MPEDA Newsletter

JANUARY 2012

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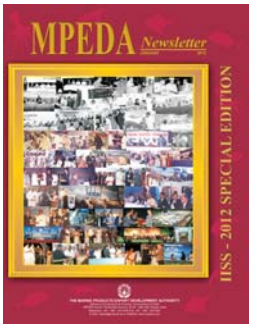

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Contents

On the platter.....!!

Dear Friend,

Welcome to this Special issue of MPEDA Newsletter. This issue comes to you at a time when we all meet for the 18th edition of India International Seafood Show, which also commemorates the 40th year of MPEDA's service to the country's fisheries, aquaculture, fish processing, seafood export and allied sectors.

As you are aware, the seafood exports reached a new height of earnings - US$ 2.8 billion during 2010-11- through the collective efforts of our fish producers, processors and exporters. It is already ensured that the bar will be raised well above US$ 3 billion during the current fiscal. The year also shows a varied pattern with regard to our market share though there is little change in our principal seafood export item. Like the previous year, the year had been extremely good for the farmed shrimp production.

MPEDA is again gearing up with new initiatives and strategies to chip in whole hearted efforts to promote seafood export with sustainability. After IISS 2012, the contingent packs up for the International Boston Seafood Show and European Seafood Exposition that fall in March and April respectively wherein a large contingent of Indian seafood exporters join us to showcase a grand show as was done in the yesteryears.

The Newsletter also gets refurbished on this occasion with a new segment, "Chairman's message". I hope you welcome and appreciate me sharing a few words on my views and thoughts related to the sector to the readers and stakeholders in every future issue of MPEDA Newsletter.

At this joyous moment, I wish you all a fabulous IISS and business season ahead!

Sd/-
(LEENA NAIR IAS)
Chairman

February 2012

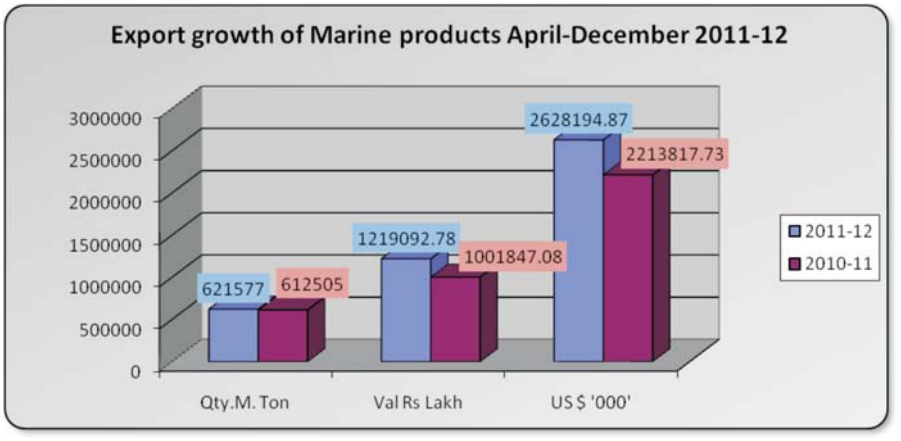
MARKETING NEWS

Marine Products Export crossed 2.6 billion mark in December 2011

Export of Marine Products during April - December of 2011-12 have registered a growth of 1.48% in quantity, 21.68% in rupee value and 18.72% in US$ realization compared to the same period last year. The unit value realization also improved by 16.98%. The details are given in the following table.

Overall Exports during 2011-12 compared to 2010-11

Export details	2011-12 (APR-DEC)	2010-11 (APR-DEC)	*Growth %*
Quantity Tonnes	621577	612505	1.48
Value Rs.crore	12190.93	10018.47	21.68
$ Million	2628.19	2213.82	18.72
Unit value $/kg.	4.23	3.61	16.98



Export of Frozen Shrimp and Fish have registered a positive growth both in volume and value. Similarly exports to South East Asia, Japan and USA have registered a growth both in quantity as well as in value terms. South East Asia became the No. 1 market of Indian marine products with a share of 25.75% worth US$ 676.87 million.

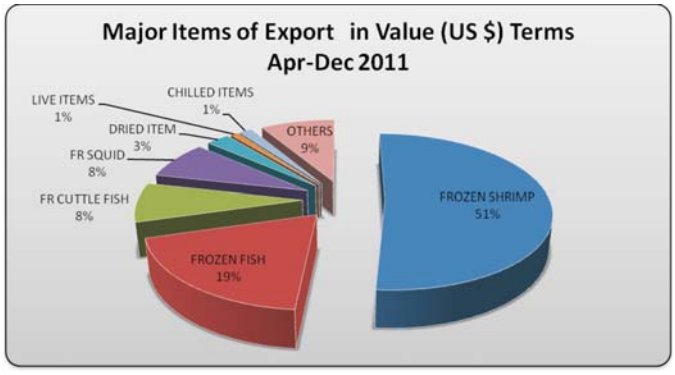
Major items of export

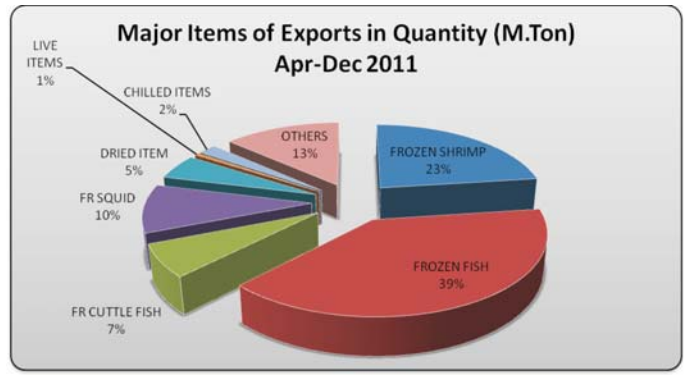
Frozen Shrimp continued to be the major export item accounting for 51.35% of the total foreign exchange earnings. Shrimp exports during the period increased by 17.67%, 34.77% and 32.98% in quantity, rupee value and US$ value respectively. There is considerable increase in unit value realization (13.01%) also. Export of Frozen Shrimp to USA has registered a growth of 38.34% in volume,41.97% in rupee and 41.07% in US$ value. Frozen Shrimp export to Japan also showed an increase of 10.15%, 19.40% and 18% in volume, rupee and US$ value respectively. Export of Vannamei Shrimp during the period increased tremendously by 272%, 326% and 318% in quantity, rupee value and US$ value respectively, compared to the same period last year.

Fish, the second largest export item in value term, accounted for a share of about 39.43% in quantity and 19.14% in US$ earnings. Frozen Fish exports during the period increased by 6.40% in quantity, 21.81% in rupee value and 15.96% in US $ earnings. Unit value realization also improved by 8.99%.

Frozen Squid and Cuttlefish exports decreased in quantity but showed an increase in value. Frozen Cuttlefish showed a decline of 12.30% in quantity and showed a growth of 14.97% and 11.35% respectively in rupee value and US$ realization. There is considerable increase in the unit value realization 26.97%.

Frozen Squid exports declined 12.21% in quantity and grew 20.10% and 18.28% in rupee value and US$ realization respectively. There is an increase in the unit value realization by 34.73%. Export of dried items declined by 39.11% in quantity 55.08% and 56.53% in rupee and US$ value respectively. The export of Chilled items improved in value but decreased in volume. Export of live items has gone down both in value as well as in volume compared to same period last year.





Item-wise Export of Marine Products during April - December 2010 and 2011

Q: Quantity in Tons, V: Value in Rs. Crores, $: USD Million, UV : Unit Value in $/KG

Item		Share%	April-2011 Dec-2011	April-2010 Dec 2010	Variation	%
FROZEN SHRIMP	**Q:**	22.90	142366	120988	21377.70	17.67
	V:	50.98	6214.74	4611.40	1603.35	34.77
	$:	51.35	1349.64	1014.92	334.72	32.98
	UV$:		9.48	8.39	1.09	13.01
FROZEN FISH	**Q:**	39.43	245061	230324	14736.29	6.40
	V:	19.51	2378.73	1952.84	425.89	21.81
	$:	19.14	503.05	433.82	69.24	15.96
	UV$:		2.05	1.88	0.17	8.99
FR CUTTLE FISH	**Q:**	6.66	41388	47191	-5803.31	-12.30
	V:	8.08	985.26	856.98	128.28	14.97
	$:	8.02	210.90	189.39	21.50	11.35
	UV$:		5.10	4.01	1.08	26.97
FR SQUID	**Q:**	9.90	61550	70109	-8559.00	-12.21
	V:	7.81	951.72	792.47	159.25	20.10
	$:	7.88	207.01	175.01	32.00	18.28
	UV$:		3.36	2.50	0.87	34.73
DRIED ITEM	**Q:**	5.19	32288	53023	-20735.50	-39.11
	V:	2.71	329.76	734.03	-404.27	-55.08
	$:	2.70	70.84	162.95	-92.11	-56.53
	UV$:		2.19	3.07	-0.88	-28.61
LIVE ITEMS	**Q:**	0.46	2882	4041	-1159.68	-28.71
	V:	0.81	98.86	106.56	-7.70	-7.23
	$:	0.81	21.37	23.53	-2.16	-9.17
	UV$:		7.42	5.82	1.59	27.39
CHILLED ITEMS	**Q:**	2.07	12871	16451	-3579.76	-21.76
	V:	1.53	186.33	169.50	16.83	9.93
	$:	1.52	40.00	37.30	2.70	7.23
	UV$:		3.11	2.27	0.84	37.06
OTHERS	**Q:**	13.38	83172	70377	12795.90	18.18
	V:	8.58	1045.53	794.70	250.83	31.56
	$:	8.58	225.40	176.91	48.48	27.41
	UV$:		2.71	2.51	0.20	7.80
TOTAL	**Q:**	**100**	**621577**	**612505**	**9072.64**	**1.48**
	V:	**100**	**12190.93**	**10018.47**	**2172.46**	**21.68**
	$:	**100**	**2628.19**	**2213.82**	**414.38**	**18.72**
	UV$:		**4.23**	**3.61**	**0.61**	**16.98**

Major export markets

South East Asia became the largest market with a share of 25.75% in US $ realization and 39.58% in quantity. Exports to SE Asia have shown a growth of 43.19% in quantity, 103.70% in rupee value and 95.99% in US$ realization. EU ranks second with a share of 22.02%, followed by USA 19.17%, Japan 14.09%, China 7.06%, Middle East 4.39% and other Countries 7.51%. Exports to EU registered a growth of 1.33% in US$ realization but declined in quantity by 13.66%. Exports to USA registered a growth of 31.33% in quantity and 39.05% in US$ realization. Japan also registered a growth of 19.25% in quantity and 18.12% in US$ realization. Exports to China have shown a drastic decline both in quantity as well as in value terms. Exports to Middle East and other countries also declined in terms of quantity but improved in value terms. The details are given below.

Market-wise Export of Marine Products during April - December 2010 and 2011

Q: Quantity in Tons, V: Value in Rs. Crores, $: USD Million

Country		Share%	April-2011 Dec- 2011	April-2010 Dec - 2010	Variation	%
Japan	Q:	10.51	65351	54802	10549.52	19.25
	V:	14.02	1709.29	1416.67	292.62	20.66
	$:	14.09	370.33	313.51	56.82	18.12
USA	Q:	8.59	53388	40650	12737.48	31.33
	V:	18.97	2312.39	1649.13	663.27	40.22
	$:	19.17	503.91	362.38	141.53	39.05
European Union	Q:	17.85	110938	128493	-17554.87	-13.66
	V:	21.94	2674.51	2589.94	84.57	3.27
	$:	22.02	578.75	571.18	7.57	1.33
China	Q:	10.07	62578	123338	-60760.08	-49.26
	V:	7.14	869.79	1579.43	-709.64	-44.93
	$:	7.06	185.56	351.25	-165.68	-47.17
South East Asia	Q:	39.58	246006	171800	74206.63	43.19
	V:	26.04	3174.66	1558.51	1616.15	103.70
	$:	25.75	676.87	345.37	331.50	95.99
Middle East	Q:	4.06	25219	32227	-7008.13	-21.75
	V:	4.41	537.41	484.91	52.50	10.83
	$:	4.39	115.29	106.94	8.36	7.81
Others	Q:	9.35	58096	61194	-3097.91	-5.06
	V:	7.49	912.87	739.87	172.99	23.38
	$:	7.51	197.48	163.20	34.28	21.01
Total	Q:	100	621577	612505	9072.64	1.48
	V:	100	12190.93	10018.47	2172.46	21.68
	$:	100	2628.19	2213.82	414.38	18.72

Technological Advancements in Retort Pouch Processing

Dr. Ansar Ali
Asst. Director (OFD), MPEDA, HO, Kochi

Food packaging is an integral part of food processing and a link between food processors and consumers. World over, consumers are showing greater awareness towards food packaging as packaging provides assurance on quality, quantity and hygienic environment for the food products. With the growing demand for convenience, the need for the off the shelf, ready-to-cook and ready-to-eat packaged food is on the rise. Retort pouch packed products are also come as RTE (Ready To Eat) or MRE (Meals Ready to Eat) products. Retort pouches are used now-a-days as a packaging material for ready-to-eat food products and used for the thermal processing of wide variety of food products including fish and fishery products. Retort pouches are used for the packing of tuna products since late 90s.

Retort pouches

The retort pouch was invented by the United States Army Natick R&D Command, Reynolds Metals Company, and Continental Flexible Packaging. Retort pouch is a flexible laminate having sufficient strength and can be used in place of metal containers for the thermal processing of sea foods. These pouches, as the name implies are capable of retorting and can withstand higher temperatures (121.1^{O}C) for several minutes under high pressure and are the latest development in the packaging industry. Retort pouch is a rectangular type package made of 3 or 4 layers of lamination.

Salient features of retort pouch as a packaging material for thermally processed fish products are:

(i) Can be produced in any size and shape

(ii) It has a high surface to volume ratio and thin cross section

(iii) Rapid heat penetration is possible

(iv) Heating is uniform

(vi) Less impairment of texture and flavour of fish products due to reduced exposure to heat

(vii) Processed pouches can be stored at ambient temperatures

(viii) Consumers can easily open the pouches

(ix) Content can be easily reheated by immersing in hot water, prior to consumption.

(X) After use, can be easily destroyed by incineration

It is usually made up of outer layer of polyester, middle aluminium foil, and inner food grade polypropylene layer. Some manufacturers provide an additional layer of nylon (Polyamide) to give puncture resistance. The outer polyester provides abrasion resistance, can be printed, and adds to overall pack strength. The middle aluminium foil provides protection against gas, light, and moisture and ensures better shelf life. The inner polypropylene provides better heat sealing medium. The pouches with middle aluminium foil are opaque and the products processed in that will have a normal shelf life of 12 months. There are also transparent retort pouches without aluminum foil or aluminium oxide impregnated for better shelf life. The shelf life of products processed in transparent retort pouch is normally 4-6 months only. The advantage of the pouches without aluminium foil is that the pouch with contents can be heated in a microwave directly. In the case of pouches with aluminium foil, the contents has to be transferred to a microwavable dish before heating.

Stand up retort pouches

Stand up Zipper retort pouches

Continuous developments are taking place in the retort pouch design and appearance. Stand-up retort pouches with multi color printing were developed later where it is easy to display it in the shelf of the supermarkets. Another advantage is that the outer duplex carton can be avoided, if long distance transportation is not required. Another development is the zipper retort pouch, in which the product can be

reused by storing under refrigeration by closing the zippers. Latest addition to the retort pouches are the self heating retort pouches in which the products can be heated without microwave or a heater. The self heating pouches are based upon the principle of exothermic reaction. Self heating retort pouches contains an extra exterior pouch. Water is added to that exterior pouch which will lead to an exothermic reaction and reheats food to a temperature of 38°C in ten minutes (www.wisegeek.com). Depending upon the convenience the cost of pouches will also vary.

Earlier, India used to import retort pouches for processing purposes and this added to the cost of production. And now quality pouches are available at a lower cost within the country.

Machinery for retort pouch production:

(I) Retorts

Retorts using different heating media are available nowadays. The heating media used for thermal processing includes water, steam-air mixture and saturated steam.

Retorts can be classified as still, rotary and also it may be vertical, horizontal, batch or continuous. Each heating media is having its own advantages and the selection of the media depends upon the nature of the product. The retorts normally used for retort pouch production lines are horizontal batch retorts and uses steam or water as the heating medium. Still water retorts may be water immersion retorts or water cascading and spraying retorts. The processing is carried out by over pressure with the aid of steam or air to prevent deformities to the pouch during processing operations. In the case of retort pouches using water as the heating medium, there will be uniform and rapid heat transfer as the packed pouches are in intimate contact with the heating media. The entire process of heating, cooling and maintaining the pressure during the entire process are controlled by PLCs (Programmable Logic Circuits) and the process can be monitored with the help of computers.

Horizontal retorts *(Photo courtesy: http://silvalab.fsnhp.msstate.edu)*

(ii) Temperature recorders and F_o value monitoring systems

The heat processing is done to a specific F_o value that depends upon the level of bacterial inactivation and optimum cooking. F_o is the time in minutes required to destroy a stated number of organisms at 121.1^{O}C with a known Z value (For *Clostridium botulinum* 10°C). F_o value recommended for Fish and Fish Products is 5-20. High precision system for thermal process has been developed by different manufacturers for F_o value monitoring. Thermocouple needles are inserted to the product inside the pouch and kept inside the coldest point of the retorts and second-wise data is generated for F_o value monitoring. These systems are helpful in thermal validation studies and also for continous monitoring of the process.

Rotary -Hot Fill / Retort Fill – Seal
(Photo courtesy: http://alliedflex.com/sjpackrotary.html)

(iii) Packing and Sealing machines

The volume of production necessitated technological advancements in the weighing and filling, steam exhausting and sealing machineries used for the retort pouches. In the initial stages of the industry, each step was done manually which used to take lot of time and was one of the main hindrance for volume production. Volumetric weighing machines were used initially. Pneumatic sealing machines are used for sealing as sealing is one of the critical steps in thermal processing process. Later integrated machines were developed which can perform the functions like weighing and filling, steam exhausting and sealing at one stretch. Automatic packing machines can operate at a speed of 30-40 pouches /minute and can accommodate varied sizes of pouches from 80-220mm.

Retort pouch packing machine (http://www.buykorea21.com)

Fish products in retort pouches

Different types of retort pouch packed fish products are available in the market. Thailand is one of the leading manufacturers of ready to eat fish products in flexible pouches. Indian producers also ventured into the ready-to-eat fish products in flexible pouches. Major retort pouch packed products in India are: Tuna in oil, Tuna in brine/sauce, Mackerel in oil, Mackerel in brine, Mackerel in sauce, Mackerel in gravy, Sardine in oil, Sardine in sauce, Sardine in gravy, Prawns in brine, Prawns in sauce, Squid in sauce, Fish balls in gravy and Prawns biriyani.

The steps involved in thermal processing

The various steps involved in the thermal processing of fish products varies depending upon the species and on the nature of the product. Various steps involved in thermal processing of fish products in flexible pouches can be classified as follows:

1. Receiving of materials
2. Preparation of the fish and media and packaging material
3. Pre-cooking of fish
4. Filling the pouches
5. Steam exhausting/ vacuumization
6. Sealing
7. Thermal processing
8. Cooling
9. Incubation and Quality Control
10. Packing and storage

(1) Receiving of materials

The raw material used for thermal processing should be as fresh as possible as the quality of the final product depends on it. The materials include fishes, dry and wet ingredients such as vegetables, spices, oil etc. and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packaging materials. Fishes commonly used for thermal processing in retort pouches include tuna, mackerel, sardines, prawns etc. Packaging materials include retort pouches, duplex cartons, and master cartons. Received raw materials are stored in different stores depending upon the storage temperatures.

2) Preparation

This includes washing, beheading or peeling, evisceration, filleting, mincing or slicing. Large fishes like tuna are bleeded well by beheading and blood can be removed by keeping it in running chilled water. Vegetable ingredients are cleaned well to remove sand and dirt, and washed well before using. Fishes are packed in a liquid media for better heat penetration and the commonly used heating media are gravy/sauce, double refined oil or 2.5% brine solution. Gravy/sauce is prepared depending upon the product to be packed. Fishes excluding prawns are cold blanched in 10% brine for 10-15 mts. This inhibits enzyme reactions, imparts firm texture to the meat, and ensures shrinkage of the raw material to permit adequate filling. (Gopakumar, 2002)

3) Pre-cooking of fish

Fish contains lot of water and this has to be removed or reduced before packing in order to reduce oxidative reactions and also to prevent the entry of water from the fish to the filling media which otherwise will dilute the gravy/sauce. Pre-cooking is achieved by steam cooking or hot blanching or flash frying. This will also make the fish pieces firm. When packed in oil or brine, tuna is pre-cooked in 10lbs pressure for 45 mts to 90 mts depending upon the size of the fishes. Smaller size fishes are pre-cooked in free flowing steam for 30 mts. Prawns are hot blanched in brine solutions. Pre-cooked fish has to be handled carefully as the bacterial flora is reduced by the heating process.

4) Filling the container

Manual filling as well as machines are used for filling the pouches. Solid part is filled first followed by liquid portion as this will eliminate the splashing of the liquid portion. Filling weight is depend upon the size of the pack and also it's holding capacity. The pouches should be filled by leaving adequate headspace.

5) Exhausting

Exhausting helps to remove air from the pouches before closure. This will help in reduces the strain on seals during retorting, removes oxygen otherwise cause oxidation, accelerate rancidity reactions, discoloration and also will give a vacuum on cooling. Exhausting is achieved by heat exhaust, steam injection or mechanical exhaust. In the case of heat exhaust contents are heated before filling and ideal for products containing lot of trapped air. When steam is injected the gases present in the headspace is flushed out and the condensed steam on either side of the inside of the pouch head when closed forms a water seal, thereby preventing further entry of air. Alternatively the complete air is removed out by using a vacuum pump and food is filled at low temepratures.

6) Sealing

Filled packed retort pouches are heat sealed. One of the important points to be noted in this is to avoid the contamination of the seal area. If gravy/sauce is present in the seal area, sealing won't be perfect and can cause spoilage after processing due to the entry of micro organisms through the imperfect seals. Strength of heat seals also has to be checked for ensuring a perfect seal for the pouches.

7) Thermal processing

The filled and sealed retort pouches are arranged in trays and trolleys and loaded into the retort. They are then heat processed to the required F_o values. Initially, the steam is allowed into the retort by opening all the vents and drains to flush out the air. Once the retort is filled with pure steam vents and drains are closed and the steam is allowed further to build up the temperature and pressure. If the air is not removed properly during venting, air pockets will be there in the retort which will hinder the heat processing and can cause under processing in some areas. Heat processing is done at 121.1^{O}C and pure steam is a better heat transfer medium. Once the temperature reaches 121.1^{O}C, then the pressure inside is maintained with the aid of steam and air. Air pressure is provided to prevent distortion of the pouches during thermal process. Heat processing should be adequate so that, it should destroy the spores of the *C. botulinum*, one of the most heat resistant pathogenic bacteria and also the high temperature resistant spore forming spoilage micro organisms to the required decimal levels. From the heat processing point of view, both these organisms are important. It also should ensure the proper cooking of the product.

8) Cooling

Once the required F_o value is reached cooling is done under air pressure. This is to prevent bursting of the pouches during sudden cooling due to the differential pressure inside the pouches and inside the retort. Cooling should be sudden and rapid. This step also ensures destruction of some bacteria due to thermal shocks. Cooling water should be chlorinated. In the modern retorts all these process of heating, pressure balance, cooling

under over pressure are done automatically by setting the F_o values in the Prgammabel Logic Circuts (PLCs).

9) Incubation and Quality Control

Processed pouches are kept at room temperature during storage. Sterility tests were carried out by incubating the product at 37°C for 15 days.

10) Packing and Storage

Once the product passes the sterility tests, they are packed in duplex cartons with all regulatory requirements and the duplex cartons are packed in master cartons.

Retort pouches are ideal packaging material for ready-to-eat food products with long shelf life and can be stored at room temperatures. It is easier to do thermal processing of fish in oil or brine in pouches compared to prepared products. Lot of factors has to be taken to account when using a gravy/curry medium as in the case of Indian products. Standardization of each ingredient in the gravy has to be done. Reduction of moisture content of each ingredient will ensures better taste to the product.

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8. http://alliedflex.com/sjpackrotary.html ●

MPEDA participated in the Meenakshi Matsya Mahotsav - 2012, Madhya Pradesh

MPEDA participated in the "*Meenakshi Matsya Mahotsav* - 2012" organized by Department of Fisheries, Govt. of Madhya Pradesh in collaboration with NFDB from 4th to 6th February, 2012 at Bhopal, Madhya Pradesh. The event was inaugurated by Hon'ble Chief Minister of Madhya Pradesh, Shri Shivraj Singh Chouhan. *Mahotsav* was attended by Ministers and senior Fisheries Officials, Scientists, Researchers, Bankers and Farmers from different places. There were 100 stalls in the fair, out of which 56 was that of the Ornamental fisheries sector. The stalls were occupied by state and central govt organizations, departments, boards and research institutes and private entrepreneurs. MPEDA also has set up a stall in the *Mahotsav* and was represented by Shri Maruti D Yaligar, Deputy Director, RC Panvel, Dr. Sreenath P G, Assistant Director, RO Mumbai and Mohammed Arif Ansari, Programme Manager (OFD), Madhya Pradesh.

Products displayed in MPEDA stall

MPEDA has taken up a stall area of 36 sq. m. and displayed live fishes like carp, sea bass and ornamental fishes in 8 aquarium tanks. Value added fish products like Fish pickles, Fish soups, Ready-to-eat Fish curry, Canned tuna and tuna in flexible pouches were displayed. Activities and achievements of Rajiv Gandhi Centre for Aquaculture (RGCA) were also showcased in the stall. The visitors were provided with literatures on MPEDA and its schemes.

View of MPEDA stall

MPEDA also had active participation in the technical sessions. Dr. Sreenath presented a paper on 'Ornamental Fish Development - Initiatives by MPEDA'. Programme Manager (OFD), Madhya Pradesh presented the MPEDA schemes for Ornamental Fish Development and Shri Maruti D Yaligar, Deputy Director interacted with visitors and bankers describing MPEDA Aquaculture Programmes and Schemes. The event concluded with a closing session on 6th February 2012. ●

FOCUS AREA

Fish for Nutritional Security

Dr T K Srinivasa Gopal
Director, Central Institute of Fisheries Technology, Kochi

The successful outcome of green revolution has answered the challenges of food security due to rapid growth in population. But the fact that 35% of Indian population falls still below the poverty line emphasizes the need to recognize fisheries as an important sector of the National economy for meeting the food and nutritional security. In the days ahead, "blue revolution" will be the buzzword to meet the challenges of food and nutritional security.

Fish and fishery products form an important food component for a large section of world population. They represent 15.6% of animal protein supply and 5.6% of total protein supply on a worldwide basis. Fish is the primary source of animal protein for over one billion people of developing countries. It is estimated that 60% of people in developing countries obtain 40-100% of the animal protein in their diets from fish. Protein, lipids and bioactive compounds from seafood have unique features that differ from those of land animals. The uniqueness of fish protein is due to its excellent nutritive value, high digestibility and presence of all essential amino acids. In general, fish flesh contains 60-84% water, 15-24% protein, 0.1-22% fat and 1-2% minerals. Seafood serves as a rich source of Polyunsaturated Fatty Acids [PUFAs], especially omega-3 PUFAs, minerals and vitamins.

Fish is a health food with relatively lesser taboos connected to it, unlike meat. World over, fish is considered as a delicious item and in nutritional point of view, it is the balanced diet one can easily think of when consumed along with cereals.

A health food should contain all the principal constituents like carbohydrates, proteins, lipids, minerals, vitamins etc. in the right proportion. Detailed biochemical composition of all important Indian food fishes (including proximate composition, fatty acid composition of body and liver oils, content of important minerals, amino acid composition of muscle proteins etc.) from fresh water, brackish water and marine environment have been compiled and reported by the Central Institute of Fisheries Technology. People are now more health conscious. Diets low in fat and cholesterol with high vitamin and mineral contents are often preferred, especially in the affluent west. For a healthy lifestyle, fish is a good starting point. Importance of fish as a source of high quality, balanced and easily digestible protein is now well understood. For the affluent, it is the best health food with curative properties. For the less privileged section in developing nations, it is the only source of high quality protein available at affordable cost and in sufficient quantity.

Fish plays a major role in human nutrition. Fish and shellfish form an important part of the human diet, both of the poor and of the wealthy. Good quality fish is an extremely safe food.

Meat products are viewed as unsafe after the incidences of diseases like mad cow disease. Fish is a versatile, tasty and easy to prepare food. Consumers are increasingly demanding for natural food stuffs, which contain no chemical residues and are not genetically manipulated. Fish is organic and is considered as wild and for the same reason safer, though of late farmed fish has posed minor problems of harmful residues.

For thousands of years, fish has been an important part of the human diet. The ancient Assyrians, Romans and Chinese were famous for their fish farming. During the past decades, per capita consumption of fish has gone up globally. Fish is the diet of the poor fishermen, which meets most of their nutritional requirements.

Researchers all over the world have repeatedly emphasized the beneficial effect of eating fish, after conducting systematic research for many years. In recent years, the link between fish oil and heart disease has been the subject of thousands of scientific papers. The whole story began following the discovery that coronary heart disease while being one of the biggest killers in the world, is practically unknown among the Eskimos. The investigations found that their diet is mostly fish based and is rich in long chain n –3 poly unsaturated fatty acids (PUFA). Eskimos also have a reduced tendency to blood clotting and longer bleeding times compared to other people. Medical researchers carried out detailed investigations and showed that men who ate fish once or twice per week were protected against

coronary heart disease. An increase in fish oils in the diet results in a marked reduction in blood cholesterol and triglyceride levels and also thrombosis problem.

Lipid content in fish varies between species as also within the species depends on many factors. Fish with fat content as low as 0.5% and as high as 18-20% are common. Squalene and wax esters are other components found in unusually high concentrations in certain fish. The fatty acid composition of marine lipids is much more complex than others. Lipids of fish and other aquatic animals contain high proportion of highly unsaturated long chain fatty acids. Fatty acids with carbon chain varying from 10 to 22 and unsaturation varying from 0–6 double bonds are common. Among the saturated acids palmitic and stearic acids are the important ones and in the monounsaturated group, palmitoleic and oleic acids are the major constituents. Among the polyunsaturated acids, arachidonic acid, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are the major components. In Central Institute of Fisheries Technology, marine, fresh water and brackish water fishes were screened for evaluating their fatty acid composition and in the flesh. Fish and shellfish from tropical waters were analysed for their cholesterol content, showing higher levels in shellfish compared to fish.

Fish oils have no effect on the levels of low-density lipoprotein cholesterol (LDL); but they do raise high-density lipoprotein (HDL) by about 10%. HDL is a protective type of lipoprotein since it takes excess cholesterol away from the tissue and returns it to the liver. Diseased heart muscle is susceptible to bouts of irregular electrical activity (*arrhythmias*), which are potentially lethal and often cause sudden cardiac arrests. There is evidence from animal studies that increasing fish oil in the diet helps to

reduce cardiac arrhythmias. Fish oils improve the functionality of cell membranes, which helps in proper signal transmission. Fish oil inhibits platelet aggregation, which also reduces the risk of heart disease. Raised blood pressure is known to be a major risk factor in coronary heart disease. Most studies on the effects of fish oil given as dietary supplements have shown modest reductions in blood pressure, especially in hypertensed people.

As stated earlier, fish oils are rich sources of the essential fatty acids eicosapentaenoic acid (EPA, C20:5 n-3) and docosahexaenoic acid (DHA, C22:6 n-3). Both EPA and DHA fall into a larger category of polyunsaturated fatty acids (PUFAs). Approximately 50% of the fatty acids in lean fish and 25% in fattier fish are polyunsaturated fatty acids. In contrast, the polyunsaturated and saturated fatty acids in beef are 4 – 10 % and 40 – 45 % respectively. EPA and DHA reduce vasoconstriction by competing with arachidonic acid for the enzyme cyclo-oxygenase. EPA, the main n-3 acid is converted by platelet cyclo- oxygenase to thromboxane A3 which is only a very weak vasoconstrictor unlike thromboxane A2, which is formed by the action of cyclo-oxygenase on arachidonic acid, the n-6 acid and is a strong vasoconstrictor. The American Heart Association recommends including fatty fish at least twice a week in the diet. Institute of Human Nutrition in New York also recommends eating plenty of fish. Italian study involving 985 people who survived heart attacks, also proved the beneficial effect of fish oil. The new slogan in the west is that a tuna sandwich a day keeps heart problems at bay. It is also stated that if a person wants to reduce the risk of heart attack by more than 20% he has to eat a tuna sandwich just once a month. No wonder they say *"Seafood is heartfood"*.

Recently, the inhibitory role of n-3 PUFAs in the development and progression of a range of human cancers have been established by researchers' world over. Studies have found that the anti-tumor effect of EPA is mainly related to its suppression of cell proliferation. The effect of DHA appears to be related to its ability to induce apoptosis or cell death. The dietary n-3/n-6 fatty acid ratio rather than the quantity administered appears to be the principal factor in the anti-tumor effect of n-3 PUFAs.

Apart from heart disease and cancer, fish oil is proved to be effective for preventing wide variety of diseases. In several observational studies, low concentrations of n-3 PUFAs were predictive of impulsive behaviors and severe mental depression. The importance of PUFAs in the maintenance of insulin in the blood has also been proved in experiments. Clinical and biochemical studies have shown that fish oil and to a lesser extent fish can be used as a source of n-3 fatty acids in the treatment of rheumatoid arthritis. Supplementations with fish oils can markedly reduce inter leukin – 1 beta production and results in a significant reduction in morning stiffness and the number of painful joints in arthritis patients. Studies have shown fish oil to be effective in the treatment of acute respiratory distress syndrome, psoriasis and multiple sclerosis also. Older people who eat fish at least once a week may reduce their risk of Alzheimer's disease by more than half. Other diseases which are reduced due to the consumption of PUFAs include primary Raynaud's

disease, gastric ulcer and Crohn's disease.

Along with fish oils, proteins in fish are also having positive role in reducing blood cholesterol. Recent studies have shown that fish proteins have a clear protective effect in diabetic renal diseases. Fish proteins are having high biological value as they contain all essential amino acids in the right proportion. Plant proteins although rich in certain essential amino acids do not always offer all essential amino acids in a single given food. Legumes lack methionine, while grains lack lysine. Fish protein is also an excellent source of lysine as well as the sulphur-containing amino acids such as methionine and cysteine. Amino acid scores of fish protein compare well with the FAO reference pattern. In the studies conducted in the Central Institute of Fisheries Technology, it was seen that the amino acid composition of the protein is crucial in determining its hypocholesterolemic properties. The alanine / proline ratio in a protein was found to be the significant factor determining its hypocholesterolemic properties.

Protein content of fish muscle ranges between 16% and 20% depending on the species of the animal, the nutritional condition, and the type of muscle. The crude protein calculated on the basis of the total nitrogen content represents proteins and other nitrogenous compounds such as nucleic acids, nucleotides, trimethylamine (TMA) and trimethylamine oxide (TMAO), free amino acids, urea, etc. Protein from fish is easily digested with most species showing a protein digestibility greater than 90%. The chemical score or amino acid score compares a food's amino acid pattern to that of whole egg protein. The chemical score of finfish is 70, an indication of its high quality. For beef it is 69 and for cow's milk it is 60. The protein efficiency ratio (PER), another measure of protein quality of fish is around 3.5 which is much higher than beef (2.30) and milk proteins (2.5) and close to that of egg (3.92). Fish is a good dietary source of taurine, a non-protein amino acid with multiple functions like neurotransmission in the brain, stabilization of cell membranes and in the transport of ions such as sodium, potassium, calcium and magnesium. Nutritional quality of protein is generally determined by factors like essential amino acid composition, digestibility and biological value. Fish protein is rated high in all the above qualities and is considered as a good dietary protein in all respects.

In general, both water soluble and fat-soluble vitamins are present in fish. Fat soluble vitamins A, D, K and E are present in fish in varying amounts-often in higher concentrations than in land animals. The amount of vitamins and minerals is species-specific and can vary with season. The flesh of lean white fish such as cod, haddock, and pollock, contains from 25 to 50 IU of vitamin A per 100 g, while in the fatty species such as herring, there is from 100 to about 4500 IU of this vitamin in 100 g of meat. The content of vitamin D in sardines and pilchards and in tuna is in the range of 530 to 5400 and 700 to 2000 IU per 100 g respectively. The contents of vitamin E in the edible parts of fish and marine invertebrates range from about 0.2 to 270 mg/100 g. Fish is a good source of B vitamins. The red meat has higher content of vitamin B than white meat. Fish liver, eggs, milt and skin are good sources of Thiamine (B_1), riboflavin (B_2), pyridoxine (B_6), folic acid, biotin, and Cyanocobalamine (B_{12}).

Fish also contributes appreciable amounts of dietary calcium, iron and zinc. Fish contains copper and those who relish fish bones get a fair share of calcium and phosphorous. Salt-water fish are rich in iodine. The iodine in marine fish ranges from 300-3000 mg/kg. Fish is a good source of almost all the minerals present in seawater. The total content of minerals in the raw flesh of fish and aquatic invertebrates is in the range of 0.6 to 1.5% of wet weight. Certain seafood such as snails and tuna are good source of the macro mineral "magnesium". Seafood, especially tuna, is an important source of the essential antioxidant trace element selenium, which provides protection against heavy metal poisonings and a variety of carcinogens. Functioning cooperatively with vitamin E, selenium is also a vital factor in protection of lipids from oxidation as part of the enzyme glutathione peroxidase which detoxifies products of rancid fat. The carbohydrate content of finfish is insignificant but certain shellfish store some of their energy reserves as glycogen which contributes to the characteristic sweet taste of these products.

When we consider the beneficial effects of dietary fish, vegetarianism in dietary habits does not seem to be wise. When one decides to become an obligate vegetarian and cuts out meat/dairy/fish out of diet, he decides to cut out some of the major nutrients body needs on a daily basis for effective functioning. The argument that fish lives in unhygienic habitat and polluted waters is also not valid as pollution is a universal phenomenon, affecting air, land and water. Fish is the heart food which gives you both satisfaction and health and it is the word for nutritional security. ●


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Private Sector Initiatives for Sustainable Fisheries

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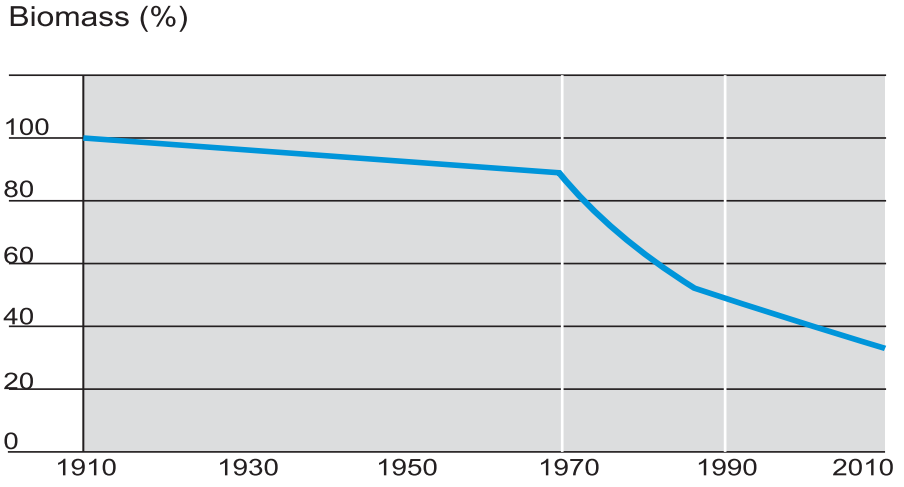
INTRODUCTION

Fish is the most nutritive non-vegetarian food and is the major source of protein for over one billion people around the world. Between 1950 and 2000 world catch of wild fish for human consumption increased from 20 to 95 million tons. As far as seafood is concerned, food **security, safety** and **sustainability** are the three S's which have attracted considerable attention in recent years and are hotly debated in many world forums. In reality, we can produce safe seafood only from sustainable fishery resources which in turn contributes to food security.

International trade in fish and fishery products has registered tremendous increase in recent years. As a result, many commercially important fish species are under pressure resulting in over exploitation and consequent resource depletion. According to FAO, 53% of marine fish stocks are fully exploited, 3% under exploited, 12% moderately exploited while 32% are overexploited (28%); depleted (3%) or recovering from depletion (1%).

In the absence of effective management measures for capture fisheries, market liberalization in the fisheries sector is likely to encourage increased fishing effort ("effort creep"), leading to further declines in the fish stocks and consequently trade losses. The prime reasons for resource depletion are over capacity of fishing fleets, inappropriate fishing gear (for example trawlers), land and marine pollution that harm the coastal marine ecosystem and weak enforcement of management measures.

Global biomass of predatory fish



Source: THE SEA AROUND US, THE NIPPON FOUNDATION

What is sustainable development?

In 1987, World Commission on Environment and Development (WCED) defined sustainable development as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs."

FAO (1988) defined it as "the management and conservation of the natural resources base, and the orientation of technological and institutional change in such a manner as to ensure the attainment of continued satisfaction of human needs for present and future generations. Such sustainable development conserves (land) water, plants and (animal) genetic resources, is environmentally non-degrading, technologically appropriate, economically viable and socially acceptable."

Sustainable seafood movement is gaining momentum on world's major seafood markets, notably the EU, USA and Japan. The movement is also very active in countries like Canada, Australia and New Zealand. The sustainable seafood movement uses the market via consumers, chefs, restaurants and the supply chain, to influence demand for seafood in an effort to influence the management of fisheries in a sustainable manner.

Ecolabelling in fisheries.

Apart from government, the private sector can also play a very important role in the development of sustainable fisheries. There are varied mechanisms that are employed by the private sector aimed at responsible fisheries. Ecolabeling is one such program for fisheries that encourages responsible fisheries by the private sector. In recent years, private labels and related certifications have assumed great significance in international trade

of fish and fishery products. Ecolabels are entering the market in increasing numbers all over the world. The organic label is perhaps the most recognized and widely used eco label in the market place today. The two main and most important labeling schemes for fisheries are Marine Stewardship Council (MSC) and Friend of the Sea (FoS). Together they cover 7% and 10% respectively of the world's capture fisheries. MSC is widely recognized as the leading sustainable fishery labeling scheme for wild caught marine fisheries. Currently MSC has certified 133 fisheries as sustainable and the number is growing steadily.

Ecolabeling had been recognized as a legitimate environmental management tool at the 1992 Earth Summit and discussed intensely in many world forums like United Nations Environmental Programme (UNEP), World Trade Organisation (WTO), United Nations Industrial Development Organization (UNIDO), Food and Agricultural Organisation (FAO), United Nations Conference on Trade and Development (UNCTAD), Organisation for Economic Co-operation and Development (OECD) etc.

The four policy goals of sea food ecolabels are:

- To improve the sale or image of a labeled product.
- To raise the environmental awareness of consumers
- To provide accurate and timely information for consumers to make informed judgments and
- To direct manufacturers to account for the environmental impact of production.

Apart from these goals, there is incentive for improved fisheries management by price premium for labeled product.

Ecolabeling is used to identify the "environmentally- friendly" products and began in 1977 with the establishment of the Blue Angel program by the German government. Since then, many eco labeling schemes have arisen for marine resources.

Ecolabelling programmes for seafood

Concern over the status of fish stock, combined with the limitations of command-and-control management mechanisms enacted by the governments led to the creation of seafood ecolabels.

An ecolabeling program is a system used to create a market-based incentive to encourage products that can demonstrate they are produced in an environmentally friendly fashion. Market based instruments are policy instruments that use market, price and other economic variables to provide incentives. The incentive is created in the market place through the selective purchasing power of consumers. Labelled products are preferentially purchased and pay a higher price. Thus the labeled product and its seller have market advantages. This reduces the sales and returns of non-labeled products.

An ecolabel is a seal, a logo or a label or a product endorsement affixed to a seafood product at the point of sale. This implies to the purchaser that the product has been produced through ecologically sustainable

FoS logo.

MSC logo.

procedures and is from a source which is well managed.

In many cases a certificate of compliance is issued, but not all certification systems lead to the award of an ecolabel. Some certification systems may not have any direct relationship to retail market and are often used for purely industrial or regulatory purposes (such as catch certification required for the EU market.) Labels, seals or logo are employed to inform the customers about the provenance, production methods and environmental friendliness of the product. Eco labels range from strictly regulated and third party certified labels to self-assertions made by individual companies to promote their own products. They also cover a wide range of topics including environmental concerns, sustainability of resources, by-catch issues, accidental capture of marine mammals and seabirds.

Three critical steps are central to an effective food label:

1. Meeting consumer demand and not trying to create a receptive market.
2. Pushing the awareness and the advancement of the specification standard and
3. Creating an attractive value proposition for producers.

Civil society groups and NGO's have spearheaded the cause of sustainable seafood movement by raising public awareness. The

Fish labelling in supermarkets help consumers to make sustainable choices. Photograph: Alex Segre/Rex Features

Big Y ,the American owned super market in New England offers customers MSC certified wild salmon, cod, halibut and haddock (Photo: Stock File/FIS)

marketplace measures adopted by NGO's include consumer boycotts, seafood guides and campaigns like "Give Swordfish a Break" and "Take a Pass on Chilean Sea Bass".

Unlike boycotts and consumer guides, eco labeling is a market driven measure that involves the consumer rewarding the fishers for eco-friendly fishing practices.

In order to understand the significance of private labels in ensuring sustainability, we have to address the following concerns:

1. What roles do the private labels play in overall governance of fisheries sustainability?
2. Do they just add additional burden by way of compliance costs for various stakeholders in the supply chain? Or do they create market opportunities?
3. How costs and benefits are distributed among various stakeholders?
4. How do they impact the developing countries and small-scale fisheries?

Choice Editing for Sustainability

Choice editing for sustainability is about shifting the field of choice for mainstream consumers; cutting out environmentally damaging products and getting real sustainable choices on the shelves. Consumers benefit from the assurance that the issues they care about are being dealt with upstream.

The main characteristics of choice editing are:

1. Understanding the real issues and range of possible solutions
2. Clear deadlines for achieving the desired level of transformation
3. Labeling products as a basis for incentives and standard setting
4. Robust incentives attached to sustainable products
5. Supportive public procurement specifications and
6. Raising the bar through progressive regulation

Unlike other consumer products, more emotion is involved in purchasing food products and, as a result, environmental issues and animal welfare have a profound influence in creating the demand for all the more sustainable products." Dolphin- safe - Tuna" is one such example of an emotional concern for animal welfare.

Many large retailers and restaurants, as part of Corporate Social Responsibility (CSR), are championing the cause of ethical and environmental food sourcing from sustainable resources with emphasis on consumer awareness. In early 2006, Wal-Mart pledged to source all its wild-caught fresh and frozen fish from suppliers certified as sustainably caught by MSC. The blue MSC label (see picture above) placed prominently on wild-caught fish of Wal-Mart is not meant to persuade consumers to choose sustainably harvested wild-caught fish over less sustainable options, as the company has edited those products completely out of the shelf. Most choice editing is aimed at exhorting consumers to use less environmentally damaging products.

Sustainability initiatives- the Indian scenario

Our marine capture fishery resources are threatened by over fishing, IUU fishing by foreign vessels, ghost fishing by Abandoned, Lost or otherwise Discarded Fishing Gear (ALDFG), habitat degradation and marine pollution. By-catch is another serious issue which leads to wastage of resources. Management of trans-boundary species like tunas and tuna

like fishes are of special concern. In the case of shrimps which undertake spawning migrations to brackish water lakes; human activities causing pollution, habitat destruction and habitat modification are posing grave threat to their survival.

Over the years we have selectively removed high predators like tuna, skipjack, sword fish, sail fish, marlin, snapper etc. from the food chain.

In the absence of the predators, population of prey fishes ("forage fishes") like oil sardine, mackerel and squid has increased substantially. Alien invasive species like Puffer fish (*Lagocephalus gloveri* and *L. enermis*) has increased considerably in the landings which compete with food fishes for food and space.

Do we need private labels?

From the above it is clear that the marine capture fishery resources are in need of management measures aimed at long term sustainability. In India a number of government agencies both under the central and state governments, are involved in fisheries management, production and post-harvest sectors and trade, at times with overlapping responsibilities or even shared responsibilities with a plethora of laws, regulations and standards. However, this kind of management regime with emphasis on top-down hierarchial governance failed to resolve fishery conflicts and to manage complex socio-ecological systems. In this backdrop, we too should consider market-driven sustainability measures like ecolabelling and certification as a viable alternative for sustainable fishery. Moreover, many large corporates like Wal-Mart, Unilever, Marks & Spencer, Frosta foods, Sainsbury and the like have decided to trade fish sourced only from sustainable fishery as part of their Corporate Social Responsibility (CSR). Ethical consumerism, which demands an active role by discerning consumers in driving trade and businesses, is gaining popularity in many developed countries. All these factors point to the need for a private initiative aimed at sustainable fisheries in the Indian context too with the involvement of private sector and civil society groups which must be supported by different ministries and departments.

The total stock of 'forage fish' such as sardines (above) and anchovies has more than doubled in the past century. Photograph: Jon Nazca/Reuters

Who should be involved?

The private initiator should include all the stakeholders like fishers, processors, exporters, trade bodies, regulatory agencies, academia, research institutes and environmental groups. Due consideration should be given to the Traditional Knowledge Systems (TKS) of fishers after scientifically corroborating them. "TEK is a cumulative body of knowledge, practice and belief evolving by adaptive processes and handed down through generations by cultural transmission". In the case of Highly Migratory Species (HMS) the sustainability measures should be implemented on a regional level. Regional Fishery Management Organizations (RFMO's) like Indian Ocean Tuna Commission (IOTC) have to be consulted while framing the management system for such HMS of fishes.

Conclusion

Wild fish stocks are of enormous importance to economic output, livelihoods and food security. If degraded fisheries are rebuilt and sustainably managed, they can make an even larger contribution. The transition of global fisheries to sustainable management will secure these benefits for the long term. Fisheries contribute approximately US$v274 billion to global GDP. However, they are currently an underperforming asset. The World Bank estimates that if fisheries were managed optimally they could deliver an additional $50 billion each year.

Private initiatives like ecolabelling and certification can play a very crucial role in the sustainable fishery management and the relevance of certification will increase in coming days when more and more consumer groups and NGO's will demand certified seafood. ●

NETFISH completes four years in fisheries extension – An overview

Joice V Thomas, Deepu A V and Afsal V V

NETFISH, MPEDA, Kochi

Introduction

Fisheries extension services play a pivotal role in the development of fisheries sector by providing technical assistance, public outreach, training & education and an important link between research results and the end users of research findings. An effective extension service at the field level requires sound management at various other levels, based on an understanding of what is happening in the field.

Fisheries management aims at ensuring the quality and sustainability of fish stocks by promoting more sustainable and selective ways of fishing and post harvest handling. It requires rigorous education campaigns, public participation and joint participation programmes. In India, various government and non-government organizations take a lead role in the conservation of natural resources and biodiversity by associating with the local community. Unfortunately many of our management measures failed to bring out the desired results due to lack of proper planning and implementation. Imparting training to fishermen at the grassroots level is a challenging task for which the involvement of agencies working close to the fishermen is highly imperative. An agency that can reach out to the grass root levels and mobilize organizations whose primary objective is to work for the welfare of fisher folk. Training fishermen on marine conservation, post harvest handling and other techniques requires devoted efforts from a dedicated extension agency. Such agency will be far more effective in imparting training to fishermen and fish workers and thus bring about a "bottom up" approach to various issues related to fish quality management, conservation and sustainable fishing.

Formation of NETFISH

Based on the above concept, Network for Fish Quality Management and Sustainable Fishing (NETFISH) was formed as a society under the aegis of Marine Products Export Development Authority (MPEDA). The Society was registered on 01/06/2006 at Ernakulam under the Travancore–Cochin Literary, Scientific and Charitable Societies Registration Act, 1955 and was formally inaugurated by the Hon'ble Minister of State for Commerce and Industry, Shri Jairam Ramesh, on 1st October 2007. NETFISH was formulated to concentrate deeply on capacity building in fish quality management and conservation of aquatic resources at the grass root level by networking with fishermen societies, federations and other non-governmental organizations. The overall objective of NETFISH is to improve sustainable livelihoods in the fisheries sector and to make concrete progress towards meeting the goals in fisheries.

Organogram of NETFISH

Chairman, MPEDA heads NETFISH as its President. Chief Executive stationed at its head office in Kochi controls its activities in all maritime states with the help of State Coordinators positioned at each state.

Various Non-Governmental Organizations (NGOs) have been selected as members in NETFISH considering their credentials on conducting fisheries development programmes. Personals from these member NGOs were trained on various fisheries extension programmes with the help of reputed fisheries institutes/universities/departments/scientists, etc. and are utilized for conducting various extension programmes among fisher folk.

NETFISH Strategy

NETFISH designed its activity on a three tier system by (i) Giving a variety of training programmes repeatedly in selected places as an effort to change the mindset of people (ii) Practical demonstration of different aspects of hygienic handling of fish and conservation by organizing coastal cleanup programmes, mass boat cleanup programmes, biodiversity day celebrations etc. with the cooperation of member NGOs, stakeholders and Govt. officials (iii) Meetings and discussions with various concerned Government agencies like Harbour Engineering Department, State fisheries department, NFDB to develop infrastructural facilities at harbours and landing centers. NETFISH liaise with State as well as National level extension agencies to network and implement its goal much effectively.

Training Aspects

With the growing importance of total quality management in seafood production, post harvest handling has assumed paramount importance. Although India has world class seafood processing plants which take care of the final stages of post harvest handling, concerted efforts in the initial stages of the quality chain demand more interventions. There is a feeling among fishermen that due to lack of reach they are completely left out of extension programmes. They do not get vital information on the quality requirements in international seafood trade as well as newly emerging areas. Another issue is the depleting fish stock and destruction of marine ecosystems which are results of illegal and irresponsible fishing practices. There is a lack of proper awareness among the fisher folk about these issues and its long term impacts. Considering all these, NETFISH's extension training programmes were designed on two major aspects *viz*. Fish Quality Management and Conservation & Sustainable Fishing.

The Fish quality management includes hygienic handling of fishes onboard, harbours, landing centers and pre-processing centers, maintenance of good fish markets, production of good quality dry fish and hygienic harvest of fishes from aqua farms. The topics dealt in Conservation and Sustainable fishing are conservation of fishery resources through responsible and eco-friendly fishing practices, code of conduct for responsible fishing, conservation of mangroves, coral reefs and other protected organisms, marine pollution, etc.

Development of Extension Tools

In order to convey its message more effectively to the beneficiaries, NETFISH has developed and use various extension tools and methods in its training programmes. The conventional method of extension training through oration cannot be so effective always. In order to add variety to the training and reach the fishermen furthermore, NETFISH uses different mass communication techniques. NETFISH has so far developed a training manual, 5 documentaries, 3 animation films, 10 posters and 13 leaflets on different topics in ten languages to use in its training programmes.

Training manual:

A training Manual entitled '*Fish Quality Management and Conservation of Fishery Resources*' was published in 2010. This training manual provides a general understanding of the issue of fish quality management and conservation of marine fishery resources and can be used as a tool for people who are involved in the fisheries extension activities.

Leaflets:

- Juvenile Fishing
- Marine Turtles
- Onboard handling of Fishes
- A Good Fish Market
- Eco-friendly Fishing Methods
- Fish Handling at Landing Centers
- Responsible Fishing
- Bycatch reduction Measures
- Mangroves
- Coral Reefs
- Pollution at Fishing Harbours
- Fish Handling at Pre-processing Centers
- Ice and Fish

Posters:

- Today's Juveniles Tomorrow's Wealth
- Wash fish in good quality water
- Never carry fish in open and without ice
- Always use shovel to handle fish
- Carry enough ice when going for fishing
- Use solar fish drier for good quality dry fish
- Clean your boat before and after fishing
- No… No…I don't need this fish, you handled it unhygienically
- Fish : Ice - 1kg : 1kg
- Who spoiled it?

Documentaries:

- Hygienic Handling of Fishes Onboard
- Hygienic handling of Fishes in Harbours
- Responsible Fishing and Conservation of Fishery resources
- Hygienic harvest of Shrimps in Aquafarms
- Hygienic Handling of Fish in Pre-processing Centers

Onboard Training Programme

Animation Films:

- Good Practices for Better Price
- Conservation of Marine Resources
- An Escape to The Depths

Training Programmes

Since its inception in 2007, NETFISH has effectively spread its reach to an immense number of beneficiaries along the coastal villages of India through its regular and concerted awareness training programmes. During the four year period from 2007 to 2011, about 10,359 training programmes were arranged at selected fisheries pockets in the nine maritime states of India. The regular awareness programmes of NETFISH include Fishermen training programmes at onboard, harbour and landing centre, Pre-processing training programmes, Aquafarm awareness programmes and Dryfish awareness programmes. In order to augment its outreach, special programmes such as street play, free medical camp, harbour and coastal cleanup programme, procession and rally, mass communication programme, door to door awareness programme etc., were also included in the activities. Various effective extension tools like documentaries, animation films, leaflets, posters and radio programmes were made use to add variety to the conventional trainings. NETFISH officials and manpower from member NGOs were trained and updated on relevant subjects by organizing various trainer's training programmes and workshops so as to impart quality training to fishermen. Table 1 provides the year-wise representation of the types and number of training programmes conducted by NETFISH during the four years period. NETFISH studied in detail the general fish quality management standard of each state and identified the bottom level problems in this area. Based on the cultural, educational and social diversity of each state NETFISH modified its training programmes in such a way to suit the local need of the beneficiaries. As each state has its own problems regarding fish quality management and conservation of fishery resources, NETFISH gave prime importance to identify these lacunas. The various programmes conducted in the nine maritime states of India are given in Table 2. Table 3 depicts the special programmes conducted at the various regions.

Fishermen Training Programmes

These programmes are meant for providing awareness to fishermen on quality and conservation aspects at onboard, harbours & landing centers. The target group of these programmes

Fishermen Training Programme

Pre-processing Center Training

includes boat crews, fisher folks, auctioneers, buyers, boat owners and all other stakeholders who handle the catch at harbours and landing centers and the programmes were conducted at onboard, harbours, landing centers and fishermen villages. Regular need based fishermen training programmes were conducted at the selected areas in each state over the years which could bring out some noticeable changes in the mindset of fisher folks towards fish quality management and sustainable fishing. Now many of them understand the need for maintaining hygiene while handling fishes as well as the importance of conservation of marine resources for a sustainable future. The programmes included awareness on handling of catch in fishing vessel, harbour and landing centers, personal hygiene, boat maintenance and demonstration of proper use of cleaning and disinfecting agents, handling of fish and use of insulated box to maintain fish quality, MPEDA's assistance schemes etc. Through onboard training programmes a regular cleaning schedule could be introduced in many of the fishing vessels. Also many of the boat crews have started maintaining personal hygiene as well as handling the catch in a hygienic manner. Knowing the importance of ice in maintaining fish quality the fishermen now carries enough quantity of good quality ice while going for fishing and ice the material in 1:1 ratio. At harbours and landing centers a regular cleaning schedule was introduced so as to keep the harbour neat and clean. At many areas bamboo baskets used for carrying fish and ice were replaced by plastic baskets, which is necessary in view of quality aspects. To encourage the use of plastic baskets NETFISH has distributed a few numbers of plastic baskets to the beneficiaries at some selected areas.

Pre-processing Training Programmes

Hygienic handling of fishes at pre-processing centre is of utmost importance as it is the critical area where steps to the fish processing begin. There are several things to be taken care of while handling fishes in the pre-processing centers. Through NETFISH's training classes, the pre-processing workers are made aware on the need of personal hygiene, hygienic requirements in a PPC and the various hygienic handling methods to be followed in PPCs. Considerable changes were achieved in many PPCs as a result of these training programmes. The practice of floor peeling was completely stopped in many peeling sheds where the workers

Table 1. Year-wise representation of training programmes conducted by NETFISH

Year	Fishermen Training	Pre-processing centre training	Aquafarm Training	Dryfish training	Others	CC campaign	Boat Reg. Campaign	Total
2007-08	660	239	9	33	30	-	-	**971**
2008-09	1912	276	33	92	369	-	-	**2682**
2009-10	1889	238	90	112	497	875	-	**3701**
2010-11	1847	273	131	110	435	-	209	**3005**
Total	**6308**	**1026**	**263**	**347**	**1331**	**875**	**209**	**10,359**

Landing Center Training Programme

have now started peeling on stainless steel tables.

Dryfish Awareness Programmes

Fish drying is one of the oldest known preservation methods, and dried fish has a considerable storage life. Much of the small fish species caught are heavily salted and sun-dried. But there is a high level of spoilage due to unsuitable drying conditions, poor handling and packaging, insect attack etc. NETFISH conducted training and awareness classes for the dry fish workers in order to change

Table 2. Details of Training programmes conducted in the maritime states of India

Sl. No	Region	Fishermen Training Programme			Pre-processing	Aqua farm	Dry fish
		Quality	Conservation	On- board			
1	**Kerala**	856	345	81	448	-	-
2	**Karnataka/Goa**	344	290	37	31	36	92
3	**Maharastra**	260	242	22	63	18	43
4	**Gujarat**	358	218	25	100	-	43
5	**Tamilnadu**	634	666	105	93	11	-
6	**Andhra Pradesh**	332	191	40	140	17	64
7	**Orissa**	266	248	210	92	27	41
8	**West Bengal**	302	205	54	59	154	64
	Total	**3352**	**2405**	**574**	**1026**	**263**	**347**

Table 3. Details of Special Awareness Programmes conducted in various regions

Sl. No:	Region	Street plays	Medical Camps	Harbour/ coastal clean-ups	Procession / Rally	School progra-mme	Door to door progra-mme	Mass commu-nications	Others	CC Campaign	Boat Registration Campaign
1	**Kerala**	340	-	1	-	-	-	44	5	157	72
2	**Karnataka/Goa**	125	8	-	3	-	3	4	4	129	-
3	**Maharastra**	82	-	1	1	5	-	-	11	142	7
4	**Gujarat**	12	-	3	-	6	-	2	4	55	29
5	**Tamilnadu**	244	6	6	-	14	-	-	8	158	-
6	**Andhra Pradesh**	87	-	1	-	4	-	5	2	68	18
7	**Orissa**	23	1	-	-	-	13	1	36	105	58
8	**West Bengal**	126	5	-	1	37	12	4	8	61	25
	Total	**1039**	**20**	**12**	**5**	**66**	**28**	**60**	**78**	**875**	**209**

Dryfish Awareness Programme

their age old practice of drying fishes in unhygienic way such as drying on bare sand beds. They were made aware of the harm in using chemicals and pesticides while drying the fish. The dry fishers were urged to practice rack system for drying and to cover the dry racks with HDPE net to prevent the entry of birds, animals and flies to avoid contamination. They have been taught to pack the dry fish with polythene lined packet to retain the quality of material meant for human consumption. After attending the training programme noticeable changes are obtained, like using straw and net as bed for drying of fish, to minimize and avoid contamination with sand.

Aquafarm programmes

Majority of the shrimp in India's seafood export come from the aqua farms. The demand for aquaculture products are still high both in domestic and export markets. Hence quality management in aqua farms is of prime importance. Proper management of aquafarms throughout the entire production cycle is required for keeping the product in good quality. NETFISH's aquafarm programmes include campaign on farm registration with designated authority, campaign on Pre Harvest Test (PHT) for residual antibiotic (ELISA test) in Shrimp, chill killing of harvested shrimp, transportation of harvested shrimps from farm to processing plant in insulated boxes, abuse of antibiotics and other harmful chemicals and muddy smell on harvested shrimps, avoid soaking of black tiger, MPEDA assistance schemes etc.

Street Plays

In 2008, NETFISH had come up with street plays, a new tool to spread awareness on fish quality management and Conservation & Sustainable fishing. Street play blended with folk arts, folk songs and dance is an easy way to communicate with the common people. In each state a street play team was formed and they conduct street play shows regularly at fishermen villages, harbours, landing centers, beaches etc. The street play covers aspects such as cleaning of beach, landing centre and fishing harbour, hygienic handling of fishes and ice in harbour and landing centre, proper icing of catches, personal hygiene and habits of fisher folks, conservation of mangrove, avoid juvenile fishing, marine pollution, protection of marine environment, hygienic practices in

Aquafarm

Street Play

Medical Camp

Coastal Clean-up Programme

Rally

Mike Announcement

Mass Communication

aquaculture etc. NETFISH street plays get good response from fisher folks at all the maritime states.

Medical Camps

Besides various training and awareness programmes, NETFISH also organizes Medical Camps for the welfare of the fishermen communities. It is also a great tool for the NETFISH to gain wide publicity among the fishermen community as well as to create awareness on health problems and personal hygiene. In these camps, doctors examine the general health and various health problems of fisher-folks and free medicines are provided by NETFISH to the patients as per the advice of doctors. Free blood group determination, blood pressure check up etc. were also facilitated in these medical camps.

Harbour / Coastal Clean-ups

Marine or Coastal pollution is one of the major concerns that affect the quality and sustainable of fisheries resources. In order to create proper awareness among the public on the problem of dumping debris in fishing landing centers and beaches and to control it to maintain a healthy marine ecosystem, NETFISH has been conducting Harbour or beach clean-up programmes at regular intervals. The major objective of these programmes is to create awareness among the coastal community on coastal pollution and its adverse impact and to remove debris and other waste materials along the coasts and harbours for encouraging the local community in doing so. These programmes are usually carried out with the participation of students from schools and colleges. NETFISH will provide gloves and jute bags to collect the debris for safety removal. Sometimes ralleys are also conducted in association with these clean-up programmes in which the participants will hold banners, phrases and slogans about cleanliness and coastal pollution etc., to draw the attention of local people. The clean-up programmes envisage the creation of awareness among the coastal community on coastal pollution, causes of litter and their impact and removal of waste along the coast.

School Programmes

Now-a-days, socio-economic condition of the fishermen community is being improved gradually and they

School Children Programme (Painting)

Mangrove Plantation

Introduction of Plastic Baskets

are sending their children to the school for their proper education. NETFISH conducts awareness programmes for the students of high school classes along the coastal blocks, so that they can make aware their parents and other family members those who are engaged in fishing and allied activities in the coastal areas. The school lectures consist of sustainable fishing, different aspects of conservation aspects in the marine sector – protection of mangrove vegetation, marine turtle and fish seed of other varieties as well as the environment where they are dwelling. It also includes the present status of the fishery resources and exports of the States as well as of India, fish quality management and personal hygiene and habits. NETFISH also conduct various competitions on painting, speech etc. with regard to conservation and quality aspects were also conducted for students to encourage their participation.

Mass Communication

NETFISH has been using various mass communication media for the effective spreading of its messages. Mass media such as Doordarshan and All India Radio are being utilized as the best tools to pass the messages. These programmes will be beneficial not only for the marine fishermen community but will also be educative of common audience at large. NETFISH's mass communication programme also include mike announcements at harbours and landing centers, mass gathering of stakeholders etc. The fishermen would generally be busy at harbours with their routine work and will be reluctant to attend any training classes. In such situations, mass communication media serves as an efficient method by which the fishermen can listen about the various issues even while working.

Trolley Distribution

Conclusion

NETFISH has established as an important extension agency in India working exclusively among fisher folk. On an average 2500 training programmes are being conducted every year all over the maritime states in India by this agency. Development of agencies like NETFISH with the support of government and related organizations are highly essential in India considering vast fishing and fishery related activites of the country. Along with the awareness of fisher folk on quality and sustainable fishing, infrastructure development in the fishing sector particularly in the primary centers like fishing harbours and landing canters is also needed to bring rapid and noticeable improvements. ●

MPEDA teams up with Meghalaya for Ornamental Fish and Scampi development in the state

The Marine Products Export Development Authority (MPEDA), as a part of expanding its activities in the north east region of India has commenced its development activities for ornamental fish and scampi in association with the Department of Fisheries, Government of Meghalaya. In a meeting between Hon'ble Union Minister for Commerce & Industry and Textiles and the Hon. Chief Minister of Meghalaya during 9th December 2011, it was requested that MPEDA may take up aquaculture in Meghalaya along with the State Fisheries and Agriculture Departments.

A follow-up meeting was organized in the Meghalaya Secretariat on 15th December 2011 under the Chairmanship of Shri P B O Warjri, IAS, Additional Chief Secretary. The meeting was co-chaired by Dr. A Jayathilak IAS, Chairman, Spices Board and Shri K N Kumar, IAS, Principal Secretary, Fisheries, Govt of Meghalaya. MPEDA was represented by Mrs. Asha C Parameswaran, Dy. Director, RO Kolkata, Mr. Dilip Kumar Biswas, Dy Director, SRC, Kolkata and Dr. T R Gibinkumar, Asst Director, SRO, Guwahati. Officials from Spices Board, Rubber Board, Department of Horticulture, Department of Soil and Water Conservation and State Bank of India also attended the meeting. It was decided that MPEDA and Dept of Fisheries will jointly organize a day's workshop at Shillong for the state fisheries officials and chalk out the action plan on development of ornamental fish and the aquaculture of varieties possible for Meghalaya.

Accordingly, a one day workshop was organized on 10th January 2012 on

the topic "***Emerging Entrepreneurial Opportunities in Ornamental Fisheries and Scampi Culture in Meghalaya***". The MPEDA officials represented in the workshop included Mrs. Asha Parameswaran, Dy. Director, RO, Kolkata, Mr. D K Biswas, Dy. Director, SRC, Kolkata, Dr. T R Gibinkumar, Asst. Director, SRO, Guwahati and Mr. Subenthung Odyuo, Programme Manager- OFD (NE Region)

The programme started with the welcome speech of Mr. N D Sangma, Director of Fisheries cum CEO, Fish Farmers Development Agency, Meghalaya. In his opening remarks Mr. K N Kumar, IAS, Principal Secretary, Fisheries Govt. of Meghalaya gave a brief outline on the activities of Fisheries Department. He has informed that the state will soon launch the of *Aquaculture Mission*, which will be a convergence of human, technical and financial resources towards the progress of fisheries in the state.

The following presentations were made by MPEDA Officials in the Workshop.

MPEDA – Export with Sustainability by Mrs. Asha Parameswaran, Dy. Director

Scampi Aquaculture Techniques by Mr. D K Biswas, Dy. Director

Ornamental Fish and its importance by Mr. Subenthung Odyuo, Programme Manager- OFD

MPEDA schemes for Entrepreneurship in Ornamental Fisheries by Dr. T R Gibinkumar, Asst. Director

Seabass Aquaculture & its Possibilities by Mr. D K Biswas, Dy. Director

A good gathering of officials from the Department of Fisheries including Additional CEO, FFDA, Fishery Information Officer, District Executive Officers, Sub Divisional Executive Officers, Research Officers, Farm Superintendents, Fisheries Programme Managers, Fishery Officers, farmers and entrepreneurs from the seven districts of Meghalaya attended the workshop. The event was given wide coverage in the print as well as visual media.

Discussion on the possibility of introducing scampi in suitable areas in Meghalaya was made during the open house session and sea bass has been taken as another candidate species having potential for development. DD, SRC Kolkata explained the minimum requirements for scampi culture that called for a survey of the potential areas and subsequent demonstration programme in suitable areas. For ornamental fish sector development in the Meghalaya, the Principal Secretary appealed all possible assistance and expertise from MPEDA. The Secretary was convinced on the structure of subsidy schemes for ornamental fish development but remarked that back end subsidy system cannot succeed in Meghalaya due to many reasons and to over come this, initiatives will be taken from Government side in order

to kick start the ornamental fish projects.

Following decisions were taken on scampi and ornamental fish after the deliberations made during the work shop.

1. MPEDA to arrange a training programme for selected fishery officials on scampi culture techniques.
2. MPEDA to produce economics on scampi culture for inclusion in Aquaculture Mission statement of Meghalaya Govt.
3. MPEDA involving the fishery officials to undertake a survey to identify the potential areas for scampi culture development in Meghalaya.
4. Study need to be conducted to identify the indigenous prawn varieties in Meghalaya and assess their culture possibilities.
5. In the case of seabass, more studies are required to find its suitability to Meghalayan waters.
6. Department of Fisheries to assist MPEDA to conduct awareness programmes on ornamental fish in seven districts in two phases on cost sharing basis.
7. Survey to identify the potential areas for ornamental fish culture in Meghalaya and for the resource mapping of indigenous ornamental fish species in Meghalayan waters.
8. MPEDA to arrange training programmes as well as exposure visits for selected fishery officials and entrepreneurs on scampi and ornamental fish activities. As per - this decision, a team of officials visited Kolkata during mid - January 2012 to have a look at the scampi farming and ornamental fish culture activities.
9. MPEDA to decide on the possibility of setting up of ornamental fish park in the state for which the land will be provided by the Department of Fisheries. On this decision the Chief Secretary of Meghalaya has written to MPEDA expressing their interest to provide land. ●

MPEDA and Department of Fisheries undertakes sample survey for indigenous ornamental fishes in West Khasi hills, Meghalaya

The West Khasi Hills, 90 km away from Shillong, is an abode of various indigenous ornamental fishes. As per the decisions taken in the recent workshop by MPEDA, a field visit to Mawkyrwat division of West Khasi Hills on 11th January 2012 was undertaken by MPEDA officials, Mrs. Asha Paremeshwaran, Dy. Director, RO, Kolkata, Dr. T R Gibinkumar, Asst. Director, SRO, Guwahati and N Subenthung Odyuo, Programme Manager (OFD), NE Region. The team was led by Officials of Department of Fisheries, Mr Rudolf Pakyntein and Mr Hapanjob Lyngdoh. The main objective was to conduct a sample survey of the potential hill streams of Mawkyrwat in West Khasi Hills and identify the indigenous ornamental fish species. A group of local fishermen were engaged for sample collection. The fishermen used iron crow-bar to lift the rocks and then used an indigenous scoop with metallic net (*Khwar*) to catch the fishes. The sample fishing was continued for about 90 minutes at different areas on the upstream waters of Rilang River.

Gagata gawshuah

The studies indicated the species richness of Meghalayan hill steams. Field identification conducted on site revealed 9 species belonging to 6 genera viz., *Gagata* spp, *Schistura* spp, *Nemachelius* spp, *Mesonemachelius* spp, *Lepidocephalus* Spp, and *Glyptothorax* Spp. And the fishes in the areas were found to live in rocky pools of torrential streams in cold temperature regimes. ●

QUALITY FRONT

Cadmium in Cephalopods – back to basics

Dr. Anikuttan.K.K,
Assistant Director, MPEDA, RO, Veraval

The global seafood trade has been badly affected in the recent past due to rejection of consignments containing objectionable levels of cadmium, and the Indian seafood industry was not an exception to this phenomenon. There have been many studies on the issue and now a plethora of information is available about various aspects of cadmium toxicity. This article is an effort to consolidate and present some basic information which could be useful for all the stake holders concerned.

History of cadmium toxicity

Cadmium as a pollutant gained worldwide attention with the outbreak of "*itai-itai*" disease in villages on the banks of the Jintsu river, Toyama Perfecture, Japan, in the 1940's. The name "*itai-itai*" (meaning "*ouch-ouch*") was so given in accordance with the patients' "shrieks" resulting from painful skeletal deformities as the bones become weak and sometimes breaks. It begins with pain in limbs and later on affects kidneys, which after a few years, results in skeletal pain in the whole body and ease of bone fracture. It is estimated that approximately hundred deaths occurred until the end of 1965 in Japan. The cause of the disease was traced to the consumption of Cadmium contaminated rice from fields irrigated by the water from Jintsu river which was polluted with the effluents from a nearby zinc mine named Mitsui Mining and Smelting Co. The causes of the disease were not well understood up to 1946 and it was thought to be simply a regional disease or a type of bacterial infection. In 1955, Dr. Hagino and his colleagues suspected Cadmium as the cause of the disease. The investigations started by Toyama Prefecture in 1961 revealed that the Mitsui Mining and Smelting's Kamioka Mining Station caused the Cadmium pollution and that the worst affected areas were 30 km downstream the mine. Twenty-nine plaintiffs, consisting of nine victims and 20 family members of victims, sued the Mitsui Mining and Smelting Co. in 1968 in the Toyama Prefectural court. In June 1971, the court found the Mitsui Mining and Smelting Co. guilty. Subsequently, the company appealed to the Nagoya District Court in Kanazawa, but the appeal was rejected in August 1972. The Mitsui Mining and Smelting Co. agreed to pay for the medical care of the victims; finance the monitoring of the water quality performed by the residents; and pay reparations to the victims of the disease.

How it affects living organisms?

Cadmium has a high solubility in sea water (up to 1000 ppm) compared to other metal pollutants, which further aggravates the toxicity of this metal to the aquatic fauna and flora. The toxicity of Cadmium is due in part to its competition with essential metals for binding sites and also its interference with sulfhydryl groups, which are essential for the normal functioning of enzymes and structural proteins. Owing to its long biological half-life, Cadmium is considered to be one of the most harmful heavy metals and the potential for exposure has increased with increasing industrial use of this metal. Results of the studies on toxic

intracellular processes show that metals are transported through the biological membranes and interfere with biochemical functions. Studies have also revealed that Cadmium sensitivity and bioaccumulation capacity are greater in marine invertebrates than in marine teleost fishes. The variation in the toxic nature of Cadmium to different species of organisms is dependent upon a number of physiological characteristics and the presence of conjugating enzymes.

Living organisms have evolved several defensive mechanisms to overcome the Cd^{2+} toxicities. In eukaryotes, cells sequester Cd^{2+} as biologically inactive forms with cysteine-rich peptides such as Glutathione (GSH), phytochelatins and/or metallothioneins.

Sources of Cadmium

The major sources of this metal are mining and metallurgical operations, refining of Zinc, Lead and Copper, electroplating industries, automotive tyres, pesticides, fertilizers, petrochemicals, fly ash, paints, plastics, photography, textile printing, batteries, leather tanning and sewage sludge. Studies have revealed that, the amount of Cadmium released into the environment from human activities has actually been about 10 times greater than the amount predicted from natural sources.

Future Perspectives

It is generally observed that cephalopods accumulate remarkable amount of heavy metals like Cadmium, and hence can also act as vectors for the transfer of Cadmium to higher marine predators. However, if the organ-wise residue retention of Cadmium in cephalopods is compared, the edible parts account for a meagre share only, where as the organs like liver, gut, eyes etc. have higher residue retention. The least concentrations seen in the edible parts of cephalopods might be the reason of cadmium toxicity not reaching the proportions as that of "*itai itai*" disease. However, chances for such situations cannot be ruled out if effective measures to check environmental pollution as well as unusual handling practices are not undertaken. The concept of eco-friendly industrialization and responsible processing methods could ensure the safety of this seafood commodity that is relished across the global markets. ●

AQUACULTURE SCENE

Advanced international workshop on Shrimp Pathology organized by RGCA (MPEDA) - A technical brief

Dr. Al. Muthuraman,
Deputy Director (SOC), MPEDA, Kochi

1. INTRODUCTION:

The Rajiv Gandhi Centre for Aquaculture (RGCA) the Research & Development arm of MPEDA organized two workshops on shrimp pathology, one at basic level and another on advance level during 14th & 15th and from 14th to 19th November 2011 respectively in collaboration with experts from Aquaculture Pathology Laboratory of University of Arizona, USA. The basic programme was attended by 61 participants and advance programme was attended by 22 participants from hatcheries, PCR laboratories, National Fisheries Development Board, Central Institute of Brackish water Aquaculture, MPEDA, RGCA , NaCSA and State fisheries department of Kerala. The faculties were Dr. Carlos Pantoja and Dr. Linda Nunan, Scientists of Aquaculture Pathology Laboratory of University of Arizona, Tucson, USA.

A report on the Workshop was published in the December 2012 issue of this Newsletter.

2. BRIEF OF TECHNCAL SESSIONS

A. Anatomy of a penaeid shrimp

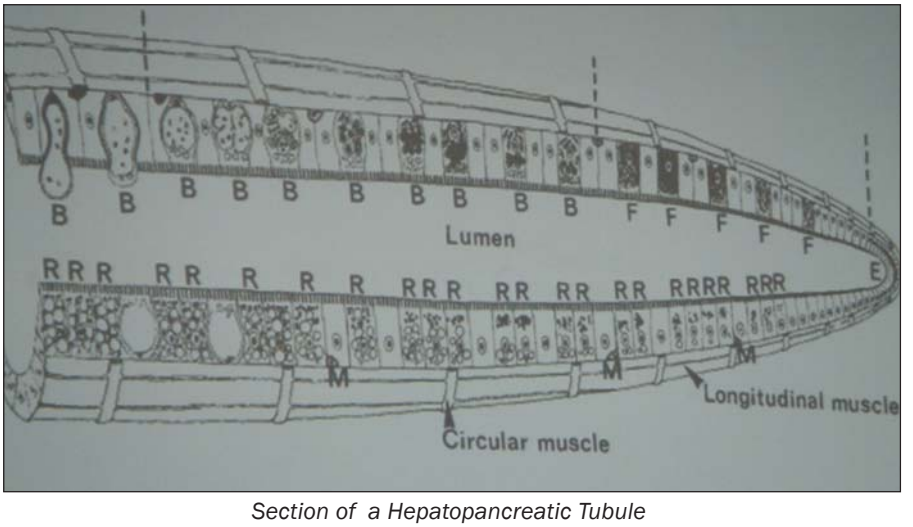
Dr. Carlos Pantoja in his session explained various organs of shrimp; starting with mandible, LabIum, Pragnatha Oesophagus, Anterior larger Stomach, posterior smaller Stomach, Anterior Midgut Caecum, Hepatopancreas, Intestine, Nervous system with Supra Oesphagical Ganglion and Ventral nerve cord, lymphoid organ and tubules, haemtopoietic tissue, antennal gland, heart and reproductive systems. The details of hepatopancreas such as enzyme producing producing/ developing 'E' cells, ribosome rich 'F' cells, vacuolated enzyme rich 'B' cells and lipid droplet rich 'R' cells were presented by Dr. Carlos as below

The presence of cuticle in the stomach and posterior hindgut, the development stages of female and male reproductive system, gills and its lamellae, haematopoietic tissue and lymphoid organ and the shrimp body muscles namely myosin rich skeletal, abdominal muscles and the short heart muscles were described by him.

B. Major types of diseases affecting penaeid shrimp and methods used for diagnosis

Dr.Carlos described the shrimp diseases as the adverse alteration in the health or culture performance of individual or population. Among the shrimp diseases affecting shrimps, the major ones are infectious transmittable infections caused by pathogens like viruses, bacteria, fungi, protozoan and metazoans and the minor non infectious diseases caused by non transmittable agents like nutrition deficiency and by toxic and environmental agents.

Among the major diseases affecting shrimps are by Viruses, Bacteria, Fungi, Protozoa, and Metazoans both western and eastern hemisphere .Among them viral infections caused 65% of losses of shrimp crop in the world. The estimated losses due to White Spot Syndrome Virus(WSSV)alone amounts to US $ 8 billion in Asia & America till now while Taura Syndrome Virus (TSV)caused a loss of US$ 3 billion, Infectious Myonecrosis Virus(IMNV) caused a loss of US$ 1 billion through out the world .The Yellow Head Virus,



Section of a Hepatopancreatic Tubule

Infectious Hypodermal and Haemtopoietic Necrosis Virus (IHHNV), Yellow Head Virus (YHV), are few more viruses causing losses in shrimp farm extensively.

The Organization of International Epizooics(OIE) listed economically important WSSV, TSV, IMNV, YHV, IHHNV as the major shrimp viruses while delisted Baculovirus Penaei (BP), Monodon Baculo Virus (MBV) and NHP in 2009 & 2010 since they do not cause much economic losses.

Generally, the penaeid viruses have multiple strains /genotypes 6 in YSV, 4 in TSV, IHHNV and BP 3 in Hepatopancreatic Parvovirus (HPV) while WSSV has single strain. Among viruses affecting shrimps IHHNV, HPV, SMV, LPV, BP, MBV, BMN, WSSV are DNA viruses while TSV, YHV, IMNV are RNA viruses either with single or double strands. The WSSV is biggest virus in size followed by MBV, BMV and YHV.

The diagnosis of disease is the determination of the disease while surveillance or screening i.e. determining the absence or prevalence of disease .The diagnostic tools available to identify the shrimp pathogens are external and clinical sign analysis of shrimps, microscopy, histology, bioassay, antibody based tests, chemical tests, toxicological analysis, molecular tests, sequencing and tissue culture. In case of noting the external clinical signs the basic details of history of stock, gross signs, unusual behaviour and mortality rates of the stock are to be noted.

C. Fixation and processing methods for laboratory analysis of penaeid shrimp

Dr. Carlos in his presentation explained the methods of dissection of shrimp adult and larvae (Annexure -1).He described the methods of histology such as dehydration, embedding, sectioning, staining, storing and examination of slides .He emphasized that the shrimp samples having signs of disease of interest in live conditions in moribund or normal form could be euthanized by Davidson's Fixative. The fixative could be injected to adult shrimp in its hepatopancreas and in organs of interest. The normal storing time of tissues is between 12 and 24 hrs for Post Larvae, 24 hrs for juveniles and 48 hrs for adults and brood stock. If the animals are more than 1 gram weight, injection could be carried out in hepatopancreas, lymphoid and among abdominal segments. Shrimps above 12 gram can be transversely cut in abdomen and cephalothorax and preserved. The labeling of tissues/ animal with date, species, gross observations, age source are to be indicated in sample collection bags / pouches /containers using pencil. International Air Travel Association

regulates the exempt Animal specimen transport for cargo transport of shrimp samples .It includes storage of tissue or animal in primary plastic container of leak proof nature with secondary and tertiary covers to avoid the leaks further. For Polymerase Chain Reactions (PCR) gills, appendages, whole shrimp, could be fixed in 95% ethanol. The tissues for PCR analysis could be fixed in 70% ethanol for 12 hrs and covered in paper towel and to be kept in a plastic bag with small amount of ethanol with labels.

D. Shrimp diseases: Prevention and control

Among the shrimp diseases **Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV).and Runt Deformity Syndrome (RDS)** caused high mortalities in early stages of *P. stylirostris* and affects *P.monodon, L.vannamei* too; transmits through eggs and ova;affects nervous system; creates runt is occurring in rostrum, tail and in between cephalothrax and abdomen;the IHHNV resistant *P. stylirostris* being developed in New Caledonia & Mexico recently and IHHNV could be preventable by selecting good broodstock. **Taura Syndrome Virus (TSV**)was identified in *L.vannamei* farms near Taura river in Ecuador; in acute phase causes necrosis of shell, stunting of ecdysis followed by chronic phase in which molting occurs and shrimp dies; it is transmitted by seagulls ; availability of SPF/SPR strains improved the culture performance against TSV. **Infectious Myonecrosis Virus (IMNV)** affect the Post larvae, juveniles and sub adults of *L.vannmaei* ; IMNV creates tail cramp and reddening of the fifth abdominal segment, low survival of shrimps and can be controlled by proper pond management but it is not preventable . **White Sport Syndrome Virus (WSSV)** affect all penaeids, carried by insects and birds; It survive in dormant rotifer eggs for longer time and cannot be removed even after cooking of produce at 100Ú C for 30 minutes in frozen shrimps; the WSSV on acuteness seen as white non removable spots in the cephalothorax shell; the hyperthermia of WSSV challenged *L.vannamei* seeds at 33Ú C reduce the vigour of WSSV and prevent the further transmission ; the development of SPF/SPR strain are on anvil in different countries against WSSV in *P. monodon* presently; **Yellow Head Virus (YHV)** affects *P. monodon, L. vannamei, P. aztecus* & *P. setiferus*; on challenge tests with SPF L.vannamei to YHV the survival is good up to 10 days but the shrimps die maximum in 14 days of post exposure. Penaeid Baculovirus Diseases are caused by **Monodon Baculovirus (MBV), Baculovirus Penali (BP) and Baculovirus mid gut Necrotic Virus (BMN);** they affect the zoea, mysis & Post Larvae can be excluded by disinfection of eggs and nauplii. **Necrotizing Hepatopancreatitis (NHP)** a rickettsia type bacterium affects Post larvae and adults; it can be controlled in farms by applying medicated feeds with Florofenicol. The **Vibrio, Luminescent Vibrio Cytophaga and Flexibacterium** are other bacteria affect the shrimp seeds in hatcheries; they colonization externally/ internally or creates septicemia and muscle atrophy; creates luminescence, swelling of mid gut and necrosis of shell and appendages; they can be controlled by water exchange and medication; **Septic Hepatopancreatic Necrosis, Bacterial Shell Disease, Systemic Micrococcus** infections are other diseases affecting the survival of *P. monodon* in farms, which can be controlled by using medicated feeds; while the **Idiopathic Hyaline Granulamatous syndrome (IHGS)** affects larger tiger shrimps led to partial ecdysis followed by death which requires development of prevention tools; the **Swollen Hindgut Syndrome** of *P.monodon* noted in India due to dark swelling of gut in the 6th abdominal segment relates to slow growth was found due to mineral deficiency in farms and could be regulated by adding minerals in the feed.

E. Issues and concerns when developing a Bio-security plan for a facility, country or Region.

Dr. Carlos described the Bio-security in Aquaculture as the means of practice of exclusion of specific pathogens from cultured stocks at brood stock facilities, hatcheries and farms or from the entire regions or countries to prevent the occurrence of economically important diseases. The disease is the expression of pathogen with equally potential support from the host and environment. Exclusion of them from the preventable pathogen control and reduce the occurrence of disease.

Practically the bio-security plans are operated by identifying the risk and placing methods at proper mode to reduce risks (such as designing of facilities, development of Standard Operating Procedures, use of high health / Specific Pathogen Free / Specific Pathogen Resistant stocks) doing routine surveillance and by implementing contingency plans.

The degree of risk is quite high if import of untested live and frozen shrimp from effected zones was done while use of untreated/filtered source water and cooking/drying /processing of crustaceans also pass the moderate to low risk of infections respectively.

The components of bio-security includes the understanding the knowledge of diseases, list of

excludable pathogens, having adequate diagnostic methods, use of clean shrimp stocks, assurance / surveillance of cultured stocks through continuous screening, environmental control, disease containment, eradication and disinfection and effective culture management practices .Even in perfect physical bio-security plan and farm design if infected stocks are used, the outcome like to cause disease.

Under OIE list, the excludable Pathogens are classified under C-1 Category mainly TSV, WSSV, IMNV, YHV &GAV which causes diseases, having a limited/geographical distribution causes significant production losses, have cost effective exclusion methods and having diagnostic/screening tools accurately to deductible. The C-2 category pathogens are significant loss producing pathogens namely YHV, GAV, LOV, IHHNV, DP, MBV, IMNV, BMV, HPV, Microsporidians, Haplosporidians which are to be excludable and C-3 category excludable pathogens like Gregarines are to be avoided in breeding programmes. The Referral Laboratories for shrimp disease diagnosis by OIE are:

1. Prof. Dr. D Lightner, Aquaculture Pathology Laboratory, University of Arizona, Tucson, USA on all Shrimp Viruses.
2. Dr. P Walker, Australian Animal Health Laboratory, Geelong Victoria, Australia on YHV
3. Prof. T W Flegal, Centex Shrimp, Faculty of Science, Mahidol University, Bangkok on WSSV
4. Dr. Grace Lo, Department of Life Scienc, Institute of Zoology, National Taiwan University, Taipei,Taiwan on WSSV
5. Dr. A S Shahul Hameed, Aquaculture Biotechnology Laboratory, Dept of Zoology, C AbduL Hakkem College, Melvisharam, Tamilnadu,India on Scampi White Tail Disease

A Specific Pathogen Free (SPF) stock means a domesticated line or stock of shrimp subject to a routine surveillance program carried out under the supervision of an approved diagnostic laboratory for not less than 2 years and demonstrated to be SPF for OIE/USMSFP listed pathogens. The Specific Pathogen Resistant (SPR) stocks are challenge test resistant domesticated stocks classified under OIE/USMSFC programmes.

Normally, the SPF stocks are produced from wild stock after screening followed by captive breeding programmes. The collection of wild stocks should be based on guidelines for Aquatic species under International Council for Exploration of stocks (ICES). The ICES specify the identity of species, allow evaluating its health/ disease status, allow to import, produce the stock, rear and sell them. It is done in three phases of quarantine screening namely the Primary Quarantine in which screened wild stocks are used for production of first generation stocks and transferring them to Secondary Quarantine in which disease free stocks are reared and bred to produce second generation stocks and supplied to Brood Stock Multiplication Centres and hatcheries. The quarantine facilities could be dependent or independent of Tertiary Quarantine (TQ). The TQ operates to screen the stocks and its operation depends upon the supplier whose role could not be controlled by the TQ operator on schedules of supply. The difference between the dependent and independent TQ alongwith advantages and disadvantages and structure and operation of quarantine facility was presented by Dr.Carlos.

In case containment of diseases in farms, the routine surveillance system should be carried out by depopulation, follow dry out and crop holiday periods. In case of countries like Australia which has strict bio-security, Sanitary and Phytosanitary Controls there is a law on prohibition of import of live / frozen shrimps from disease prevailing countries to avoid the containment or control of disease spread.

F. Disease Diagnostic Methods: Examination in the field

The disease diagnostic tools to examine the cause of disease specifically used in farms are checking the history of species, source of seeds gross clinical signs, unusual behaviour and mortality rate, observation in the wet mounts prepared at field ,noting of clotting time of haemolymph, bacterial culture, antibody test kit usage and preservation samples for histology and PCR .The gross signs to be noted in the shrimps in farms are activity of the shrimp as swimming behaviour such as active or lethargic or moribund movement. The signs like presence of cramped muscle, cuticle deformities, melanised cuticle deformities in the rostrum, telson, tail fins, walking and swimming legs, broken appendages, body discoloration with or without black sports ,gill discoloration, consistent muscle capacity (flaccid or soft),status of mid gut (full / partially full / empty)are to be noted .The presence of melanised spots in the abdomen suggest the cuticular vibriosis or TSV or NHP ; discoloration last abdominal segment denotes IMNV while irregularies in rostrum state it as IHHNV.If the clotting time of haemolympth exceeds 2 minutes from average 1 minute duration specify TSV, vibriosis or IHHNV.

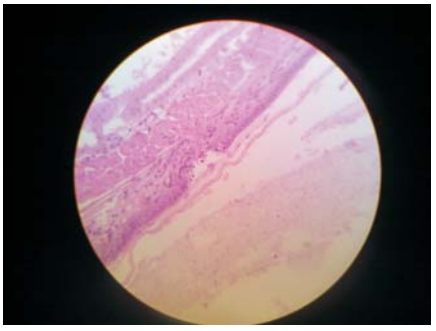
External examination of hepatopancreas denotes IHHNV if it

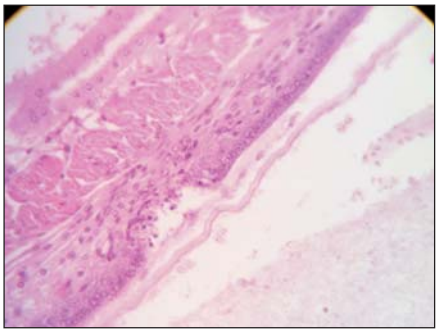
is atrophied and bulky lymphoid organ suggests IMNV.Unstained or stained wet mounts in slides states the classification of grades of severity of infection such as absence of parasites or infection as Grade 0 , the presence of epicommensals or parasites and could be below the deduction level as Grade trace ,insignificant presence of pathogen as Grade -1 low or moderate presence of pathogen with slight mortality as Grade-2, moderate pathogen / parasite presence with potentially lethal progress of loss as Grade -3 and high pathogen /parasite presence with serious losses externally as Grade -4.In the wet mounts of hepatopancreas occlusion bodies denote SP / MBV / melanised tubules suggest NHP.The fouling of gills with Leucothrix mucor or Zoothamnium could be easily diagonosed and the presence of gregarines in mid gut could be observed also. The presence of melanized uropod or cuticular epithelium of stocach suggests TSV.

Bacterial culture of haemolymph or tissue extracts in marine agar/TCBS Agar /Mueller-Hinton Agar could show the presence/absence of green/ yellow vibrio colonies. The use of DOT-Blot test using shrimple test kit provide the presence of WSSV virus if the levels care 2 million base pairs of DNA of WSSV in the shrimp in the field but the low level presence of WSSV could be accurately deducted only through 2-step PCR that could deducted 20 base pairs.

G. White Spot Syndrome Virus – White Spot Disease - WSSV

WSSV was identified in 1993-94 in China and accepted by OIE in 2000 and confirmed by the International Committee on Taxonomy of Virus in 2005 as virus under family Nimaviridae under genus Whispovius ie with tail. It is a double stranded DNA virus having a size of 80-120X250-380 nm size with a nucleocapsid of 58-67X230-350 nm. It is having 531 Open Reading Frames (ORF) for 181 functional protein molecules. Physically it is elliptical rod in shape with a tail. It replicates its 305 Kilo Dalton-KD super coiled DNA molecule having a density of 1-18 to 1.25 g/ml. The haemolymph of WSSV affected shrimp takes longer time. On actute phase of WSSV the level of base pairs in whole head of shrimp is 25 milion base pairs of DNA while pleopods have maximum level of 4700 million base pairs. The WSSV become a pandemic in 1992 to 2001 and flattened the tiger shrimp production. The estimated loss due to WSSV is around US$ 8 billion. The WSSV is having 104 hosts and carriers such as cray fish, crabs, Artemia cysts, lobsters, rotifers and seagulls. It entered Americas due to intra regional trade of nauplii and reprocessing and marketing of frozen shrimp. In Australia, it was reported the WSSV outbreak linked to use of imported frozen shrimp to feed the broodstock.





Cuticular epithelium with granular inclusion bodies of WSSV infected shrimp

The affected shrimps die within 3 days after sudden reduction on feeding, lethargic become red colour, have soft shell with culmination of white sports of 0.5 to 2 mm dia. WSSV affects cuticular epithelium, allows to develop granular inclusion bodies, which grow bigger, creates necrosis in lymphoid organ and occlusion bodies develop within the cells with marginalized nuclei. It affects stomach, gill filaments, antenna; glands, lymphoid organ, muscle and haematopoietic tissue. Increase of bio-security, exclusion of wild vectors, reduction of water exchange, use of SPF stocks, avoiding cold seasons for stocking and use of green house reduce the WSSV spread. The grades specifed in test kits could help to grade the levels of WSSV only for surveillance but not for screening.

H. Infectious Myonecrosis Virus-IMNV and Penaeus vannamei nodvirus - PVNV

IMNV was emerged in 2002 in vannmaei in Northeastern Brazil, and listed in 2007 in OIE. IMNV is a small 40 nm size virus with 7.7 kb double strand DNA with a weight of 106 KD with 1.369 density / ml. IMNV has 7650 base pairs, with two ORFs and its plasmid has 993 base pairs at ORF-1. The alignment of IMNV has an affinity with GLV (Giardia Lambra Virus a protozoan virus) with bootstrap value of 83% under Baynesian Evolutionary Analysis by sample Trees (BEAST). It caused more than US$ 1 billion loss from the period of discovery. The IMNV caused serious loses in 2004-06 in Brazil and later in Indonesia and identified in 2009 in Vietnam.

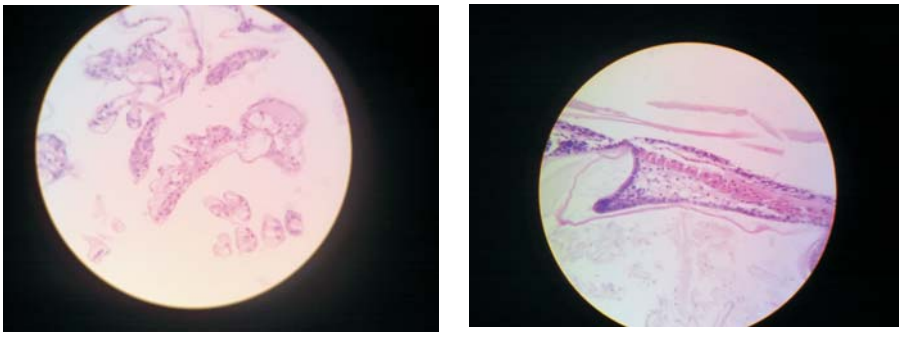
In histology, hemocytic inflammation, presence of spheroids in lymphoid organ, presence of pale basophilic cytoplasmic inclusions, presence of ectopic spheroids outside

lymphoid organ, coagulative muscle necrosis with edema in the abdominal and tail muscles are the characteristics of IMNV. The IMNV is present in frozen shrimp tissues, experimentally infected shrimps gill, tail, pleopid and in haemolymph IMNV affects PL, juveniles and sub adult, *L.vannamei* has white foci in muscle, have progressive necrosis in tail fan has enlarged lymphoid organs, led to low survival rates (30-40%) opacity of muscle, red coloration of tail are few marks of IMNV. Laboratory infection of IMNV inoculum shows the presence/ death in *L.vannamei* but not muscle coagulation. The horizontal transmission occurs due to cannibalism and is vertically transmitted too.

The screening of IMNV through nested reverse transcription polymerase chain reaction (RT-PCR) could develop less amplicons only but the Tati man real time reverse transcription PCR (QRT-PCR) could identify more It was observed nested RT-PCR could identify copies only upto 1097 copies microliter while QRT PCR could identify even if 5 copies of IMNV is present per microliter . The PvNV virus is similar to IMNV in all aspects and it infects *L. vannamei* both in nature and in experiments but not virulent and could be differentiated only by RT PCR.

I. Infectious Hypodermal and Hematopoietic Necrosis Virus-IHHNV

IHHNV is also called Runt Deformity Syndrome (RDS). It was discovered in 1981 affected *L. stylirostris* juveniles and caused RDS in L.vannamei in 1991; IHHNV as integrated form was noted in *P. monodon* It is a single strand DNA nuclear replicating with a size of 20-22nm; its 3909 base pairs are in 3 ORF and in 3 to 4 lineages. Out of 3 strains of IHHNV, type II found in vannamei and monodon is infectious while type -1 and type III are non-infectious and found in monodon. The non-infectious integrated IHHNV was identified in *P. monodon*. It has no inclusion body, found hemophilic cells in antennal gland, haematopoietic tissue, gills and nerve cord.



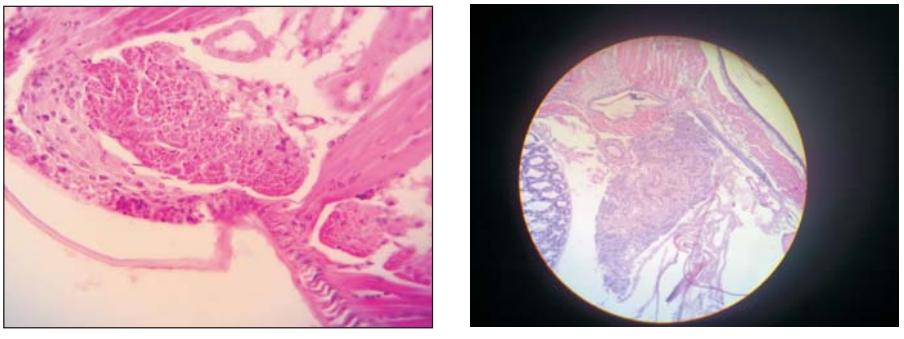
Gill Lamellae and Haemtopoietic tissue affected with IHHNV

It was identified in Thailand and found in Americas and the infected juvenile shrimps die within 40 days of stocking; it affects the PL 35 up to 20 gm sub adults. IHHNV effects create deformities in rostrum and has acute blue pigmentation. It is vertically transmitted through eggs, sperms and also through horizontally too. In vannamei it creates cuticular deformities led to mortality led to crop loss; the survivors in the farm found to be chronic carriers and in broodstock it is carried through oocytes and spermatozoa.

J. Taura Syndrome Virus (TSV)

TSV was identified near farms adjacent to Taura river in Ecuador in *L.vannamei* in 1991 and found in Asia in 1999, and affects seriously *L.vannamei* led to pandemic crop loss. It is a single strand RNA virus having cytoplasmic replicating habit through its 31- 32 nm size virus. The RNA of TSV is having 10250 base pairs in 2 ORF; it is having 4 genotype and 3 strains.

Externally it creates cuticular de-ecdysis during molting, led to cuticular necrosis and melanaised spot formation followed osmotic failure in the intermediate stage and end of molting and death in the chronic phase Its levels are high in tail, gills, uropod, shell of abdomen and cephalotherax. The etiology of the virus could be seen through necrosis of cuticular opithelium of stomach with pycnotic carryorhytic nuclei, in histology. It could be detected easily by RT-PCR of haemolymph. TSV affects lymphoid organ led to atrophy. The infected shrimps, float and eaten away by sea gulls. The SPF of L.vannamei against TSV already been produced through out world however RNA of TSV is



Necrtotic cuticular epithelium of stomach and atrophied lymphoid organ by TSV

highly mutable.

13 Baculovirus diseases of penaeids

Monodon baculovirus (MBV), Baculovirus penaei (BP) and Baculovirus mid gut necrosis (BMN) are present in both hemispheres and in *P.monodon* .Baculoviruses are occulated single enveloped rod shaped double strand DNA viruses replicates in nucleus , affects zoea, mysis and PL led to mortality. It affects hepatopancreas, could be identified as spheroid occultation bodies in nuclear of cells of hepatopnacreas, found in mid gut and faces. The MBV break and kill the cells and seeds. However the infection does not create serious economic losses presently and could be excluded by clear egg / nauplii wasting.

J. Hepatopancreatic Parvovirus (HPV)

HPV was identified in 1982 and is found monodon and vannamei. It is a single strand DNA virus; affect larvae, PLs and juveniles, creates lesions in hepatopancreas, transmitted vertically through eggs.

K. Yellow Head Virus – Complex diseases (YHV,GAV & LOV)

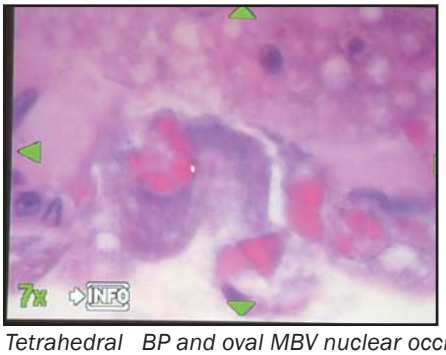
It was found in 1995 It is a RNA virus, replicates in cytoplasm found as enveloped a spike shape cap The YHV is found eastern Asian countries led to loss of US$ 0.5 billion worth of crop of vannamei; affect the gill lamellae lymphoid organs F cells of HP, heart connective tissue and anterior mid gut caecum. It creates yellow hepatopancreas, transmitted vertically through other crustaceans. The necrosis of lymphoid organ and connective tissue could be identified by RT-PCR.

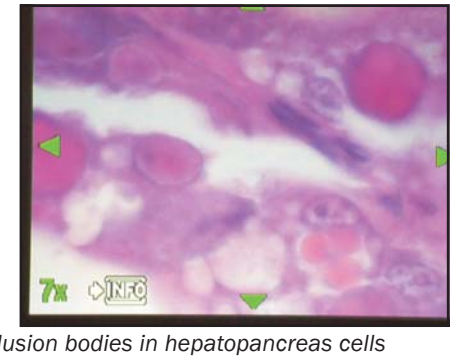
L. Other diseases of penaeid shrimps

The Mourilyan Virus (MOV) was identified in Mourilya, Australia in P.monodon and affects the lymphoid organ .The Laem Singh Virus (LSNV) affects *P.monodon, L.vannamei, M. dobsoni* and *P.merguiensis*. It was identified in Thailand and found in India, it shows positive retinopathy and loose shell also. It may be associated to monodon slow growth syndrome but yet to be conformed, it creates differential growth, dark colouration and size variation in *P. monodon*.

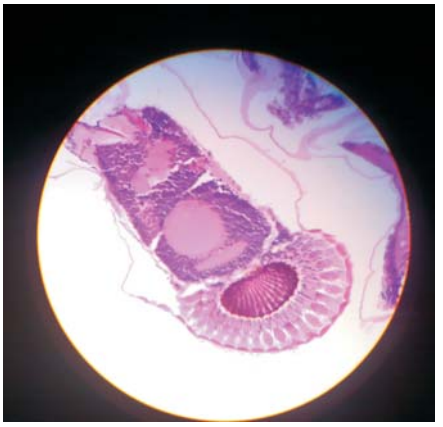
M. Idiopathic Hyaline Granulotmatous Syndrome (IHGS)

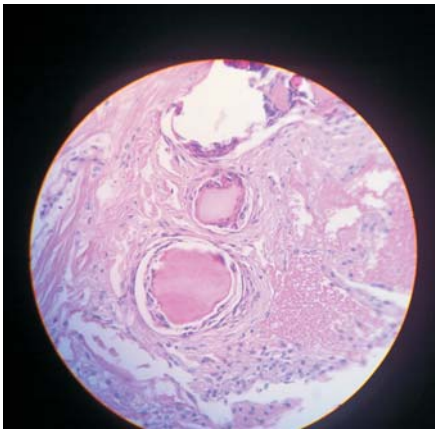
IHGS is due to unusual mortality occurring in natural tiger shrimp in India; externally the affected weak adults move lethragically, have papery cuticle, atrophied skeletal muscle, led to starvation and death. It is a filterable material of unknown bacterium or virus. It creates grouloma with hyaline centers in gills, heart, hepatopancreas.





Tetrahedral BP and oval MBV nuclear occlusion bodies in hepatopancreas cells





Retinopathy due to LSNV and IHGS in Hepatopnacreas of tiger shrimp

N. Practicals on histopathology

Dr. Carlos Pantoja presented and focused the attention of trainees on the identification of the following through practicals on 16,17 and 18/11/2011.on histology of shrimp,tissues and organs of shrimp, WSSV, TSV, IMNV, YHV, IHHNV, MBV, BP, IHGS, NHP, Vibriosis, Spiroplsma, Streptococcus, Systemic vibriosis.

The following tables provide the easy mode of identifying the viral infections in shrimps and the next table provides details histological observation to be noted:

O. Practicals on Extraction of DNA, RNA, WSSV, TSV analysis through PCR and Gel Electrophoresis

The following table provides the easy mode of identifying the viral infections in shrimps and the next table provides details of histological observation

Sl. No.	Name of virus disease indicated	Species affected	Target organ	Type of inclusion/0cclusion	Organ of replication and type of infection
1.	WSSV(DNA)	M, V	G/LO/AG/HT/CES/NC	Inclusion	Systemic/ cytoplasm
2.	IMNV(RNA)	V	S.M/LO	Inclusion Spheroids	Systemic /nuclear
3.	IHHNV(DNA)	V, M	LO/G/HT/AG/NC	Inclusion body in stomach	Systemic /Nucleus
4.	TSV (RNA)	V, M	IG/LO	Spheroids inclusion in chronic phase	Systemic /cytoplasm
5.	YHV(RNA)	M,V	CT/G/LO	Diffused necrotic inclusion	Systemic /cytoplasm
6.	MBV(DNA)	Larvae M	HP	Spherical occlusion	Enteric /nucleus
7.	BP(DNA)	Larvae M	HP	Tetrahedral occlusion	Enteric/ nucleus
8.	HPV(DNA)	Larvae M	HP	Nuclear cap occlusion	Enteric/ nucleus
9.	SMV(DNA)	M	AMGC	Not known	Systemic/ cytoplasm
10.	LSNV(RNA)	M	LO	Granular	Systemic/ cytoplasm

CES=Cuticular Epithelium of stocach G= Gill; LO= Lymphoid organ; AG= Antennal Gland HT= Haematopoietic TissueNC=Nerve cord HP= Hepatopancreas;AMGC = Anterior midgut calcum; V= Vannamei, M= Monodon

Sl. No.	Organ	WSSV	IMNV	IHHNV	TSV	YHV
1.	CES	Inclusion	—	Inclusion	Inclusion	Diffused Necrosis
2.	LO	Wide Lumen	Spheroids	—	Spheroids	Severe Necrosis
3.	AG	Inclusion body	—	Inclusion	—	—
4.	CT	—	—	Inclusion	—	Inclusion
5.	NC	—	Inclusion	Inclusion	Focal	Diffused
6.	Haemocytes	Hypertrophy Nuclei	—	—	—	Black spots

Dr. Linda Nunan Expert on PCR technology divided the trainees into 5 batches with 4-5 candidates each and taught the practicals on extraction of RNA,extraction of DNA ,amplification of RNA & DNA by PCR, electrophoresis of WSSV and TSV followed by Gel documentation and DNA level checking through spectrophotometer. The undersigned at Group 4 could analysis the WSSV through PCR and found the presence

as non specific binding genone at 940 base pairs. Similarly the TSV on analysis through Gel Electrophoresis indicated the absence of viral RNA against the infected samples since our group had SPF L.vannamei sample against TSV. The training content of extraction and electrophoresis details are at Annexure 2 to 6.The optical density of the DNA extracted from the tissues was analysed through the spectrophotometer indicated that the ratio of absorbance of WSSV within1.8 KD level, and the DNA level of contaminated WSSV was identified between 177.5 and 368.8 nm.

Participants in advanced workshop on shrimp pathology with scientist from University of Arizona and Project Director, RGCA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Extension Strategies through cluster approach for increasing the tiger shrimp production by small scale farmer groups

Rajkumar G

National Centre for Sustainable Aquaculture (NaCSA), Kakinada, Andhra Pradesh

National Centre for Sustainable Aquaculture (NaCSA), is an extension arm of MPEDA for export oriented aquaculture, set up with its Head Quarters in 2007 at Kakinada, Andhra Pradesh to serve the small scale aqua farming communities by promotion of Better Management Practices (BMPs) through cluster approach. It supports the farmer groups to develop their site oriented BMPs, develop Standard Operating Procedures (SOPs), and provide technical support for analysis of soil, water, stocking, feeding, pond management and harvesting. NaCSA also organizes meetings with suppliers and exporters.

Empowering small-scale farmers

NaCSA has assisted the formation of 805 societies in six coastal states with an average of 22 farmers in each society, ranging from 18 in Karnataka to 24 in Tamilnadu as indicated in the Table 1. The societies have 17698 aqua farmers as members.

The farmers of the Society are very small and their average land holding is less than one hectare. This varies from 0.34 ha in West Bengal to 1.69 ha in Tamilnadu. The marginal farmers of the farming groups coordinate their activities based on a single water source. These societies hold an area of 20.22 ha on an average ranging from 7.85 to 41.02 ha as indicated in Table 2. The support for society formation is maximum in 6 coastal districts in Andhra Pradesh, 2 in Tamilnadu, one each in West Bengal, Odihsa and Karnataka. It is in infant stage of development in Kerala.

Organizing farmers into groups (Societies) is one of the key mechanisms for supporting farmer empowerment. They have the potential for cooperative action, which can change the position of the farmer in relation to the opportunity structures and thereby influence the business environment of the farming community. The approach has helped the farmers to reduce disease occurrence and production cost, increase productivity, quality, profit, and ability to meet market requirements such as organic certification, traceability and eco-friendly sustainable production. Moreover, small-scale farmers can,

Table 2. Area holding of farmers under the societies in different states

State	No. of farmers involved	Total area under culture (ha)	Average area per farmer (ha)	Average farming area per society
Andhra Pradesh	13720	12688	0.92	20.23
Karnataka	358	381	1.06	19.05
Kerala	41	46	1.12	23.00
Odisha	1188	801	0.67	14.56
Tamilnadu	1144	1928	1.69	41.02
West Bengal	1247	424	0.34	7.85
Total	**17698**	**16278**	**0.92**	**20.22**

Table 1. Details of functional societies and member farmers

State	No. of Societies functioning	No. of farmers Involved	Average number of farmer per society
Andhra Pradesh	627	13720	22
Karnataka	20	358	18
Kerala	2	41	21
Odisha	55	1188	22
Tamilnadu	47	1144	24
West Bengal	54	1247	23
Total	**805**	**17698**	**22**

through organization, gain the advantages of economy of scale in accessing services and markets, which are otherwise limited to large commercial farmers. Farmer groups also improve information exchange and sharing among group members. The small scale shrimp farmer groups of India are in a better position today compared to the situation when they were unorganized.

Capacity building

The farmers registered with the Coastal Aquaculture Authority (CAA) organize themselves as nonprofit cooperative societies for collective purchase of inputs and sales. These societies are registered with the State Registrar of Societies and members are elected to the general council which regularly organizes meetings and deliberate the cluster approach in a transparent way. With the support of NaCSA, 361 societies have been provisionally registered with MPEDA as indicated in the Table 3. Registration in Odisha and West Bengal is steadily improving.

Table 3. Registration status of Farmers' societies in different states

State	No. of societies registered provisionally With MPEDA	Total number of farmers	Total area under farming in the registered society(Ha)	Average farming area per society (Ha)
Andhra Pradesh	314	7082	7120	22.6
Karnataka	10	196	223	22.3
Kerala	2	41	46	23.0
Odisha	9	208	164	18.2
Tamilnadu	24	626	1198	49.9

Through MPEDA, NaCSA provided support to these societies for various activities such as start up of the society, electrification, desilting of drainage, utilization of manpower etc.

Further, NaCSA has taken up an extensive awareness program through village level meetings, educating farmers in "Sustainable Aquaculture" and promoting Better Management Practices (BMPs) through organized society. During the year 2010-11, NaCSA organized 993 meetings in the five coastal states (Table 4).

Table 4. Details of training programmes organized by NaCSA in 2010-11

State	No of meeting conducted attended the meeting	Avg No farmers/ society
Andhra Pradesh	751	15
Karnataka &Kerala	63	10
Odisha	41	18
Tamilnadu	36	14

Production and Productivity increase in society farms

The implementation of the better management practices through the cluster concept has provided many benefits to the farmers, including socio economic development of the region and infrastructure inputs such as electricity, roads, bridges, aerators through increased co-operation, development of corpus fund and assistance by MPEDA. It also improved discipline in cropping pattern, reduced crop loss due to diseases through proper preparation of the farm and by strictly following the crop calendar. Purchase of good quality disease free seed through contract hatchery system, stocking in a fixed period and information exchange during disease outbreak etc., helped society farmers achieve crop success rate of more than 85%. The following table indicates the reduction in crop losses in areas in different states during 2009-10 and 2010-11 due to the efforts of NaCSA.

The increased sustainable production resulted due to the efforts of society as indicated in the table 6 shows the active role of NaCSA in the field.

With the increased rate of crop success in society farms and that of MPEDA - NaCSA, insurance companies are showing interest in crop insurance for Societies against disease outbreaks like WSSV and natural calamities. As a result, the abandoned farms are reclaimed through organized farmer groups. Realisation of higher price for harvested tiger shrimps during 2010-11 compared to 2009-10 is also another remarkable achievement of the cluster approach.

Conclusion

The Farmers Societies ensure social and environmental responsibility, and food safety. The members are able to reduce the production cost through efficient use of resources, avoiding unwanted chemicals or antibacterial agents, and sharing of expenses for developing infrastructure such as deepening of canals, seed testing, transportation of inputs, lab, electricity etc. Society facilitates access to institutional finance and insurance. It is a source for linking the farmers with processors and exporters for better market access and price. There are signs of increased confidence in

Table 5. The comparison of crop failures during 2009-10 and 2010 – 11 in different states

State	Number of Farmers assisted during 2009-10	Number of Farmers assisted during 2010-11	% of disease affected ponds during 2009-10	% of disease affected ponds during 2010-11	Improvement of crop success rate
Andhra Pradesh	3240	10168	27.8	15.1	+ 12.7%
Orissa	7	668	4.3	4.5	- 0.2%
Tamilnadu	507	892	43.9	2.4	+ 41.5%
W. Bengal	-	313	-	2.2	-
Karnataka	184	121	1.4	3.8	- 2.4%
	3938	12162	19.5	11.6	

Table 6. Comparison of Production details of the farmers' societies during 2009-10 and 2010-11

State	Average production per ha in kgs 2009-10	Average production per ha in 2010-11	Increase in production in kgs/ha	Percentage level of increase in production	Average rate(30c) per kg in 2009-10	Average rate(30c) per kg in 2010-11
Andhra Pradesh	0.88	0.89	0.01	1.1%	350	340
Karnataka	0.61	1.59	0.98	61%	340	350
Odisha	1.03	1.79	0.76	42%	300	340
Tamilnadu	1.02	0.90	-0.12	-13%	360	350
West Bengal	-	3.13	-	-	330	400
Average	0.92	1.60	0.58	34.7%	336	356

shrimp farming through cluster approach, resulting in more and more farmers join to form societies and implementing BMPs. NaCSA plans to organize about 2000 societies in India within the next two years to help the small farmers to sustain shrimp farming and their livelihood. By 2012, NACSA will take up cluster certification of 100 societies in 100 to help them meet emerging market requirements. ●

India forays in to International Organic Shrimp Market

P N VINOD

Asst. Director (IOAP), MPEDA, Kochi

Fish as health food has considerable scope to be promoted as organic food product. The ecological concerns of organic fish farming ensure environmental sustainability of the practices as well as the quality of the products. Therefore, both producers as well as consumers benefit from organic aquaculture. The organic culture system should conform to specific organic culture standards, which is required to be validated by proper certification procedures. The farm management is expected to target at the good health and welfare of the farmed animals, so that their natural behavioral patterns are unaffected by the interventions.

There is an increasing concern for the environment in the global market, and organic aquaculture attempts to redress these issues, while assuring on the product quality. The practice has natural advantages for eco restorations such as improvement of natural vegetation, enhancement of soil fertility, protection of ground water, prevention of top soil erosion and conservation of energy. Organic aquaculture practices do not involve the use of deleterious chemicals or toxic substances. Therefore, choosing organic products is an easy way to ensure food safety. Moreover, organic aquaculture is an accepted method of production in a sustainable and eco friendly manner.

Organic shrimp farming sector is set for further developments in India, as the message of sustainability is transpiring in to the mindset of Indian shrimp farmers. There is a recent shift in the farming practices from Black Tiger to Pacific - White Shrimp in the major farming areas. However, the small scale and marginal farmers still continue with Black Tiger Shrimp farming. This target group offers excellent scope to promote organic farming, as they can be organized into clusters for effective management. Therefore, the country has rich natural resources that offer excellent potential for development of organic aquaculture.

The export of farmed certified organic shrimp from India commenced during the current year. The Marine Products Export Development Authority (MPEDA) has been striving for the production and export of Organic Black Tiger Shrimp and Freshwater Prawn (Scampi) under the *India Organic Aquaculture Project* (IOAP), since 2007-08. Finally, India is emerging as a supplier of organic shrimp to the global palate.

Organic Sea Food Trade

There is a strong awareness amongst consumers about the issues surrounding the sustainability of various sea food varieties available in the international market. Hence, organic aquaculture possesses a bright future to cater to the demand from the global market, which is increasing at about 10-15% per year. The international market for organic food is growing at an exponential scale. The global demand for organic food is estimated to be around US $ 50 billion.

The global organic fish production mainly comes from

Europe, Asia, USA, Africa and Australia - New Zealand. The species organically produced through aquaculture practices include Salmon (30%), Trout (36%), Sea Bream / Seabass (7%), Carp (10%), Shrimp (18%), Tilapia (2%) and Pangasius (2%). The major markets for organic products in the Europe are Germany, UK, France, Italy, Switzerland, Austria, Denmark, Netherlands and Sweden. As per the reports of *Naturland*, Germany, most of the organic fish produced by the developing countries are targeting the markets in Europe. The European market appears to offer attractive premium prices for the organic fish products. The Pacific-White Shrimp from Ecuador and Honduras are important organic shrimp products in the US market.

In the Asian region, fast growth has been reported for organic food products. The countries such as Japan, Korea, Thailand, Taiwan, Malaysia and China are the major players in the region. According to INFOFISH, Malaysia, Chinese organic food market is worth US$ 4-5 billion, while the Japanese market is around US $1 billion.

India has been a traditional exporter of raw shrimp in block forms. The onus of the industry is now on value addition of sea food products, in pursuit of higher unit value realizations. In view of this, the coastal aquaculture activities in the country are definitely heading for a facelift, with the value addition measures of the products. Organic certification is a sustainable form of value addition.

Recent Developments In Organic Aquaculture:

To promote organic aquaculture in the region, INFOFISH implemented a pilot project in association with the Common Fund for Commodities (CFC) and Food and Agriculture Organisation (FAO) on Organic Aquaculture Development. The countries covered under the project were Malaysia, Thailand and Myanmar. The project was launched in 2007- 08 for a span of three years. The project components included technology adoption and transfer, work studies, promotion and export trials, investment promotion as well as technology and information dissemination. The species identified for organic farming were shrimp, fresh water prawn and fishes. At the end of the project period, two shrimp farms in Thailand were certified by *Naturland*, while three farms were certified under *Organic Aquaculture Farm and Product Certification Centre* (OAPC), Thailand. In Myanmar, two farms were OAPC certified, while two other farms are practicing ecofriendly and chemical

free aquaculture operations. In Malaysia, one shrimp farmer is certified by the OAPC. The organic products from the project were supplied to domestic as well as international markets. The regional markets in Malaysia, Singapore etc. were explored for opening this niche segment, while the overseas markets in Europe and Japan were also catered by the project farms.

The development of organic aquaculture in Bangladesh was accelerated during the recent years, with the launch of an Organic Shrimp farming Project (OSP) by *M/s WAB Trading International*, an organic seafood supply chain and market development company. The first consignment of organic shrimp from Bangladesh was exported to Europe in 2008, and the organic shrimp farms produced 417 metric tons from 1390 ha area in the year. The estimated production was 2100 metric tons during 2009. It is reported that about 3600 farmers have since registered to take up organic farming in about 7042 ha area in Bangladesh.

It is reported that organic shrimp farming has been steadily picking up in Vietnam, under the certification of *Naturland*. The organic shrimp production from Ca Mau Province rose from the level of 17 metric tons in 2002 to 131 metric tons in 2005. Since then, the production has gone up to the 300-400 metric tons. In Indonesia also, *Naturland* certified organic shrimp farming is in practice, since 2002.

In India, organic aquaculture was initiated in 2007 by the MPEDA in technical collaboration with the *Swiss Import Promotion Programme* (SIPPO), Switzerland. The India Organic Aquaculture Project (IOAP) was started with an objective to introduce the concept of organic farming in to India as well as demonstrate the technology under Indian conditions.

The IOAP, envisaged the organic aquaculture production for brackish water shrimp, *Penaeus monodon* (Black Tiger shrimp) and the fresh water giant river prawn, *Macrobrachium rosenbergii* (scampi). The organic aquaculture project in India was implemented as per the standards stipulated by *Naturland*, *Bio Suisse*, Switzerland as well as EU Organic aquaculture norms. The farmers, hatcheries, feed mill and processors were encouraged for conversion to produce organic products. As a result, hatcheries for production of organic seeds of scampi and black tiger shrimp, feed mills for production of organic feed and organic seafood processors for processing organic seafood were established in the country, in accordance with international standards. India became the first producer in the world to market certified organic scampi to Europe in 2008.The SIPPO assisted project was concluded during 2010.

Subsequently, MPEDA is continuing to promote this sector by modifying the assistance package for organic farming, with the approval received from the Government in 2011. As a result, organic shrimp aquaculture is popularized in some of the maritime states such as West Bengal, Andhra Pradesh, Kerala etc. *M/s WAB Trading International*, Hong Kong, with their successful experience in organic farming in Bangladesh is currently supporting the Indian farmers to take up this programme. The traditional shrimp farms (*Bheries*) of West Bengal and extensive shrimp farming areas in Krishna District of Andhra Pradesh offer ample scope to produce organic shrimps. The farms certified under *Naturland* / EU norms have successfully produced organic shrimps. As a result, five consignments of certified organic Black Tiger (BT) were exported to Germany during 2011-12. The organic project is subsequently being scaled up in various maritime States to build up the organic shrimp exports. Apart from organic Black Tiger, the native species, Indian White Shrimp (*Fenneropenaeus indicus*) is also being considered for organic production in India.

Principles Of Organic Aquaculture

The general principles for organic aquaculture aim to produce healthy, disease free aquatic animals, without the use of any artificial chemicals, antibiotics, hormones etc. and at the same time, protect the environment from all adverse conditions. Organic aquaculture includes various elements, which ensure that the farming activity is in harmony with nature while keeping in mind the good health and welfare of the cultured organisms and environment. This involve the following:

- Careful selection of sites for aquaculture farms
- The units should follow the prevailing laws of the land
- Protection of adjacent ecosystems
- Active avoidance of conflicts with other users of the aquatic resources (eg. fishermen)
- Prohibition of chemicals
- Natural remedies and treatments in the case of disease
- Feedstuff from organic agriculture
- Fish meal and fish oil in feed derived from by-products of fish processed for human consumption (no dedicated "feed fishery")
- Prohibition of genetically modified organisms (GMOs),

neither in feedstuff, nor in the stock itself

- Processing according to organic standards

Organic Aquaculture Standards

Certification is a procedure for verifying whether a product or process is conforming to certain standards. The steps in organic certification involve the exchange of information, pre-evaluation visit, inspection, certification, contracts and issue of certificates. The organic standards for seafood production may vary in different countries, although the basic norms with the perspectives of environment and social obligations and economic considerations remain similar. Among these, the norms of *Naturland* and *Bio Suisse* are followed by some of the Indian organic aquaculture units. The European Union has brought out EU Organic Certification Guidelines vide EC No.834/2007 dated 28/6/2007 containing the principles of organic farming and EC No 710/2009 dated 5/8/2009 describing the aquaculture production rules. The EU norms have become the statutory guidelines for import of organic products by any country under the EU, since July 2009.

In India, the inspection agencies such as *Indocert*, Alwaye, Kerala and IMO, Bangalore, Karnataka are currently certifying organic aquaculture units under the EU norms. Sometimes, conversion plans are advocated by the certification bodies to the new farms, before bestowing them the certified organic status.

In India, the standards for organic agriculture are prescribed under the National Programme for Organic Production (NPOP) by the Agricultural and Processed Food Products Export Development Authority (APEDA). The authority has now taken initiatives to evolve standards for Organic Aquaculture in the country, under the NPOP.

The standards for aquaculture entities are being continuously revised and constantly updated by the certification bodies. Hence, the general standards for organic aquaculture production and processing are briefed below:

Standards for Hatchery - Organic Seed Production

- Species – naturally occurring in the region, preferred
- Organic seed production protocol to be followed
- Administration of untreated seafood for parent stock permitted
- Use of antibiotics, Chemotherapeunts etc are prohibited
- Physical manipulations for breeding are principally prohibited
- Use of hormones not allowed
- No GMO inputs allowed
- Artificial illumination – simulated day length shall not exceed 16 hours
- Aeration, artificial lighting shall be decreased as much as possible
- Efforts towards domestication of brood stock, to conserve the wild stock

Standards for Feed mill - organic feed production

- Separate product flow through the entire process of manufacturing
- All ingredients of agriculture origin to be certified
- The water used for the process to have drinking water standards
- Preventive measures against cross contamination
- Fish meal/oil from sustainable fisheries or off-cuts from processing factories
- No GMO ingredients allowed for production
- Antimicrobial growth promoters strictly prohibited
- Full traceability and stringent feed safety

Standards for Aqua farms - Organic Farming

- Conversion plan to be worked out based on the site conditions
- Fertilization with locally produced nutrients/organic fertilizers
- Synthesized herbicides and pesticides on the farm area not allowed
- Wild seed stocking is not permitted, and seed to be procured from organic hatchery
- Feeding with certified organic feed
- The use of antibiotics, chemotherapeutics and comparable substances prohibited
- Lowest possible water exchange and decrease energy consumption
- Health status of animals to be monitored and documented on regular basis
- Maintain farm documents/dairy to support documentation
- Effluent water quality to be monitored
- Chill killing of the harvest to be practiced
- Procurement at quality ice and packaging boxes
- Switching between organic and conventional farming method not permitted.

Standards for Processing Plants - Organic Processing

- Processing to follow organic principles
- No cross contamination with conventional products
- Water used for processing to have drinking water quality
- Flavouring agents/enzymes prohibited
- Use of mineral nutrients, trace elements and vitamins prohibited
- Use of sodium meta bisulphate, phosphate and carbon monoxide prohibited
- The treatment with microwaves or ionizing ray's is prohibited
- The production of the packaging should be eco-friendly
- Packaging materials containing chlorine, metals or aluminium should not be used
- Use of bio plastics is recommended for packing
- Printing dyes containing no harmful solvents are to be chosen
- The irradiation (electrical or ionization) of packaging is prohibited
- Operator must keep proper

documentation

- The use of iodized table salt to be labeled clearly

Future

In view of the increasing global demand for quality food, the organic seafood market is poised for steady growth. The need of the hour is to create wider awareness on the scope and potential of this sector and popularize organic farming in suitable areas. The lack of organized supply of organic inputs appears to be the major limiting factor for large scale production levels. However, this could be mitigated by organizing the sector in a better way with adequate incentives. Such measures would increase the production of organic sea food from the country to meet the demand in expanding global markets. ●

NEWS SPECTRUM

Zero anti-dumping duty on shrimp exports to US

Giving relief to India's seafood exports sector, the US Department of Commerce (DoC) has cut anti-dumping duty on frozen shrimp exports to nil. The decision will be effective from next year, when the seventh administrative review on anti-dumping duty completes in March 2013.

DoC is modifying its method of calculating the weighted-average dumping margins and anti-dumping duty assessment rate. Currently, it compares the transaction-specific export prices and average normal values to arrive at the value of dumping. However, DoC does not offset the amount of dumping.

Several World Trade Organisation (WTO) dispute settlement reports have found that the application of these methods by the US has been inconsistent with the world trade body's obligations. Now, DoC has decided to calculate the weighted-average margins of dumping and anti-dumping duty assessment rates in a manner that offsets non-dumped comparisons while using monthly average-to-average comparisons in reviews. This may lead to de-minimum duty (below 0.5 per cent), which in effect carries zero anti-dumping duty on exports to the US.

The department is also modifying its five-year (sunset) reviews so that they not rely on weighted-average dumping margins that were calculated using the inconsistent methods. The Indian government had not taken the issue seriously earlier. In fact, it could have been implemented three years back if India had lodged a complaint before with WTO.

In its judgment, WTO said the US was violating global trade rules by using its controversial 'zeroing' method to impose anti-dumping tariffs on shrimps from Vietnam. In effect, the duties on shrimp imports from Vietnam were removed in August 2004. Earlier, countries like Argentina, Brazil, Canada, Ecuador, EU, Japan, Mexico, South Korea and Thailand had also won their zeroing cases at WTO.

In the first week of March 2011, DoC announced the preliminary results of the fifth administrative review (AR) of anti-dumping duty. The average duty for India had been reduced to 1.69 per cent from 2.67 per cent. The anti-dumping duty on frozen shrimp imports from India into the US was imposed with effect from August 4, 2004 and the levy was confirmed through the anti-dumping duty order dated February 1, 2005.

-The Business Standard.

India - EU FTA talks have gone on longer than we thought : Joao Cravinho

(Excerpts from the interview with European Union's Ambassador to India by Nayanima Basu)

The free trade agreement (FTA) between India and the 27-member European Union (EU) would not be signed during the upcoming India-EU summit on February 10. However, talks have reached the final stage and are expected to be concluded by the second half of 2012, says João Cravinho, the European Union's new ambassador to India and head of the EU delegation to India, in an interview with Nayanima Basu. Edited excerpts:

As we enter the fourth year of negotiations for the India-EU FTA, all eyes are on the India-EU summit on February 10. Is anything big expected?

The FTA has gone on longer than we thought. But that is the nature of any negotiation. We had periods of great intensity. In the last couple of months, there had been a tremendous intensity in the talks. A day before the India-EU summit, there would be a meeting between (minister of commerce & industry) Anand Sharma and our trade commissioner, Karel De Gucht. So, things are building up for an important announcement during the summit. Besides taking stock of the progress on the EU-India FTA, many topics would be discussed. We will discuss issues related to the use of renewable energy. We will also clarify positions on trading on emissions and the Iran and West Asia peace process,

where both India and the EU are engaged.

You said there would be an important announcement during the summit. Do you mean the FTA would be initiated by both the parties?

There will be no signature on the FTA at the summit. There is too much technical work to be done before we can have a signature. The most important thing is that a political decision on the trade-offs have to be taken. We are hoping there would some movement on the trade-offs when Prime Minister Manmohan Singh meets EU president Herman Van Rompuy and European Commission president Jose Manuel Barroso at the summit. The technical work going on till February 10 would help reach a breakthrough that would enable negotiators to complete work on the FTA by the second half of the year.

Do you mean the talks would be concluded by the second half of 2012?

I think these can be concluded by that time if between now and the summit, there is sufficient flexibility for both sides to arrive at a political formula that would give us a clear overall picture.

There was a formal round of negotiations earlier this month. What are some of the stumbling blocks that both sides still face?

I would not talk of stumbling blocks. We do not have a blind eye in trade negotiations. We have requirements that are more difficult to meet by both the sides. We are embarking on what would be India's most ambitious trade agreement, one that would arguably benefit India the most, but one that would also require flexibility. We know we also have to show flexibility. So, this is a moment when the political leadership takes a call.

But what about the issues concerning India's high tariff on wine and autos, which the EU had been vehemently opposed to? Also, one of India's primary demands in the FTA with EU is greater liberalisation of services trade. What is the position on that?

Yes, there are issues related to wines & spirits and Indian automobiles. India has very, very high tariffs in these areas. In services, there is a different challenge. The important thing about services is it requires give-and-take on both sides. We have to give mobility from the EU's side. There are some political difficulties on this, but these would be overcome. And, the Indian side has to open up its services market. The services package mainly requires greater mobility.

In the purview of the FTA, the EU had been insistent upon including issues concerning sustainable development like climate change and labour laws, which India had been opposed to. Have you been able to sort these issues?

This is not an obstacle. We are not asking for anything India has not already signed up to in other contexts. We believe sustainable development has to be part of the agreement. Trade agreements cannot be signed in isolation. We have to look at the social impact. What we want is the standards we have commonly agreed internationally should be reinstated in the trade agreement. We have not finalised this chapter at all. But I do not think this would be a problem if we find an appropriate solution.

Given the current crisis in the euro zone, would European businesses and industry be keen on supporting the FTA with India?

European companies view trade liberalisation as a favourable opportunity, and protectionism is identified as a major danger. However, countries are being defensive about their economies. Trade agreements give very good signals in this regard. There is great interest on the European side in extending their services. For instance, European companies are looking at running their accountancy firms from India or expanding legal firms in this market. This is a wide-ranging agreement, so numerous sectors are covered.

- www.bilaterals.org

Do you know?

- Shrimp is the most popular seafood in the United States
- Most popular seafood in Germany is Pollock.
- And salmon is most popular seafood in the United Kingdom
- Total U.S seafood imports in 2010 was 2.5 billion kgs. It was 1.8 billion kgs in 2000 and 989 million kgs in 1980
- U.S. states that have introduced legislation calling for the labeling of foods containing genetically modified ingredients.
- And Alaska has an approved genetically modified food labeling law.

- Seafood Intl.

Fishers switch to tuna

Declining fish catches are leading many mechanised boat operators to venture into the tuna-fishing business.

Rising fuel costs are also making gill and trawl net fishing unviable, and so mechanised boats from Visakhapatnam, one of India's main fishing centres, are eyeing tuna's potential. Out of Visakhapatnam's 600 mechanised boats, a whopping half is tied up in port because fishers cannot afford the increasing operational costs. Of the regular operators, 60 to 70 have resorted to long liners to catch tuna, it is reported. A fisher must invest about INR 300,000 (USD 6,058) for tuna long-lining.

Boat owners say tuna availability is very high in deep waters and that initial responses are already encouraging. For a 15-day voyage, boat operators say they need 2,500 to 3,000 l of diesel. Subsidies are being granted but only for boats registered up to 31 March 2002.

The subsidy has not been reviewed despite increasing fuel costs in the last two years. Burgeoning demand for tuna has prompted mechanised boat operators to venture northward to Kalingapatnam, Puri and Paradip. But the success of tuna fishers largely depends on winds, as heavy breezes get in the way of catches.

On average, the boats get 50 to 70 pieces of tuna weighing from 25 to 60 kg when they embark on a two-week long fishing trip. Agents then purchase the tuna at the Visakhapatnam fishing harbour and later airlift it to Chennai for export.

Infrastructure, necessary for making a big centre for tuna exports out of Visakhapatnam, is still lacking despite the efforts of the Marine Product Export Development Authority (MPEDA) and National Fisheries Development Board (NFDB) to promote tuna as part of sustainable fishing.

"Existing facilities are woefully-inadequate. For trained manpower and world-class infrastructure, we are ready to offer joint collaborations", Australia's Trade Commissioner Michael Carter said.

- www.fis.com

60,000 tonnes of tuna need to be imported: Anfaco states

The National Association of Canned Fish and Shellfish (ANFACO-CECOPESCA) states that the canning industry in the European Union (EU) needs to import 60,000 tonnes of tuna, not the 30,000 tonnes required by the sector.

ANFACO managers argue that these 30,000 tonnes represent "only half" of the raw material the industry requires to continue operating properly.

This was said by Juan Manuel Vieites, secretary general of ANFACO after meeting with Secretary General of Fisheries, Carlos Dominguez.

This week, the industry claimed the purchase of 30,000 tonnes of fee free tuna for the period between 2013 and 2015, a demand that does not satisfy ship-owners. Currently 15,000 tonnes are imported with a tax of 6 per cent.

Vieites argues that the fishing fleet will "maintain its monopoly" over the processing industry, while the canneries "have sought a consensus position" in demanding the entry of only 30,000 of the 60,000 tonnes needed, EFE agency informed.

"These are real needs that we have extensively discussed and we believe we have taken a very balanced position to avoid distortions and problems to a fleet that also sells to our competitors", Vieites explained.

During the meeting, the ANFACO secretary general spoke to Dominguez about the evolution of the sector in 2011 and its outlook for 2012, and on the liberalization of markets in the World Trade Organization (WTO) and the reform of the Common Fisheries Policy (PPC).

Both officials also discussed the status of the agreements signed between the EU and third countries such as Papua New Guinea, which was "very damaging" to the Spanish sector.

Vieites said that Dominguez "perfectly understood" ANFACO arguments, emphasizing that they are based on actual figures and the position of the entity to maintain "the 12,000 direct jobs generated by this sector in Galicia", La Opinion reported.

"While we understand that each of us defends his own business and we are very happy of the good results achieved by the fleet, which only generates 300 direct jobs in Spain, it seems inappropriate that it may seeks to supply us with raw materials exclusively, when they can sell and in fact sell their catches where they want, even to our competitors and when their tuna loins discharges in Galicia are down ", perhaps for that reason, he added.

- www.fis.com

Effects of 'El Niño' and 'La Niña' analysed in tuna stocks

A team of experts from the Centre for Atmospheric Science (CCA) of the National Autonomous University of Mexico (UNAM) showed that the dynamics of the tuna stocks is linked to the oceanic events El Niño and La Niña, which are atypical heating and cooling phenomena in tropical waters.

Under the research project entitled '*Climatic effects on the pelagic tuna abundance*,' scientists found out that the effect of El Niño causes a decrease of up to 14 per cent in the tuna population.

However, they noted that after this oceanographic condition the rejuvenation of the population takes place, which leads to the formation of recovery loops.

This has been remarked by Walter Ritter Ortiz, head of the Department of Bioclimatology of CCA, who along with Sergio Guzman Ruiz is working on mathematical models of natural resources such as fisheries, among others.

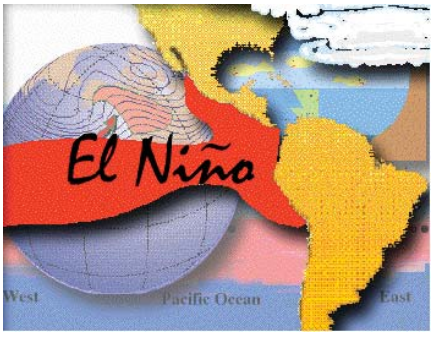
Ritter Ortiz noted that the Eastern Pacific Ocean (EPO) is the world's most productive area of yellowfin tuna. Besides, it is the place where are all atmospheric phenomena are climatically formed in the Northern Hemisphere.

UNAM scientists explain that if the event is too large, the fish schools rejuvenate and remain above their proportions. In 1982, for example, it was noted that the advent of El Niño caused an increase of 40 per cent of fish stocks, including the pelagic ones.

According to Ritter Ortiz, the temperature and the presence of tuna can be used to predict the presence of El Niño phenomenon: "We've studied it but from the viewpoint of a new physics and mathematics called Analysis of Complex Dynamic Systems."

"We have proposed a new vision in the mathematical modelling of these resources, through Complex Dynamic Systems, which produce a better representation of the natural phenomena than the traditional formula," he points out.

The researchers argue that "the classical methods are necessary but not sufficient", so a "new transdisciplinary and interdisciplinary vision that allows for better management should be used." According to these experts, if



these methods are followed and are complemented with the existing ones, the benefits will be very important, since the populations could increase up to 40 per cent.

According to the data from the Inter American Tropical Tuna Commission (IATTC), between 1 January and 30 October, 2011 a total of 474,552 tonnes of tuna was caught, 17.7 per cent more than in the same period last year, when 402,868 tonnes were captured.

Until 30 October, the Mexican vessels captured 118,613 tonnes of tuna, the Ecuadorian fleet caught 171,140 tonnes, the vessels from Panama captured 48,558 tonnes and those from Venezuela caught 40,659 tonnes, among others.

- www.fis.com

EU to withdraw market access

The European Union is to withdraw its market access for countries that have not signed the Economic Partnership Agreement (EPA) by 2014.

That means all countries in the East African Community (EAC) bloc and other Least Developed Countries (LDCs) that have not signed up to EPA, a scheme to create a free trade area between the EU and African Caribbean and Pacific (ACP) group of countries, will no longer have duty free and quota free market access to the giant market. Rocked by economic challenges in the Eurozone, trade analysts contend that the withdrawal of the market access is a reflection of the fatigue within the EU.

Alex Nakajjo, the Operations Officer at the EU Delegation in Uganda, says the EU is now focusing on its internal market. "There is less momentum in the EU side to continue with endless negotiations", Nakajjo said during a discussion on the World Trade Organisation (WTO), the Doha Development Round and Multilateralism: Mapping out the future, which was organized by SEATINI Uganda in Kampala recently.

In 2007, Uganda and her EAC

counterparts initialed the trade agreement. They were supposed to eventually sign the EPA. The signing has, however, been put off due to the lack of consensus on some pending issues like development cooperation where the EAC countries are asking for more funding.

The EU still largely finances the EAC's operations in the ongoing EPA negotiations.

- Joseph Olanyo , www.bilaterals.org

Trade agreement extension negotiated with India

In the first three days of February the Fourth Round of the Partial Scope Agreement (PSA) in force between Chile and India was held in New Delhi.

According to Rodrigo Contreras, bilateral director of the Directorate General for International Economic Relations (Direcon) and leader of the Chilean delegation, "extending the current agreement aims to increase the number of products with preferential tariffs" covered by the current protocol. It also has the goal of "deepening disciplines on sanitary and phytosanitary measures and those related to trade technical barriers."

According to Contreras, the link between Chile and India will foster the trading of marine products, among others.

"We hope this exploratory conversation serves as a kick off for discussion of a comprehensive Free Trade Agreement (FTA) with India and thus help to deepen the existing disciplines, including, for example, issues such as investment or government procurement", continued Direcon bilateral director.

During the meeting, the chief negotiators agreed to end the deepening of the Partial Scope Agreement in mid 2012.

Chile is the first Latin American country that managed to sign a bilateral trade pact with India, a huge market of 1,200 million of people.

According to data released by Direcon last year Chile exported products to the Indian market for USD 1,944 million and imported for USD 488 million. Moreover, the trade relationship with India has a trade balance surplus for Chile of USD 1,456 million.

- www.fis.com

Price List of MPEDA Publications / Periodicals

	PERIODICALS	Annual Subscription (Rs.)
1	PRIME Weekly (Price Indicator for Marine Products)	350.00
2	MPEDA Newsletter	300.00
	PUBLICATIONS	**Price Per copy (Postage extra)**
3	Chart on Commercial Fishes of India	75.00
4	MPEDA Act, Rules & Regulations	25.00
5	Statistics of Marine Products 2008	350.00
6	Seafood Delicacies from India	100.00
7	Indian Fishery Hand Book	250.00
8	Product Catalogue	150.00
9	Handbook on Ornamental Fish Diseases	50.00
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14	Ornamental Fish Breeders / Traders Directory	25.00
15	Directory of Exporters of Marine Products	75.00
16	Directory of Exporters of Marine Products CD	30.00

Seafood is perfect for 'brain gyms'

Brain fitness? Brain gyms?

In North America, Europe and elsewhere people of all ages are using Web sites such as Lumosity to play brain games that keep them mentally sharp. Over 14 million people in 180 countries are users of Luminosity's Web site.

Sharp Brains, a market research firm, estimates the size of the market will grow to $2 billion (£ 1.4 billion) by 2015.

Luminosity's Kunal Sarkar says brain fitness is the latest wave in healthy living.

The fact more of us work in jobs that rely on how well our brain functions is part of what's driving the interest in brain fitness.

Lumosity users include everyone from actors wanting to get better at memorizing scripts, to pilots looking to improve their spatial abilities and reaction times.

Some analysts predict there will soon be brain gyms, where folks can go and work out their minds with the help of a trainer, just as people do now at exercise gyms.

Seafood, with its abundance of omega-3s, is one of the best foods for nourishing the brain. May be it's time to make it the official food of brain fitness buffs and begin promoting it on brain fitness sites and elsewhere.

- Seafood Intl.

Researchers find new species at world's hottest, deepest ocean vents

New research from an intrepid team of British oceanographers reveals that the world's deepest submarine volcanic vents are also the hottest that scientists have yet discovered. Moreover, they appear to be teeming with a variety of previously unknown life forms.

According to measurements made in a recent expedition, the mineral-rich water streaming out of volcanic jets at the bottom of the Cayman Trough reaches temperatures exceeding 840 degrees Fahrenheit. Located over 3 miles below the pristine surface of the Caribbean waters, these aquatic infernos are hot enough to melt solid lead.

And yet in a testimony to the tenacity and resourcefulness of life, the researchers say the waters around the vents surge with never-before-seen species of animals and bacteria. One of these includes a newly discovered species of albino shrimp that appears to have an organ on its back for detecting light.

The researchers from England's National Oceanography Centre in Southampton published their findings this week in the science journal Nature Communications.

Research on the large vents—known as "black smokers" due to the cloudy, dark mixtures of waters and minerals that they emit—first began in April 2010. One of these vents, the so-called Beebe Vent Field, was discovered over half a mile deeper than any previously known vent.

One of the expedition's leaders, Dr. Jon Copley of the University of Southampton, described the team's discovery of the vent as a moment full of awe and wonder.

"When we came across the black smokers on the sea floor there were honestly tears among the science party, there was this sort of moment of

overwhelming wonder at the marvel of the world," Copley told Matt McGrath of BBC News.

"The Beebe Field is a mound of mineral rubble on the bottom of the ocean estimated to be about 80m across about 50m high. On top of the mound are naturally formed chimneys, estimated to be about six meters tall with hot fluid gushing out."

Copley explained that the mineral-rich mixture contains particularly large amounts of copper, which immediately reacts with the cold sea water to form the large chimney-like structures surrounding the vents.

As current instruments do not allow direct measurement of the water's temperature as it gushes out of the thermal vents, the team was able to arrive at the approximate temperature indirectly by analyzing the chemical reactions taking place around the vents.

Another find of potentially even greater significance was discovered in a shallower vent field in the side of a deep-sea mountain known as Mount Dent. Here the team discovered a number of black smokers on the mountain that were a significant distance from the volcanic zone on the ocean floor where vents typically form.

"Finding black smoker vents on Mount Dent was a complete surprise," said the team's geochemist Doug Connelly in a press release. "Hot and acidic vents have never been seen in an area like this before."

Yet the researchers suspect that such mountain vents may be more than just a rare anomaly.

"The kind of underwater area where we found the second set of vents, we think is actually quite common around the world's oceans and so if you can get vents on mountains like that it could be that there are a lot of them out there dotted around," Copley told BBC.

Dr. Nicole Dubilier of Germany's renowned Max Planck Institute of Marine Microbiology couldn't agree more with Dr. Copley's assessment.

"I am convinced that deep sea vents are very common and this is only the beginning of a hopefully long line of future discoveries," Dubilier told BBC.

"That we now have the technology to explore and sample such exotic environments is exciting in itself, comparable to the fact that we can collect rocks from the moon or may one day be able to collect them from Mars," she added.

And as every student of science knows, exotic new environments tend to yield exotic new forms of life.

The team's submarine cameras captured footage of an eerily pale new crustacean that the scientists are calling Rimicaris hybisae.

The tiny shrimp, while lacking true eyes, appears to have evolved a highly specialized light-sensing organ located on its back. While waters at these depths are typically pitch black, the molten-hot sea vents produce a faint glow in the alien-like aquatic landscape, and the shrimps tiny photo-sensitive organ appears to allow it to navigate its dimly lit environment.

A related species, Rimicaris exoculata, has been found living at the edge of another deep-sea vent 4,000 kilometers away on the Mid-Atlantic Ridge.

"Studying creatures at these vents, and comparing them with species at other vents around the world, will help us to understand how animals disperse and evolve in the deep ocean," Copley said. A Rimicaris exoculata, a close cousin of the newly discovered albino shrimp, was previously discovered nearly 3,000 miles away on the Mid-Atlantic Ridge.

The research team reported that the vents on the side of Mount Dent were also populated with an array of previously unknown sea creatures, including snake-like fish, marine snails and a flea-like crustacean called an amphipod.

Production & Consumption of Fishmeal

Many in the aquaculture industry are dependent on fishmeal, according to the Norwegian School of Economics and Business Administration.

The fishmeal production process and value chain

Fishmeal is a brown powder obtained after cooking, press drying and squeezing fresh raw fish or trimmings from food fish. IFFO has estimated that in 2009 pelagic fish was used in 75 per cent of all fishmeal production, while the remaining 25 per cent came from trimmings. Pelagic species are ocean fish that swim in schools and live in the upper sea levels. Their source of food is mainly plankton and most pelagic species are considerably fattier than other fish species. Historically, landings of fish have been around 90 million tons p.a. and about 1/3 of this has been converted into fishmeal and fish oil,

while the remaining 60 million tons are marketed as fresh, frozen and canned fish.

Fishmeal contains typically 60 to 72 per cent protein, 10 to 20 per cent ash, 5 to 12 per cent fat and has a high content of the fatty acids EPA and DHA; more commonly referred to as omega-3 (IFFO 2011).

Fishmeal in its basic form has been produced for centuries and usage has varied from production of fertilizers to salmon feed. Nowadays, fishmeal is used primarily in feed production. Fishmeal and fish oil production has become a very thriving industry as both fishmeal and fish oil prices have soared (see figure 5.1 for fishmeal price data).

The Peruvian fishmeal and fish oil producer Copeinca has illustrated how the value chain in the industry is formed.

The production process can roughly be described in three steps: First the fish is inspected, cleaned and cooked at about 95 ° Celsius. This process helps sterilize the fish as well as separate out proteins and oils. The cooked fish is squeezed to free most of the remaining liquids, and the material is then dried and ready to be sold (IFFO 2011). Fishmeal can be grouped into four product categories:

- High quality – used mainly for small-scale aquaculture units (e.g. trout farms)
- Low temperature meal – produced by steam drying, is highly digestible which nurtures rapid growth, and is thus especially suitable in salmon farming and piglet production
- Prime – meal with a protein count between 66 and 68 per cent
- Fair Average Quality (FAQ) – flame dried meal with a lower protein count (direct fire causes proteins to disintegrate)

Global production

Global production of fishmeal is concentrated around a few top producers; top ten manufacturers in 2007 made up approximately 80 per cent of the global production. Today Peru is the largest producer, China the second, Chile the third and then the Nordic countries Norway, Denmark and Iceland follow as the most important producers. There are approximately 300 dedicated plants worldwide that produce about 6.3 million tons of fishmeal and 1.1 million tons of oil annually from roughly 33 million tons of whole fish and trimmings (FIN 2010). The species used in production vary from region to region, but generally speaking it consists of small, bony, pelagic fish that has little or no commercial value as fish for direct consumption5 (FAO 1986). It is estimated that about 90 per cent of the fish species used to make fishmeal is "presently unmarketable in large quantities as human food" (Bose et.al 1991). See table 2.1 for an overview of the different species used around the globe.

The global fishmeal output has remained at 6 to 7 million metric tons p.a. for the last 20 years, while world trade has averaged around 3 to 4 million tons. Fluctuations in output and export level are naturally linked to variations in landings of fish used for fishmeal production. Overfishing and unsustainable fishery management has caused some of this variation, but the large deviations are mainly due to the El Niño phenomena.

El Niño

The El Niño is a disruption of the ocean-atmosphere system in the Tropical Pacific having important consequences for weather and climate around the globe (Philander 1990). A mild El Niño occurs every 2 to 7 years and typically lasts from nine months to two years. Major El Niño events (major meaning long-lasting and/or highly influential) have on average occurred every 26 years (NOAA 2011). El Niño means The Little Boy or Christ Child in Spanish, and this name was chosen since the event arrives most often around Christmas time. Among the consequences are increased rainfall across South America, drought in the West Pacific, and a shift in the Pacific Trade winds.

In normal, non-El Niño conditions, the trade winds in the South Pacific blow towards the coast of Australia and Asia. These winds push warm water towards the west Pacific and the effect is so strong that the sea surface is about ½ meter higher around Indonesia than in Ecuador (NOAA 2011). When warm water is pushed away, the laws of physics dictate that it must be replaced by something else and thus deep, cold, nutrient rich water seeps up towards the coast of South America. This process is called upwelling and is what (among other factors) fuels the large schools of fish present around the eastern Pacific (Coull 1993). During El Niño years this nutritious process can collapse and the fish is driven deeper and away from the shorelines of South America. This makes it harder to catch and landings are reduced significantly. With Peru and Chile as the most prominent fishmeal producers in the world (responsible for approximately 40 per cent of the global output), the El Niño can have a significant adverse effect on global supply of fishmeal.

South American Fisheries

The El Nino's destructive force on South American fisheries becomes apparent when viewing historical landings in Peru and Chile. From 1950 to 2008 there were three major El Ninos: 1972/73, 1983 and 1998, and fishery landings were reduced by 50 to

90 per cent compared to the year before. Historically, overfishing has been a big problem in South America and combined with an El Nino event it nearly depleted the anchoveta schools during the 1970s. The stocks recovered throughout the decade, but overfishing caused a man-made stock cycles that coincided with a major El Nino in 1998 and once gain almost eradicated the anchoveta. After 2000 improved regulatory fishery schemes have been introduced in both Peru and Chile, with reduced quotas and increased resources to the fight against poaching of fish.

World trade of fishmeal

Approximately 60 per cent of world fishmeal production is each year exported and not consumed in the manufacturing country, meaning world fishmeal trade equals about 3-4 million tons each year. Excluding China, which is a net-importer of fishmeal, the world trade share is raised to over 70 per cent. Peru and Chile contribute about 60 per cent of the globally exported fishmeal, and this further underlines the importance of the South American fisheries to the fishmeal market. The statistics show that even though China is one of the world.s biggest fishmeal producers, is also by far the biggest importer of fishmeal with 30 per cent of the global trade volume in 2007. Following China are the Asian nations Japan (11per cent), Taiwan (4per cent) and Vietnam (3per cent). The Scandinavian nations and Germany are involved in much intra-European trade (both importing and exporting fishmeal) and their figures should therefore be interpreted with caution.

Consumption of fishmeal by region

As an estimate of consumption, the following relationship of FAO's FISHSTAT database is used.

Consumption = Production + Import - Export

Factors like country-intermediary storage and lagged/premature dating could cause some of the data to shift to one of the adjacent years in the sample and thus alter the consumption estimate. These effects are however considered negligible in most of the years, and not affecting the goal of providing a presentation to the biggest fishmeal consumers in the world.

Like global production of fishmeal, global consumption is to large extent concentrated around some key players. China is by far the greatest consumer, with a fishmeal consumption level ranging in between 1.6 and 2.0 million metric tons (MMT) annually. Japan then follows with a consumption of about 0.7 MMT, Thailand with about 0.4 MMT and Norway has around 0.35 MMT annually. China has been the main driver for the increasing consumption concentration, as they have gone from consuming 3 per cent of world fishmeal production in 1985 to nearly 40 per cent in 2007. As China imports around 1.2 MMT fishmeal annually (around 1/3 of total world trade) their demand is a significant factor in the forming of fishmeal prices.

Consumption by sector

As mentioned in the introduction, fishmeal has historically been used for several different purposes. In the 1960s fishmeal was used almost exclusively

in pig and poultry production as the high protein content combined with health enhancing acids provided rapid and stable biomass growth. From the 1960s onwards the aquaculture sector expanded production and thus its share of world fishmeal production rose. Since fishmeal has a high content of nutrients particularly favorable in aquaculture production, e.g. omega-3 acids (IFFO 2005 and Connor 2000), aquaculture farmers attach a higher premium to fishmeal over vegetable proteins, than what pig & poultry producers will do. Therefore, the tilting towards a larger fishmeal consumption share for the aquaculture sector is not only driven by the expansion of the sector itself, but also because it compared to pig & poultry producers has poorer substitution options.

From the 1960s the aquaculture sector has grown into the far most important consumer of fishmeal. A more detailed view of the dynamics in this change can be obtained by viewing consumption share data gathered from fishmeal research papers.

Aquaculture's share of about 10 per cent remained stable throughout the 1980s, before it increased fourfold over the next decade. A drop in 1998, which coincided with a major price hike in fishmeal prices, was followed by further increments in the consumption share. These numbers are interesting when it comes to understanding the dynamics behind the trade and valuation of fishmeal.

- the fishsite

Direct high pH effects on shrimp :

1 Poor growth. 2. Slow mortality 3. Molting disturbance

4 Calcium and magnesium deposit on shell,

Indirect high pH effects on shrimp :

1 High pH favours toxic blue green algal blooms

2 Ammonia toxicity will be greater in high pH

Contents :

Highly effective formula to reduce high pH from 11 to 8 without any toxic effect to shrimp.

It contains organic acids and algal bloom control enzymes.

Benefits of using B green

1 Reduces high pH value 2. Reduces over bloom.

3. Control toxic blue green algae. 4. Increases alkalinity.

5. Does not harm to probiotic bacteria.

Dosage : 1kg./acre in fresh water ponds. 2.5 kg / acre in brackish water ponds or as advised by an aqua consultant.

Presentation : 500 gms.

ALTER

To Control LB

Composition :

Contains poly alkyl – aromatic compound.

Uses :

1 To control LB in ponds.

2 To control toxic flagellates in ponds.

3 To control toxic blue-green algae.

4 Stimulates moulting in prawns.

5 100% Safe for prawns.

6 No residual effect in prawn.

Dosage : 2-4 Kgs. Per acre.

Application : dilute 1 ltr. In 40 ltrs. of water spray uniformly to the ponds.

Presentation : **5 ltrs.**

Contact for Stocks :

DHATHRI AQUA REMEDIES

VIJAYAWADA-520 003, A.P., INDIA. Mobile : 98483 59918

e-mail : dhathri2003@yahoo.co.in

Nutrimar pioneer in shrimp traceability in Brazil

Nutrimar Pescados company, a pioneer in the country in organic shrimp farming, invests in technology since 2009 to be awarded the reputation of being the only Brazilian fish company that guarantees traceability in its products.

Traceability allows consumers to know the story of a particular product from its origin to its use and application through a label with the corresponding identification number (3D bar and numerical code).

It is a tool for quality, production and performance control that enables users to check what day the product was downloaded and packaged, in which Brazilian state was produced and which is the company that handled it. For information on a company's product consumers can enter the code number on Nutrimar website or read the 3D code using an application for mobile smartphones.

"In Brazil, Nutrimar is the first and only fish company to offer this guarantee and has already invested BRL 180,000 (USD 101,700) in the project", says Fabricio Ribeiro, the company's commercial director, *Inteligemcia* reported.

"The idea is to link a seal of approval to products and generate more convenience to the consumer who will know all about what they are buying", Nutrimar executive said. This company has shrimp farms in Ceará.

Source:www.fis.com

Fisheries: European Commission proposes measures against countries which allow unsustainable fishing

The European Commission has adopted a proposal for a Regulation which would authorise the Commission to impose a range of measures against third countries that allow unsustainable fishing. Once the proposal is approved by the European Parliament and the Council, the EU will have a new powerful tool to discourage unsustainable fishing practices swiftly and to promote international cooperation on shared fish resources. The measures foreseen will range from restricting imports of fish products from the concerned stock as well as associated fish species to prohibiting the conclusion of chartering agreements with economic operators from countries allowing non-sustainable fishing. The framework will guarantee strict respect of international law. The Commission will assess carefully the likely environmental, trade, economic and social effects of measures and the administrative costs of their implementation. The countries concerned will be granted an opportunity to be heard before the measures are adopted, and to take corrective actions to avoid them. Commissioner Maria Damanaki, in charge of Maritime Affairs and Fisheries, said: "This is a groundbreaking measure. If backed by Member States and the European Parliament, we will have for the first time an effective legal instrument to help us secure the conservation of fish stocks that the EU shares with other countries. This is of prime importance to our fishing communities and the long-term conservation of stocks - in the interest of consumers and the society at large."

Source:europa.eu

FAO global capture fisheries production database: catching the trend

With data series extending for 60 years, including catch data for almost 1850 species items, and reflecting geo-political, historical and natural events, the FAO capture fisheries production database provides a service to the community interested in fishery information.

In the last 15 years, over 600 articles from refereed journals have cited the database. The species included in the database have grown significantly in the last decade and an analysis of annual reporting has shown more timely data submissions, although the number of non-reporting countries remained stable throughout the years. An evaluation of data quality found over half developing countries reporting inadequately but also one-fourth of reports by developed countries were not satisfactory.

A recent article in *Marine Policy*, a journal published by Elsevier, provides meta information on historical developments, data sources and coverage, and advice on what should be kept in mind when using the database for trend studies.

Source: www.fao.org/fisher…e-production/en

Waste having a choking effect on backwater fish

Plastic, metal and other waste choking the backwaters are not only robbing them of their beauty, but also leading to a rapid decrease in the density of fish in the backwaters, according to a survey by a team of scientists and researchers of the Central Marine Fisheries Research Institute (CMFRI).

Breeding habitats deteriorate when the plastic waste covers the area, fish suffer when they consume the waste and many, caught in ghost-nets, perish. As they are not biodegradable plastics can float around for years.

"We found fishermen netting a staggering amount of plastic and other waste along with the catch. The fishermen who are not aware of the hazards throw the waste back into the water. Even large sheets of thick plastic trapped in the nets are dumped back into the water and they invariably settle on critical habitats like rocks where fish lay eggs," said V Kripa, Principal Scientist and head, Fishery Environment Management Division, who led the survey at Panangad, Moothakunnam and Thevara.

"As we are conducting the survey with the cooperation of stake net fishermen, we have asked them to sort out the plastic and weigh them and we're keeping a record," she said. Besides the waste being dumped, a lot of refuse flows into the backwaters during rainy season. During high tide, water flows onto the land and returns to the backwaters with a lot of waste during low tide. Fish end up consuming such debris, leading to death.

"Ghost nests or tattered nets thrown into the sea by fishermen are also fatal for the fish.ýÿ Shoals of fish get caught in those discarded nets and die unable to move or feed," she added.

Explaining the menace of metal wastes, sheýÿ stated that these create endless problems for fishermen too, for they cut into their nets.

"We are creating awareness and asking the fishermen to bring back the plastic waste, but what to do with it is the moot question. If they are left on the shore, they will flow back into the water," she explained.

The New Indian Express

Researchers develop 'fish free' diet for farmed fish industry

A TEAM of researchers in the United States may have overcome one of the main environmental criticisms connected with fish farming.

The researchers from the Institute of Marine and Environmental Technology in Baltimore have announced that they have developed a plant-based diet for three popular saltwater fish — striped bass, cobia and Mediterranean sea bream. Taste-testers can't tell the difference between fish raised on the plant-based diet (vegetarian) and those raised on fish meal, they say.

Both diets contain fish oil, so neither was totally fish-free, but the researchers also raised fish on a vegetarian diet using wheat, corn, soy and algae meal to replace the oil. That raises the possibility of fish-free aquaculture for saltwater, carnivorous fish, said Aaron Watson, a graduate student at the institute.

The Baltimore Centre is a highly respected institution which looks at many aspects of marine environmental sustainability involving people and natural resources. One of its aims is to help reduce the environmental impact of fishing and fish farming. It even has its own fishing research fleet.

US President Barak Obama has already give to the go-ahead for a major growth in his country's aquaculture plans and Mr Watson added: "If we wish to get aquaculture to expand, we need to find alternatives."

American nutritionists are constantly urging people to eat at least two fish meals a week for good heart health, but many are worried about some of the environmental concerns surrounding fish farming - witness the debate in British Columbia, Canada. It is hoped that the results of the Baltimore research will help overcome some of those concerns.

Mr Watson said that the tests showed that a plant and algae diet had a same levels of heart-healthy fats as a fish based diet which should give more confidence to consumers.

- Fishupate

Push for sustainable fisheries

Jorhat, Feb. 6: The fishery research centre of the Assam Agricultural University here has come up with an easy package of practices in order to augment production of small fishes like moa, puthi, kanduli and xingora as well as give a nutritional boost to the diet of the fish farmer.

Bibha Chetia Borah, in- charge of the fishery research centre, said Assam which was the second largest in fish production in the Northeast next to Tripura, had more than 31 hectares of waterbodies where fish could be produced. However, 40 per cent remained unutilised for lack of depth and circumference.

"Many households in the villages of Assam have ponds in their backyards which are less than 200 square metres in area and one metre in depth making them non-viable for farming of big fish like rohu, bahu (catla) and carp. The families, however, lets these ponds lie idle. If they had farmed fish in them, it would not only have added to the income but also given essential proteins and calcium as these small fish are consumed along with the bones," she said.

Chetia Borah said overfishing of indigenous varieties which were earlier found abundantly in fields, big drains, marshy areas and lowlands where water remained throughout the year, had resulted in a severe decline of many species of small fish and a few were no longer to be found.

"Small fish like xingora and kanduli sometimes command as high a price as big fishes and sometimes more because of their scarcity. Our centre took up three species, the xingora, moa and kanduli for sustainable fishing so that fingerlings can also be easily available," she said

Of the 158 natural waterbodies studied where these three fish species exist, moa was found in 66, kanduli in 60 and xingora in 83. Twenty-six of these waterbodies did not have moa, four did not have xingora and kanduli was not found in 13. The research found that from the point of view of production and income, kanduli was the most viable out of the three fishes but for nutrition for the whole family, xingora and moa were better options.

Chetia Borah said the centre was training farmers on the best feed to be given to these fishes, their breeding seasons, when to remove the parent fish after it laid the eggs as there was apprehension about one species of feeding on its young.

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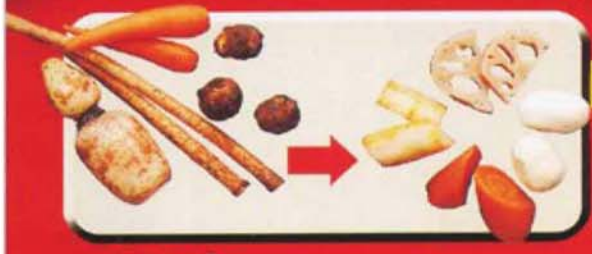
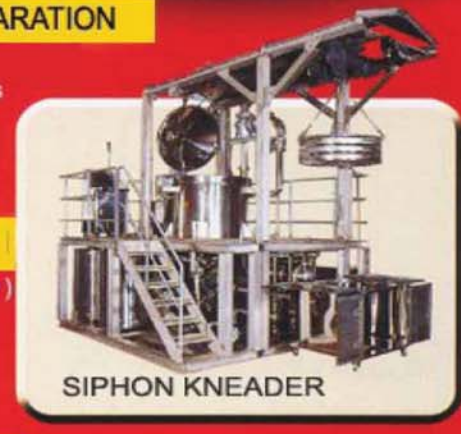
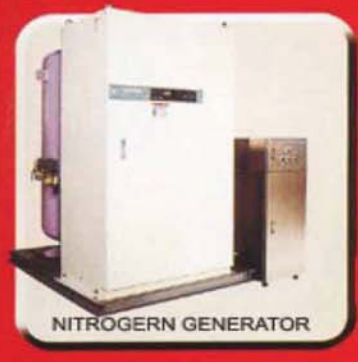


1. 1st PREPARATION

Peeling, cutting,
Remove Harshness



SIPHON KNEADER



NITROGERN GENERATOR

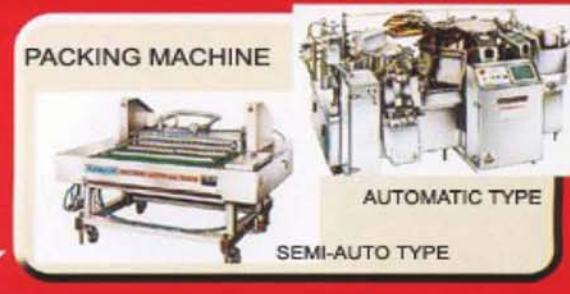
2. 2nd PREPARATION

Reduce Microbial (our Know-how)
and Seasoning

3. PACKAGING

Fill in to the Hi-barrier Pouch,
Vacuum then Inject Inert Gas

Technical Gas Cooling Machine (T.G.C.M.)



PACKING MACHINE

AUTOMATIC TYPE

SEMI-AUTO TYPE

4. COOKING AND STERILIZATION

our Know-how

5. FINISHED PRODUCTS