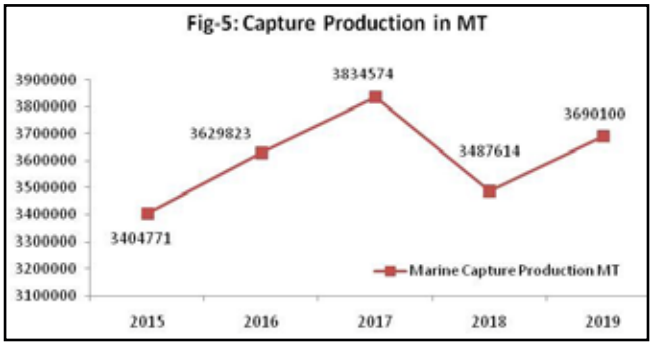
Marine Capture production has always shown a fluctuating trend and during 2015, the production was 3.4 million MT and in 2019, the production is around 3.7 million MT (Table-5 and Fig-5). The all-time high production of 3.94 million MT from marine capture sector was observed in 2012 and thereafter the production fluctuated year after year.

Similarly, we have 3.15 million ha of reservoirs, 2.5 million ha of ponds and tanks, 1.25 million ha of brackish water area, cold water resources of hilly states and all other inland fishery resources offer a production potential of about 15 million MT.

Table-5: Marine Capture production during last 5 years

Year	2015	2016	2017
Landings MT	3,404,771	3,629,823	3,834,574

2018	2019
3,487,614	3,690,100



The mechanized sector contributed 2.98 million MT (83 per cent) towards the total landings in 2019 which is 0.13 million MT more than that in 2018. The contribution by motorized and non-motorized sectors are 0.56 million MT (16 per cent) and 0.03 million MT (1 per cent) respectively.

In the marine capture sector, the maximum landings took place during the period October-December, followed by periods January-March, July-September and April-Jun.

Conclusion

• If we look at the trend for the last five years its is showing a positive note.

• The aquaculture production is also showing an increasing trend during last five years.

• During last five years the overall trend of capture production is also increasing, though ups and downs are observed.

• The precise increasing trend of production from aquaculture sector shows that India's marine products export has got the potential to increase in the coming years.This is the perfect time to join the race. To start your export business, you can register at the following link

http://e-mpeda.nic.in/registration/Reg_login.aspx

Virtual meet on enhancing seafood exports by air from Kolkata

MPEDA's Kolkata Regional Division has hosted a virtual meeting with representatives of GMR Group - IGI Airport, New Delhi, seafood exporters and other stakeholders on 12th January 2021. The aim of the meeting was to discuss ways and means to enhance exports of the marine products to South East Asian Nations. Twenty three exporters, utilising air cargo for logistic support attended the meet.

Mr. Archiman Lahiri, Deputy Director, RD Kolkata, Mr. Munish Davessar (Head-Cargo Business Development, GMR-IGI Airport), Mr. Vaibhor Puri (Manager-Import/TP), Ms. Sanskriti Yadav (AM-Export), and Mr. Vaibhav Singh (AM-Domestic) attended the meeting. After a quick introduction about seafood exports through Kolkata airport, Mr. Vaibhav Singh and Mr. Munish Davessar gave a detailed presentation on exports through IGI Airport. They spoke about the Trans-shipment Excellence Centre (TEC) and D-3 Approach at the airport and its benefits. The forum was then opened for the exporters to present their queries.

Mr. Syed Anwar Maqsood (Naaz Impex Pvt. Ltd.), Mr. Shamim Akhtar (Kolkata Marine Products Pvt. Ltd.), Mr. Sandeep Ray (Blue Ocean Exports), Mr. Sankha Subhra Maity (Chetana International), Mr. Soumen Basu Roy Choudhury (IFB Agro Industries Ltd.) raised their queries, which were promptly addressed by the representatives of GMR. Some of the questions that came up during the discussion were on the benefits of using the green corridor from Kolkata to Delhi, Customs clearance process involved, timings for the cargo, handling procedures for perishable commodities, temperature controlled infrastructure in case of delay, arrangements of Full Flight Cargo from Kolkata to Delhi, so as to have connection flights onwards for Hong Kong and provision of exports to CSI countries.

While addressing the queries, Mr. Munish Davessar assured that it is possible to provide connectivity from Kolkata to Delhi with fast customs/cargo processing. He said a D-3 system is in place for fast clearance of custom processes.

Dr. Shine Kumar C S, Deputy Director (Marketing Services)suggested providing details of flight charges levied by the Kolkata and Delhi airports for various commodities with the airway bills, so that the issues faced by exporters in relation to airway charges can be taken up to the Ministry of Civil Aviation.

FSI is committed to bring sustainable blue revolution

Dr. L. Ramalingam

Deputy Director General (Fisheries)

Director General-in-Charge of FSI

INSTITUTE OF THE MONTH: FSI

Dr. M.K. Farejiya, Dy. Director General (Engg.)

FSI Headquarters and Mumbai Base

FSI Chennai Base

FSI Mormugao Base

FSI Visakhapatanam Base

FSI Kochi Base

FSI Portblair Base

INSTITUTE OF THE MONTH: FSI


A. Tiburtius


Dr. Sijo P. Varghese


Dr. M. Vinodkumar


Dr. S. Ramachandran


S. K. Jaiswal


Dharmaveer Singh


D. Bhami Reddy


C. D. Rao


Shri N. V. Ramanamurthy


Bapu M. Raut


Ashok kadam


B. Balanayak

Over the years, fisheries sector in the nation has witnessed a sea of change. The demand for seafood has increased manifold, but the fishing area remained the same and resources dwindled. The situation is made more serious with the opening up of overseas market and the ever-increasing demand for export quality seafood.

This is where Fishery Survey of India (FSI) steps in. The FSI has been working tirelessly for decades now to bring about innovation in technology and methodology in fishing. Over the years, FSI has learnt that the shallow waters of less than 50 m depth zone of sea have been subjected to extreme pressure due to increased number of vessels operating in limited area with limited resources.

"The scientists of FSI understood the crisis and rope in the diversified eco-friendly fishing technology such as deep sea tuna longlining, squid jigging, pot fishing, trap fishing, pelagic fishing etc; so as to reduce the fishing pressure in 50m depth zone and also to offer varieties of fishing options beyond demersal trawling," said Dr. L. Ramalingam, Deputy Director General (Fisheries) and Director General-in-Charge of FSI

in an exclusive interview with MPEDA Newsletter. FSI has trawled the knowledge sector much earlier and pioneered these technologies.

"Not only that, FSI had advised the Union Government to implement diversification of demersal trawl to Tuna longlining. As a result of this, the Government rolled out a scheme for conversion of demersal trawlers of above 20 m OAL to monofilament tuna long-liner with a 50 per cent subsidy on the total actual cost with a maximum ceiling of 15 lakhs through FSI in 2005." Since then, the scheme has come under the mandate of MPEDA, NFDB through respective coastal States. This scheme is also a major component of the "Blue Revolution" under the Prime Minister's Matsya Sampada Yojana.

Such interventions are critical in the present scenario as marine fisheries provide a source of livelihood for more than 3.5 million people in over 3,000 villages along the coast. Almost the entire population from these small coastal communities are engaged in fisheries-related livelihoods, with the majority of them being small-scale operators. With the catch rate coming down regularly and more large boats withdrawing from active fishing, it has become an extremely difficult task to sustain the balance of the fragile economic system in the coastal belt. Therefore, the Union Government is encouraging a shift to more distant deep water fishing within the EEZ.

"Product quality remains an issue for the landed fish catch, leading to losses of up to 15 per cent of harvest plus lower prices for poor quality fish that are sold," Dr. Ramalingam said. Hence, FSI plays the vital role of connecting the stakeholders at multiple levels of the fisheries sector to the policy makers.

Regional Workshop

Computer Division

Library

Open house

Students visit

With the markets across national borders opening up, quality of the catch becomes all the more important. There have been instances of seafood exports from India being flagged by countries with very strict import rules like the US and Japan. The Union Government has entrusted FSI to find a way out to ease the stress on exporters and

accordingly, FSI regularly carries out National Technical Expert Consultations. At the end of these consultations, "FSI submits the report to the Union Government advising the best management practice to augment the export."

The recommendations of FSI include guidance for improving exports are enhancement of value addition, enrichment of products branding, product diversification, exploration of new export market, value chain to ensure maximum value for fishery products, integration of food products with Food Safety Standards Authority of India (FSSAI), promotion of traceability and eco-labelling of high-valued fish. Such critical interventions endorse FSI's pivotal role in export promotion of seafood products through helping the government to take informed decisions on policy matters.

At the same time, FSI engages the stakeholders directly to loosen the grip of export regulations by consumer nations and also bring in more value to exported seafood products. Most often, the seafood products exported from India get flagged due to concerns regarding incidental catches of sea turtles and marine mammals.

To counter this, FSI holds regular regional workshops, awareness programmes and open houses for providing awareness among the fishermen on the importance of using turtle excluding devices in trawls and avoiding marine mammal bycatch in the fishery, especially in gillnetting. Further, the bycatch hotspots, identified during the exploratory fishing are passed on to the fishermen, enabling them to avoid such hotspots for the conservation of these flagship species.

While the Union Government has brought in much changes to support and improve the scenario in fisheries sector, there is still a long way to go. "A policy shift to fisheries management, based more on maximising net benefits, will require alternative and enhanced livelihood opportunities to be developed for fishers and implemented as soon as possible. Potential long-term impacts from climate change need to be factored into alternative livelihood program planning and implementation," said Dr. Ramalingam.

Serious academic reviews of economic, social and environmental performance done by FSI recently show fisheries management in India is meeting only a few policy outcomes against stated planning goals established by the government. This, it is pointed out, leaves out much space for improving the overall performance.

"A policy need to be formulated focusing on economic growth, trade, livelihood and the environment. With a more appropriate policy decision, over the long-term marine fisheries can contribute to a broader economic growth and poverty alleviation, which would provide stronger incentives for resource conservation."

These policy decisions need to be arrived with an insight based on scientific facts about the impact of these decisions can have in future. It takes many years of expertise to manage the course of the policy decision with reference to the economic value that might be generated, and also foresee how the policy can emphasise best allocation of value to ensure the sustainable development of coastal communities.

That, in all its senses, is the role played by the Fishery Survey of India.

Training hands that harvest the sea

The Fishery Survey of India (FSI) approaches the fisheries sector in a wholesome manner. While working towards helping the governments in arriving at policy decisions at one side, the FSI is simultaneously working towards enhancing the knowledge skills for stakeholders in the industry.

In fact, it is one of the key mandates of FSI to work on the development of human resources. That has resulted in series of regularly held practical training sessions that update the skill sets of not just fishing operatives and fishermen, but also that of fisheries officials, exporters and students.

These are the different training programmes organised by FSI.

Onboard Training Programmes Monofilament / Multifilament Tuna Longlining

• The FSI in collaboration with the National Fisheries Development Board (NFDB), Hyderabad imparted onboard training programmes on Monofilament / Multifilament tuna longlining to the fishermen. The programme has successfully produced 197 trained fishermen of the respective Maritime States/ UTs.

• In association with CIFNET, 40 fishermen from Tamil Nadu were given onboard training on Monofilament long lining.

• In association with Department of Fisheries, Puducherry, FSI successfully trained 20 fishermen from Puducherry and Karikal regions on monofilament longlining fishing under the FIMSUL – II Project. The project was funded by the World Bank.

• In addition to the funded projects, FSI also imparted hands-on-training to more than 500 fishermen during the regional workshop/ awareness programmes conducted onboard the survey vessels on eco-friendly fishing methods.

Onboard Training Programmes

Training to the Fishermen / Stakeholder / Exporters

• Assisted the entrepreneurs by deputing experienced skippers, fishing second hands and engine drivers (fishing vessels) and engineers (fishing vessels) to train them in demersal trawling for deep-sea shrimps and lobsters in 200-500 m depth.

• FSI provided training to the fishers from maritime States and UTs on longline fishing, navigational equipment, sea safety, fish handling etc.

• FSI regularly provides training to the local fishermen in fishing gears fabrication, fishing methods, fishery resources, deep sea fishing, fish handling, preservation etc.

• FSI assists the fishery entrepreneurs and exporters as per their requirement.

• The FSI had imparted training in Pole and Line fishing and masmin (a dried tuna product) preparation to the fishermen of the Andaman and Nicobar Islands.

• FSI introduced a new fishing methodology called Squid Jigging, to exploit abundant oceanic squid resources. This is being tried in the Indian seas for the first time. The economic viability of this new technology was established and a few fishermen were trained on this latest technology.

• FSI has undertaken a research programme to study the abundance of mesopelagic fishery resources off the Indian EEZ and adjoining seas. The fishermen are encouraged to exploit these abundant mesopelagic resources to ease the fishing pressure on juvenile fishes, an important raw material for the fish meal industry.

• Considering the importance of sustainability in Indian fisheries, Ministry of Agriculture instructed FSI to initiate capacity building for fishermen on sustainable resource exploitation and is being developed.

• Trainers training programme was organised for the fisheries officials. Awareness among the key operational staff about the sustainability and its importance was the prime objective of the programme.

• Interactive workshops were conducted at

Chennai, Mangalore, Kochi and Goa. Officials from State Governments, scientists, officers, researchers were benefited by the training programme.

Eyes of the Ocean

The Fishery Survey of India (FSI) flaunts an impressive fleet of vessels that leave nothing in the sea unnoticed. The data collected from this highly-advanced research vessels go a long way in helping the FSI reach vital conclusions about changes happening in our seas. This information is very important for the academic and administrative perspectives. Presently, FSI has a fleet of 11 deep sea survey vessels (multifilament Tuna longliners - 2, monofilament Tuna longliners - 2 and Stern Trawlers - 7) equipped with the state-of-the-art technology equipment.These vessels are deployed from seven operational bases – Mumbai, Mormugao, Cochin, and Porbandar on the West coast and Chennai, Visakhapatnam and Port Blair on the East coast. The long coastal belt of India is thus effectively covered as required under the mandate of FSI.

Demersal Resources Survey and Monitoring Programme

Coast / Vessel	Lat./Depth (m) (between)
West Coast	
Matsya Nireekshani	18° –23°N 30-500 m
Sagarika	12° –18°N 30-300 m
Matsya Varshini	07° –12°N 30-500 m
Lavanika	08° –11°N 20-100 m
East Coast	
Samudrika	10° -16°N 30-300 m
Matsya Shikari	16° –21°N 30-200 m
Matsya Darshini	16° –21°N 30-200 m

Activities

• Preparation of species inventory of demersal finfish and shellfish resources.

• Estimation of abundance indices of demersal resources and major components associated to it, with emphasis on Sciaenids, Threadfin breams, Catfish, Bulls eye, Barracuda, Ribbon fish, Horse mackerel, Scads, Squids and Cuttlefish.

• Identifying spatio-temporal distribution pattern of above resources.

• Study of biological aspects of important resources.

• Stock assessment of important species/ resources.

• Study of suitable mesh size for important species.

• Imparting training in fishing techniques and demonstrations of modern equipment on board to fishermen, fishing industry representatives and entrepreneurs.

Pelagic Resources Survey and Monitoring Programme

Coast / Vessel	Survey Project	Latitude (between)
West Coast		
Matsya Varshini	Meso-pelagic fishes survey by Mid-water trawling	7°N–12°N
East Coast		
Matsya Darshini	Pelagic resources survey and monitoring by Mid-water trawling	16°N–21°N

Activities

• Preparation of species inventory of meso-pelagic fin-fish and shellfish resources.

• Estimation of abundance indices of meso-pelagic resources and the major components related, with emphasis on myctophids.

• Mapping spatio-temporal distribution pattern of the resources.

• Study of biological aspects of the dominant species for ensuring sustainable utilization.

• Establish the trade-offs between exploitation, sustainability and viability of the resource, and identify options for its governance.

Oceanic Tuna Resources Survey Programme

Coast/ Vessel	Survey Project	Region/Lat.
West Coast		
Matsya Vrushti	Tuna resources survey using monofilament longline	Arabian Sea including Lakshadweep waters Lat. 04° – 23°N
Yellow Fin	Tuna longline survey using multifilament longlining	Arabian Sea Lat. 08°-18°N
East Coast		
Matsya Drushti	Tuna resources survey using monofilament longline Experimental bottom set vertical longline survey	Bay of Bengal Lat. 10° – 20°N
Blue Marlin	Tuna longline survey using multifilament longlining, Experimental bottom set vertical longline survey	Andaman waters Lat. 10°-15° N Nicobar waters Lat. 05° – 10°N

Activities

• Estimation of abundance indices of oceanic tunas and allied resources.

• Estimation of abundance index of Sword fish.

• Estimation of abundance index of Perches.

• Identifying spatio-temporal distribution pattern of the above resources.

• Study of biological parameters in respect of important species as per Annexure-I.

• Study of oceanographic and metrological parameters influencing Tuna and Swordfish distribution.

• Study of migration pattern of Yellow-fin Tuna.

• Experiment with bottom set longline for surveying stock status of Oil Shark resources in the Andaman and Nicobar waters.

• Imparting training in fishing techniques and demonstrations of modern equipment onboard to the fishermen, fishing industry representatives and entrepreneurs.

Reaching out to a wider audience

The FSI is working as a common platform for organising workshops, open houses, marine exhibition street plays and rallies for fishermen. The whole idea is to share the information gathered through resource survey operations to the stakeholders and end users like fishermen and fisherwomen, boat owners, NGOs working in fishery sector, students and policy makers.

FSI associates with IOTC

FSI is the designated nodal agency of the Government of India to meet the research and data requirements of the Indian Ocean Tuna Commission (IOTC) as part of India's international obligation. The IOTC, a regional body of the FAO, responsible for management and conservation of the tuna and allied resources in the Indian Ocean. The IOTC provides technical and scientific support and training to the member countries to expand their tuna fishing activity in the Indian Ocean.

Tuna Tagging Programe

The FSI Scientists have the distinction of possessing highly specialised expertise for undertaking tagging of live tunas and releasing them to sea to study their migrations, growth etc. Tunas being highly migratory fishes, the IOTC had embarked upon an ocean-wide tuna tagging programme in the Indian Ocean. In this activity, the coastal countries like India, Indonesia and Maldives were given training in undertaking small-scale tuna tagging exercise. India had implemented two small scale tuna tagging projects with plastic dart tags in Lakshadweep and Andaman and Nicobar Islands by releasing large number of yellowfin and skipjack tunas during the period 2005-'08. In addition to this, the FSI, in collaboration with the Indian National Centre for Ocean Information services (INCOIS, Hyderabad), has undertaken

Step 1

Step 2

Step 3

Step 4

Step 5

Step 6

Tuna Tagging Programe

a five-year project entitled "Satellite Telemetry Studies on Migration Patterns of Tunas in the Indian Seas (SATTUNA)", wherein, in addition to information on migratory pattern and growth, the oceanographic parameters Influencing yellowfin tuna distribution and behaviour were studied by tagging live tunas with pop-up satellite archival (P-Sat) tags.

FSI linkages

FSI has vital linkages with several national agencies and institutions associated with ocean studies and fisheries development like the Ministry of Earth Sciences, Indian Council of Agricultural Research, National Fisheries Development Board, Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology, Central Institute of Fisheries Education, National Institute of Oceanography, Space Applications Centre, National Remote Sensing Agency, Centre for Mathematical Modelling and Computer Simulations, Marine Products Export Development Authority, National Institute of Fisheries Post-harvest Technology and Training, Central Institute of Fisheries Nautical and Engineering Training, Indian National Centre for Ocean Information Services, Central Institute of Coastal Engineering for Fisheries and State/UT Fisheries Departments.

At international level, FSI is the nodal institute of the Government of India for matters related Bay of Bengal Large Marine Ecosystem (BOBLME), besides being the nodal agency for the Indian Ocean Tuna Commission (IOTC).The FSI in collaboration with SAC and ISRO has engaged in the development of resource specific fishery forecast models using Ocean Satellite derived data on ocean colour (Chlorophyll) and Sea Surface Temperature (SST).

To meet the scale of work that the FSI has undertaken, regular updating of its infrastructure is also needed. For example, the Marine Engineering Division (MED) was added to the

Marine Engineering Division (liferaft service station)

Marine Engineering Division (slipway drydock yard)

FSI from NIFPHATT, which was formerly known as Integrated Fisheries Project (IFP). The facility, which was transferred in 2005, has a prime land of 3.8 acres and a jetty. The MED can undertake maintenance works including dry-docking / underwater repairs of the deep-sea fishing vessels at an affordable cost. The facilities available at MED are:

• Slipway Yard - It has the capacity to dock the vessels up to 150 GRT. The special feature of the slipway is that, the vessel can be kept in horizontal position while in the Dry-Dock.

• Engineering Workshop - It has the required machinery and equipments such as lathe machines, radial drilling machines, plate and pipe bending machines, pneumatic power hammer etc.

• ILR Servicing Centre - Certified with ISO 9001:2000 and approved by the DG Shipping.

• Dredging - MED has a grab dredger with a capacity of 40 cubic meter per hour, and also Cutter Suction Dredger.

• Marine Electronic Section - Marine Electronic Section of MED undertakes the repair and maintenance of electronic equipments like Echo-sounders, Auto Pilot, RADAR, GPS, VHF & AIS etc.

The FSI is surging ahead to bring in qualitative changes in the Indian fisheries.

India's Marine Fish Landings Decline in January 2021

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

NETFISH-MPEDA records marine fish landings and boat arrivals at selected major harbour/landing centres in the nine coastal states of India through the Harbour Data Collectors on a daily basis. This report gives the species-wise, harbour-wise and state-wise trend of marine landings that occurred at 95 harbours in January 2021.

Estimations on fish landings

A total catch of 69224.26 tons of marine fishery resources was reported from 95 harbours during the month. The major contributor to the total landings was pelagic finfish resources with a share of 43% (29737.27 tons). This was followed by the demersal finfishes with landings of 21911.45 tons (32%). The Crustaceans contributed 8813.30 tons (13%), Molluscs 8659.16 tons (12%) and miscellaneous items contributed a meagre 103.10 tons (Fig.1).

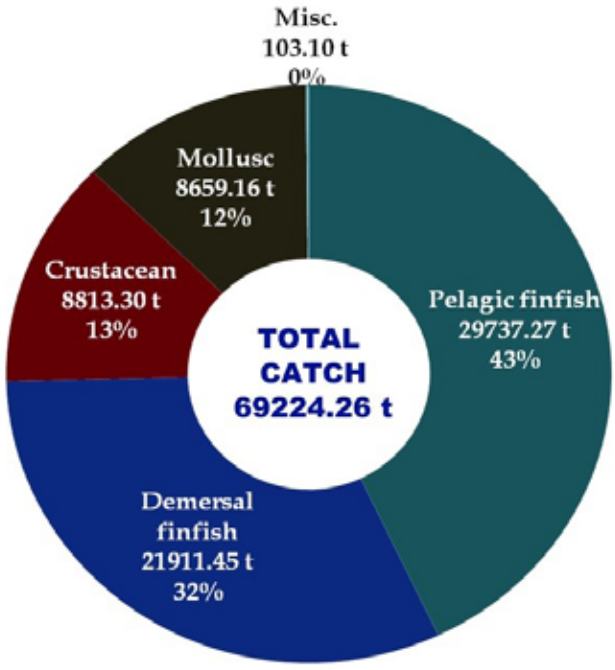


Fig.1. Catch composition of marine landings recorded in January 2021

The total catch comprised 281 species of fishery items, of which the highest five contributors were *Rastrelliger kanagurta* (Indian mackerel), *Nemipterus japonicus* (Japanese thread fin bream), *Sepia pharaonis* (Pharaoh cuttlefish), *Otolithes* Spp (Dhoma croaker) and *Johnius* Spp (Croaker) (Table 1).

Sl. No.	Common name	Scientific name	Quantity in tons
1	Indian mackerel	*Rastrelliger kanagurta*	6055.82
2	Japanese thread fin bream	*Nemipterus japonicus*	3028.44
3	*Pharaoh cuttlefish*	*Sepia pharaonis*	2966.34
4	Dhoma croaker	*Otolithes* Spp	2714.89
5	Croaker	*Johnius* Spp	2287.58

Whereas, considering various fishery items landed, in general, the top five contributors were Croakers, Coastal shrimps, Indian Mackerel, Cuttlefish and Tunas which together formed 39% of the total catch (Fig. 2).

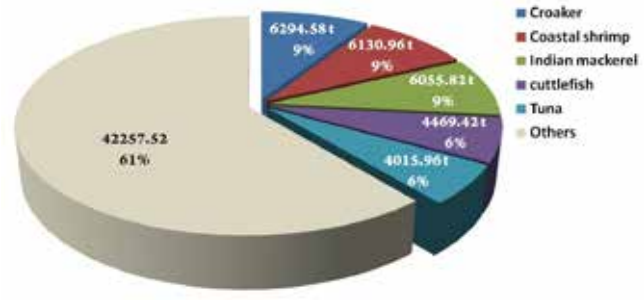


Fig. 2. Major fishery items landed during January 2021

The total catch quantity of various categories of fishery items recorded during January 2021 is enlisted in Table 2. Among the Pelagic finfish resources, Indian

mackerel, Tunas & Ribbon fishes were the major contributors whereas among demersal finfishes, the major contributors were Croakers, Japanese Threadfin breams and Lizard fish. About 70% of the Crustacean catch comprised various species of Coastal shrimps, among which the highest contributor (21%) was the Karikkadi shrimp. Cuttlefish was the major molluscan variety landed during the period.

Table 2. Category-wise landing of various fishery items during January 2021

Fishery item	Quantity in tons	% of total catch
Pelagic finfishes		
Indian mackerel	6055.82	8.75
Tuna	4015.96	5.80
Ribbon fish	3510.65	5.07
Lesser sardines	3004.86	4.34
Scads	2615.31	3.78
Anchovies	2581.02	3.73
Bombay duck	2241.47	3.24
Indian oil sardine	1191.08	1.72
Seerfishes	1069.13	1.54
Shads	879.58	1.27
Trevallys	628.82	0.91
Mackerels	332.39	0.48
Barracudas	308.68	0.45
Mahi mahi	304.00	0.44
Sail fish	200.04	0.29
Herrings	136.59	0.20
Mullets	125.62	0.18
Marlins	107.77	0.16
Indian salmon	105.35	0.15
Queenfishes	96.56	0.14
Needlefishes	81.69	0.12
Cobia	68.55	0.10
Flying fish	51.50	0.07
Sea bass	12.55	0.02
Halfbeaks	6.49	0.01
Milk fish	3.77	0.01
Wahoo	1.94	0.00
Pompanos	0.10	0.00
Total	29737.27	42.96
Demersal finfishes		
Croakers	6294.58	9.09
Japanese thread fin bream	3028.44	4.37
Lizard fishes	2169.57	3.13
Catfishes	1877.68	2.71
Groupers	1515.63	2.19
Sole fishes	1193.09	1.72
Pomfrets	1034.80	1.49
Bullseyes	847.39	1.22
Moon fish	684.14	0.99
Sea breams	531.70	0.77
Goatfishes	481.97	0.70
Trigger fishes	370.38	0.54
Ponyfishes	321.42	0.46
Sharks	249.71	0.36
Eels	223.83	0.32
Rays	223.75	0.32
Snappers	213.20	0.31
Rabbit fishes	158.40	0.23
Flat heads	151.49	0.22
White fishes	130.73	0.19
Threadfins	62.34	0.09
Silverbellies	37.99	0.05
File fishes	36.99	0.05
Perches	22.66	0.03
Whitings	15.72	0.02
Halibuts	15.52	0.02
Surgeon fishes	5.01	0.01
Mud skipper	3.73	0.01
Parrot fishes	3.38	0.00
Sweet lips	2.70	0.00
Grunts	2.63	0.00
Sickle fish	0.59	0.00
Spade fish	0.33	0.00
Total	21911.45	31.65
Crustaceans		
Coastal shrimps	6130.96	8.86
Deepsea shrimps	1787.86	2.58
Sea crabs	844.66	1.22
Lobsters	42.17	0.06
Mud crab	7.66	0.01
Total crustaceans	8813.30	12.73
Molluscs		
Cuttlefishes	4469.42	6.46

Squids	3819.27	5.52
Octopus	339.46	0.49
Baigai	31.01	0.04
Total molluscs	8659.16	12.51
Miscellaneous		
Jellyfish	94.92	0.14
Pearl spot	6.13	0.01
Moon jellyfish	1.95	0.00
Tilapia	0.10	0.00
Total	103.10	0.15
Grand Total	**69224.26**	**100.00**

Harbour-wise landings

The total landings reported from each of the selected harbours during the month are given in Table 3. Of the 95 harbours, the New Ferry Wharf harbour in Maharashtra recorded the maximum fish landing, which was to the tune of 8761.60 tons (13%) and it was followed by the Porbandar and Veraval harbours in Gujarat with 5122.50 tons (7%) and 4853.16 tons (7%) respectively. The least quantity of marine fish catch was recorded from Jagathapattinam harbour in Tamil Nadu (10.46 tons).

Table 3. Total landings reported from selected harbours during January 2021

State	Harbour	Catch Quantity (tons)	Boat arrivals (nos.)
West Bengal	Petuaghat Deshpran	1706.46	556
	Digha Sankarpur	1499.33	511
	Namkhana	1158.78	297
	Raidighi	909.41	294
	Kakdwip	518.57	272
	Fraser Ganj	449.60	298
	Soula	388.12	171
Odisha	Balramgadi	590.63	258
	Dhamara	468.51	175
	Paradeep	426.99	137
	Bahabalpur	369.56	159
	Balugaon	123.30	547
Andhra Pradesh	Visakhapatnam	1195.60	310
	Nizampatnam	536.37	137
	Vodarevu	429.71	387
	Machilipatnam	271.43	124
	Kakinada	264.79	133
	Pudimadaka	164.34	148
Tamil Nadu	Chennai	2440.18	544
	Nagapattinam	1538.16	583
	Karaikal	796.11	289
	Tharuvaikulam	558.39	231
	Thengaipattinam	473.95	419
	Colachel	460.57	225
	Pazhayar	194.14	496
	Yanam	150.31	132
	Cuddalore	136.60	543
	Pondicherry	131.46	135
	Poompuhar	117.94	470
	Tuticorin	107.79	317
	Chinnamuttom	88.00	333
	Mudasalodi	64.55	215
	Kodiyakarai	61.09	359
	Mandapam	50.88	220
	Mallipatnam	35.42	221
	Rameswaram	34.61	141
	Pulicat	22.95	461
	Kottaipatnam	17.94	153
	Jagathapathinam	10.46	87
Kerala	Sakthikulangara	1916.93	1190
	Thoppumpady Cochin	1585.43	502
	Munambam	1229.93	838
	Neendakara	760.21	686
	Beypore	570.71	306
	Vypin	314.72	238
	Kayamkulam	247.19	226
	Chellanam	231.69	459
	Azheekkal	178.34	339
	Puthiyappa	157.25	106
	Mopla Bay	137.09	328
	Cheruvathur	105.19	320
	Ponnani	93.56	217
	Thangassery	93.15	226
	Thottappally	77.74	171
	Koyilandi	72.44	209
	Munakkakadavu	65.95	207
	Vaadi	39.54	270
	Vizhinjam	38.45	349
	Chettuva	28.37	117
Karnataka	Malpe	2374.96	1027
	Mangalore	2043.43	873
	Gangolli	656.60	598
	Honnavar	547.56	228

	Bhatkal	417.81	417
	Amdalli	287.16	141
	Karwar	244.32	182
	Belekeri	227.42	109
	Tadri	196.32	355
Goa	Malim	2027.04	455
	Cutbona	559.13	201
	Vasco	292.07	205
	Chapora	24.82	232
Maha-rashtra	New Ferry Wharf	8761.60	1045
	Ratnagiri	1388.49	439
	Sasoon Dock	1035.60	478
	Arnala	733.97	318
	Sakharinate	452.22	240
	Harne	252.10	544
	Uttan	242.88	111
	Alibagh Koliwada	197.13	412
	Satpati	131.94	168
	Malvan	108.16	384
	Versova	107.61	152
	Onni Bhatti Dabhol	96.48	268
	Taramumbri Devgad	96.26	415
	Vasai	73.67	81
	Dahanu	17.65	76
Gujarat	Porbandar	5122.50	1935
	Veraval	4853.16	2266
	Okha	3097.76	1064
	Mangrol	2358.22	1730
	Jafrabad	1564.75	464
	Vanakbara	1387.30	714
	Chorwad	215.56	721
	Kotada	123.80	64

State-wise landings

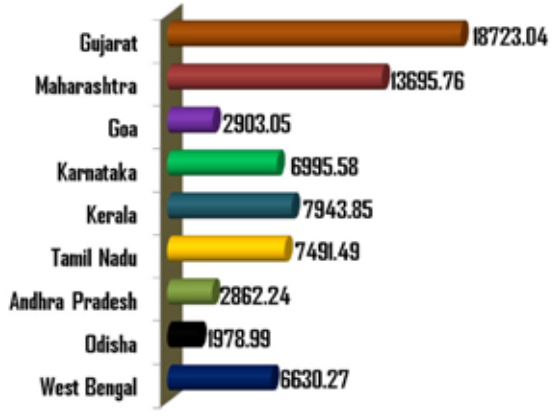


Fig.3. State-wise fish landings (in tons) during January 2021

The state of Gujarat recorded the highest marine landings in January 2021, to the tune of 18723.04 tons (27%) (Fig.3). Maharashtra, in the second position, contributed 13695.76 tons (20%), followed by Kerala with a total landing of 7943.85 tons (11%). The state which reported least landing during the period was Andhra Pradesh, with a landing of 2862.24 tons (4%) of marine catch.

Estimations on boat arrivals

In January 2021, about 37904 nos. of boat arrivals were recorded from the 95 harbours. State-wise figures for the month (Fig. 4) shows that the highest number of boat arrivals occurred in Gujarat, followed by Kerala and Tamil Nadu. The harbour-wise details of boat arrivals are enlisted in the Table 3. The highest recording was from Veraval (2266 nos.), Porbandar (1935 nos.) and Mangrol (1730 nos.) harbours in Gujarat. The Kotada harbour in Gujarat is the last in the list with only 64 nos. of boat arrivals.

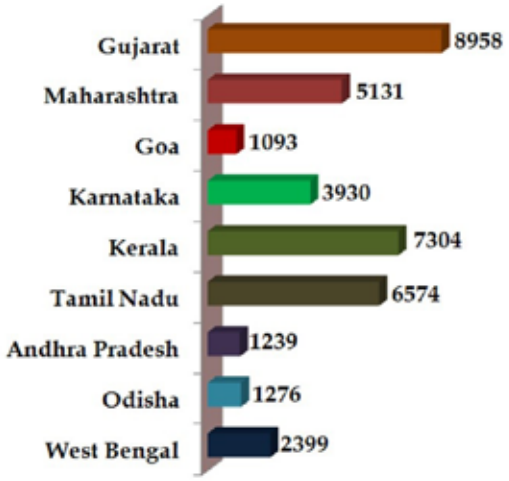


Fig. 4. State-wise boat arrivals (nos.) during January 2021

Summary

In January 2021, 69224.26 tons of marine fishery resources were landed. 37904 nos. of boat arrivals were reported from 95 major fish landing sites of India. A dip by around 28000 tons was observed in the total catch, when compared to December 2020 and the number of boat arrivals had registered a decrease by more than 5500 numbers. The Pelagic finfishes continued to be the major contributors to the total landings and the Indian mackerel maintained its 1st position of the most landed fishery item for the month. As in previous month, the state of Gujarat had recorded the maximum landing for the month and the New Ferry Wharf harbour in Maharashtra reported the highest quantity of fish landings. In terms of number of boat arrivals, Gujarat state and the Veraval harbour in the state continued to top the list with the most number of boat arrivals.

Export promotion and assistance to seafood sector in post WTO era in developing countries

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Exports are important to all developed and developing countries as it generates employment, production and revenue. Government support is very much required for promoting the export in developing countries.

In most of the cases, governments in developing countries are offering support, services and financial assistance to exporters to promote exports. Infrastructure facilities and services are very much essential to reduce the transaction cost of the exporters.

Unfortunately, the issues related to lack of adequate infrastructure and services are not addressed properly in developing countries and this affects the export competitiveness of these countries. To compensate for the difficulties faced by the exporters, authorities in developing nations are providing direct or indirect financial assistance to exporters.

As per the WTO agreement on subsidies and countervailing measures "subsidies contingent, in law or in fact, whether solely or as one of several other conditions, upon export performance" are prohibited. This article explores the possibilities of export promotion in developing countries which is in compliance with WTO agreement on Subsidies and Countervailing measures.

WTO Agreement on Subsidies and Countervailing measures

Part II article 3 of relevant portion of WTO Agreement on Subsidies and Countervailing measures is as below:

Article 3: Prohibition

3.1 Except as provided in the Agreement on Agriculture, the following subsidies, within the meaning of Article 1, shall be prohibited:

(a) Subsidies contingent, in law or in fact , whether solely or as one of several other conditions, upon export performance, including those illustrated in Annex I;

(b) Subsidies contingent, whether solely or as one of several other conditions, upon the use of domestic over imported goods.

3.2 A Member shall neither grant nor maintain subsidies referred to in paragraph 1.

Annex I

Illustrative List of Export Subsidies

(a) The provision by governments of direct subsidies to a firm or an industry contingent upon export performance.

(b) Currency retention schemes or any similar practices which involve a bonus on exports.

(c) Internal transport and freight charges on export shipments, provided or mandated by governments, on terms more favourable than for domestic shipments

(d) The provision by governments or their agencies either directly or indirectly through government-mandated

schemes, of imported or domestic products or services for use in the production of exported goods, on terms or conditions more favourable than for provision of like or directly competitive products or services for use in the production of goods for domestic consumption, if (in the case of products) such terms or conditions are more favourable than those commercially available on world markets to their exporters.

(e) The full or partial exemption remission, or deferral specifically related to exports, of direct taxes or social welfare charges paid or payable by industrial or commercial enterprises.

(f) The allowance of special deductions directly related to exports or export performance, over and above those granted in respect to production for domestic consumption, in the calculation of the base on which direct taxes are charged.

(g) The exemption or remission, in respect of the production and distribution of exported products, of indirect taxes in excess of those levied in respect of the production and distribution of like products when sold for domestic consumption.

(h) The exemption, remission or deferral of prior stage cumulative indirect taxes on goods or services used in the production of exported products in excess of the exemption, remission or deferral of like prior-stage cumulative indirect taxes on goods or services used in the production of like products when sold for domestic consumption; provided, however, that prior-stage cumulative indirect taxes may be exempted, remitted or deferred on exported products even when not exempted, remitted or deferred on like products when sold for domestic consumption, if the prior stage cumulative indirect taxes are levied on inputs that are consumed in the production of the exported product (making normal allowance for waste). This item shall be interpreted in accordance with the guidelines on consumption of inputs in the production process contained in Annex II.

(i) The remission or drawback of import charges in excess of those levied on imported inputs that are consumed in the production of the exported product (making normal allowance for waste); provided, however, that in particular cases a firm may use a quantity of home market inputs equal to, and having the same quality and characteristics as, the imported inputs as a substitute for them in order to benefit from this provision if the import and the corresponding export operations both occur within a reasonable time period, not to exceed two years. This item shall be interpreted in accordance with the guidelines on consumption of inputs in the production process contained in Annex II and the guidelines in the determination of substitution drawback systems as export subsidies contained in Annex III.

(j) The provision by governments (or special institutions controlled by governments) of export credit guarantee or insurance programmes, of insurance or guarantee programmes against increases in the cost of exported products or of exchange risk programmes, at premium rates which are inadequate to cover the long-term operating costs and losses of the programmes.

(k) The grant by governments (or special institutions controlled by and/or acting under the authority of governments) of export credits at rates below those which they actually have to pay for the funds so employed (or would have to pay if they borrowed on international capital markets in order to obtain funds of the same maturity and other credit terms and denominated in the same currency as the export credit), or the payment by them of all or part of the costs incurred by exporters or financial institutions in obtaining credits, in so far as they are used to secure a material advantage in the field of export credit terms.

Provided, however, that if a Member is a party to an international undertaking on official export credits to which at least twelve original Members to this Agreement are parties as of 1 January 1979 (or a successor undertaking which has been adopted by those original Members), or if in practice a Member applies the interest rates provisions of the relevant undertaking, an export credit practice which is in conformity with those provisions shall not be considered an export subsidy prohibited by this Agreement.

(l) Any other charge on the public account constituting an export subsidy in the sense of Article XVI of GATT 1994.

History of Countervailing Duty investigation on frozen shrimp exports from India and six other countries by the United States

A legal petition for imposition of countervailing duty (CVD) on import of shrimps has been filed on 28/12/2012 by Coalition of Gulf Shrimp Industries (COGSI), against shrimp exports to the USA by seven countries viz. China, Thailand, Vietnam, Ecuador, Indonesia, Malaysia and India.

COGSI claims that subsidies provided by Govt. of India to the Indian shrimp Industry provide an unfair advantage for Indian shrimp exports to the USA, resulting in Indian exporters to sell their products at lower prices. The Government of India had consultations with the US DOC on the subject matter and had meeting with US ITC on January 14, 2013.

The Government of India expressed its concern about the protective regime followed by USA and WTO inconsistent actions taken by US Authorities and gross deficiencies in the petition. Chairman, MPEDA also attended the conference /ITC hearing in connection with the investigation.

In this regard, the US Department of Commerce (USDOC) has issued Questionnaire for the Govt. of India on 14/02/2013, with a period of investigation from 1st April 2011 to 31st March 2012 by selecting two major exporters from India as mandatory respondents. Based on the replies received from all relevant organizations, the response of Govt. of India to the Questionnaire has been filed on 02nd April 2013.

Two more supplementary questionnaires were also replied by GOI. On 13th August 2013 US Department of Commerce announced its affirmative final determinations in Countervailing Duty investigations of imports of certain frozen warm water shrimp from Ecuador, India, Malaysia, China, Vietnam and negative final determination for Indonesia & Thailand. Exporters from India have been assigned a subsidy rate of 10.84. As some of the subsidy schemes in India were terminated, USDOC finally determined a cash deposit rate of 5.85% for exports made from India.

The United States International Trade Commission (USITC) on 20/09/2013 determined that U.S. industry is neither materially injured nor threatened with material injury by reason of imports of frozen warm water shrimp from China, Ecuador, India, Malaysia, and Vietnam, that the US Department of Commerce had determined, were subsidized. As a result of the USITC's negative determinations, the US did not issue countervailing duty orders on imports of these products from India, China, Ecuador, Malaysia, and Vietnam. Due to this, none of the seven countries including India, need not pay countervailing duty for their shrimp exports to the US.

Export promotion in post WTO era

Export is considered as a major economic activity of the developing countries. Developing countries usually provide financial assistance as incentives or grants for buying machineries, developing other infrastructure facilities to exporters, processors, and other stakeholders.These assistances are provided mainly based on export performance. As per the WTO agreement on subsidies and countervailing measures, these assistances are treated as prohibited subsidies. Such kind of direct assistance to exporters will be against the violation of WTO agreement and adversely affecting developing countries' position in WTO.

Moreover, direct financial assistance based on export performance will create unhealthy competition among exporters. Exporters who are handling a large volume of exports will monopolize the domestic market and undersell their products in international markets.This will gradually eliminate small scale players in the long run and prevent entry of new entrepreneurs in the seafood business. In view of this, direct financial assistance based on export performance to exporters needs to be reviewed and alternative methods for supporting production and processing industry need to be considered.

Support and coordination from the government is required in these countries for production, processing, transportation and warehousing. The government support in these areas will ensure better prices for the producers and processors in the developing countries. Traceability, biosecurity and sustainability issues are affecting the market access of the seafood sector in developing countries. Coordinated approach of researchers, development agencies, producers and other stakeholders are essential to address them. It also requires a huge amount of infrastructure and funds. Unfortunately, these are not getting due attention before the government authorities in developing countries.

WTO agreement is not prohibiting or preventing any kind of projects or programmes or actions that supports traceability, biosecurity, sustainability and contaminant issues in these countries. It is need of the hour to address these issues in these countries to protect the farmers and fishers.

Services to exports for ease of doing business

Entrepreneurship in export business can be promoted by providing better services and better infrastructure facilities to export fraternity. For market access, most of the seafood products require various certifications from the government authorities. Exporters are required to pay fees/charges for obtaining such certification from these government agencies. Government authorities may extend testing services and registration / certifications for exports without charging any fees. This will reduce the transaction cost of the entrepreneurs/ exporters considerably. Withdrawal of fees and service charges for obtaining certificates and inspection from government authorities will also support the producers/ farmers. This will help the exporter to offer better price to farmers/ fishers in these countries.

These initiatives will be compatible with WTO norms and WTO agreement on SCM.

Alternative methods for supporting the production and processing industry.

1. Assistance can be provided for development of infrastructure facilities, like sea port, airport, road, electricity projects, solar power projects, aqua clinics, testing laboratories, common effluent treatment system and hatcheries in farming areas. Assistance may be provided by assessing the requirement of the area, production and export of that particular region. Equitable allocation of funds is necessary for such activities considering the production and export of that particular region/area/state.

2. Project-oriented proposals from the processing sector may be considered for all kinds of processing units. Assistance to such proposals should not be differentiated between the domestic or export sector.

3. Local governments can allocate land or lease the land for establishment of new processing units.

4. Reduction of income tax on all kinds of manufacturing units.

5. Development of an investor friendly image and environment.

6 Development of a platform for technological development by encouraging and supporting increased interaction between scientific institutes, universities, and industry.

7. Develop a well-built commercial intelligence with the support of HS based data on export consignments which is linked with traceability.

Role of research in developing countries

Biosecurity & antibiotic residue issues in aquaculture as well as sustainability issues in capture fisheries are severely affecting the market access of developing countries in the international market. Concrete studies and policy recommendations are required to address these issues in international scenarios to enhance and maintain market access. Research institutions that are working in aquaculture and capture fisheries need to give concrete recommendations to governments in developing countries and address these issues based on their research findings. Such kind of research will bring ideas and concepts to formulate policies which are helpful to defend the country's status in the international market in terms of traceability, sustainability, contamination due to residue and biosecurity issues.

Due to various other reasons, market access for developing countries is already affected. Research institutions in the fisheries sector need to orient their research in such a way that it is beneficial to industry, farmers and fishers in aquaculture and capture fisheries sector. It may be ensured that the funding of research in the fisheries sector needs to be prioritized in the above mentioned areas to give policy recommendations with action points.Research and status updation in aquaculture and capture fisheries related to traceability, sustainability, biosecurity and contaminant issues are very much required to protect the interest of farmers, fishers and trade in these countries.

The views, findings and recommendations from the research institute concerned will ensure the requirements of importing countries. Detailed research studies in this area will defend the position of developing countries in international scenario and international organizations like WTO, FAO, Codex, OIE, IOTC etc and facilitate the ease of doing business.

References: WTO Agreement on Subsidies and Countervailing Measures

1.https://www.wto.org./english/tratop_e/scm_e/subs_e.htm - Agreement on Subsidies and Countervailing Measures (" SCM Agreement")

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Do fish eat stones? A rare incident with its removal procedure

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It's a happy time for fish keepers when they notice bulging of abdomen in fish. They often think it to be a gravid female with eggs, getting ready to spawn. But when it becomes weak and stops feeding they sense the danger.

Abnormal swelling of abdomen in fish is mostly attributed to dropsy, caused mainly by bacteria Aeromonas hydrophila or can be due to cancerous internal tumor. In either of these cases an accumulation of fluid in the abdominal cavity occurs leading to swelling of abdomen.

The reversal and cure for this is unlikely and one needs to prepare for the worst. In case of bacterial dropsy, the abdominal swelling is generally uniform on either side and the scales of the fish protrude outwards. Its early detection and treatment with epsom salt (30 ppm) or antibiotic like tetracycline (5 ppm) as bath may provide some relief to fish. In case of tumor, which is rare in fish the protrusion will be towards one side and the scales will be normal, inclined towards the body as in a healthy fish.

Fig. 1. Arowana fish with abdominal bulging

Recently a suspected case of tumor was noticed in an eight-year-old Arowana fish at Silver Hills Higher Secondary School, Kozhikode, Kerala, India (Fig 1). The fish was housed in a 5 ft x 2 ft x 2 ft aquarium decorated with glittering smooth pebbles at the bottom. It was being fed with small live goldfish. Arowana is often considered to be a symbol of good luck as per Feng shui, but this fish had side wise abdominal bulge and was a sore sight. It had stopped feeding and was finding it difficult to wade through water.

The fluid accumulation caused due to tumor in the abdominal cavity can be removed by sucking it out using a syringe. This can give temporary relief to fish as the fluid can reaccumulate within a fortnight. The permanent solution is removal of the tumor, but this could be risky, as it requires an internal surgery.

For any procedure or treatment it's better to shift the fish to a smaller tank. In this case a hundred litre barrel was used. Half of the barrel was filled with aquarium water collected from the upper portion of the tank. Extreme care was taken while catching Arowana as they are natural jumpers. The fish was guided into a flexible bag net, the top portion of the net was closed to prevent the fish from jumping out while shifting it to the treatment tank.

Clove oil at 30 ppm was used as anesthetic to immobilize the fish. Half of the dose was administered before introduction of the fish and the remaining was given after introducing it. Clove oil was added drop by drop with vigorous agitation of water near the gills of the fish to accelerate the action of anesthetic. It is advisable not to use anesthetic at a higher dose and leave fish unattended as this may lead to euthanasia. Once the fish was immobilized, attempts were made to suck the fluid out from its abdomen using a 10 ml syringe attached to a 2ml syringe needle (Fig. 2).

The use of a lower size needle reduces the area of the puncher there by reducing the chance of post

Fig. 2. Examining fluid in abdomen

infection. In case of this Arowana there was no fluid accumulation and on further physical examination of lump with hand it gave a clattering sound indicating the presence of stones in its abdomen. This was one of the rarest cases where the fish had accidently gobbled smooth pebbles along with the feeder goldfish.

Fig. 3 Removing stones from Arowana

Surgery of internal organs in fishes can be fatal as cutting open and stitching needs to be done layer by layer. It's highly risky to cut open the stomach and stitch even with an absorbable suture. The gastric juice from stomach may ooze through the stitch when the fish moves leading to infection and its death in subsequent days.

Hence use of long artery forceps is the best and safest method to take stones from the stomach of fish through its mouth. Here it could not be used as the fish had not gone into complete anesthesia and even its slightest movement would have been risky, as the curved forceps may puncture internal organs. It's also hard to hold the smooth stones with forceps.

Fig. 4. Stones removed from Arowana

Hence the mouth of the fish was kept wide open using fingers. It was taken out of water for 30 seconds to 1 minute, held vertically and the stones were directed towards its mouth using the other hand (Fig 3). After nearly 8 to 10 attempts all the stones were pushed out from its stomach. Sufficient time (2 to 3 mts) was given for the fish to breathe in water between each attempt. Twenty one glittering pebbles were removed from its abdomen weighing 123 grams (Fig 4).

All the pebbles in the aquarium were removed before transferring the fish back to the aquarium. It recovered from anesthesia within a few minutes, but was not feeding even after two days. This was due to the fact that the fish had become weak to hunt the three goldfish in the aquarium.

On introducing a dozen of new gold fish it started to consume them. The fish has now fully recovered and has slowly regained its shape. This incident clearly indicates that fish can accidently gobble stones. Here the size of pebbles and feeder goldfish were almost similar. This Arowana could have consumed these many stones over a period of time while swallowing the goldfish. The accumulation of stones had made its abdomen bulge and the weight of the stones had made it less agile making it unable to hunt its prey. Subsequently the fish had become weak.

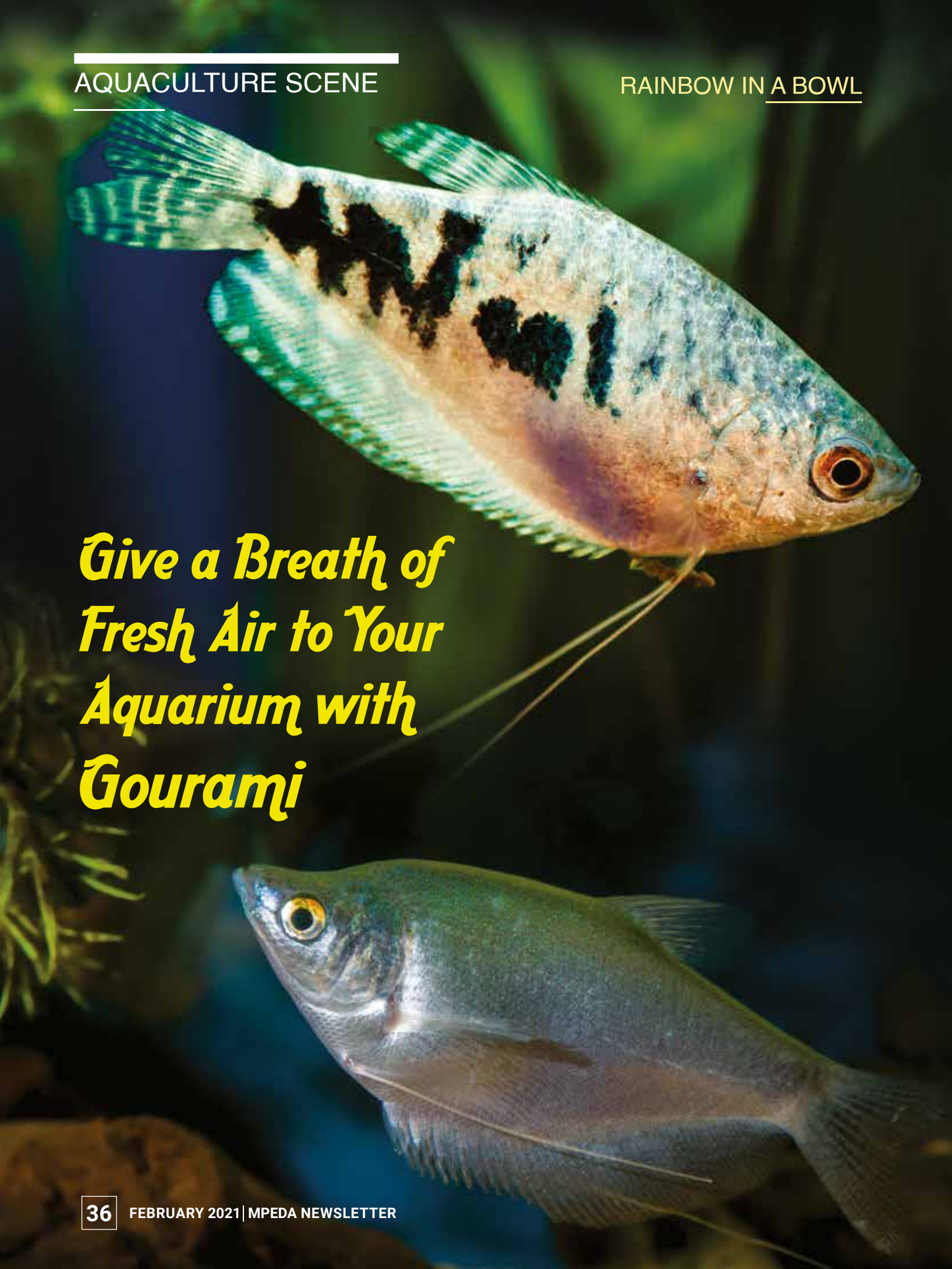
Keeping a clean aquarium without turbid water is a challenge for any aquarist. For this as a rule of thumb one has to give feed suiting to the mouth gap of fish and the substrate used at the bottom should not fit into its mouth. Always try to tame carnivorous fishes to a non-living diet such as pieces of cleaned fish with head, gut and scales removed or pealed beheaded shrimps.

Never over feed carnivorous fishes as they may expel the excess feed consumed after some time. This may decompose and deteriorate the water quality. Freshwater fish should be fed with cleaned marine fish and marine fish should be fed with freshwater fish to prevent disease outbreak.

Here the Arowana was lucky enough to have attained passive immunity against almost all diseases which were indirectly carried to the aquarium through the goldfish procured from a pet shop. The golden quote "prevention is better than cure" is true with fish. Hence utmost care should be taken while selecting the fish, its feed, substrates, decorative and life support equipment.

Acknowledgement:

Special thanks to Fr. Biju John, Principal Silver Hills Higher Secondary School, Kozhikode Mr. Jithesh, Mr. Kumaran, and my brother Dr. Prasanth B Nair



Give a Breath of Fresh Air to Your Aquarium with Gourami

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.

The labyrinth fish, Gourami, is a native of western and southern Africa, northeastern, southeastern, south and southeast Asia. It has an accessory respiratory organ, which lies in the gill cavity. This paired organ, consisting of many curled or flower-like delicate membranes with rich blood supply, enables the fish to get additional oxygen from the atmosphere. One might have noticed that these fishes periodically swim to the water surface to exchange gases through the accessory respiratory organ. As most of the water bodies in the tropical area are poorly oxygenated, labyrinth fishes have evolved this supplementary respiratory organ. In fact, most of these fishes would die if they were denied access to air even if the water is oxygenated.

Colisa lalia, the Dwarf Gourami, occurs naturally in freshwater ponds, streams and paddy fields of northeastern India and Bangladesh, and is the most popular among the Gouramis. They exhibit sexual dimorphism; males with striking exquisite colours while females have silvery colouration. The males are slightly larger than the females. They are laterally compressed with an oval-shaped body when viewed from the side. The dorsal and anal fins are more developed in the male. The pair of ventral fins is filamentous and almost longer than the body. Today more than 10 varieties with striking colourations are cultured such as Golden, Neon, Rainbow, Red Neon, Blue Coral, Long Finned, Coral and Peacock. The original Dwarf Gourami is red while others are selectively bred from spontaneous mutants or developed through hybridisation between varieties.

Compared with Dwarf Gourami, the other species are not so popular among the fish hobbyists. The Honey Gourami *(C chuna)*, with a typical stocky and compressed body and having a length of about 4 cm, is popular in some markets. The general colour is yellowish with a dark brown longitudinal stripe, running from the eye to the tail, resembling the colour of honey. Sexing is difficult except during the spawning period as the male shows a distinct colouration while the female has a swollen abdomen when she is gravid.

The Indian Gourami *(C fasciata)* is larger than the Dwarf Gourami with colourful males. The male is larger than the female and attains about 10 cm. The laterally compressed body is ovate but long. The dorsal and anal fins are very long with the posterior end drawn out to a point in males. A number of oblique iridescent bluish stripes are present on the flanks, while the female is grayish and has larger bands along the body. Green and orange varieties are also now available.

The Thick-lipped Gourami *(C labiosa)* also exhibits sexual dimorphism. The male is longer than the female. They are colourful with the end of the dorsal fin pointed while females are less coloured with a rounded dorsal fin. Hybridisation of *C fasciata* and *C labiosa* is being carried out.Like the Colisa species, the genus Trichogaster also has long hair-like ventral fins. The most popular among these is the Three Spot Gourami *(T trichopterus trichopterus)*. The common name, Three Spot Gourami, is derived from two prominent black spots on the body, one in the middle of the flank region and the other on the caudal peduncle and the eye is generally considered as the third spot. The common colouration is silvery-olive, darker dorsally and paler towards the abdomen. The dorsal, caudal and anal fins are laced with white or pale orange spots. The long anal fin has pale orange frills. The males are slimmer with longer and pointed dorsal fins while females have rounded dorsal fins and plump bodies.

They are prolific breeders and assume bright colouration during spawning. Now a mutant, the Golden Three Spot Gourami, is also available. Other varieties among the Trichogaster are the Blue Gourami *(T trichopterus sumatranus)*, Pearl Gourami *(T leeri)*, Snakeskin *(T pectoralis)* and the Moonlight Gourami *(T microlepis)*. Among these, Pearl Gourami is most attractive with the entire body and fins overlaid with a dense pattern of iridescent pearl-like spots. With thick fleshy lips, the Kissing Gourami *(Helostoma temmincki)* is popular among the hobbyists as they often make kissing motions.

Gouramis are bubble nest breeders. In most of the species, the male builds a floating nest of bubbles either on the water surface or under aquatic plants. The bubbles are coated with mucous secretion to make them firm. The gravid female releases eggs under the nest and the eggs float upward towards the bubble nest or the male picks up the eggs in his mouth and places them in the bubble nest. Parental care is common among Gourami and the male guards the eggs and the nest. The method of culture of all Gouramis is similar. They prefer slightly acidic but soft water.

Farmers' Meet discusses antibiotic abuse, farm enrolment & traceability

More than 50 farmers took part in the Farmers' Meet organized by MPEDA's Sub Regional Division of Bhimavaram to create awareness on Better Management Practices, diversification in aquaculture and issues associated with antibiotic use.

The Meet was conducted on 25th January 2021 at Vanne Chintalapudi Village, Amalapuram Mandal in East Godavari District of Andhra Pradesh. Apart from farmers, traders, aqua technicians and officials from the Department of Fisheries attended the meet.

The major points of discussion at the meet included farm enrolment, BMPs, diversification for sustainable aquaculture, issues related to diseases and pond management, export-oriented aquaculture, relevance of NRCP sampling and issues developed by the use of banned antibiotics.

Experts who led the awareness sessions at the Meet were Mr. Koteswara Rao, Principal, SIFT, Dept. of Fisheries, East Godavari District, Dr. Sandeep, Scientist, SVVU, East Godavari District, Mr. K. Srinivasa Rao, Deputy Director, Department of Fisheries, Amalapuram Mandal, Dr. K. Gopal Anand, Assistant Director, MPEDA, Sub Regional Division, Bhimavaram, Mr. K. Ramanjaneyulu, Junior Technical Officer, MPEDA, Sub Regional Division, Bhimavaram and Mr. K. Anjaiah, Field Technical Officer, MPEDA, Sub Regional Division, Bhimavaram.

Speaking on the occasion, Mr. Koteswara Rao explained the activities of the Taskforce committee and inspection of aqua shops in East Godavari district to prevent sale of banned antibiotics and substances. While pointing out the rejection of consignments from the EU and the USA, he explained about SIMP and its implications on aquaculture export. He requested all farmers to enrol their farms with MPEDA to comply with the export requirement for traceability.

Dr. Sandeep delivered a lecture on diversification in aquaculture, as well as identification and selection of good fish varieties suitable for culture in the area. He also explained the activities of societies like RGCA and the role of RGCA in seed production of commercially viable species, and training being conducted by them in various farming and seed production technologies etc. He requested the farmers to purchase seeds only from registered hatcheries.

Mr. K. Srinivasa Rao delivered a lecture on the Pradhan Mantri Matsya Sampada Yojana (PMMSY) & other centrally sponsored schemes being implemented by the state Fisheries Department. During the session, he briefed the farmers upon various programs implemented for the fisheries and aquaculture sectors in the state by the department, MPEDA's farm enrolment process, and antibiotic usage in aquaculture. Mr. Rao also urged farmers to keep the bills while purchasing products for farming as it will help traceability.

Dr. K. Gopal Anand delivered a lecture on topics related to MPEDAs' extension activities for making the aquaculture in the region sustainable. He explained to the farmers about abuse of banned antibiotics in aquaculture and market situations. Briefing them on export rejections due to various diseases, he requested all farmers to stock the seeds purchased from authorized hatcheries and follow good farm management practices. He also explained the procedure of forming aqua farmer's societies and the role of NaCSA towards to Implementing BMPS in the society and the activities of Aqua One Centres.

The programme was concluded with vote of thanks by Mr. K. Ramanjaneyulu.

Sri Koteswara Rao, Principal SIFT, Dept. of Fisheries, East Godavari District. Addressing the farmers

Dr. Sandeep, Scientist, SVVU, East Godavari District Delivering a lecture

Inauguration of the Farmers meet

Sri Dr.K.Gopal Anand, Assistant Director, MPEDA, Delivering a lecture

Discussion & General Interaction with farmers

Intensive Pond Aquaculture Technology (IPAT): A Perfect Way for Sustainable Aquaculture

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Introduction:

Aquaculture is one of the fastest flourished industries in the world. Based on the reports in 2018 of FAO's SOFIA, the Global Aquaculture Production in 2016 has hiked to 171 million metric tonnes of which 88% was direct human consumption and the rest is non-food production. There is increased demand for fish production due to a rise in the global population to compensate for the protein requirements. The lack of nutrients that engender malnutrition can be eliminated by consuming fish which is rich in vital macro and micronutrients. According to recent reports in global fisheries, there is a steady decrease in the wild fish catch. It is assertive that highly efficient techniques have been executed for the wild fish catch expansion based on different aquaculture operations which knock a great threat to ecosystems due to overexploitation

in oceans. Indian fisheries are increasingly contributing to the nutritional security of the country. According to annual reports of the Department of Fisheries, India's production of fish during 2018-2019 is estimated to be 9.58MMT, of which nearly 70% (9.58MMT) is from inland sector and rest is from marine sector.

Of the 9.58MMT from the inland sector, about 50 % of total production is from culture fisheries. It is estimated that India's population holds a share of 17.7 % in world population according to UN data and holds only 2.5 percent of the world's land area and 4 percent of the world's freshwater resources at its disposal. In India, very few aqua-farmers are producing fish using advanced culture techniques like Biofloc, RAS (Recirculatory aquaculture system), Raceways, IPAT (intensive pond aquaculture technologies) or IPRS (intensive pond aquaculture systems), Cage cultures, mono-sex culture and Aquaponics.

There is a need for sustainability in aquaculture practices over the country for the production of well-organized and cost-effective techniques for human utilization and conserving the water bodies with less or zero environment pollution and wellbeing in terms of socio-economic indices. The major cultured species in India are Indian major carps, Chinese major carps, Cat fishes and Tilapia etc.

The present study is about intensive pond aquaculture technology (IPAT) and in simple words it's an in-pond raceways system. This system provides high stocking density and high survival rate when compared to conventional fish culture systems.

The efficiency of this IPAT was demonstrated in China by the US soy export council (USSEC) and the root study of this technology was developed by Auburn University to meet the increasing demand of fish through sustainable aquaculture practices without altering environmental constraints. In this IPAT, only 2.5% of land in 1 hectare pond is used for operation of raceways by providing aeration and periodical removal of solid wastes.

What is the Design of In-pond raceways?

In India, aquaculture farmers are following the traditional way of fish rearing from fry/fingerlings to marketable size in the span of 8-10 months with an average production of 7-8 tons/hectare pond. But through the IPA technology, farmers are able to attain a three-fold or higher increase in fish production. This technology mainly consists of 2-3 cells (raceway) at any corner of the pond in Fig.1 and each cell is having dimensions of 25 meters length, 5 meters width and 2 meters depth with a volume of 250 m^3 in each cell.

The reason behind construction of these cells is when we provide aeration with high volume blowers through the bottom diffusers they create an airlift system that form a water channel to run into the cells through the fine mesh provided at the opening of cell and at the end of cells which directs water into Quiescent zone which is deep sludge collecting chamber where all the solid wastes are sucked through vacuum pumps which operate horizontally about two to three times a day.

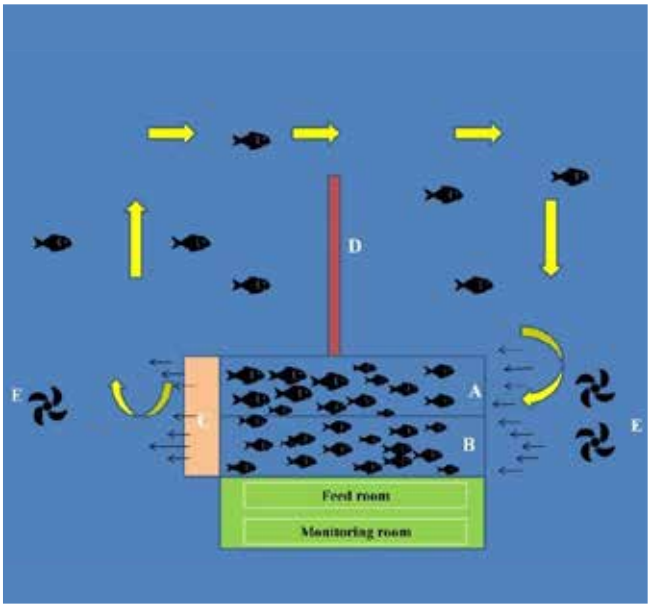

Figure 1: A & B – raceway cells ; C - Quiescent zone; D - earthen dike ; E – blowers ; Arrow marks( ) indicates water flow in a circular movement.

The solid wastes sucked are used for production of bio-fuel and fertilizers. There is an earthen dike in the middle of the pond attached to cells to create a water-flow movement.

This earthen dike helps in full circulation of water in the pond without re-entering into cells. In this IPA technology, the water stream creates a riverine flow that maintains good health of fish. The risk of disease is very minimal due to continuous water flow and close monitoring of cells, if required immediate action is taken to control the disease by adding required medicine.

Which fish can be cultured?

In early 2013, Wujiang fish farm in Jiangsu Province, China, started a 3 cell raceway with grass carp fish which created an impeccable yield of 42 Metric Tons in 2.1 hectare pond area in 182 days. The IPRS has been developed to culture grass carp in Vietnam, trout in Columbia and tilapia in Columbia, Mexico and Egypt. In china, they are culturing bighead carp, channel catfish in this system. In India, Dr. P.E Vijay Anand, Representative of USSEC, demonstrated this IPRS model in Andhra Pradesh.

He suggested farmers to culture carps, pangasius and murrells in this system. In this we can go for seed rearing, fingerling rearing of commercially important species like Channa striatus which is facing problems in rearing of fry, fingerlings.

Apart from the cells (raceways), the remaining pond area can be used for production of 15 tons of other important fishes like filter feeding silver carp, omnivorous fishes. The remaining pond area can be used to grow very few aquatic plants like water hyacinth which can filter the water.

Why is it so productive?

The high density stock is present in the 2-3 cells, present in 1 ha pond, which covers only 2.5 % of total area. The IPAT is a totally sensor modulated type and all the water quality parameters are recorded by probes in cells which is an internet-based system. The water quality is well maintained, ammonia nitrogen levels are not greater than 3mg/L; nitrite levels are undetectable; total alkalinity is 175mg/L and total hardness is 530mg/L.

Formulated floating feed with 32-36% crude protein is provided to the fish. The feeding rate of fishes according to their body weight is not fixed in order to attain faster growth with high stocking density there is need to provide feed up to satiation level.

This process of feeding can be monitored directly while feeding the fishes without wasting excess feed that creates more deterioration of water quality. The velocity of water is very slow creating a riverine flow. The whole stock of fish in cells can be monitored directly for growth rate, mortality, feed conversion rates, disease management and harvesting the whole stock is very easy for farmers.

What are the major advantages?

• Conservation of water, the water in ponds can be used for 4-5 years without affecting the environment.

• The organic load, which is a major problem in the pond, is removed periodically from the quiescent zone at the outlet of cells.

• Entire crop can be monitored very easily.

• Provides healthy environment for fish grow out

• Uniformity in size of fish is maintained.

• Improves FCR and reduces cost per unit weight gain

• Improves survival rates.

• Disease management is easy with less costly treatments.

• Bird predation is eliminated by close monitoring

• Allows partial harvest for cash flow in the middle of culture periods.

• Easy harvest and less manpower for unit harvest

• It is sustainable for the environment and socio-economically.

What are the constraints involved?

• The initial investment will be high to a small scale farmer.

• The electricity has to be 24 hrs for running all types of aerators and an extra standby generator is needed in the farm.

• A keen observation of cells is required.

• As the stock is higher than conventional methods, disease management should be properly maintained.

Conclusion

The production of fish in a way to maintain our standards and health benefits following sustainable aquaculture practices is possible only through In-pond

raceway systems. The ammonia present in water is one of the major problems for changes in water quality parameters which is adverse for fish growth and susceptible for disease occurrence. So, the removal of ammonia wastes from cells can promote the growth of fish. The growth of fish is uniform which increases demand in export markets.

Few studies on this technology in some parts of the world created a revolution in terms of fish production per year without any water exchange for a span of 5 years. The constraints involved in IPA technology can be sorted out by satisfying the demands involved in this technology. Initially, investment will be high; in the same way production is expected to be high, which makes it worth investing.

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Farmers' Meet on sustainability & diversification in aquaculture species

Aquaculture has emerged as one of the fastest growing enterprises in the world. It has a share of 41% of the total aquatic products consumed at present. It is the only alternate source of fish food production because of stagnation in fish catch from natural resources for the last several years. Asia dominates global aquaculture production with plenty of water sources conducive for aquatic animal growth in the temperate zones and contributes 87% of the global cultured finfish production. India plays a major role in fish production both by capture & culture, and ranks third in the world with more than 10% of global fish biodiversity. Major carps in inland areas and shrimp in brackish water areas are the dominant species of aquaculture in India. Keeping in view the sustainable production and supply of fish and fishery products to the export market, new technologies are being developed for culture production of shell & fin fishes of export importance.

In order to improve awareness among farmers about the sustainability & diversification in aquaculture species, MPEDA's Regional Division in Bhubaneswar organized Farmers' Meet at Parikhi in Sadar District of Balasore on 27th January 2021. Apart from MPEDA officials, Mr. Aditya Dash, MD, M/s Suryo Udyog Pvt Ltd and Authority Member of MPEDA, Mr. Prabhuram Panda, Director, M/s Aquatic Farms Limited, Mr. Manas Ranjan Das, Senior Deputy General Manager, M/s NIPPAI Shalimar Feeds Pvt Ltd, Mr. Ashok Kumar Das, Project Manager, M/s Suryo Udyog Pvt Ltd, Mr. Kamala Kanta Khatua and Mr. Ghanashyam Das, a leading farmer, participated in the programme.

Giving a brief account on the present status of shrimp culture in the country, Mr. Aditya Dash emphasized the need to understand day-to-day problems associated with aquaculture arising out of various diseases and the use of antibiotics both in farms and hatcheries.

Mr. Prabhuram Panda, Director of M/s Aquatic Farms Limited, Chhatrapur, spoke about the processes involved in the production of antibiotics-free shrimp seeds in hatcheries, starting from purchase of brood stock, quarantine of brood stock, production of nauplii to selling of pathogen & antibiotics-free L vannamei seeds to farmers. Mr. Rajakumar Naik, Deputy Director, RD Bhubaneswar presented the statistics on the export of Indian shrimps and the issues in various markets. He urged farmers to enrol their farms with MPEDA and to undertake Pre-Harvest Testing (PHT) to ensure that the product is free from antibiotics. Mr. Ashok Kumar Das explained the quality of shrimp production and various techniques related to the application of inputs like lime and probiotics in farms. He also elaborated BAP, ASC certification programmes and the procedures for getting such certificates. Mr. Sibasish Mohanty, JTO, MPEDA elaborated on the programmes being carried out by MPEDA like demonstration, extension programmes and Shaphari for hatcheries.

The Farmers' Meet was attended by 61 farmers from the Kayakodala, Parikhi, Ramtara & other nearby villages. Leaflets with a list of banned antibiotics, GIFT culture and pond management were distributed to the participants. The meet concluded with the vote of thanks proposed by Mr. Sibasish Mohanty.

A view of Farmers Meet at Parikhi, Balasore on 27/01/2021

L to R : Sri Manas Ranjan Das, Sr General Manager, NIPPAI Shrimp Feed, Sri Prabhuram Panda, Director, M/s Aquatic Shrimp Hatchery, Sri Aditya Dash, Authority Member MPEDA, Sri Rajakumar Naik, Director, MPEDA, Bhubaneswar

Training programme on Eco-friendly and Sustainable Aquaculture through Species Diversification

MPEDA Regional Division Kochi organized a training programme on 'Eco-friendly and Sustainable Aquaculture through Species Diversification' at Mullurkkara village in Thrissur district from 27th to 29th January 2021 as a part of its extension programmes.

The training programme, that targeted new farmers, was aimed at promoting sustainable and diversified aquaculture production through adoption of Better Management Practices (BMPs). It was attended by 15 farmers from Thrissur district. The programme was inaugurated by Mrs. Girija Meledath, President, Mullurkkarara Grama Panchayat. Mr. B. K. Thankappan, Vice President, Mullurkkarara Grama Panchayat, Mrs. Prathibha Manoj, Standing Committee Chairperson and officials from Panchayat and MPEDA RD Kochi attended the inaugural function.

The attendees were briefed about different aquaculture practices suitable for their locality. Further, culture aspects like stock assessment, feed & water quality management, health - disease management, PHT sampling, harvesting methods, post-harvest management, marketing aspects related to species like Scampi, Seabass, Tilapia etc were covered in the training programme. Apart from above, presentations on MPEDA schemes, issues related to use of banned antibiotics, and trends in aquaculture were also included in the programme. The technical sessions were handled by officials of MPEDA RD Kochi including Mr. Johnson D' Cruz, Deputy Director, Mr. Viswakaumar M, Assistant Director, Mr. P. Bijimon, JTO, Mrs. Manjusha K., Field Supervisor and Mr. M. Shaji, Joint Director (Retired) , MPEDA and Mrs. Angha Suresh, Project Coordinator, Department of Fisheries, Thrissur.

After the technical sessions, a valedictory function was organised on 29th January, during which stipend and training certificates were distributed to trainees in the presence of Panchayat officials.

Mrs. Girija Meledath, President, Mullurkkara Grama Panchayat inaugurating the training programme

Mr. Viswakumar, Assistant Director, MPEDA

Mr. Johnson D' Cruz, Assistant Director, MPEDA

Participants of the training programme

Equipping farmers for sustainable aquaculture

Through training programs, MPEDA encourages farmers to adopt Better Management Practices and diversification in farming

The increasing demand for seafood in the world market has put considerable pressure on the aquaculture industry. Farmers are shoring up their production to meet the demand. At this juncture, it is important for farmers to learn about the Better Management Practices (BMPs), diversification, adverse impacts of using banned antibiotics, export requirements of various countries, export rejections and the need to focus on sustainability.

In order to increase farmer awareness about these topics, MPEDA's Sub Regional Division at Bhimavaram organized a three-day general training programme at Duggudurru village of Amalapuram Mandal in East Godavari District.

The programme, conducted from 27th to 29th January 2021, was attended by 15 shrimp farmers from the region.

On the first day of the training, Dr. K. Gopal Anand, AD (AQ), MPEDA, briefed the farmers on biosecurity, physico-chemical parameters, pH and D.O Fluctuations in aquaculture and growth monitoring and stock assessment.

He discussed the procedures to be followed in pond preparation, liming and water quality management (pond bottom preparation including sludge removal, drying, tilling etc.), and special treatment for both acidic and alkaline soils.

During the session, Dr. Gopal Anand familiarised farmers with different tools like water and soil test kits, instruments like soil tester, refractometer, DO and pH probes, pen, seechi disc as well as various test kits and checkers.

He sensitized them on the importance of liming, different liming materials, calculating the quantity of lime and fertilizer, the importance of bloom, phytoplanktons and zooplanktons and their role in the early phase of culture. Preparation of probiotics for bloom development, how to tackle water quality issues during farming etc, importance of traceability and certification were also discussed.

On the second day, Mr. B. Narasimha Rao, AD (Retd), MPEDA gave a presentation on the diversification in aquaculture and prospects of GIFT, Seabass, Pompano, Crab, Cobia & Penaeus monodon as candidate species in aquaculture. He detailed the breeding and farming technology for the species. During the session, Mr. Narasimha Rao covered topics including guidelines for grow-out culture of GIFT Tilapia, registration and license, stocking, food and feeding, economics etc. He also explained feed management, water quality management, disease management, and good management practices in aquaculture.

He also spoke on prevention and control of diseases, including common GIFT diseases, their symptoms and prevention, other non-pathogenic diseases and stress reduction. Growth and FCR, sampling and health monitoring, water quality parameters required for Tilapia grow-out ponds, preferable protein content in feeds at different stages for optimum growth etc were also discussed.

The final day of the training programme had Mr. K. Srinivas Rao, DD, Dept. of State Fisheries, Amalapuram Mandal, leading the session on export rejections, prospects of shrimp exports from Andhra Pradesh and India, antibiotic issues in aquaculture etc. Highlighting the state fisheries schemes being implemented by the department for aquaculture farmers, he emphasized the need for diversification.

Dr. Gopal Anand spoke on the procedure for farm enrollment, antibiotic issues, NRCP, Pre Harvest Test requirements, QC Lab, ELISA labs and AOC labs in the region. He briefed them on the launch of online PHT services for farmers.

Participants were informed about the significance and importance of OI broodstock from MPEDA RGCA BMC, Vizag, status of shrimp culture before and after invasion of WSSV in Andhra Pradesh, status of Vannamei culture

at present and various diseases causing great losses to farmers and their preventive measures. The need for daily data record maintenance to be maintained as per certification programme were also discussed.

After the technical sessions, group discussions, a test and feedback session were conducted. Certificates and stipends were distributed to trainees by Mr. K. Srinivas Rao and Dr. K.Gopal Anand. Mr. K. Anjaiah, Field Technical Officer, SRD Bhimavaram, proposed Vote of Thanks.

Mr. B. Narasimha Rao, AD (Retd), MPEDA delivering a lecture on Diversifiaction

Inauguration of the training program by the farmers and officials

Mr. K. Srinivasa Rao. DD, Amalapuram Mandal, delivering a lecture

Dr. K. Gopal Anand AD, MPEDA delivering a lecture to the trainees

Dr. K. Gopal Anand AD (AQ), MPEDA distributing the certificates & Stipend to the trainees

Promoting eco-friendly and sustainable shrimp farming

In order to promote sustainable and eco-friendly aquaculture practices among shrimp farmers, MPEDA's Sub Regional Division at Valsad organised a five-day training programme on 'eco-friendly and sustainable shrimp farming' at Khambhat from 18th to 22nd January 2021 for the benefit of the SC/ST candidates of Anand District in Gujarat. The training was attended by 33 farmers.

Mr. Maruti D Yaligar, Deputy Director, inaugurated the training programme. After the inaugural session, officials from MPEDA led training sessions on various topics. Mr. Maruti D Yaligar and Mr. Bhavin M., Field Supervisor, MPEDA delivered lectures on the role of MPEDA in promoting eco-friendly & sustainable shrimp farming and the identification and life cycle of shrimp and pond preparation.

On the second day of the training programme, farmers were briefed upon site selection, farm construction, seed selection, packing, transportation, acclimatization, stocking and water quality management.

On the third day, the participants were taken for a field visit to the shrimp farm of Mr. Rakeshbhai Khalasi at Navi Akhol village. The practical aspects of farm construction and management, biosecurity measures, Good Management Practices (GMPs) and use of field equipment for testing of various water quality parameters were explained to the trainees. Mr.

Inaugural address by Shri. Maruti D Yaligar, Deputy Director.

Certificate distribution by Shri. Upen K Pandya, Assistant Director.

A view of participants.

Eknath, farm-in-charge, explained his experience and vannamei shrimp culture method.

The fourth day, Mr. Upen K. Pandya, Assistant Director, and Mr. Bhavin delivered lectures on feed management, daily monitoring and farm management, land leasing policy and procedure for submission of application to the Collector/Department of Fisheries for allotment of government land for shrimp farming, L. vannamei culture and biosecurity measures, uses of probiotic and abuse of antibiotics in aquaculture, harvesting & post-harvest management, marketing and HACCP in aquaculture.

On the final day of the programme, topics like disease prevention and control, procedures for applying for license and diversification were discussed. At the end of the training, a test was conducted for the trainees. Stipend and certificates were distributed to the participants by Mr. Upen K. Pandya and Mr. Rohit Bhai Kharva, social worker/former President of Khambhat Nagarpalika.

Microalgae Oil for the future aquafeed industry

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Aquaculture is the fastest-growing food production sector, contributing to nearly half of the global food fish production. The growth of aquaculture is increasing tremendously in comparison to capture fisheries. In aquaculture, feed costs constitute 50-60% of total production costs and fish oil is one of the costliest feed ingredients driving the feed price. Fish oil is indispensable as a feed ingredient because it is an excellent source of lipids particularly HUFAs and PUFAs.

The fishmeal and fish oil supply for aquafeed has significantly decreased as capture fishery has declined. If fish oil continues to remain the primary lipid source in aquafeeds, aquaculture will remain costly and unsustainable. Therefore, there is a need to look for alternative lipid sources that are cheaper and nutritionally complete. Microalgae oil is a viable alternative for fish oil as it contains omega 3 and omega 6 fatty acids. It has excellent sensory properties, stability, and long shelf life. Also, there is no need for any solvents.Oils extracted from microalgae such as Isochrysis, Nannochloropsis, Phaeodactylum, Pavlova, and Thalassiosira contain sufficient omega-3 LC-PUFA to serve as an alternative to fish oil which is used as the 'golden standard'. The Indian coast is bestowed with several species of micro algae which can be screened for potential oil content and can be developed for further oil extraction.

Introduction

Aquaculture provides food, nutrition, and employment opportunities to people around the world. Earlier, Capture fisheries was the primary source of fish, but gradually it has declined due to overfishing, habitat destruction, etc. It has paved the way for efficient utilisation of natural resources leading to aquaculture with diversification of species and culture system.

The success of aquaculture mainly depends on quality seed and feed which is highly expensive making up 50-60% of total production costs. Fish meal and fish oil are traditional/conventional feed ingredients used for making aquaculture feeds. Fish oil is used as the lipid source in aquaculture feeds.

It contains n-3 long-chain polyunsaturated fatty acids (PUFA), viz., Eicosapentaenoic acid (EPA) & Docosahexaenoic acid (DHA) that play an important role in supporting normal growth, health, and nutritional quality of farmed aquatic animals. EPA and DHA are important essential fatty acids (EFA) which cannot be synthesized by fish themselves. In contrast, non-essential fatty acids such as Linolenic acids, Arachidonic acids, etc. can be synthesized by the fish body.

Carnivorous fishes require higher amounts of essential fatty acids for their growth and development. These n-3 long-chain polyunsaturated fatty acids (PUFA) play a significant role in the food web of aquatic ecosystems. Usually, phytoplankton synthesize essential fatty acids, which will be enriched to zooplankton on feeding upon phytoplankton. Carnivorous fishes uptake the fatty acids on consumption of zooplankton and small fishes which feed on the fatty acids enriched phytoplankton. Dietary essential fatty acids are also crucial to the reproductive quality in broodstock.

Fish Oil

Fish oil is the oil extracted from the fish body. It is rich in triacylglycerols (TAGs), which comprise the major component of stored fats, generally contributing to over 90% of the total fatty acid composition. The fat composition of the fish decides the nutritional composition of the fish oil. As mentioned earlier, the presence of HUFAs and PUFAs such as EPA and DHA make it an integral part of fish feed.

There is a growing dependence on fish oil as the ideal lipid source particularly for carnivorous fishes. But, the supply of fish oil is limited and unsustainable as fish oil

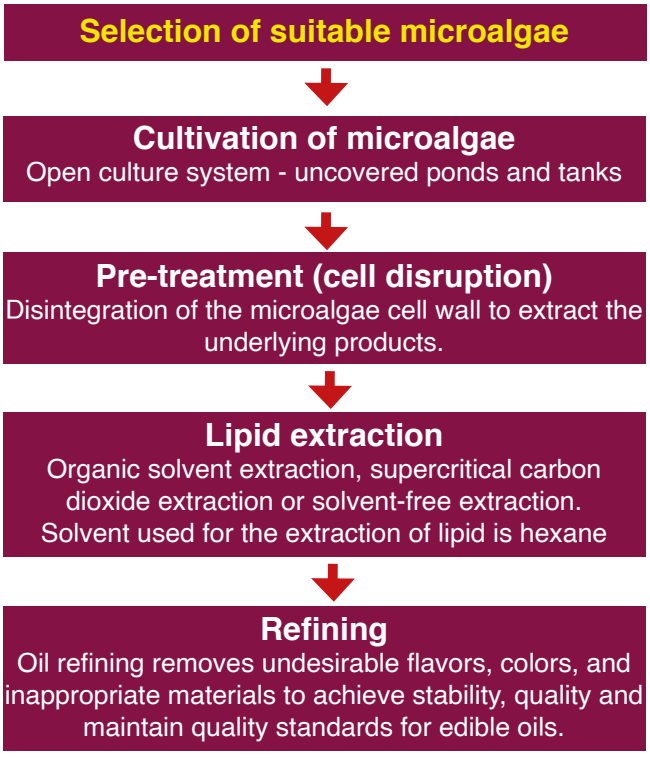
is derived from small oily fishes i.e. lower trophic fishes caught from the oceans. They form the base of the food chain and when they are removed, it topples the entire ocean food web. So, there is a need to consider sustainability issues and high costs of fish oil exerting substantial pressure on the global aquafeed sector. To overcome these issues, we have to find economically viable and environmentally sustainable substitutes to fish oil for use in aquaculture feeds. Unlike oil from terrestrial plants, microalgae oil contains a high amount of n-3 long chain polyunsaturated fatty acids (PUFA). Thus, it can be a viable alternative lipid source to aquafeeds.

Microalgae oil

Microalgae oil is a green oil extracted from certain microalgae and it is also rich in essential fatty acids EPA and DHA. It can be incorporated into animal feeds that use fish oil like poultry and fish feeds after extraction followed by purification of the oil. Algal oil lacks potential contaminants, which are an important risk in fish oils. It does not possess odors, in contrast with the fishy odor which accompanies fish oils. Mainly, the algae biomass production is easier and more environmentally friendly, giving higher yields when compared to fish oil production.

Oil extraction

Oil extraction involves cultivation, pre-treatment for cell wall disruption, extraction of lipids, refining and separation of other value-added products.



Other value-added products

After extraction of the oil from biomass, cell debris is collected. This debris also contains various nutrients. The biomass residues are converted into high-value products via biorefinery to promote the microalgal process's economic feasibility.

Furthermore, residual debris can also be processed to cultivate microalgae as nitrogen and carbon sources. Besides, separated pigments (carotenoids, chlorophylls, and phycobiliproteins) have considerable prospects for food and pharmaceutical applications due to their beneficial biological activities.

Microalgae Oil in India

India has an abundance of diversity in all resources and micro algae is no exception. Researchers are concentrating on utilization of microalgae produced in waste treatment plants for biofuel production. This can be supplemented with works on inclusion of algae oil for fish and also as a replacement to fish oil. Micro algae offers great opportunities to be cultured in small areas like wastewater treatment tanks, raceways, backyard tanks with minimal infrastructure. The Fisheries departments and other premier institutions of the country can develop projects to involve women SHGs and other beneficiaries for such programs on micro algae cultivation and with some additional technical support, oil extraction from microalgae may be possible in the near future.

Conclusion

Algal oil will be a proven, sustainable alternative to fish oil and it will be advantageous than fish oil due to the high proportion of the EPA/DHA. The use of algal oils in foods and supplements will continue to grow as demand for EPA/DHA increases. New technology can further enhance the yields of algal oil from open pond algae. The continuing development of omega-3 ingredient forms with improved oxidative stability will enable their incorporation into an ever-widening range of food products. Hence, it is time that the aquafeed industry start looking up at algae oils for their fish feeds. Research can be directed towards identification of potential species in India and their promotion.

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Fish oil
(Picture courtesy: https://www.amazon.in)

Microalgae oil
(picture courtesy: https://www.nuffoodsspectrum.in)

Capsules of microalgae oil
(Picture courtesy: https://htc.co.uk)

Prebiotics in aquaculture

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Introduction

The term prebiotic was first introduced by Gibson and Roberfroid (1995) exchanging the prefix 'pro' in probiotics for 'pre', meaning 'before' or 'for'. Prebiotics have been defined by FAO/WHO as 'non-digestible food ingredients that beneficially affect the host by selectively stimulating the growth and/or activity of one or a limited number of bacterial species already resident in the colon, and thus attempt to improve host health'. Therefore, prebiotics are not digested by the host directly, but are fermented by bacteria present in the host gut or the probiotic bacteria added to the gut via feed, such as Bifidobacterium and Lactobacillus.

Evolution of prebiotics

Though probiotics present all potential advantages, there are some bottlenecks to use it in aquaculture. As probiotics are predominantly live organisms (generally bacteria) that can alter the bacterial communities in the surrounding environment, they present a threat of modifying the biome of the culture environment or fish gut. In addition, probiotics are given as additives in the feed but most of them do not withstand feed extrusion conditions i.e. high temperature and pressure and it is difficult to keep a constant probiotic level in aquafeeds throughout the shelf life of the feeds. These issues paved the way to the development of prebiotics in aquaculture. Prebiotics are inert substances and hence can withstand the test of temperature and time.

Commonly used prebiotics in aquaculture

The most common prebiotics established in fish to date include inulin, levan, glucan transgalactooligosaccharides(TOS) and lactulose, fructooligosaccharides (FOS), short-chain fructooligosaccharides (scFOS), mannanoligosaccharides (MOS), galactooligosaccharides(GOS), xylooligo-saccharides (XOS), arabinoxylooligosaccharides (AXOS), isomaltooligosaccharides (IMO), GroBiotic, Lesaffre feed additives (Yeast cell wall), Immunogen (Yeast cell wall), Vitacel (fermentable fibre), Immunoster (Yeast cell wall) and Brewtech (Brewer's yeast).

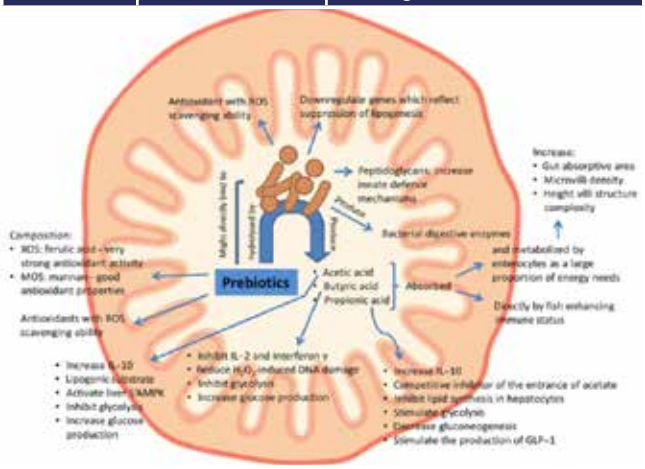
Benefits of prebiotics

- Development of the mucosal barrier.
- Production of short chain fatty acids (scFAs) and reduction in gut pH.
- Activation of the immune system.
- Metabolism of bile acids and synthesis of vitamins.
- Improves gut health, intestinal microbial balance and performance.
- Enhances nutrient utilization (eg. Amino acid and proteins).
- Decrease environmental pollution and production cost.

Effect of prebiotic on fish:

Prebiotic	Fish species	Results
FOS	Atlantic salmon	Increased feed intake, growth
scFOS	Hybrid tilapia	Increased growth rate, feed intake, feed conversion, survival and increased uncultured bacterium clones
GOS	Atlantic salmon	Increased protein and organic apparent digestibility coefficient values, increased nitrogenous and energy losses in the non-faecal nitrogen excretion and decreased ADC
XOS	Crucian carp	Increased growth, survival and enzymatic activity
AXOS	African catfish	Increased acetate, propionate, and short chain fatty acids production
	Siberian sturgeon	Increased, propionate, and short chain fatty acids production, no effect on growth

IMO	Pacific white shrimp	Developed immune response and resistance to white spot syndrome virus
Grobiotic	Golden shiners	Increased resistance against *F. columnare*
	Red drum	Increased protein, lipid and organic ADC values



Schematic summary of the mechanism of action of prebiotic (Guerreiro et al., 2018)

Prebiotics and immune response

Immune system of fish is activated by prebiotics in two distinct ways; by either stimulating the innate immune system directly or through enhancement of the commensal microbiota growth (Song et al. 2014). Pattern recognition receptors (PRRs) have been identified in teleost fish, including toll-like receptors (TLRs), NOD-like receptors (NLR), C-type lectin receptors (CLRs), and peptidoglycan recognition proteins (PGRPs). Prebiotics interact with fish pattern recognition receptors (PRRs) such as beta (b) glucan receptors and dentin-1 receptors expressed in macrophages, microbe-associated molecular patterns (MAMPs) such as teichoic acid, peptidoglycan, glycosylated protein, or the capsular polysaccharide of bacteria. Administration of prebiotics may also result in a higher production of metabolites such as propionate, butyrate, or short-chain fatty acids (SCFA) by the microbiota which can be used by the immune cells of the Gut Associated lymphoid tissue (GALT), as reported in mammals and may also activate the specific SCFA-receptors.

Effects of prebiotics on immune response of various species:

Prebiotic	Fish species	Immune response
MOS	Rainbow trout	Increased antibody titre, lysozyme activity, alternative and classical complement pathway activity
	African catfish, Snakehead, red drum, Atlantic salmon	Increased lysozyme activity
	Japanese flounder	No effect on lysozyme activity
Yeast cell wall (Immunoster)	Great Sturgeon	No significant impact on the serum lysozyme activity and IgM level
Yeast cell wall (Lesaffre Feed Additives)	Japanese seabass	No significant impact on the IgM level and complement component three levels
Grobiotic	hybrid striped bass; Golden shiners; Nile tilapia	No significant impact on the humoral immune response
Vitacel	Rainbow Trout	Remarkably elevated serum innate immune parameters include serum lysozyme, ACH50, bactericidal activity, and agglutination antibody titer and lysozyme and TNFa genes expression were significantly upregulated
Yeast cell wall (Immunogen)	Rainbow trout	Increased Lysozyme activity and Complement activity

Marine-derived Polysaccharide

MDPs are generally a kind of homo and hetero polysaccharides, consisting of fructose, galactose, glucose, glucuronic acid, mannose, mannuronicacid, rhamnose and xylose. Polysaccharides of marine origin are alginate, fucoidan, carrageenan, laminarin, ulvan, galactan, agar, chitin and chitosan. The origin of raw materials and the extraction products have a great influence on their monosaccharide composition. Carrageenan and galactan from red algae; alginate, fucoidan and laminarin from brown algae; ulvan from green algae are the different products and sources of MDP. The molecular weight of MDPs range from 6.2 to 5052 kDa.

Marine-derived polysaccharide	Fish species	Benefits
Alginate	*E. coioides*	Increased respiratory burst, SOD, lysozyme, phagocytic index.

Fucoidan	*L. rohita*	Increased respiratory burst, lysozyme, myeloperoxidase, phagocytic activity.
Carrageenan	*C.carpio*	Increased respiratory burst, phagocytic activity and alternative complement activity.
Laminarian	*S. salar*	Increased feed uptake
Ulvan	*O.niloticus*	Increased hematocrit, white blood cells and phagocytic activity
Chitin	*S. aurata*	Increased cytotoxic activity and complement 3

Role of prebiotics in a highly stressful rearing environment

Fish growth, physiology and biological activities are affected when they are in stressful environments. Prebiotics are some of the leading candidates for environmentally friendly feed additives in the aquaculture industry.

• When beneficial bacteria (present in the gastrointestinal tract) ferment prebiotics, the by-products of the reaction will be used to improve host health.

•Applying prebiotics that modify the gastrointestinal conditions to help certain bacterial species that may enhance growth efficiency and reduce the susceptibility to pathogens of the host organism seems to be a very promising way to help support development of the industry.

In a study where commercial prebiotic Levabon® was fed to juvenile European seabass, the fishes became generally healthier than their counterparts. This commercial prebiotic is composed of autolyzed yeast *(Saccharomyces cerevisiae)* cells that contain potentially immunomodulatory substances, such as chitin, chitinase, nucleotides, mannan-sugars and manno-proteins. In this case, the higher glucose levels may have provided them with the energy to better cope with the stress conditions, and the relatively higher lysozyme could have made them more resilient against potential invasive pathogens. Also, the mannan-oligosaccharides that make up the product may have contributed to an improved response against oxidative stress, resulting in less oxidative damage. All these positive outcomes enabled the fish to spend more energy in their somatic processes, and culminated in better growth, higher haematocrit values and a better condition index.

Conclusion

Thus, prebiotics can enhance living conditions for the naturally occurring gut microbiota eventually promoting the wellbeing of the fishes or promote the growth of the probiotics added with the feed. The inclusion of the right prebiotic in the right feed will help in reduction of feed costs. Dosage of prebiotics can be optimised by considering the following, different basal diet, inclusion level, type of monosaccharide, adaptation period, chemical structure (degree of polymerization, linear or branched, type of linkages between monomeric sugars), origin of prebiotic, animal characteristics (species, age, and stage of production), duration of use, hygienic conditions of the farming / experiment.
There is a need for more research on the effect of prebiotic in aquaculture to determine the ideal prebiotic for particular fish species and also to harvest the marine derived polysaccharides which are treasures hidden in our oceans.

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Ensuring seafood safety amid COVID-19

MPEDA officials inspected processing plants for compliance with guidelines

Officials of the Regional Division of MPEDA in Kolkata inspected seafood processing plants to ensure compliance with COVID-19 guidelines issued by the Authority for the seafood industry.

The officials inspected M/s. Basu International Unit III, M/s. Basu International Unit IV, M/s. Elque & Co, M/s. Naaz Impex Private Limited, M/s. Nezami Rekha Seafoods Private Limited, M/s. S.S. Sea Food, M/s. Saha Traders, during January 2021.

During the visit, it was found that the units are operating as per the protocols and are implementing COVID-19 guidelines issued by MPEDA. Awareness drive is conducted regularly for all workers and staff by the supervising team. No incidents of COVID-19 infection had been reported at the units so far.

Social distancing of processing workers in M/s. Basu International Unit III

India aims to increase seaweed production to 11.5 lt in five years: Fisheries Secretary

India is aiming to increase seaweed production in the country to 11.5 lakh tonnes from the current production levels of 2,500 tonnes in the next five years. This can be achieved by using just 1 per cent of its 8,000-kilometre-long coastline, said Fisheries Secretary Rajiv Ranjan.Globally, seaweed production is $12-15 and is expected to grow to $26 billion by 2025.

Currently, China and Indonesia have 80 per cent of the market share. “Even if India aims only for the low-hanging fruits in the sector, it can easily achieve the target it set. Currently, seaweed production in India is primarily confined to the Gulf of Mannar and Palk Bay in Tamil Nadu,” Ranjan said at a curtain raiser event for an international webinar on entrepreneurship development on seaweed business.

PM Matsya Sampada Yojana

Ranjan sad that promotion of seaweed cultivation, which requires little capital investment, is going to be one major component of the ₹20,000-crore PM Matsya Sampada Yojana (PMMSY). The government has earmarked ₹640 crore for developing seaweed industry in country.

The webinar, to be organised by the National Cooperative Development Corporation (NCDC), together with Department of Fisheries, will deliberate on how fisherwomen cooperatives can be created for encouraging seaweed cultivation at a large scale across several coastal States in the country, said NCDC’s Managing Director, Sundeep Nayak.

Seaweeds grow abundantly along the Tamil Nadu and Gujarat coasts and around Lakshadweep and Andaman and Nicobar islands. There are also rich seaweed beds around Mumbai, Ratnagiri, Goa, Karwar, Varkala,

Vizhinjam, Pulicat and Chilka. Out of approximately 700 species of marine algae found in both inter-tidal and deep water regions of the Indian coast, nearly 60 species are commercially important

Domestic production

The seaweed industry in India is mainly a cottage industry and is based only on the natural stock of agar-yielding red seaweeds, such as *Gelidiella acerosa* and *Gracilaria edulis*, and algin yielding brown seaweeds species such as Sargassum and Tubineria.Currently most of the seaweed produced in India is used for plant growth factor, which reduces the requirement of fertilisers by nearly 13 per cent, Ranjan said.

They are also used in a variety of industries such as pharmaceuticals, neutraceuticals, food and cosmetics. Indian firms are currently importing these seaweed-derived materials from other countries, he said. In contrast to other forms of aquaculture, seaweed farming has minimum capital and technological requirements and provides important economic opportunities to marginal coastal communities with limited livelihood options.

-www.trendypedia.com

5 fishing harbours to be modernized

Five major fishing harbours will see substantial investments for modernisation and development, according to Finance Minister Nirmala Sitharaman's budget speech.

"To start with, five major fishing harbours — Kochi, Chennai, Visakhapatnam, Paradip and Petuaghat — will be developed as hubs of economic activity," she said. "We will also develop inland fishing harbours and fish-landing centres along the banks of rivers and waterways," she added.

Emerging sector

Ms. Sitharaman announced measures to promote seaweed cultivation. "Seaweed farming is an emerging sector with potential to transform the lives of coastal communities.

It will provide large scale employment and additional incomes," she said. "To promote seaweed cultivation, I propose a Multipurpose Seaweed Park to be established in Tamil Nadu," she added.

Overall, the Fisheries department saw an increase in budget allocations from ₹825 crore in 2020-21 to ₹1,220 crore in 2021-22. The Blue Revolution centrally sponsored schemes saw their budget allocation double, with the new Pradhan Mantri Matsya Samada Yojana alone getting a ₹1,000 crore allocation.

-www.thehindu.com

Jellyfish venom stops cancer cell growth in lab trial

A recent case study, published in the Saudi Journal of Biological Sciences, has identified jellyfish venom as a potential cancer therapy. Researchers from the University of Madras tested crude venom from the *Acromitus flagellatus* jellyfish against different human cancer cell lines in vitro, tracking any changes in the cells' morphology.Their initial results show that although cells in the control group underwent minimal changes after being exposed to the venom, cells from the human liver cancer cell line HepG2 shrank significantly within 48 hours of exposure.

A similar effect was seen in cells from the human lung cancer cell line A549. The lab tests also show that the crude venom solution prevented the cancer cells from multiplying, while showing limited changes in control cells.These results indicate that molecules in the crude venom can stall and potentially reverse cancerous growths without causing severe damage to surrounding tissues. Further research could show that treatments based on A. *flagellatus* venom could be an effective – and innovative – lung and liver cancer therapy.

Why use jellyfish venom?

Animal venoms and toxins operate by targeting and disrupting metabolic processes in prey animals. After a jellyfish stings a fish (or unlucky human), the bioactive compounds in venom attack on a cellular level, destroying cell structures, hijacking enzyme pathways or interrupting neurotransmitters. This either weakens or kills the jellyfish's prey outright. As researchers began to understand how these venoms worked, they identified them as a potential source for novel drugs. The ability to target and kill cells or override biological signals are key elements in modern pharmaceuticals. If the active compounds in venom are refined, they could be harnessed as antivirals or be used to treat human health conditions like cancer

Crude venom versus cancer cells

Researchers captured A. *flagellatus* specimens from a brackish water source in India. They then extracted venom from nematocyst cells in the jellyfishes' tentacles. After conducting a biochemical and antioxidant analysis of the venom solution, the researchers created challenge tests to see the venom's reaction to different cell lines.The team was specifically looking at the venom's cytotoxicity, or its ability to prevent cells from growing and multiplying. They tested different concentrations of the solution against a control (kidney

cells from a green monkey), cancerous human liver cells (HepG2) and lung cancer cells (A549).

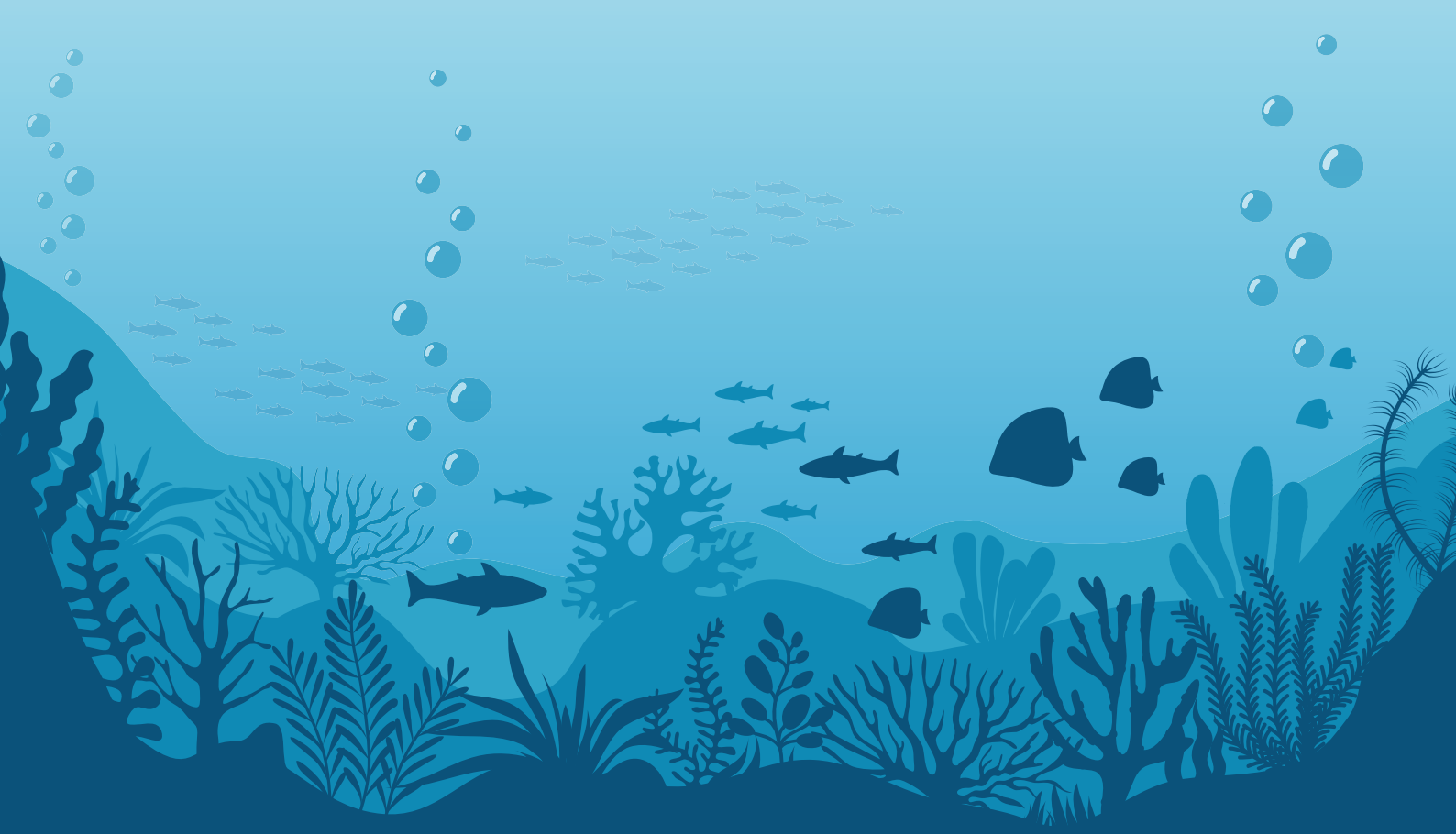
Key results

The lab results showed that while the venom had a limited effect on the green monkey cells, it slowed the growth of both the liver and lung cancer lines after 48 hours of exposure. Microscopic analysis showed that individual cells in the liver and lung cancer samples shrank after receiving a "dose" of the venom – becoming spherical after 48 hours.The tests also indicated that A. *flagellatus* venom stopped the lung and liver cancer cells from proliferating without causing significant damage to the green monkey cells. The venom's cytotoxic effect is key – preventing targeted cell growth without damaging the surrounding tissue is one of the principal theories behind cancer treatments.

From the lab to human trials

Liver and lung cancers are among the leading causes of death worldwide. Recent medical innovations have not improved the prognosis of the diseases – lung cancer has a survival rate of only about 16 percent, despite decades of research. The numbers are similarly grim for liver cancer (hepatocellular carcinoma, HCC). Any potential treatments for the diseases could dramatically improve life expectancy.This study could be an important step in developing a new therapy for liver and lung cancer. The in vitro tests show that the bioactive compounds in A. *flagellatus* venom can significantly change the morphology of cancer cells and stall their growth. This ability suggests that the venom could be used to prevent or reduce cancerous growths in human trials.If future tests can repeat these results and demonstrate jellyfish venom's efficacy in in vivo trials, pharmacists could develop more therapy options for cancer patients.

-www.thefishsite.com



Chennai to get aquatic quarantine centre

CHENNAI: An aquatic quarantine facility at Padappai with a disease diagnosing laboratory exclusively for freshwater organisms, will be ready by January next year. Union minister of fisheries, animal husbandry and dairying Giriraj Singh laid the foundation stone for the facility. The state fisheries department has allocated 3 acres of land for the facility, to be set up using the 19 crore sanctioned by the Centre, a fisheries department official said.

The project also includes disinfection unit, water recirculation system, temperature control (heating and and chilling) and aeration facilities. The main objective behind the Centre is to help in augmenting ornamental fish trade. The official added that there is tremendous scope for development in terms of ornamental fish sector and marine fish varieties. Hailing the establishment of an aquatic animal quarantine centre, president of TN Aquarium Association, R Rajarajan said the project has been a long pending demand of the association.

Importing ornamental fish is not possible in Chennai now as there is no quarantine facility available. Similarly, there is no scope for diagnosing diseases in ornamental fish due to which they die, resulting in huge loss for traders, Rajarajan said, adding that the new facility will help boost the trade. The association has also sought a smaller laboratory in Kolathur, which has hundreds of ornamental fish production units, and a fish park.

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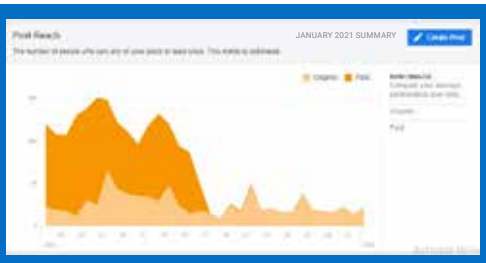

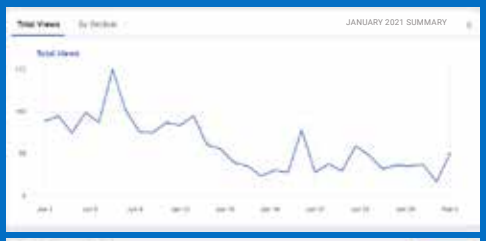

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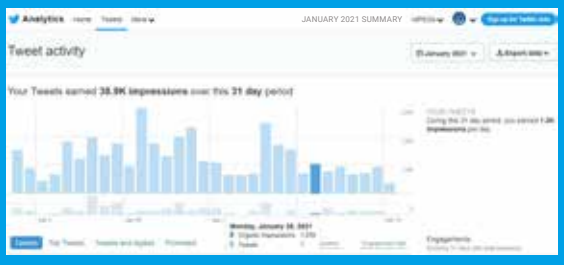

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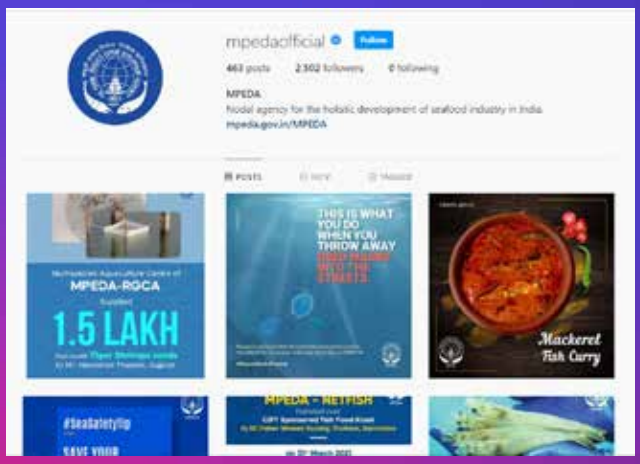

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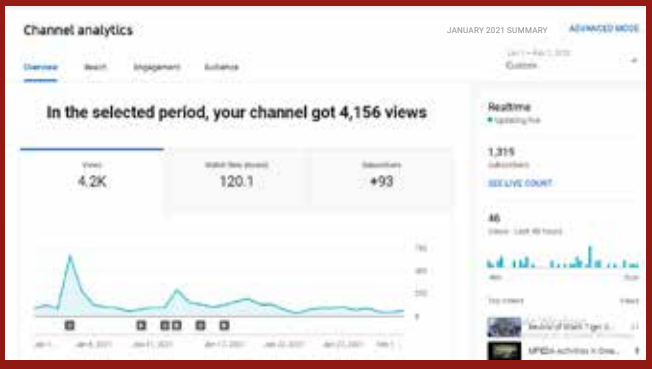

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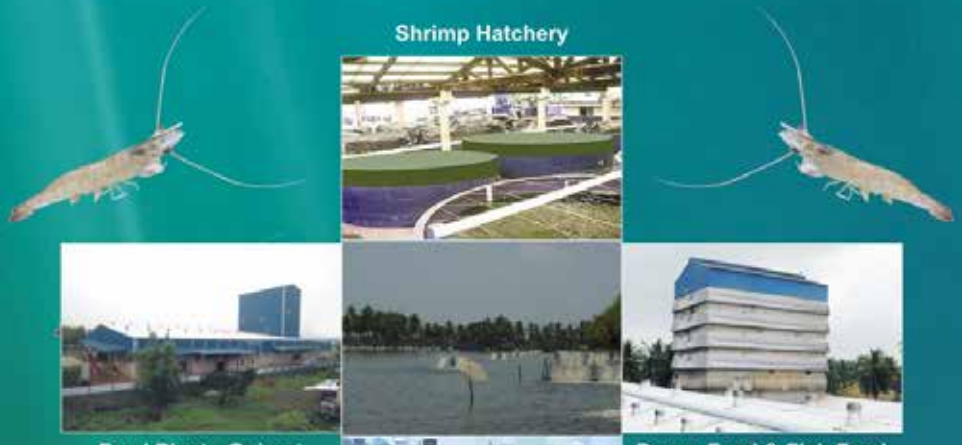

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