PROCEEDINGS OF
NATIONAL WORKSHOP ON
AQUACULTURE OF SEA BASS – STATUS AND WAY FORWARD FOR COMMERCIAL PRODUCTION
HELD ON 28-01-2015

THE FISHERIES TECHNOCRATS FORUM, CHENNAI
&
CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTRUE, CHENNAI-600 028

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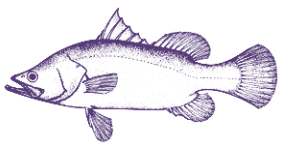

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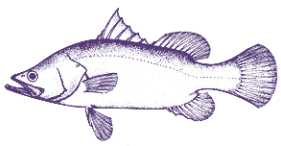

केन्द्रीय खारा जलजीव पालन अनुसंधान संस्थान,
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Dr.K.K. Vijayan
Director

Foreword

B*rackishwater aquaculture sector is presently going through a dynamic phase, where the introduced SPF vannamei shrimp has almost replaced the tiger shrimp, with a production of about 2,75,000 tonnes, earning the major share of seafood export earnings of ~ Rs.30000 crore in the current year. At the same time, issues such as disease out break, high input cost, price fluctuation, are serious concerns, which raise question on sustainability and profitability.*

B*rackishwater finfish farming is one of the best alternate methods of diversification to augment fish production. In this context, CIBA has developed a comprehensive indigenous technology for seed production and farming of Asian sea bass Lates calcarifer, and validated the hatchery and farm rearing, through extensive field trials. This has created interest among the fish farmers, and sea bass farming is expanding, as a viable alternative to disease struck shrimp farming sector.*

***I** am really happy to record my appreciation to the Fisheries Technocrats Forum, Chennai and all those who are guiding the Forum, for organizing an important workshop on **'Aquaculture of Sea bass – Status and Way Forward for Commercial Production'** on 28.2.2015 in collaboration with CIBA. The timely effort of the Fisheries Technocrats Forum, to bring out proceedings of the workshop, deserves appreciation. I am sure, this proceedings on sea bass aquaculture, will be a ready reference to all those interested viz. farmers, entrepreneurs, scientists, technicians, consultants and academicians, who are interested in finfish farming in this country.*

Dr. K.K. Vijayan
Director

PROCEEDINGS OF NATIONAL WORKSHOP ON AQUACULTURE OF SEA BASS – STATUS AND WAY FORWARD FOR COMMERCIAL PRODUCTION HELD ON 28-01-2015

Preamble:

The Indian aquaculture though showing a steady improvement for the last few years, is often confronted with many problems and constraints. The freshwater aquaculture has made remarkable progress, dominated by the Indian major carps and the options for the other species is minimal. However, the farming of Indian major carps too is often facing a problem of marketing with low price. The coastal aquaculture, though showed a rapid growth up to the middle of 1990s, faced a setback due to the outbreak of uncontrollable diseases as well other socio ecological problems. A quick review of the situation indicates that for the sustainability of the Indian aquaculture, diversification to other species is imperative. In this context efforts are made for introduction of few species. However, for many species the technologies for seed production and farming is not available to make it as a commercial venture. Through the concerted efforts of the R & D institutes especially by Central Institute of Brackishwater Aquaculture (CIBA) a breakthrough was made for the first time in controlled breeding and seed production of sea bass (*Lates calcarifer*) in 1997. This has paved way for the seed production of other species like Cobia, Pampano, etc. However, in this direction lot of efforts have to be made. Sea bass is a high valued species which can be farmed in cages, ponds and pens in fresh, coastal and marine ecosystems, depending upon the expertise of the entrepreneurs / farmers. The efforts taken by CIBA and other R&D Institutes like Rajiv Gandhi Centre for Aquaculture (RGCA) for the last 15 years through small scale demonstrations / pilot programmes on the farming of sea bass has not picked up on large scale as expected though the technology is viable and proved to the entrepreneurs through demonstrations.

To take stock of the state of art on Asian sea bass culture, it was decided to bring the concerned stake holders before a platform for exchange of views and future plans. In this context, the Fisheries Technocrats Forum (FTF), Chennai, comprising of the retired / serving Fisheries Professionals, Academicians, Students, Research Fellows, entrepreneurs and farmers, organized a one day National Workshop on "***Aquaculture of Sea bass – Status and way forward for commercial production***", on 28th January 2015 in collaboration with Central Institute of Brackishwater Aquaculture, Chennai. The main objective of the programme was to discuss the state of art of the technology on seed production and culture of Sea bass developed by different R&D Institutions like CIBA, RGCA, Central Marine Fisheries Research Institute (CMFRI), Kochi and National Institute of Ocean Technology (NIOT), Chennai. An interaction session with farmers to share their experiences in the farming of sea bass was also held

The Workshop was attended by 124 delegates including the Fisheries professionals, bureaucrats, administrators, faculties from Universities and colleges, entrepreneurs, fish farmers from Andhra Pradesh, Kerala, Odisha, Tamil Nadu and West

Bengal. The Workshop was held in the Auditorium of CIBA. CIBA extended the logistic support like the venue and printing of manual (in English) and brochures (in vernacular languages such as Telugu and Tamil as well as in English) on different aspects of sea bass culture for the Workshop participants. The Coastal Aquaculture Authority, Chennai and National Fisheries Development Board, Hyderabad supported by providing financial support for the conduct of workshop. CIBA and CMFRI provided excellent support by paying rental charges for the exhibition stalls which has helped to show case the start of art in R & D development in sea bass aquaculture. . The programme was chalked out as follows:

Inaugural function

The Fisheries Technocrats Forum (FTF) in collaboration with the Central Institute of Brackishwater Aquaculture (CIBA-ICAR) conducted a National Workshop on Aquaculture of Sea Bass – Status and Way Forward for Commercial Production on 28-01-2015.. The inaugural function of the Workshop took place at CIBA Auditorium by 10.00 hrs. Dr. M. Sakthivel, President, Aquaculture Foundation of India and Former Director & Chairman of MPEDA presided over, while Dr. P. Ravichandran, Member Secretary, Coastal Aquaculture Authority, Ministry of Agriculture, Govt. of India inaugurated the workshop.

Welcome address by
Dr. A.R.T. Arasu
Chairman, FTF

Presidential address by
Dr. M. Sakthivel
President, AFI

Inaugural address by
Dr. P. Ravichandran
Member-Secretary, CAA

In his welcome address, Dr. A.R. Thirunavukkarasu, Chairman, FTF and former Principal Scientist, CIBA outlined the success in the CIBA's Research & Development Programmes in captive breeding and seed production of Asian Sea Bass (*Lates calcarifer*) in 1997 for the first time in India, standardization of protocols for broodstock development, larval rearing, fry & fingerling rearing and grow-out culture, subsequent demonstrations through the NFDB programme in fish farmers fields and transfer of technology to other government organization through consultancy. However, those shrimp farmers affected consistently with the out-break of white spot virus in the cultured tiger shrimp have shown keen interest in taking up the sea bass farming, as an

alternative brackishwater farming and met with considerable success. A large scale sea bass farming could not take place for want of desired size of fish for stocking and economically viable feeds for reared fish. Those farmers who attempted sea bass farming could manage with locally available indigenous trash fish. Dr. M. Sakthivel in his presidential address stressed the importance of diversification in brackishwater farming and sea bass as one of the suitable species for freshwater, brackishwater and sea water farming and recalled how his organization encouraged the CIBA scientists and technical personnel involved in the successful seed production of sea bass. .

In his inaugural address, Dr. P. Ravichandran appraised the ongoing large scale commercial fish farming in Norway and other countries and the appropriate technology should be adopted to make sea bass farming more economically viable, for which, stockable seed & feed and live fish marketing technologies should be developed.



Felicitations by

Dr. C. Gopal
Principal Scientist, CIBA

Dr. A.G. Ponniah
Former Director, CIBA

Dr. R. Alfred Selvakumar
Former Asst. Director General, ICAR

Felicitations were offered by Dr. A.G. Ponniah, Emeritus Scientist & Former Director of CIBA, Dr. C. Gopal, Acting Director & Principal Scientist of CIBA and Dr. R. Alfred Selvakumar, Former Assistant Director General of ICAR.

Release of CIBA Sea bass manual and brochures

Interview for a regional TV programme

Dr. A.R. Thirunavukkarasu, Chairman gave a talk on the successful R & D programmes and field demonstrations of sea bass culture by different government departments and the advantages in uplifting the socio-economical status of coastal fishermen through such fish culture. The interview was telecasted in the afternoon regional news bulletin on 28-01-2015 itself.

Presentation of Life Time Achievement Award

Dr. M. Sakthivel receiving the citation from Mr. D.A. Gnanadoss

Dr. A.R.T. Arasu handing over the citation of Mr. A. Sreenivasan, to Mr. V. Venkatesan

Two fisheries experts, namely, Dr. M. Sakthivel, former Director & Chairman, MPEDA and Mr. A. Sreenivasan, Former Joint Director of Fisheries, Govt. of Tamil Nadu, were honoured with Life Time Achievement Award. Dr. M. Sakthivel received the award and citation from Mr. D.A. Gnanadoss, Former FAO Fisheries Expert, while the award meant for Mr. Sreenivsan was received by Mr V. Venkatesan as Mr. Sreenivasan was able to attend the function.

Participants

Compere by Dr. Deboral Vimala, PS, CIBA

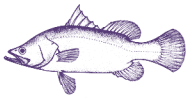
Workshop stage Management by Dr. Krishna Sukumaran, Scientist, CIBA

Vote of Thanks by Dr. V.S. Chandrasekaran, PS, CIBA

Dr. Deboral Vimala, Principal Scientist did the compere of the entire proceedings, while Dr. V.S. Chandrasekaran, Principal Scientist & Scientist-in-charge of Social Science Division, CIBA proposed a vote of thanks.

Exhibition

To create an awareness on the technology for sea bass broodstock development, seed production, nursery rearing, grow-out culture and feed development, CIBA, CMFRI, RGCA and CAA have put stalls with live materials and charts to show their level of achievement. The exhibition was declared open by Dr. A.G. Ponniah, Emeritus Scientist, ICAR & Former Director of CIBA. The FTF has put up a stall to show its fisheries promotional activities for the last two and half decades, while a private sea bass feed manufacturer also exhibited the products. Apart from the delegates of the workshop visit to the exhibition, the children from the nearby schools visited the stalls to understand the state of art in Research & Development programme in marine fish culture.

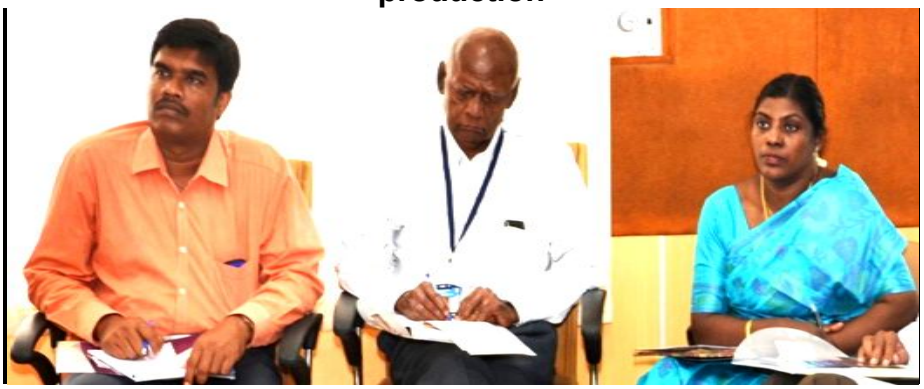


Technical Sessions

Four technical sessions were conducted:

Session 1: Present Status of sea bass broodstock development and seed production.
Session 2: Evaluation of demonstrations of nursery and grow-out culture.
Session 3: Review of experience gained by sea bass culture by farmers.
Session 4: Future strategies for large scale commercial production.

Session I: Present Status of sea bass broodstock development and seed production



Chairman: Dr. M. Sakthivel, President, AFI (middle)
Rapporteurs: Dr. Satyanarayana Sethi, Sr Scientist (left) & Dr. Nila Rekha, PS (right), CIBA

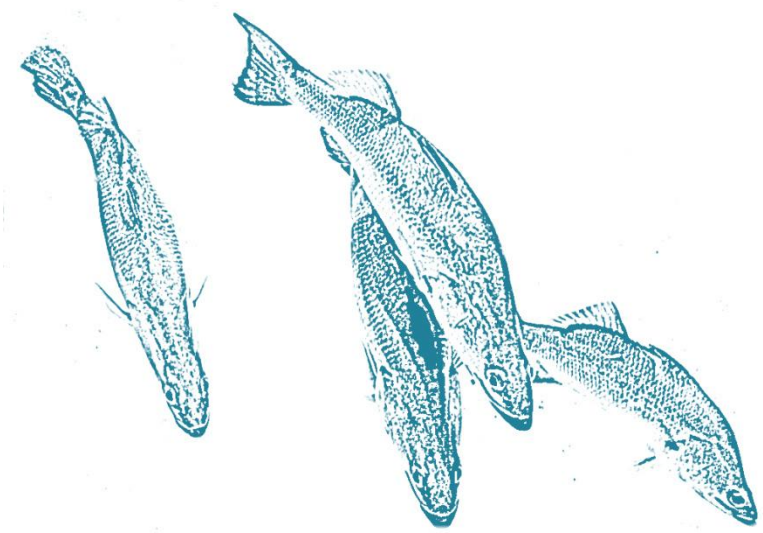
Talk-1: Asian Sea Bass hatchery and farming technologies – CIBA Initiatives for popularization

By Dr. M. Kailasam, Principal Scientist from CIBA

Technologies Developed for Transfer

	Technology package	Invest. Cost Approx. (Rs.)	Targeted clients/ Beneficiaries	Mode of adoption
1	Hatchery technology for seed production of Asian Sea bass *Lates calcarifer*	50 lakh and above*	Entrepreneurs	Consultancy
2	Nursery rearing technology for Asian sea bass *L.calcarifer*	2.0 to 10 lakhs*	Farmers/self help groups/ Entrepreneurs	CIBA training/ consultancy
3	Grow-out culture technology for *L. calcarifer* in pond based system	5.0 to 10 lakhs*	Farmers/self help groups/ Entrepreneurs	CIBA training/ consultancy

S.No.	Activities	Year of Achievement	Technology details
1	Induced breeding and seed production of Asian seabass Lates calcarifer achieved for the first time in India	1997	Standardized induced breeding protocols through hormone treatment, larval rearing and nursery rearing
2	Farming of sea bass feeding with trash fishes	1999	Grow out culture feeding with Tilapia in the farmers pond (productivity 3.5-4.0 kg/ha)
3	Transfer of technology to RGCA	2000-2002	Seed production technology of Asian sea bass technology transferred to RGCA
4	Year round breeding and seed production	2006-2007	Established RAS facility for Year round breeding could be achieved
5	Demonstration of grow out culture in pond system in different states feeding with formulated diet (Bhetki ahaar)	2008-2013	Under NFDB funding demonstrated farming of sea bass in 6 states
6	Commercialization of Bhetki Ahaar	2014	Commercialized to Rathna Agro-Vet Pvt Ltd,
7	Consultancy on hatchery technology	2012-14	Two hatcheries taken up (Odisha & Andhra Pradesh)
8	Demonstration of hapa/pond based nursery rearing	2013-2014	Men/Women Self help groups



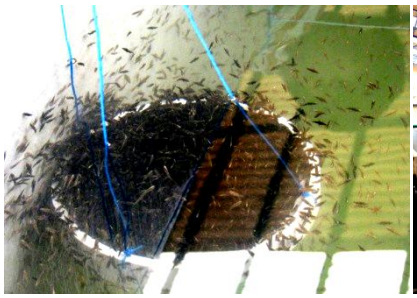
Talk-2: Asian Sea bass hatchery operation – Challenges and Prospects …. –

By Dr. K. Ganesh, Project Manager, RGCA

Hatchery facility

Broodstock holding tanks

Hormonal injection treatment for brooder fishes



Weaning in to artificial diets

Automatic belt feeder for Artificial diet

Grading and size-wise stocking

Grading

Grading apparatus

Enrichment for live feeds

Algal enrichment

Standardization in fry packing

Available Brands of weaning diets in India

An Indigenus Feed for Nursery Rearing – NUTRILA

- **Extruded Floating Feed for Sea bass**
- Feed characteristics
- Scientifically formulated complete and balanced nutrition
- Manufactured with latest proven technology
- Good in digestibility and palatability
- Ensure higher fish growth with better feed conversion ratio
- Less water pollution and free from prohibited chemicals

Die size (mm)	Moisture Max. %	Crude Protein Min. %	Crude Fat Min. %	Crude Fibre Max. %
1.2	10	45	10	2.5
1.8	10	45	10	2.5
3	10	40	10	3
4	10	40	10	3

Lucky Brand supplied by M/s Aquaworld, Chennai

Skretting finfish diets may be available shortly in India with the support of Ananda Group

Promotional price of seabass larvae

Size of larvae	Promotional price (Rs.)
Hatchling – 2 dph	0.05
3 – 8 dph	0.2
9 – 13 dph	0.3
14 – 17 dph	0.4
18 – 21 dph	0.7
22 day to 1.5 cm	2
2-5 cm	Length (in cm) x 2-1
>5cm	Length (in cm) x 2

Indicative Costing - Larvae

Major head of expenditure for 1 cycle (50 days)	Amount (Rs.)
Cost o hormone	6,000
Cost of Artemia (Rs. 3,800 & 175 tins)	6,65,000
Fuel/electricity - LS	4,00,000
Yeast for rotifer production (Rs. 240 X 150 kg)	35,000
Chemicals, broodstock feed and othr consumables	50,000
Weaning diets	20,000
Total	11,77,000

Cost of larvae

	Amount (Rs.)
Cost of 3 cm larvae	5
Number of 3 cm larvae for break even point	2,35,400
Say	2.5 lakhs
Total expenditure including salary and wages (11.77+5 lakhs)	16,77,000
Number of 3 cm larvae for break even point (@ 5 rupee per larvae)	3,35,400
Say	3.5 lakhs

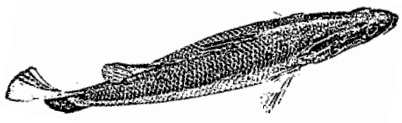
Business option

Rearing option	Size/weight range	Duration (days)
9 day old fry to fingerlings	4mm – 5 cm	30-40
Fingerlings to 50 gram	5 cm - 50 gm	60
50 gm. For cage farming	50 - 800 gm	180
50 gm for open pond farming	50 – 800 gm	180

Consultancy package for those who own functional Seawater based hatchery

Tasks	Fee
Supply of one day old Spawn, live feed production starting from rotifer to weaning feed for production of 0.5 million 30 days old fry.	Rs.5,00,000.00 excluding the charges of inputs like Spawn, drugs fertilizers and weaning feed etc.
Supply of 15 days old fish fry to produce 0.5 million 30days old fry.	Rs. 2,00,000.00 excluding the charges of inputs like fish fry drugs fertilizers and weaning feed etc
Supply of 30 days old fish fry to produce 0.25 million fingerlings and stocking in grow out cages.	Rs. 2,00,000.00 excluding the charges of inputs like fish fry feed and cages etc.

Hands on training: Asian sea bass aquaculture

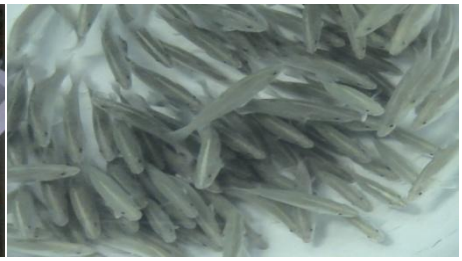


Session 2: Evaluation of demonstrations of nursery and grow-out culture

Talk-3: Aquaculture of Asian Sea bass - RGCA's Experience in farming

By Mr. S. Pandiarajan, Project Manager, RGCA

Nursery Rearing in Indoor Hatchery Facilit

Rearing of weaned Fry/Early fingerlings of 1.5 – 5.0 cm.
Tank capacity : 10 M.T
Initial stocking @ 5000 nos./m^3
Type of feed : Extruded slow sinking / floating feed.
Feeding rate : 10 – 6 %
Water exchange : 100 - 200 % daily
Grading frequency: 6 – 10 days
Rearing period : 40 – 50 days.
Survival : 75 – 80 %

Nursery Rearing in Net Cages in Pond


Rearing of early fingerlings of 2.0 – 2.5 cm
Type of cage used : Nylon knotless net cages
Mesh size : Initial - 3 sq.mm
Final - 12 sq.mm
Stocking density - Initial :2000 nos./sq.m
- Final : 300 – 350 Nos.

Extruded pellet feed - Initial : 1.2 mm
Final : 3.0 mm
Feeding rate - 6 – 4 %
Grading frequency - 10 – 15 days.
Water exchange - 10 – 20 % on fortnight once
Rearing period - 45 – 60 days.
Survival - 70 – 80 %
Size at harvest - 7 – 10 cm.

Nursery Rearing in Happas in Pond


Rearing of early fingerlings of 4.0 – 5.0
Mesh size : Initial - 4 sq.mm
Final - 12 sq.mm
Stocking density - Initial :1000 nos./sq.m
Final : 250 – 300 Nos.
Extruded pellet feed - Initial : 1.2 mm
Final : 3.0 mm
Feeding rate - 6 – 4 %
Grading frequency - 12 – 15 days.
Water exchange - 10 – 20 % on every fortnight
Rearing period - 40 – 50 days.
Survival - 70 – 75 %
Size at harvest - 7 – 10 cm

Asian Sea bass Farming in Cages in Pond

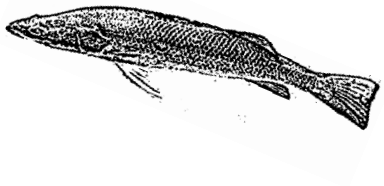


Area of the Pond – 1 ha. WSA
Dimension of the net cage – 2.0 m x 2.0 m x 1.3 m
Cage Mesh Size(s) - 12mm. 16 mm,20 mm, 24 mm, 32 mm & 38 mm
WaterdDepth – 1.8 m
Aeration - 4 Aerators
Initial No. of net cages – 10 Nos.
Initial Size fingerling at stocking – 8.0 Cm; 7.0 Gm.
Stocking density – 200 Fingerlings/m^3
Total No. of fingerlings stocked - 10,500 nos.
Initial biomass – 2.0 Kg/m^3

Type of feed	– Extruded Floating Pellet
Feeding rate	– 5.0 to 1.8 % of av. body wt.
Water exchange	- 10 – 40 %
Grading frequency	– 15 - 45 days
No. of cages at harvest	– 75 Nos.
Final biomass	– 20.0 Kg/m^3
FCR	– 1:1.5 – 1.6
DOC	– 8 Months
Size at harvest	– 700 - 900 Gm.
Survival	– 80%
Total production	– 6.0 M.T

Culture in Open Pond

- Fingerlings of 8.0 – 10 cm reared in Net Cages in Pond.
- Stocking density @ 1 No./sq.m
- Feeding with extruded pellet feed (2.0 mm – 14.0 mm)
- Water exchange : 10 – 30 %
- Culture duration : 8 – 10 months
- Size at harvest (range) :0.5 – 1.5 Kg.
- FCR : 2.0 – 2.5 : 1
- Production : 3.0 – 4.5 M.T
- Survival range : 45 – 65 %



Talk-4: Moving Towards Farming the Sea……

By Dr. Joe Kizhakudan, Principal Scientist, MRC of CMFRI

Cage Culture – an over view

- It is estimated that over 60percent of coastal marine finfish aquaculture is in cages.
- Marine and brackishwater cage farming in Asia is also diverse, with a variety of species being cultured at varying intensities. In most nations the individual operations are not large, and often a clustering of farming activities is seen. This clustering is primarily a result of the limited site availability in coastal waters.
- Cage farming is most dominant in East and Southeast Asia,. The main species farmed in brackishwaters are the barramundi or Asian seabass (*Lates calcarifer*) and the milkfish (*Chanos chanos*).
- Almost all cage farming of these species is based on hatchery-produced fry and the use of pelleted feed.
- In inshore marine cage farming, apart from traditionally farmed species such as amberjacks (*Seriola* spp.) and snappers (*Lutjanus* spp.), in Southeast Asia the cage farming of groupers (*Epinephelus* spp.) and cobia (*Rachycentron canadum*) is gaining ground, the former particularly to cater to the live-fish restaurant trade.
- Some cage farming in Asia is still dependent on wild-caught seed stock, particularly for grouper species.

A view of cage culture for fish in different countries



Trials in the Indian Seas

Bay Of Bengal-Visakhapatnam (Sea bass):

I .May 2007- (45 Days-15m Dia; HDPE

II. Dec 2007 till April 2008-15m Dia; HDPE

III. 2008-2009 HDPE -15m Dia

Vizhinjam, Vizag, Veraval, Diu, Mangalore, Mumbai, Kochi, Chennai, Balasore, Karwar, Mandapam, Nellore, Pulicat (Sea bass, spiny lobster, mullets, Etroplus, Snapper, Cobia, tiger shrimp)

IV. 2009-2010 HDPE -6m

Karwar, Kochi, Chennai, Mandapam, Veraval, Vizag, Mangalore, Mumbai

V. 2011-2014 GI-2-3-4-5-6-m Dia

- Initial trials with sea bass , stocking densities were lower and seed nursing was carried out in the cages directly in separate hapas. The small mesh nets clogged at faster rates and grading was not convenient in the weather.
- Poor survival rates were obtained and growth was not uniform in sea bass
- After the introduction of nursery rearing to the hatchery supplied seed and raising them to 15-17 cm the survival rates increased and so did the growth uniformity
- 6 m cage was found to be more adaptive to our waters and ease of handling
- The size holds good for the GI version also
- 3 tonnes produced in 6 m dia cage at Balasore, 1.7 tonnes (3960 nos) at Vizhinjam, 1 tonne at Kochi (3500 nos), 2 tonnes (2500 nos) and 4 tonnes (6200nos) at Karwar
- The Asian sea bass is a euryhaline fish with high tolerance to a wide salinity range (0-38 ppt) and high turbidity levels.
- Cage culture of sea bass quite well developed in Thailand, Malaysia, Indonesia, Hong Kong and Singapore.
- Open sea cage culture of the Asian sea bass *Lates calcarifer* was carried out for the first time in the Bay of Bengal off Chennai by CMFRI during February – August 2010.

ACIVITIES

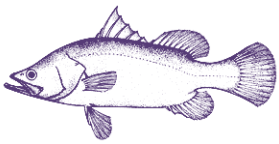
- Site selection
- Cage set up and specifications
- Mooring
- Stocking
- Monitoring and tending of stock
- Cage maintenance
- Harvest

Collection of bottom soil and depth sounding to confirm bottom safety.

- Inputs from fishermen, local knowledge on surf zone, wave heights, wind speeds, bottom nature, currents, amplitudes etc.
- Selected site CHEMMENCHERRY20 km south of Chennai; Bay of Bengal; 12º46.815'N; 080º15.521E
- 3-4 km away from bar mouth; curved shoreline preventing influx of ground water & terrestrial discharge towards cage site.

Cage specifications

- circular, gravity model
- HDPE frame of 6 m inner diameter and 8 m outer diameter
- 3 pipes in the collar
- HDPE net cage bags of different mesh sizes, of 3 & 4 m depth respectively.
- floor space area was 28.3 sq m, volume of the suspended net was 82.6 cu. m.



Nursery rearing & grading

- Sea bass require grading till 16–17 cm TL.
- Graded in 7-10 days time to avoid cannibalism and suppression of growth.
- Smaller sizes will necessitate holding in small hapas or cages with regular grading.
- Pellet feeding, grading and monitoring during these stages in open sea environment difficult
- Beyond 17 cm, further grading not recommended.
- Therefore stocking to cages at this size advantageous.

Stocking

- Initial stocking density of sea bass seed (16-22 cm/60-100 g) was 83 nos./cu. m (6.6 kg/cu. m) (7000 numbers)
- Culture period for 160 days (February to August 2010)

Feed

- Nursery feed (pellets and live shrimps) continued from second day after stocking, for 13-14 days.
- Weaning done gradually to fresh fish (anchovies) twice daily @ 2.5 % biomass
- After 40 days of culture, sardines, cut into small pieces introduced.
- Three-times-a day feeding practised in initial months, feed given twice a day in the final phase of culture.
- The FCR was 1:4.06.

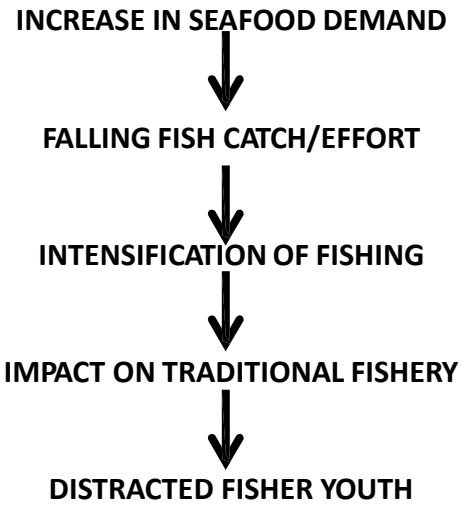
Harvest

- Periodical sampling at feeding time using scoop nets to assess growth, density infections/infestation etc
- Loss of fish due to escapement to outer net and beyond be monitored.
- Fishes had attained sizes ranging from 0.8 kg to 1.8 kg weight (25-49 cm total length) with an average weight of 1.3 kg.
- > 90% of the fishes were in the weight range of 1.1 to 1.5 kg.
- The harvested fish were sold at prices ranging from Rs.180/- to Rs. 200/- per kg.
- considering loss of stunted sizes during bigger mesh net introduction, net survival is 63.6% survival, producing 46.62 kg/cu. M, i.e. 3.84 t

- secondary thinning and prevention of loss at net damage and exchange can improve the production rates.
- results promising as production rate and growth rate of 6.375 g per day are very promising in marine culture of sea bass at high densities.
- The financial support rendered by the NFDB to carry out the open sea cage trial off Chennai is gratefully acknowledged
- The enthusiastic support and cooperation of the fishermen of Chemmencherry and Kovalam villages and the technical team at Kovalam Field Lab ,Chennai in the implementation and completion of the programme is also acknowledged





Dwindling stakeholders interest in resource conservation/augmentation

Central Marine Fisheries Research Institute has been encouraging fishermen to take up open sea cage farming as an additional or alternate livelihood practice.

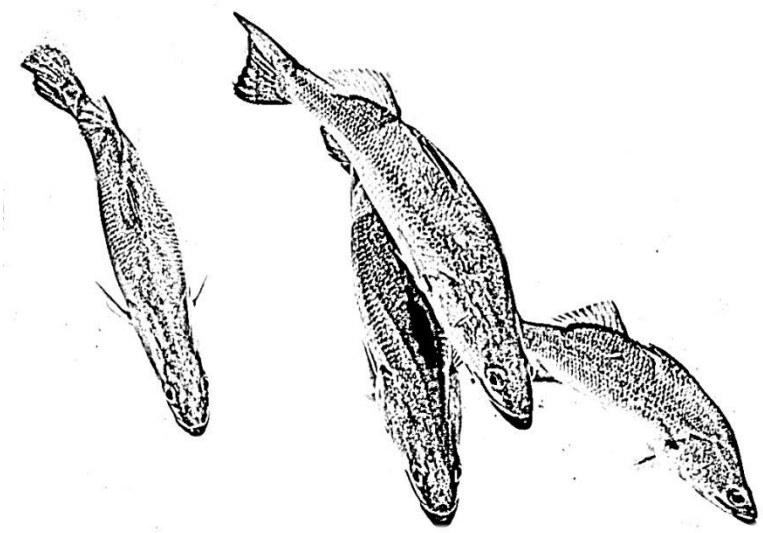
Kovalam fishing hamlet in Tamil Nadu is one of the focal points of CMFRI's initiative towards this. As a continuous process of reviving and retaining interest among fisher youth, CMFRI has been conducting awareness and demonstration programmes on seafarming and habitat restoration. A team of fifty young fisher youth (below 30 years of age) were encouraged to form the **Association of Kovalam Progressive Fishermen (AKPF)** with the approval of Kovalam fisher and Panchayat leaders. These boys were trained in all aspects of sea cage culture operations, from cage fabrication to harvesting & marketing.

Another demonstration at Kovalam

- Stocking in 5mOD/4m/ID –GI cage—51CU.M- with 1500seabass ,50-60gm
- DoC-100 days, Harvested on 25 Sept 2014
- 80 PERCENT RECOVERY, AV. SIZE 0.5 KG,TOTAL 600KG
- Fishes caught with caution not to injure least stress
- Small volume catching, shifting in aerated water to shore
- Held in running water facility on shore, weighed, shifted
- Transported in tanks-Sintex with oxygen supplies, reduced densities
- Sale price of Rs. 400 per kg
- Revenue Rs. 2,40,000/-
- Stunted juveniles (150 gm)@Rs. 100 per piece, 300 nos
- Revenue Rs. 30,000/-
- Total Revenue Rs. 2,70,000/-
- Seed cost Rs. 12,500
- Income percent to village Rs. 12,500/-
- Feed Rs. 30,000/-
- Labour Rs. 10,000/-
- Net income Rs. 2,05,000/-
- Cage, net and mooring provided by the Institute for operations

Concluding Remarks

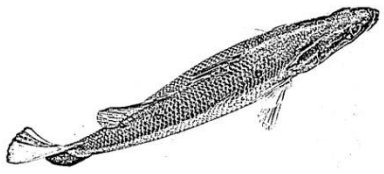
One of the advantages of live marketing for SPORT FISHING/FRESH TRADE IN EATERIES is that the grow-out period can be shortened since demand on larger size is less. New marketing avenues with a higher value realization have opened new vistas in open sea mariculture in India.



Talk-5: Demonstrations in sea bass and Cobia culture

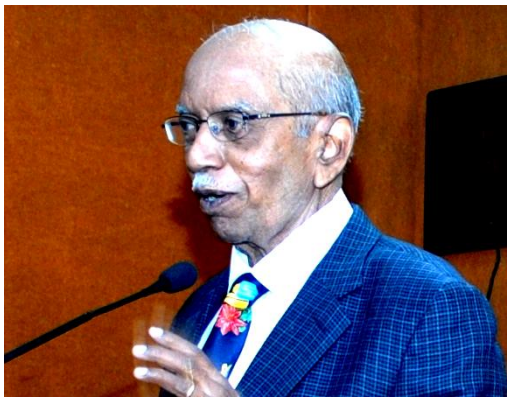
by Dr. Senthilkumar, Scientist, NIOT

Dr. A.Senthil Kumar, Scientist from NIOT presented the experiences of NIOT on the cage farming of sea bass and other fishes at Olakuda, Rameshwaram and at Andaman Islands. He explained that they have also received seed from CIBA and stocked in their nursery cages where they can get appreciable survival rate. The juvenile fishes after stocking in the grow out cages have grown to marketable size within 8 months. The techno-economic viability of Asian sea bass farming was demonstrated. As a part of the demonstration, they have taken up a demonstration with the participation of fisher folk of Olakuda. The programme was excellently successful. The fisher folks have shown keen interest in taking it up on a commercial scale, if the adequate inputs like seed and feed are available. In his presentation Dr. Senthil Kumar informed that through their experience on cage designing, fabrication and installation they developed a software for the cage farming wherein they could get all the details on the techno-economic viability of the cage farming of a particular species of fish, if the inputs like the species, the expected production, etc. are given. He informed that the software is available at NIOT for public domain and those who are interested in cage farming can avail this facility.



Session 3: Review of experience gained by sea bass culture by farmers

Dr. A.R.T. Arasu (left), Dr. P.S.B.R. James (middle) & Dr. M. Sakthivel (right)



Dr. P.S.B.R. James addressing the gathering

One of the main objectives of the Workshop are to discuss on the experiences of farmers from various parts of India in the sea bass farming. The following experts were the panel members for this meet.

1. Dr. P.S.B.R. James, former Director, CMFRI
2. Dr. M. Sakthivel, President, Aquaculture Foundation of India
3. Dr. A.R.Thirunavukkarsu, Chairman, FTF

In his address to the participants, Dr. P.S.B.R. James, Former Director of CMFRI stressed the need for diversification in brackishwater aquaculture and fresh initiatives for open sea fish culture. He appreciated the roles played by CIBA, CMFRI & RGCA in the development of captive broodstock, induced breeding, larval rearing, nursery rearing, grow-out culture, field demonstrations and training of technical and farm personnel, for commercially important fishes like sea bass, cobia, etc. Further, he stated that those fish farmers who have come from different states and attending this workshop, should express their experience, so as to fine-tuning the already available technology.

From West Bengal

From Odisha

From Kerala

Marketing Manager For sea bass feed

From Tamil Nadu (Mr. Nithyanandan)

An entrepreneur from West Bengal, Mr. Rohit Kumar Chhajer informed that he planned to take up sea bass farming covering each value chain from nursery rearing in an area of about 50ha in Digha, West Bengal. He expressed that the seed and feed will be the major requirements. In this context he requested the R&D Institutes to give support for his endeavor. Mr. Anjan Kumar Dandapat, a farmer who has taken up sea bass farming starting from nursery to grow out at Sahada in Balasore, Odhisa gave a narration on his experience on sea bass farming. He informed that within 8 months he got sea bass size of 800gm-1.5kg. He had a stock of 7 tonnes in his 2ha farm within a period of 18 months. He informed that due to flooding he has lost the crop. He also informed that marketing of sea bass is not a problem as the farmer has to harvest small quantity everyday for the domestic/local market.

Mr. Nithyanandan, a progressive fish farmer from Thiruporur near Chennai informed that live grown-up sea bass (1 to 3 kg size) harvested from CMFRI open sea cage culture at Kovalam were stocked in a freshwater pond after acclimatizing them to freshwater condition. The reared fish were fed with trash fish and are being caught by anglers, who visit his farm, in order to create an awareness on game fishing. The stocked fish tend to congregate at a place where clean water is pumped in. Further, trash fish as feed is being thrown at the same spot for more congregation of stocked fish. When the fishing rod with artificial bait is thrown into the congregated mass of fish, the chances for getting caught in the artificially baited rod are more. After hooked in the rod, fishes were retrieved from the hook without any damage and released in live condition back into the pond, till another angler hooked them.

The photographs taken during the visit by some members of the FTF to Mr. Nithyanandan's Game Fishing Farm at Thirupporur on 14-03-2015 are depicted below.

Thirupporur Game Fishing farm

Fishing rods

Clean water pumped in, for congregation of reared fish

Angling being done

Fish caught

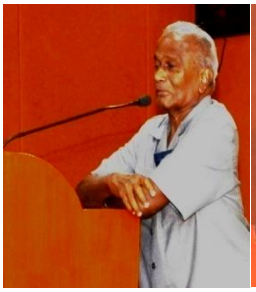
Hooked fish being held Dr. A.R.T. Arasu and other FTF members

The Andhra Pradesh farmers explained their experiences in the sea bass farming. Farmers from Krishna District have taken up nursery rearing of sea bass as a livelihood activity which is carried out commercially and another set of farmers are taking up growing sea bass to juvenile stage for supplying to grow out culture farmers. The linkages are working out on a small scale and the farmer informed that there is a scope for further expansion of such activity. The farmers from Kerala shared his experience on the grow out farming of sea bass in small net cages. They informed that the major problem encountered was the damage by the crabs in the cages. However, due to their experience they have learnt to use a protective net for keeping away the crabs.

From Tamil Nadu

From Tamil Nadu

Dr. M. Vijayakumaran NIOT



Dr. D.B. James FTF

Dr. R. Soundararajan FTF

Farmers from Tamil Nadu informed that not only in the brackishwater, there is lot of scope for farming of sea bass in the freshwater along with carps. They informed that in the ponds are stocked with carps each weighing around 200g and above during September – October. A lot of pest fishes like Tilapia, Barbus, etc. were found in such carp farming. Some farmers introduced sea bass of around 300-400nos/ha and allowed to prey upon these pest fishes and harvested after 6-7 months where they got sea bass as additional crop in their farms.

The farmers from Andhra Pradesh, Kerala, Odhisa, Tamil Nadu and West Bengal who have undertaken the sea bass nursery and grow-out farming of sea bass spoke on the experiences and future plans and interacted with the other participants.

Session 4: Future strategies for large scale commercial production

Panel of experts: Dr. P.S.B.R. James, Former Director of CMFRI
Dr. M. Sakthivel, President, AFI, Dr. A.G. Ponniah, Emeritus Scientist & Former Director of CIBA, Dr. A.R. Thirunavukkarasu, Chairman, FTF & Former Principal Scientist, CIBA, Dr. M. Kailasam, Principal Scientist, CIBA

Based on the presentations and the experiences of the farmers and entrepreneurs and on the views of participants, the following recommendations were drafted.

Recommendations

The major requirement for the commercial venture of Asian Sea bass was mainly centered around 2 major inputs, the seed and the feed.

Seed production

1. Considering the importance of the quality seed for commercial production of sea bass, it was felt at least 10 hatcheries with production capacity of 10 million each, 3 in East Coast and 2 in West Coast should be established for the supply of required seed. To start with, the hatcheries can be established with the participatory mode under the Government Agencies and entrepreneurs.

2. At present there are only 2 small scale hatcheries with limited broodstock facility, established by CIBA and RGCA. For the production of seed, a viable broodstock is essential. Keeping in mind the requirement of the broodstock, tangible efforts should be made for establishing Broodstock Centres of sea bass. This can be supported by the funding agencies like NFDB which will be Nucleus Centres for the supply of hatchlings.

3. To start with, Satellite rearing centres can be started on a Public-Private-Partnership mode, where the fertilized eggs/ hatchlings can be obtained from R&D Institutes and reared to early fry stage which will be supplied to the nursery phase.

4. For a sustainable breeding and supply of quality hatchlings, the broodstock quality should be maintained. A critical study on the possibility of genetic improvement and selective breeding of sea bass should be taken up by the R&D Institutes.

5. The quality of the live feed is utmost important for the production of quality fish seed, for which, appropriate R & D programmes in enrichment of live feeds may be undertaken.

6. At present the larval rearing in the hatcheries is solely dependent on live feed only which is fluctuating and the synchronization is a problem. To overcome this, immediate attention should be paid on priority basis for developing suitable formulated feed for the early stages of the fish.

7. The major problem to be solved is to increase the larval survival rate and quality of seed, which is related to the differential growth and the hierarchy. The concerted research effort is required for production of uniform sized siblings through management / breeding protocol interventions.

Nursery rearing

8. The major problems in the nursery phase rearing are obtaining desirable sized seed, cannibalism among the reared larvae and lesser survival rate. Efforts should be made in fine tuning the technology on the nursery rearing and the protocols in optimising density, physio-chemical requirements, water quality, feed and feed ration. Duration of rearing should be further standardized and the comprehensive technology should be made available for the commercial production. Based on the experience gained by the farmers, small scale nursery rearing can be permitted with the participation of the fisher folk / entrepreneurs. Adequate training should be provided and demonstrated to the entrepreneurs for taking up nursery rearing of sea bass as an activity of livelihood and income generation and to produce quality seed for commercial farming. The duration for grow-out is longer, i.e. 8-10 months. To reduce such long duration, stocking of juveniles of 80-100 g may help reduce the growing period. The technology for producing such large-sized juveniles is required, for which appropriate protocols may be developed.

Grow-out culture

9. Culture of sea bass in earthen ponds may require low inputs and differential size groups are obtained at the final harvest. The periodical grading during the culture operations may help in reducing the differential growth and obtaining uniform product.

10. The cage culture of sea bass in shore seas has shown promising results and to take it up on large scale in the open culture bodies, appropriate leasing policy may be drawn.

Feed development

11. Sea bass is either cultivated along with other food fishes or fed with low cost fishes. For large scale commercial operation, formulated feed is the immediate requirement. Efforts should be made to establish feed mills by participatory mode of govt. agencies and private sector.

Marketing

12. The sea bass is consumed mainly in the domestic market and a large scale production of sea bass would eventually face problem in marketing. An appropriate study on the quantum of domestic need, consumption, the required size in the domestic markets in different regions of India may be undertaken for developing a market strategy and the remunerative price to the growers. Sea bass is sold either as a fresh or dry fish mainly in the domestic markets. A technology for the value-added products from sea bass may be developed.

Sea bass for sport fishing

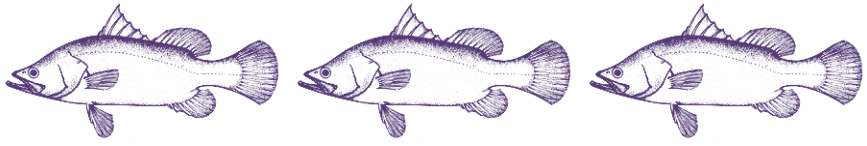
13.Sea bass is performing well in the open culture system as an excellent sport fish. Such venture for sport fishing may be encouraged to attract national and international angler personnel, which may be more remunerative.

Financial support

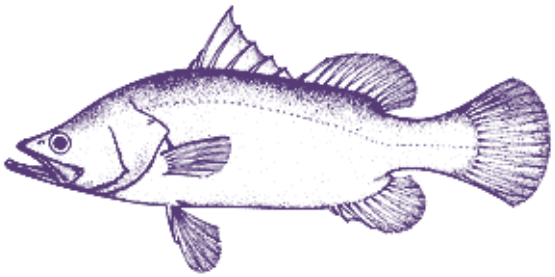
14. Farming of sea bass is as of today being practiced by small entrepreneurs / farmers. For the promotion of large scale farming adequate financial support seems to be the need of the hour. Agencies like NFDB should include sea bass as a diversified species for farming to sustain the aquaculture in fresh water, brackishwater and marine ecosystems and support with adequate promotional subsidies to the entrepreneurs for setting up Hatcheries / Rearing Centres / Nurseries / Live Feed Centres / Grow out Systems.

Participants

A total of 125 personnel (16 CIBA scientific & technical, 6 MRC of CMFRI scientific & technical, 5 CAA officials, 6 colleges professors & students, 40 fish farmers- 14 from Andhra Pradesh, 3 each from Kerala & Odhisa, 20 from Tamil Nadu, 1 from West Bengal, 32 FTF, Chennai members, 4 FTF, Madurai branch members, 3 former ICAR officials, 3 each from RGCA & Tamil Nadu Fisheries University, 4 Aquaculture industry entrepreneurs and 2 media officials) attended the workshop. A. list of participants are given in Annexure 1.



INDIAN CONTRIBUTION ON SEA BASS, *LATES CALCARIFER*



THROUGH SCIENTIFIC AND TECHNICAL PAPERS

Taxonomy

1.Biswas, G. 2009. Taxonomy and identification of cultivable brackishwater finfishes. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 152-155.

2.Bloch, M.E., 1790. Naturgeschichte der ausländischen Fische. *J. Morino & Comp*., Berlin. vol. 4: 1-128.

3.Day, F. 1878. Fishes of India. Vol. I. Bernard Quaritch, London.

4.Geetha, A., J.P. George, Ansy Mathew, S. Giri, G. Chakravarty, S. K. Chakraborty and S. Dam Roy. 2005. Ichthyofauna of the Mangrove Ecosystem. In: Mangrove ecosystems - A Manual for the Assessment of Biodiversity, (Ed.) J.P. George, *CMFRI Spl. Publ*., No. **83**: 83-116.

5.Gopalakrishnan. V. 1973. Taxonomy and biology of tropical fin fish for coastal aquaculture in the Indo-Pacific region. In Coastal Aquaculture in the Indo-Pacific Region, (Ed.) T.V.R. Pillay, Fishing News (Books) Ltd., London, p. 120-149.

6.Grace, Mathew. 2009. Taxonomy, identification and biology of Seabass (*Lates calcarifer*). In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 38-43.

7.Misra, K.S. 1962. An aid to the identification of the common commercial fishes of India and Pakisthan. *Rec. Indian Mus*., **57** (1-4) : 1-320.

8.Misra, K.S. 1969. Pisces : The Fauna of India and Adjacent Countries. Vol. 1 (2nd ed.) Manager Publication, New Delhi, 276 pp.

9.Misra, K.S. 1976 a. Pisces. The Fauna of India and adjacent countries. Vol. II (2nd ed.), Manager Publication, New Delhi, 438 pp.

10.Misra, K.S. 1976 b. Pisces. The Fauna of India and Adjacent Countries. Vol. III (2nd ed.), Manager Publications, New Delhi, 367 pp.

11.Rajan, P.T., C.R. Sreeraj and T. Immanuel. 2011. Fish fauna of coral reef, mangrove, freshwater, offshore and seagrass beds of Andaman and Nicobar Islands. Zoological Survey of India, Andaman and Nicobar Regional Centre, Haddo, Port Blair.

12..Talwar, P.K. and A.G. Jhingran. 1991. Inland fishes of India and adjacent countries. Oxford and IBH Publ.Co., New Delhi. 1158 pp.

.

13.Talwar, P.K. and R.K. Kacker. 1984. Commercial sea fishes of India. Zoological Survey of India, Calcutta. pp. 997.

Common and vernacular names

14.Andrews, J. 1994. Scientific, common and vernacular names of commercially important fin and shell fishes. 3. Kerala. *Mar. Fish. Infor. Serv. T & E Ser*., **134**: 12-17.

15.Dan, S.S., S.K. Ghosh, S. Bar and S.N.H. Rao. 1994. Scientific, common and vernacular names of commercially important fin and shell fishes. 5. Orissa. *Mar. Fish. Infor. Serv. T & E Ser*., **134**: 28-33.

16.Dan, S.S., P.B. Dey, S.K. Khar and B.K. Burman. 1994. Scientific, common and vernacular names of commercially important fin and shell fishes. 6. West Bengal. *Mar. Fish. Infor. Serv. T & E Ser*., **134**: 33-38.

17.Gurusamy, R. 1994. Scientific, common and vernacular names of commercially important fin and shell fishes. 4. Tamil Nadu. *Mar. Fish. Infor. Serv. T & E Ser*., **134**: 17-27.

18.Kharbhari, J.P. 1982. Scientific, common and local names of commercially important marine fishes and shell fishes of Maharashtra and Gujarat coasts. *Mar. Fish. Infor. Serv. T & E Ser*., **44**: 18-23.

19.Rao, C.V. Seshagiri. 1991. Scientific, common and local names of commercially important edible marine fin and shell fishes of Andhra Pradesh. *Mar. Fish. Infor. Serv. T & E Ser*., **108:** 1-10.

Biology

20.Abdulrahiman, K.P., T. Harishnayak, P.U. Zacharia and K.S. Mohamed. 2004. Length-weight relationship of commercially important marine fishes and shellfishes of the southern coast of Karnataka, India, *Naga Quarterly*, WorldFish Center, **27**(1-2): 9-14.

21.Anita Bhatnagar, S.K. Garg, S.N. Jana and G.S. Dinodia. 2003. Food and feeding habits of some brackishwater fish species in relation to relative length of the gut. In: Fish production using brackishwater in Arid Eco-System, (Eds.) S.K. Garg & A.R.T. Arasu, *Proc. 3rd Interaction Workshop*, Hisar, India, pp. 86-88.

22.Basu. N.C. and B.B. Pakrashi. 1979. Brackishwater fish and prawn seed potentialities of Bakkhali area in lower Sunderbans, West Bengal. *J. Inland Fish. Soc. India,* **11**(1): 40-48.

23.Bensam, P. 1988. On the early developmental stages of a few fishes from Vellar estuary. *J. mar. biol. Ass. India.,* **29**: 257-272.

24.Bhanot, K. K. 1971. Observations on the availability of brackishwater fish seed in the Matlah estuary around Port Canning. *J. mar: biol. Ass. India,* **13** (I&2): 274-278.

25.Bhanot, K.K. and D.K. De. 1979. Seed resources of brackishwater culturable finfish and shell fish of India. *In* Souvenir: the ICAR Golden Jubilee Year, CIFRI, Barrackpore. Part 2: 183-186.

26.Biswas, G. 2009. Biology of cultivable brackishwater finfishes. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 10-15.

27.Chacko, P.l. 1949. On the nutrition of the young stages of certain estuarine fishes of Madras. Fish and Fisheries of the Mulhupet Saline Swamp, Tanjore Dist. *Proc. Indian Sci. Congress*, **36**(3): 163-164.

28.Chacko. P.1. 1949a. Migratory movements of fishes of the Coleroon. *Proc. Indian Sci. Congress*, **36**(3): 161-165. .

29.Chacko, P.I. 1956. Observations on the biology and ecology of the inland water fishes of Madras with special reference to lheir suitability for culture. Govenment of Madras Fisheries Stalion Report and Yearbook 1954-55, p.247-270.

30.Chacko, P.L. J.G. Abraham and R. Andal. 1953 . Report on the survey of flora and fauna and fisheries of Pulicat Lake, Madras Stale, India (1951-52). Central Freshwater Fishery Biology Station, Madras, 8: 1-20.

31.De, D.K. 1971. On the biology of postlarvae juveniles stages of *Lates calcarifer* (Bloch). *J. Indian Fish. Assoc*. **1**(2):51-64.

32.Devanesen, D.W. and K. Chidambaram, 1953. The common food fishes of the Madras State. Madras, Superintendent Government Press

33.Dhareswar, V M. 1998. *On a large seabass from Karwar coast, India. Mar. Fish. Infor. Serv. T & E Ser*., No. **158**: 20.

34.Ganguly, D.N., B. Mitra and N. Bhatacharya. 1959. On the interrelationship between total length, standard length, depth and weight of *Lates calcarifer*. *Proc. Natl. Inst. Sci. India*, **25**(B):175-187.

35.Ghosh, A. 1973. Observation on the larvae and juveniles of "bhekti"·*Lates calcarifer* (Bloch) from the Hooghly-Matlah estuarine system. *Indian J. Fish*., **20**(2): 372-379.

36.Ghosh. A., A.K. Saha and P.R. Roy. 1977. Structure of vertebrae and its role in age determination of *Lates calcarifer* (Bloch). *J. Inland Fish. Soc. India*, **9**: 186-189.

37.Gopalakrishnan, V. 1968. Collection of brackish-water fish seed from the Hooghly estuary. *Proc. Seminar on Production of Quality Fish Seed for Fish Culture*, CIFRI, Barrackpore, pp. 232-247.

38.Gopalakrishnan, V., K.K. Bhanot, S.N. Dutta and S.B. Saha. 1975. Procurement of stocking material for brackishwater fish culture from the Hooghly-Matlah estuarine system. *J. Inland Fish. Soc. India,* **7**: 216-224.

39.Hora, S.L. 1923. Fauna of Chilka lake. Part V. Fish. *Mem. Indian Mus*., **11**: 737-770.

40.Jayabalan, N., G.S. Thangaraj and K. Ramamurthy. 1985. Finfish seed resources of Vellar estuary. *Proc. Symp. Coastal Aquaculture*, Mar. Biol. Ass. India, Part **3**: 732-749.

41.Jeyaseelan, M.J.P., N, Ramanathan, V. Sundararaj, K. Venkataramanujam and M. Devaraj. 1998. Manual of fish eggs and larvae from Asian mangrove waters. United Nations Educational, Scientific and Cultural Organization. Paris, 193 p.

42.Kailasam, M. and A.R. Thirunavukkarsu. 2009. Biology of seabass *Lates calcarifer*. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 11-14.

43.Kaliyamurthy , M. and K.J. Rao. 1977. Preliminary observations on the food and feeding habits of some fishes of the Pulicat Lake. *J. Inland Fish. Soc. India,* **4:** 115-121.

44.Kaliamurthy, M., G.R.M. Rao and A.V.P. Rao.1977. Ecological considerations concerning the seed of cultivable fishes of the Pulicat lake. *Indian* J. *Fish.,* **24**(I&2): 23-227.

45.Karna, S.K., D.K. Sahoo and S. Panda. 2012. Length-weight relationship (LWR) and growth estimation of *Lates calcarifer* (Bloch) in Chilika lagoon, India. *Bull. Environ. Pharmacol. & Life Sci*., **1**(3):61-66.

46.Kapoor, D., R. Dayal and A.G. Ponniah. 2002. Fish biodiversity of India. National Bureau of Fish Genetic Resources, Lucknow, India, 775 p.

47.Kowtal, G.V.1976. Studies on the juvenile fish stock at Chilka lake. *Indian J. Fish*., **23**(1&2): 31-40.

48.Kowtal, G.V. 1977. Some observations on the breeding of *Lates calcarifer* (Bloch) from the Chilka Lake. *J. Inland Fish. Soc. India,* **9:** 191-192.

49.Lal, K.K.1991. Studies on the reproductive physiology of *Lates calcarifer* (Bloch). Ph.D.Thesis, Cochin University of Science & Technology, Cochin, India.

50.Lal, K.K. and A.K. Pandey. 1998. Hypothalamo-neurosecretory system of the female sea bass, *Lates calcarifer* (Bloch), with special reference to gonadal maturation. *Indian J. Fish*., **45**(1): 51-60.

51.Lal, K.K. and P.S.B.R. James. 1998. *Egg production in the threatened seabass, Lates calcarifer (Bloch) along Tuticorin coast, Gulf of Mannar. Indian J. Fish*., **45**(4): 451-455.

52.Lazarus, S. and K. Nandakumaran. 1988. *Potential resources of cultivable fish seed around Calicut area. Bull. Dept. Aqua. Biol. Fish.,* **7**: 167-174.

53.Menon . P.M.G. !941. On the food of the ··bhekti·· *Lates calcarifer* (Bloch) in the cold season. *Curr. Sci*., **17**: 156-157.

54.Mohanty, P.K. 2008. Monitoring and modelling lakes and coastal environments. Capital Publ. Co., Springer

55.Mohanty, S.K. 1975. The breeding of economic fishes of the Chilka Lake – a review. *Bull. Dept. Mar. Sci, Univ. Cochin*, **7**(3): 543-559.

56.Mohanty, S.K., K. S. Bhatta, K.M. Rajeeb, S. Mishra, A. Mohaptra and A.K. Patnaik. 2008. Eco-restoration impact on fishery biodiversity and population structure in Chilika Lake. In: Monitoring and modelling lakes and coastal environments, (Ed. P.K. Mohanty, Capital Publ. Co., Springer, p. 1-21.

.

57.Mohanty, A.K., L. Nayak and K.S. Bhatta. 2014. Length-weight relationship and relative condition factor of Asian seabass, *Lates calcarifer* (bloch) from Chilika Lagoon, Odisha. *Intl. J. Fish. Aquat. Stud*., **1**(6): 222-224.

58.Mohapatra, A., K.M. Rajeeb, S. K. Mohanty, K. S. Bhatta and N. R. Das. 2007. Fisheries enhancement and biodiversity assessment of fish, prawn and mud crab in Chilika lagoon through hydrological intervention. *Wetlands Ecol Manage*, **15**:229–251.

59.Mookerjee. H.K., D.N. Ganguly and T.C. Majumdar. 1946. On the food of estuarine fishes of Bengal. *Sci. & Cult*., **11**: 564-565.

.

60.Mukhopadhyay, M.K. and P.U. Varghese. 1978. 0bservations on the post larvae of "bhekti" *Lates calcarifer* (Bloch) in Muriganga estuary with a note on their collection. *J. Inland Fish. Soc. India,* **10:** 138-141.

61.Naskar, K., N.S. Sarkar, A. Ghosh, M. Dasgupta and B. Sengupta. 2004. Status of the mangroves and mangroves ecosystem of Sundarbans in West Bengal: Its impact on estuarine wetland fisheries. *Bull. Cent. Inland Fish. Res. Inst*., **134**: 1-53.

62.Nayak, A. Dipti Raut and L. Patnaik. 2014. Ichyofauna of Atharbanki waterway, Mahanadi estuary, east coast of India. *Intl. J. Recent Sci. Res*., **5**(10): 1871-1878.

63.Patnaik, S. and S. Jena. 1976. Some aspects of biology of *Lates calcarifer* (Bloch) from Chilka Lake. *Indian J. Fish*.. **23**(1/2): 65-71.

64.Pillai, P K M. and K. Sindhu Augustine. 2000. *A code list of common marine living resources of the Indian Seas (Revised Edition). CMFRI Spl. Publ*., **12** (Revised): 1-115.

65.Rahman, A. Abdul. 1987. Ecosystem studies and management in coastal belt of Cauvery delta at Mthupet, Tamil Nadu. *Proc. Natl. Seminar on Estuarine Management,* (Ed.) N. Balakrishnan Nair, Trivandrum, pp. 168-171.

66.Rajkumar, M., P.J. Antony and J.P. Trillers. 2006. Length-weight relationship of Asian seabass (*Lates calcarifer* Bloch, 1790) from Pichavaram mangrove waters, south east coast of India. *Asian Fish. Sci*., **19**: 177-183.

67.Rajamani, M., S. Lazarus, P.P. Pillai and T.M. Yohannan. 2000. *Artificial reefs.* **In**: Marine Fisheries Research and Management, (Eds.) V.N. Pillai & N.G. Menon, CMFRI; Kochi, Kochi, pp. 669-676.

68.Rajan, S. 1968. Environmental studies of the Chilka Lake. I. Feeding spectrum of fishes. *Indian J. Fish*., **11**: 521-532.

69.Rajyalakshmi, T. and S.M. Pillai, 1988. Brackishwater prawn and fish seed resources of Orissa. In: Seminar on status and propects of brackishwater aquaculture in Orissa, Puri, 14 October 1988, *CIBA Spl. Publ*., **2:** 39-49.

70.Ramesh, 2000. No impact studies in critical habitats: Pulicat lake ecosystem. Annual Report submitted to ICMAM-PD, Dept. of Ocean Development, Govt. of India, New Delhi.

71.Rao, K.V. Rama. 1995. Pisces. In: Fauna of the Chilka lake, Zool. Surv. India, p. 483-506.

72.Rao, N.G.S. 1967. On the distribution of larvae, postlarvae and juveniles of fishes in the Mahanadi estuary. *Indian J. Fish*., **11A**(1): 107-122.

73.Rao. A.V.P.. and V. Gopalakrishnan. 1975 . Seed resources and bionomics of culturable braekishwater fishes in India. *J. Inland Fish. Soc. India,* **7:** 142-155.

74.Ratnakala, M., M. P. Kumar and K.S. Ramulu. 2013. The length-weight relationship and condition factor of *Lates calcalifer* in West Godavari and Krishna Districts of Andhra Pradesh. *Intl. J. Sci. Technol. Res*., **2**(7): 190-193.

75.Saha. A.K .. P. Ghosh and P.R. Roy. 1978. Observations on the growth rate of *Lates calcarifer* (Bloch). *J. Inland Fish. Soc. India,* **10:** 113-119.

76.Sarkar, U.K., J.K. Jena, S.P. Singh, A.K. Singh and S.C. Rebello. 2012. Documenting coastal fish biodiversity of India: Status, issues and challenges. In: International Day for Biological Diversity – Marine Biodiversity, Uttar Pradesh State Biodiversity Board, pp. 22-28.

77.Sarma, K., S. Dam Roy and P. Krishnan. 2009. Biology of Brackishwater Fishes cultivable in Andaman. In: Training Manual on Brackishwater Aquaculture in Andaman, (Eds.) S. Dam Roy, K. Sarma & P. Krishnan, Central Agricultural Research Institute, Port Blair, pp. 12-14.

78.Singh, R.K. and V.B. Mehta. 1997. Distribution of post-larvae and juvenile of *Lates calcarifer* in coastal region of Maharashtra. *J. Mah. Agri. Univ*., .**21**(3): 117-119..

79.Solanki, H.G., P. Kumar, J.H. Bhat, S.M. Pillai, R,G, Patil and A.R.T. Arasu. 2013. Length-weight relationship of Asian seabass *Lates calcarifer* Bloch, 1790 reared in pond. *Indian J. Fish*., **60**(3): 131-133.

80.Thakur, N. K. 1975. Observations on the availability of brackishwater fish seed in the Kulti estuary, West Bengal. *J. Inland Fish. Soc. India,* **7**: 105-108.

81.Venkatasamy, G., G. Sathiyamurthy and S. Durairaj. 1988. Some aspects of biology and fishery of *Lates calcarifer* in Muthupet lagoon. *CMFRI Spl. Publ*., **40**: 1-17.

82.Venkateswaralu, T., K.R. Devi, T.J. Indra, and J.G. Pattanaik. 1998. Fishes. In: Fauna of Mahanadi estuary. Estuarine Ecosystem Series : Part 3, Zool. Surv.India, Calcutta, 23-114 pp.

Fisheries

83.Anon. 1968. Kerala Fisheries (facts and figures). Kerala, Superintendent Government Press.

84.Bijoy, Nandan, S., P.R. Jayachandran and O.K. Sreedevi. 2013. Temporal pattern of fish production in a microtidal tropical estuary in the south-west coast of India. *Indian J. Fish*., **59**(4): 17-26.

85.Biswas, K.P. 1995. Ecological and fisheries development in wetlands: A study of Chilka lagoon, India. Daya Publ. House, New Delhi, 205 pp.

86.Chacko. P.1. 1949b. The river Krishna and its fisheries. *Proc. Indian Sci. Congress*, **36**(3): 165-166.

87.CIFRI. 2000. River Godavari - Environment and Fishery. *Bull. Cent. Inland Fish. Res. Inst.*, **102**: 1-29.

88.Datta, P. *et. al.* 1973. Fishery resources of the Hooghly - Matlah estuarine system. *Bull Cent. Island Fish. Res. Inst.,* Barrackpore, No. **19**: 1-24.

89.David, A. 1954. A preliminary survey of fish and fisheries of a five-mile stretch of the Hooghly river near Barrackpore. *Indian J. Fish.,* **1**(1-2): 251-255.

90.David, A. 1959. Effects of Calcutta sewage upon the fisheries of the Kulti estuary and the connected cultivable fisheries. *J. Asiat. Soc*., **1**(4): 339-363.

91.David, A. 1963. Studies on fish and fisheries of the Godavari and the Krishna river systems - Part-I. *Proc. Nat. Acad. Sci. India,* (B), **33**(2): 263-286.

92.David, A. 1963. Studies on fish and fisheries of the Godavari and the Krishna river systems - Part-II. *Proc. Nat. Acad. Sci. India,* (B), **33**(2): 287-293.

93.Devasundaram, M.P. 1951. Fishing methods in Chilka mullets. *Indian Farming*, **12**(1-2): 22-25.

94.Devasundaram, M.P. 1954. Report on the fisheries of Chilka Lake from 1948-1951. Orissa Government Press, Cuttack, pp. 34.

95.Evangeline, G. 1975. Hydrobiology of the estuaries and backwaters of Ramanathapuram District, Tamilnadu. In: *Recent Researches in Estuarine Biology*, (Ed.) R. Natarajan, Hindustan Publ. Corp., Delhi, pp. 193-211.

96.Gopalakrishnan, V. 1971.The biology of the Hooghly-Matlah estuarine system (West Bengal, India) with special reference to its fisheries. *J. mar. biol. Ass. India,* **13**(1&2):182-194.

97.Gopalakrishnan, V. 1973. Fishery resources of the Hooghly-Matlah estuarine system and its relation to fisheries in the Bay of Bengal. *Proc. Symp. on Living Resources of Seas around India*, CMFRI, Cochin, pp. 373 -386.

98.Gurusamy, R., H. M. Kasim and Pon Siraimeetan. 1989. *Note on the subsistence fishery of Periasamipuram in Gulf of Mannar. Mar. Fish. Infor. Serv. T & E Ser*., **102**: 9-11.

99.Hornell. J. 1924. The fishing methods uf Madras Presidency. *Madras Fish. Bull*., **18**(2): 59-110.

100.ICAR. 2011. Chapter 10. Estuarine fisheries. In: Hand book of fisheries and aquaculture, Directorate of Knowledge Management in Agriculture, Indian Council of Agriculture, New Delhi, pp. 208-237.

101.Jayachandran, P.R., S. Bijoy Nandan, O.K. Sreedevi and V.F. Sanu. 2013. Influences of environmental factors on fish assemblage in the tropical estuary of South West coast of India, A Case Study of Kodungallur-Azhikode Estuary. *Intl. J. Mar. Sci*., **3**(2): 4-16.

102. Jha, B.C., D. Nath, N.P. Srivastava and B.B. Satpathy. 2008. Estuarine fisheries management options and strategies. CIFRI Policy Paper, 3: 1-23.

103.Jhingran. V.G. 1982. Fish and Fisheries of India. Hindustan Publ. Corp. (India). New Delhi, 502 pp.

104.Jhingran. V.G. *el al*. 1963 . Report on the fisheries of Chilka Lake 1957-60. *Bull. Cent. Inland Fish. Res. Inst*., **1**: 1-115.

105.Jhlngran, V.G. and A.V. Natarajan. 1966. Final report of the fisheries of Chilka Lake 1957-65. *Bull. Cent. Inland Fish. Res. Inst*., No. **8**: 1-40.

106.Jhlngran, V.G. and A.V. Natarajan. 1969. A study of the fisheries and fish populations of Chilka Lake during the period 1957-65. *J. Inland Fish. Soc. India*, **1**: 49-126.

107.Jhlngran, V.G. and A.V. Natarajan. 1977. Forcasting possibilities of Chilka Lake fisheries under present rate of exploitation. *J. Inland Fish. Soc. India*, **9**: 154-160.

108.Jones, S. and K.H. Sujansingani. 1954 . Fish and fishcrles of the Chilkal Lake with statistics of fish catches for the years 1948-1950. *Indian J. Fish*., **1**(1&2): 256-344.

109.Kasim, H. M. and P.S.B.R. James. 1987. Distribution and fishery of *Lates calcarifer* in India. In: Management of wild and cultured Sea Bass/Barramundi (*Lates calcarifer*), Proc. Intl. Workshop held at Darwin, N.T. Australia, 24-30 September 1986, (Eds.) J.W. Copland and D.L. Grey, p. 109-115.

110.Kathirvel, M. 2001. Brackishwater Fisheries of India. *Fish & Fisheries*, The News Letter of the Fisheries Technocrats Forum, Chennai, No. **28**: 1-4.

111.Korakandy, R. 2000. Recreational fisheries development in India. Daya Publishing House, Delhi, pp. 353

112.Misra, P.M. 1991. Improvement of Chilka Lake as an index to coastal development with special reference to fisheries. *Seafood Export J*., **23**(5): 14-19.

113.Mitra, G.N. 1946. Development of the Chilka. Lake. Orissa Govt. Press, Cuttack, 126 pp.

114.Mitra, G.N. and J.P. Mohapatra. 1957. Survey report on the fishing industry. Bulletin on the development of Chilka Lake. Govt. Press, Cuttack, pp. 51.

115.Naidu, M.R. 1939 . Report un a survey of the fisheries of Bengal. Superintendent, Govt. Printing, Bengal Govt. Press, Alipore.

116.Panigrahi, R.C. The Chilka lake – a sensitive coastal ecosystem of Orissa, east coast of India. *J. Indian Ocean Studies*, **7**(2&3): 222-242.

117.Rajyalakshmi, T. and D.K. De. 1979. The fisheries of open estuaries of India. In: Commemoration of ICAR Golden Jubilee Year, Souvenir, CIFRI, Barrackpore, Part 2: 198-204.

118.Raman, K. and K.V. Ramakrishna. 1979. Fisheries of brackishwater lakes – Chilka, Pulicat and Vembanad. In: Commemoration of ICAR Golden Jubilee Year, Souvenir, CIFRI, Barrackpore, Part 2: 193-197.

119.Rao, S V Subba. 2002. *Unusual landings of Lates calcarifer by shore seine at Venkatarayapur in Ganjam District, Orissa. Mar. Fish. Infor. Serv. T & E Ser*., **174**: 11.

120.Reddy, D.V. 1984. Brackishwater fisheries in Andhra Pradesh. *Proc. Symp. Coastal Aquaculture*, Mar. Biol. Ass. India, Part **3**: 738-741.

121.Sam Bennet, P. and G. Arumugam. 1989. *The present status of small scale traditional fishery at Tuticorin. Mar. Fish. Infor. Serv. T & E Ser.,* **99***:* 1-15.

122.Sam Bennet, P. and G. Arumugam. 1991. *The present status of small-scale traditional fishery at Tuticorin. Mar. Fish. Infor. Serv. T & E Ser.,* **113***:* 1-16.

123.Sengupta, S.E. and J.S. Patros. 1970. Fish landings and export at different centres in Chilka during 1958-60. In: The Chilka Lake, Directorate of Fisheries, Govt. of Orissa, p. 42-66.

124.Shetty H.P.C. 1965.Observations on the fish and fisheries of the Vembanad backwaters, Kerala*. Proc. Natn. Acad. Sci. India,* **35**(B):115-130.

125.Shetty, H.P.C. and K.K. Ghosh. 1963. On the collection of capture fisheries statistics in the Mahanadi estuary. *Indian J. Fish.* (A), **10A**(1): 48-58.

126.Shetty, H.P.C., R.D. Chakraborty and C.G. Battacharya. 1965. A report on the fisheries of the Mahanadhi estuarine system, Orissa. *Bull. Cent. Inland Fish. Res. Inst*., No. **5**: 1-76.

127.Thirumilu, P. and P. Poovannan. 1993. *Price structure of marine fishes landed at the Madras Fisheries harbour with special reference to fin and shellfishes. Mar. Fish. Infor. Serv. T & E Ser.,* **120***:* 12-17.

128.Venkatean, V. and M. Kathirvel. 2010. Brackishwater fisheries of India. In : Inland Fisheries of India. Souvenir, The Fisheries Technocrats Forum, Central Institute of Brackishwater Aquaculture & Coastal Aquaculture Society of India, Chennai, pp. 42-49.

129.Yadav, B.N. 1999. Fish and fisheries, Daya Publishing House, New Delhi, India. 366 pp.

Diseases

130.Azad, I.S., M.S. Shekhar, A.R. Thirunavukkarasu, M. Poornima, M. Kailasam, J.J.S. Rajan, S.A. Ali, M. Abraham and P. Ravichandran. 2005. Nodavirus infection causes mortalities in hatchery produced larvae of *Lates calcarifer*: first report from India. *Dis. Aqua.Org.*, **63**: 113-118.

131.Azad, I.S., A.R.Thirunavukkarasu, M. Kailasam and J.J.S. Rajan. 2004. Virulence and histopathology of *Vibrio anguillarum* - like (VAL) bacterium isolated from hatchery produced juveniles of *Lates calcar!fer* (Bloch). *Asian Fish. Sci*., **17**: 101-110.

132.Azad, I.S., K.P. Jithendran, M.S. Shekhar, A.R. Thirunavukkarasu and L.D.de la Pena. 2006. Immunolocalisation of nerve necrosis virus indicates vertical transmission in hatchery produced Asian seabass (*Lates calcarifer*) - A case study. *Aquaculture*, **255**: 39-47.

133.Azad, I.S., M.S. Shekhar, A.R. Thirunavukkarasu and K.P. Jithendran. 2006. Viral nerve necrosis in hatchery-produced fry of Asian seabass *Lates calcarifer*: sequential microscopic analysis of histopathology. *Dis. Aqu. Org.,* **73**: 123-130.

134.Binesh C.P. and K.P. Jithendran. 2012. Enhancement of diagnostic capability of betanodavirus infection in fishes. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, pp. 61-62

135.Binesh, C.P. and K.P. Jithendran. 2013. Genetic characterization of betanodavirus isolates from Asian seabass *Lates calcarifer* (Bloch) in India. *Arch. Virol*. **158**: 1543-1547.

136.Dash, B., Madumita Das, R. Ranjan and S. Ghosh. 2015. Biofouling problems in open sea cage farming of marine fishes. *Fishing Chimes*, **34**(11): 54-56.

137.De, D., T.K. Ghoshal, A. Pramanik and R.A. Raja. 2009. Identification of potential cellulolytic bacteria isolated from gut of Asian seabass and milkfish. *Proc. 13th Biennial Conf. Animal Nutrition Society of India on Diversification of Animal Nutrition Research in Changing Scenario*, NIANP, Bangalore, pp. 188-189.

138.Jithendran, K.P., 2014. Parasites and parasitic diseases in fish culture system. In: Veterinary Parasitology, (Eds.) Katoch, R., Godara, R., Anish Yadav Satish Serial Publishing House, Azadpur, Delhi, pp. 331-376.

139.Jithendran K. P. and C.P. Binesh. 2011. Viral nervous necrosis-an emerging disease 9in finfish aquaculture. *Indian Farming*, **61**(7), 27-29.

140.Jithendran, K.P. and C.P. Binesh. 2013. Sub-clinical betanodavirus infection in freshwater and marine fishes: Need for surveillance in Indian aquaculture. *Fishing Chimes*, **33**(4): 63- 66

141.Jithendran, K.P., M. Natarajan and I.S. Azad. 2005. Management of monogenean parasites in brackishwater finfishes. *Aquaculture Asia*, **10**(4): 38-41.

142.Jithendran, K.P., P.K. Sahoo, C.P. Binesh and B.R. Mohanty. 2011. Outbreak of betanodavirus in cage-cultured Asian seabass (*Lates calcarifer* Bloch): A case study. Eighth symposium on Diseases in Asian Aquaculture, 21-25 November, 2011, Mangalore (India)

143.Krishnan, P., S. Dam Roy and K. Sarma. 2009. Health management in brackishwater ponds in AndamanIn: Training Manual on Brackishwater Aquaculture in Andaman, (Eds.) S. Dam Roy, K. Sarma & P. Krishnan, Central Agricultural Research Institute, Port Blair, pp. 39-41.

144.Mukherjee, S.C., M. Peer Mohamed and S.V. Alavandi. 1989. *Case of furunculosis in laboratory-reared Lates calcarifer. Curr. Sci.,* **58**(12): 707-709.

145.Palanisamy, V., N. Oseko, T.T. Chuah, B.C. Kua and N. Vijayenthy. 2002. Pathogenic *Vibrio* isolates from cultured seabass (*Lates calcarifer*), groupers (*Epinephelus* spp.) and red snappers (*Lutjanus* spp.). In: Diseases in Asian Aquaculture IV. Fish Health Section, (Eds.) C.R. Lavilla-Pitogo and E.R. Cruz-Lacierda, Asian Fisheries Society, Manila, Philippines, p. 235-24.

146.Parameswaran, V., S. Rajesh Kumar, V.P. Ishaq Ahmed and A.S. Sahul Hameed. 2008. A fish nodavirus associated with mass mortality in hatchery-reared Asian Sea bass, *Lates calcarifer*. *Aquaculture*, **275**: 366–369

147.Raja, R. Ananda and K.P. Jithendran. 2015. Aquaculture disease diagnosis and health management. In: Advances in Marine and Brackishwater Aquaculture, (Eds.) P. Santhanam, A.R. Thirunavukkarasu & P. Perumal, Springer India, pp 247-256.

148.Rajendran, K.V., A.R. Thirunavukarasu, Mathew Abraham and M. Kailasam. 1999. Diseases and pathogens of seabass, *Lates calcarifer* (Bloch). *Fishing Chimes*. **19**(8) p.16-18.

149.Rajendran, K. V., A.R. Thirunavukkarasu and T.C. Santiago. 2000. Mortality of captive seabass, *Lates calcarifer* (Bloch) due to monogenetic parasite, *Diplectanum latesi* (Tripathi, 1957). *J. Aquacult. Trop*., **15:** 199–206.

150.Rajkumar, M., P. Perumal and J.P. Trilles. 2005. *Cymothoa indica* (Crustacea, Isopoda, Cymothoidae) parasitizes the cultured larvae of the Asian seabass *Lates calcarifer* under laboratory conditions. *Dis. Aquat. Org*., **66**: 87–90.

151.Sanil, N.K., P.A. Vikas, T.B. Ratheesh, K.C. George and K.K. Vijayan. 2009 *Mortalities caused by the crustacean isopod, Cirolana fluviatilis, in tropical, cage-cultured Asian seabass, Lates calcarifer: a case study from the southwest coast of India. Aquaculture Research*, **40**: 1626-1633.

152.Sharma, S.R.K., G. Rathore, D.K. Verma, N. Sadhu and K.K. Philipose. 2012. *Vibrio alginolyticus* infection in Asian seabass (*Lates calcarifer*, Bloch) reared in open sea floating cages in India. *Aquaculture Research*, **44(**1): 86-92.

153.Sharma, S.R.K., N. Sadhu and K.K. Philipose. 2012. Diseases and their management in cage culture. In: Hand book on pen sea cage culture, (Eds.) K.K. Philipose, Jayasree Loka, SR.K. Sharma & D. Divu, Central Marine Fisheries Research Institute, Karwar Research Centre, p. 125-136.

154.Sobhana, K.S. 2009. Diseases of seabass in cage culture and control measures. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 87-93.

155.Subburaj R., P. Kumar, A.R. Thirunavukkarasu, M. Kailasam, G. Thiagarajan, S. Elangeswaran and S. Venu. 2012. Common ectoparasite parasitizes the cultured fingerlings of the Asian seabass *Lates calcarifer* under laboratory conditions. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 66.

156.Sujeet Kumar and R. A. Raja. 2009. Brackishwater finfish and crustacean diseases and their control. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 75-82.

157.Tripathi, Y.R. 1952. *Henneguya latesi* from *Lates calcarifer*. *Rec. Indian Mus*., **50**: 63-88.

.

158.Venu S., A.R. Thirunavukkarasu, P. Kumar, R. Subburaj and G. Thiagarajan. 2011. Antioxidant level response in Asian seabass *Lates calcarifer* early stages under vaccination for Noda Viral disease and on challenge. In: Renaissance in fisheries: Outlook and strategies. Book of Abstract, 9th Indian Fisheries Forum, CMFRI, Kochi and Asian Fisheries Society, Indian Branch,19-23 Dec., 2011, Chennai, India. 381pp, p. 164

159.Venu S., A.R. Thirunavukkarasu, P. Kumar, R. Subburaj and G. Thiagarajan. 2012. Pathogenicity of the Nervous Necrosis Virus to the Asian Seabass (*Lates calcarifer* (Bloch) juveniles under laboratory conditions. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 54.

160.Venu, S., A.R.T. Arasu, Prem Kumar, R. Subburaj and G. Thiagarahan. 2012. Evaluation of the influence of nodavirus pathogens to Asian seabass, *Lates calcarifer* (Blotch) juveniles under laboratory conditions. In: Global Symposium on Aquatic Resource for eradicating hunger and malnutrition – Opportunities and Challenges, 3-6 December 2012, Mangalore, Abstract PT-60.

161.Venu S., A.R. Thirunavukkarasu, P. Kumar, R. Subburaj, G. Thiagarajan and A.B. Gaikwad. 2012. Evaluation of the performance of viral nervus necrosis (VNN) diseas vaccine on the growth of Asian seabass (*L. calcarifer*) early stages. National Conference on Biotechnological Approaches in Aquaculture, p. 75

162.Vimal, S., N. Madan, M.A. Farook, K.S.N. Nambi, S.A. Majeed, T. Rajkumar, S. Venu, A.R. Thirunavukkarasu and A.S.S. Hameed. 2014. Production of recombinant vaccine using capsid gene of nodavirus to protect Asian sea bass, *Lates calcarifer* (Bloch, 790). *Aquaculture*, **418–419:** 148–154..

163.Vimal, S., S.A. Majeed, K.S.N. Nambi, N. Madan, M.A. Farook, C. Venkatesan, G. Taju, S. Venu, R. Subburaj, A.R. Thirunavukkarasu and A.S.S. Hameed. 2014. Delivery of DNA vaccine using chitosan–tripolyphosphate (CS/TPP) nanoparticles in Asian sea bass, *Lates calcarifer* (Bloch, 1790) for protection against nodavirus infection. *Aquaculture*, **420–421**: 240–246.

Biotechnology

164.Anuradha K., A.R. Thirunavukkarasu, R. Subburaj and G. Thiagarajan. 2012. Activities of some antioxidants on Asian Seabass (*Lates calcarifer*) fry on exposure to different levels of ammonia. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 82..

165.Asha, J.K. and R.N. Vijayalakshmi. 1999. Concentration of metals in fishes from Thane and Bassein creeks of Bombay, India. *Indian J. Mar. Sci*., **28**: 39-44.

166.Azad, I.S., A.R. Thirunavukkarasu, M. Kailasam and K.V. Rajendran. 2000. Ontogeny of immune system: The key factor in fish vaccination. *Fishing Chimes*, **20**(5): 20-22.

167.Azad, I.S., A.R. Thirunavukkarasu, M. Kailasam, R. Subburaj and J.J.S. Rajan. 2009. Ontogeny of lymphoid organs in the Asian seabass (*Lates calcarifer* , Bloch). *Asian Fish.Sci*., **22**, 901-913.

168.Azad, I.S., A.R. Thirunavukkarasu, K.K. Vijayan, M. Kailasam, K.V. Rajendran, Mathew Abraham and J.J.S. Rajan. 2002. Preliminary nstudies on the ontogeny of lymphoid organs in the Asian seabass, *Lates calcarifer* (Bloch). *Proc. the Fifth Indian Fisheries Forum*, (Eds.) S. Ayyappan, J.K. Jena & M. Mohan Joseph, Asian Fisheries Indian Branch, Mangalore, p. 189-192.

169.Babu, R.R., V.M. Karunagaran, S. Babu and A. Subramanian. 1992. Levels of chlorinated insecticides in fishes from the Bay of Bengal. *Mar. Poll. Bull*., **24**(11): 567-570.

170.Chakravarthy N., K. Aravindan, N. Kalaimani, S.V. Alavandi, M. Poornima and T.C. Santiago. 2012. Intracellular Copper Zinc Superoxide dismutase (icCuZnSOD) from Asian seabass *Lates calcarifer*: Molecular cloning, characterization and gene expression with reference to *Vibrio anguillarum* infection. *Dev. Comp. Immunol.*, **36**, 751-755.

171.Chakravarthy N., S. Sivakumar, N. Kalaimani, T.C. Santiago, S.V. Alavandi and M. Poornima. 2012. Identification and pathogenicity of *Vibrio* (*Listonella*) *anguillarum* from cultured Asian seabass *Lates calcarifer*. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 46.

172.De, D., 2009. Use of probiotics in aquafeed. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 102-103.

173.De D., T.K. Ghoshal, A. Pramanik and Subha Ganguly. 2009. Isolation, identification and methods of use of different beneficial microbes as probiotics in aquafeed. in aquaculture. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 173-175.

174.De, D., T.K. Ghoshal, R. A. Raja, A. Pramanik and Subha Ganguly. 2009. Estimation of different digestive enzymes of shrimp and finfish. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 179-180.

175.Ezhilmathy, R., K. Rajalakshmi and A. Chezhian. 2014. Histological alterations in sea bass, *Lates calcarifer* exposed to combined stressors of pesticide and metal (Profenofos and lead nitrate). *Intl. J. Res. Mar. Sci*., **3**(2): 44-47.

176.Gopikrishna, G., C. Sarada and T.V. Sathianandan. 2006. Truss morphometry in the Asian seabass-*Lates calcarifer*. *J. Mar. Biol. Ass. India*, **48**(2): 220-222.

177.Hameed, A.S. Sahul, V. Parameswaran, R. Shukla, I.S. Bright Singh, A.R. Thirunavukkarasu and R.R. Bhonde. 2006. Establishment and characterization of India's first marine fish cell line (SISK) from the kidney of sea bass (*Lates calcarifer*). *Aquaculture*, **257**: 92-103.

178.John, A., C. Prasannakumar, P.S. Lyla, S. Ajmalkhan and K.C.A. Jalal. 2010. DNA barcoding of *Lates calcarifer* (Bloch, 1790). *Res. J. Biol. Sci*., **5**(6): 414-419.

179.Kailasam, M., A.R. Thirunavukkarasu and Mathew Abraham. 2004. Biotechnological research in finfish breeding. *Proc. State level Seminar in Animal Biotechnology*, Jamal Mohammed College, Tiruchirapalli, Tamil Nadu, pp. 13-16.

180.Kalaimani, N. 2009. Oxydative stress and its impact on quality seed production. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 75-84.

181.Kishore Chandra, A.R.T. Arasu**,** Mathew Abraham and M. Kailasam. 2000. Genetic parameters for early growth traits in *Lates calcarifer* (Bloch). *J. mar. biol. Ass. India*, 42 (1&2) p.194-199

182.Kishore Chandra, M. Kailasam, A.R.T. Arasu and Mathew Abraham. 2000. Preliminary study on geno-type environment interaction with special reference to *Lates calcarifer* (Bloch). In: Symposium on Ecofriendly Mariculture Technology packages - An update to be held at CMFRI, Mandapam during 11-12 April 2000.

183.Krishnani, K.K., I.S. Azad, M. Kailasam, A.R. Thirunavukkarasu, B.P. Gupta, K.O. Joseph, M. Muralidhar and Mathew Abraham.2003. Acute toxicity of some heavy metals to *Lates calcarifer* fry with a note on its histopalhological manifestations. *J. Environ. Sci. Health*. **A38**(4): 645-655.

184.Kumar, Prem, A.R.T. Arasu, J.K. Sundaray and M. Kailasam. 2009. Concept of stress and its mitigation in aquaculture. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 125-134.

185.Lal, K.K. 1991. Studies on the reproductive physiology of *Lates calcarifer* (Bloch). Ph.D Thesis, Post Graduate Programme in Mariculture, CMFRI, Cochin, Kerala. 108 p.

186.Mohanraj V., A.R. Thirunavukkarasu, M. Kailasam, R. Subburaj and G. Thiagarajan. 2012. Effect of sublethal concentrations of heavy metals (Cadmium & Mercury) on the hematological parameters of Asian Seabass (*Lates calcarifer*) juveniles under laboratory conditions. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012.

187.Natarajan, R. and K. Subrahmanyam. 1974. A karyotype study of some teleost from Portonovo waters. *Proc. Ind. Acad. Sci*., Ser.B. **79**(5):173-196.

188. Noornissabegum, M., K. Revathi and K. Anjalai. 2014. *Penaebacillus alvei* Isolated from *Lates calcarifer* showing plasmid mediated antibiotic resistance. *Intl. J. Curr*. *Biotechnol*., **2**(4):10-14.

189.Pereira, S. 2009. Cryopreservation of spermatozoa of Asian seabass *Lates calcarifer*. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 23-28.

190.Poornima, M. and T.C. Santiago. 2009. Molecular diagnosis of fish nodavirus with special reference to PCR. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 43-46.

191.Raja, R. A. and Sujeet Kumar. 2009a. Application of polymerase chain reaction (PCR) in aquaculture. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 88-91.

192. Raja, R. A. and Sujeet Kumar. 2009b. Advances in molecular diagnostics and therapeutics in aquaculture. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 122-127.

193. Raja, R. A. and Sujeet Kumar. 2009c. Demonstration of PCR and RT-PCR. in aquaculture. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 165-169.

194. Raja, R. A., A. Panigrahi, D.De and Sujeet Kumar. 2009. Monitoring of microbial status in fish and shrimp culture. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 83-87.

195.Rajasekar, M., M. Thangaraj, T.R. Barathkumar, J. Subburaj and K. Muthazhagan. 2012. Genetic diversity analysis of *Lates calcarifer* (Bloch, 1790) in captive and wild populations using RAPD markers. *Not. Sci. Biol.,* **4**(3):33-37.

196.Rejomon, G., M. Nair and T. Joseph. 2010. Trace metal dynamics in fishes from the southwest coast of India. *Environ. Monit. Assess*., **167**(1-4); 243-255.

197.Santiago, T.C., K.K. Vijayan, S.V. Alavandi and N. Kalaimani. 2009. Genetics and fish stock improvements. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 19-22.

198.Satheeshkumar, P., G. Ananthan, D. Senthil Kumar and L. Jagadeesan. 2011. Haematology and biochemical parameters of different feeding behaviour of teleost fishes from Vellar estuary, India. *Comp. Clini. Pathol*., Published Online on 28 April 2011.

199.Stalin, P. M. Kailasam and A.R.T. Arasu. 2011. Effect of starvation on the digestive enzyme and growth in Asian seabass *Lates calcarifer* (Bloch) larvae. In: Renaissance in fisheries: Outlook and strategies. Book of Abstract, 9th Indian Fisheries Forum, CMFRI, Kochi and Asian Fisheries Society, Indian Branch,19-23 Dec., 2011, Chennai, India. 381pp, p. 144

200.Stalin P., M. Kailasam and A.R. Thirunavukkarasu. 2012. Investigation on the enzyme producing bacteria in the gut of Asian seabass *Lates calcarifer larvae*. In: National Conference on New Vistas in Indian Aquaculture-Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 111.

201.Sujeet Kumar and R. A. Raja. 2009a. Vaccine in aquaculture. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 128-132.

202.Sujeet Kumar and R. A. Raja. 2009b. Isolation of pathogenic bacteria from finfish and shellfish. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 156-159.

203.Sujeet Kumar, A. Panigrahi and R.A. Raja. 2009. Bioremediation measures and probiotics in aquaculture. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 133-136.

204.Sundaray, J.K., M. Sukham, A.R.Thirunavukkarasu, M. Kailsam and A. Panigrahi. 2007. Endocrine disruptor chemicals and fish reproductive health with reference to the environment. In: Environmental Biotechnology (Eds.) C.S.K. Mishra and A. Juwarkar, A P H Publishing Corporation, New Delhi, pp. 369-391.

205.Sundaray, J.K., A.R.T. Arasu and M. Kailasam. 2009. Hormonal control of reproduction in fishes. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 15-18.

206.Sundaray J. K., G. Biswas, A.D. Deo and A.R. Thirunavukkarasu. 2012. Reproductive manipulation of fish by using hormones. Training Manual on CAFT Program on development of brood and gene banks of aquaculture production and conservation, CIFE Mumbai, 62-72.

207.Vijayakumar R., J.J.S. Rajan, R. Singaravel, S. Ramakrishnan, D.R. Kumar, T.C. Santiago, N. Kalaimani, M. Poornima and S.V. Alavandi. 2012. Antibody response of Asian seabass (*Lates calcarifer*) against pathogenic *Vibrio anguillarum*, serotype O2a and O2b. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012 p. 45.

Captive broodstock development

208.Alavandi, S.V., N. Kalaimani, T.C. Santiago and A.R.T. Arasu. 2009. Fish broodstock health management. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 35-42.

209.Arasu, A.R.T. 2008. An innovative technology for year round breeding of Asian seabas (*Lates calcarifer*) under controlled conditions. In: Aqua India 2008-Unique Annual Aqua Event.

210.Arasu, A.R.T., M. Natarajan, M. Kailasam and J.K. Sundaray. 2008. Induced breeding techniques in Brackishwater Finfishes. In: *Proc. Natl. Seminar on Recent Trends in Aquaculture Biotechnology*, Jamal Mohamed College, Tiruchirapalli, Tamil Nadu & University Grant Commission, pp. 7-14.

211.Arasu, A.R.T., M. Kailasam, J.K. Sundaray, R. Subburaju and G. Thiagarajan. 2011. Controlled breeding and seed production of salt water fishes – Status, pprospects and problems in India. *Indian J. Sci. Technol., 9th ISRPF Issue,* 4 (S8): 289.

212.Arasu A.R.T., M. Kailasam, S.V. Alavandi and R. Subburaju. 2012. Brackishwater fish broodstock management for quality seed production. In: *Natl. Conf. Aquaculture*: *Fish for billion*, CIFA, Bhubaneshwar, pp. 1-6.

213.Kailasam, M., A.R.Thirunavukkarasu, P. Kishore Chandra, S. Pereira and K.V. Rajendran. 2006. Induction of maturity and spontaneous spawning of captive broodstock of bhetki *Lates calcarifer* (Bloch) through hormonal manipulation. In: Recent Advances in Hormonal Physiology of Fish and Shellfish Reproduction, (Eds.) B.N. Singh & A.K. Pandey, M/s Narendra Publ. House, New Delhi, pp. 185-195.

214.Kailasam, M., A.R.Thirunavukkarasu and J.K.Sundaray. 2008. Induced breeding techniques and culture of brackishwater finfishes with special reference of Asian seabass *Lates calcarifer*. In: State Level seminar on Recent trends in Environmental Biotechnology. 13 March 2008, Jamal Mohammed College, Tiruchirappalli Tamil Nadu. pp.74-77.

215.Kailasam, M., A.R. Thirunavukkarsu and J.K. Sundaray. 2009. Broodstock maintenance. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 31-34.

216.Kailasam, M., A.R. Thirunavukkarsu and J.K. Sundaray. 2009. Induced maturation. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 53-58.

217.Kumar, P., A.R. Thirunavukkarasu, M. Kailasam, R. Subburaj and G. Thiagarajan. 2011. Neuro-endocrine control of reproduction and induced breeding through hormonal intervention. *Fishing Chimes*, **32**(2): 47-51.

218.Kumar, P., A.R. Thirunavukkarasu, R. Subburaj and G. Thiagarajan. 2012. Concept of stress and its mitigation in Aquaculture. Manual on Advances in aquaculture technology, (Ed.) P. Santhanam, Bharadhidasan University, Tiruchirappalli, p. 81.

219.Kumar, Prem, A.R. Thirunavukkarasu, R. Subburaj and G. Thiagarajan. 2015. Concept of stress and Its mitigation in aquaculture. In: Advances in Marine and Brackishwater Aquaculture, (Eds.) P. Santhanam, A.R. Thirunavukkarasu & P. Perumal, Springer India, pp 95-100.

220.Kumaresan, K. A.R.T. Arasu, N.K. Chaddha, J.K. Sundary, Prem Kumar, R. Subburaj and G. Thiagarajan. 2012. Studies on the egg size and yolk utilization in Asian seabass (*Lates calcarifer*) on exposture to different salinities. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 9.

221.Mathew Abraham**,** L. Krishnan, K. Gopinathan and N. Kalaimani. 1997. First report on development of a captive broodstock and induced maturation of the Sea Bass, *Lates calcarifer* (Bloch) from India. *J. Mar. biol. Ass. India*. **38**(1&2) p.178-181.

222. Nammalwar, P., R. Marichamy, A. Raju, P. Jayashankar, M.R. Arputharaj, C. Kasinathan and S. Palanichamy 1999. Collection, Transport and Maintenance of Asian Seabass *Lates calcarifer* (Bloch). *Proc. Fourth Indian Fish. Forum,* dated 24th to 28th Nov'1996. pp. 45-47.

223.Musthafa, M.S., A.R.T. Arasu, S. Elangeswaran, M. Kailasam, P. Kumar, R. Subburaj and G. Thiagarajan. 2011. Comparative evaluation of the biochemical characteristics of milt from the land based captive broodstock of black king fish cobia *Rachycentron canadum* and Asian seabass *Lates calcarifer*. In: Renaissance in fisheries: Outlook and strategies. Book of Abstract, 9th Indian Fisheries Forum, CMFRI, Kochi and Asian Fisheries Society, Indian Branch, 19-23 Dec., 2011, Chennai, India. p. 215

224.Subburaj R., G. Thiagarajan, A.R. Thirunavukkarasu, M. Kailasam, J.K. Sundaray, P. Kumar, Krishna Sukumaran and K. Karaiyan. 2012. An innovative method of extending the Asian Seabass (*Lates calcarifer*) breeding under controlled conditions. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 22.

225.Sundaray, J.K., A.R.T. Arasu, M. Kailasam and Mathew Abraham**.** 1999. Use of gonadal hormones in maturation and spawning of seabass *Lates calcarifer* (Bloch). (Abstract) *Nat. Workshop on the use of gonadal hormones in the manipulation of sex and growth in fishes* during 18-19 Jan., 1999 at Univ. of Agri. Sciences, Bangalore.

226.Sundaray, J.K., A.R. Thirunavukkarasu, M. Kailasam and G. Biswas. 2008. Reproductive hormones in fishes. *Proc. Natl. Seminar on Recent Trends in Aquaculture Biotechnology*, Jamal Mohamed College, Tiruchirapalli, Tamil Nadu & University Grant Commission, pp.15-21.

227.Thirunavukkarasu. A.R. 2005. Breeding and culture of Asian Seabass *Lates calcarifer*. Souvenir, Silver Jubilee celebration, April 2004. Scott Christian College, Nagercoil. pp.137-147.

228.Thirunavukkarsu, A.R., M. Kailasam, P. Kishore Chandra, S. Pereira, Mathew Abraham, A.V.K. Charles and R. Subburaj. 2001. Captive Broodstock development and breeding of seabass *Lates calcarifer* (Bloch) In India. In: Perspectives in Mariculture. (Eds. N.G. Menon & P.P. Pillai). CMFRI. Cochin. pp. 111-124.

229.Thirunavukkarsu, A.R., M. Kailasam and J.K. Sundaray. 2009. Protocols & procedures for controlled breeding of Asian seabass *Lates calcarifer*. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 1-5.

230.Thirunavukkarsu, A.R., M. Kailasam and J.K. Sundaray. 2009. Finfish breeding techniques. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 6-10.

231.Thirunavukkarasu A. R., M. Kailasam, J.K. Sundaray, G. Biswas, P. Kumar, R. Subburaj and G. Thiagarajan. 2012. Controlled breeding, seed production and culture of brackishwater fishes. Manual on Advances in aquaculture technology P. Santhanam (Ed.), Bharadhidasan University, Tiruchirappalli, pp.1-14.

232.Thirunavukkarasu, A.R., M. Kailasam, J.K. Sundaray, G. Biswas, Prem Kumar, R. Subburaj and G. Thiagarajan 2015. Controlled breeding, seed production and culture of bracksihwater finfishes. In: Advances in Marine and Brackishwater Aquaculture, (Eds.) P. Santhanam, A.R. Thirunavukkarasu & P. Perumal, Springer India, pp 75-87.

Hatchery seed production

233.Arasu, A.R.T., M. Kailasam, R. Subburaj, G. Thiagarajan and K. Karaiyan. 2003. Effect of salinity on egg hatching and early larval survival of Asian seabass *Lates calcarifer* (Bloch). In: Fish production using brackishwater in Arid Eco-System, (Eds.) S.K. Garg & A.R.T. Arasu, *Proc. 3rd Interaction Workshop*, Hisar, India, pp. 89-95.

234.Arasu, A.R.T., M. Kailsam, J.K. Sundaray, Mathew Abraham, R. Subburaj, G. Thiagrajan and K. Karaiyan. 2006. Simplified hatchery technology for seabass, *Lates calcarifer* seed production. Central Institute of Brackishwater Aquaculture, Chennai.

235.Arasu, A.R.T., M. Kailasam, J.K. Sundaray, R. Subburaj, G.Thiagarajan and K. Karaiyan. 2008. Improved hatchery technology for Asian seabass *Lates calcarifer* (Bloch). *CIBA Spl. Publ*., No. **34**.

236.Arasu, A.R.T., M. Kailasam and J.K. Sundaray. 2009. Asian Seabass fish seed Production and culture. *CIBA Spl. Publ*., No. **42**.

237.Arasu, A.R.T., M. Kailasam, J.K. Sundaray, R. Subburaj and G.Thiagarajan. 200. Seed production technology for Asian seabass (*Lates calcarifer*). In: Refresher training for officers of fisheries discipline, NABARD on recent trends in brackishwater aquaculture, *CIBA Spl. Publ.* **49**: 54-62.

238.Biswas, G. 2009. Hatchery technology for Asian seabass seed production. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 62-65.

239.CIBA. 2001. Hatchery technology for seabass transferred to Rajiv Gandhi Centre for Aquaculture (RGCA). *CIBA News*, **6**(4): 1-2.

240.Kailasam, M., P. Kishore Chandra, M. Muralidhar, A.R. Thirunakkarasu and Mathew Abraham. 2001. Survival and growth of seabass *Lates calcarifer* (Bloch) fry reared at different stocking densities. . In: Perspectives in Mariculture. (Eds. N.G. Menon & P.P. Pillai). CMFRI. Cochin. pp. 311-320.

241.Kailasam, M., A.R. Thirunakkarasu, Mathew Abraham, P. Kishore Chandra and R. Subburaj. 2002. Influence of size variation and feeding on cannibalism of Asian seabass *Lates calcarifer* (Bloch) during hatchery rearing phase. *Indian J. Fish*., **49**(2): 107-113.

242.Kailasam, M., A.R. Thirunakkarasu, J.K. Sundaray, Mathew Abraham, C. Sarada, R. Subburaj, G. Thiagarajan and K. Karaiyan. 2006. Daily growth and length-weight relationship of Asian seabass *Lates calcarifer* (Bloch) during hatchery rearing phase. *Indian J. Fish*., **53**(4): 487-491.

243.Kailasam, M., A.R.Thirunavukkarasu, S. Selvaraj and P. Stalin. 2007. Effect of delayed initial feeding on growth and survival of Asian seabass *Lates calcarifer* (Bloch). *Aquaculture*, **271**: 298-306.

244.Kailasam M., A.R. Thirunavukkarasu, P. Stalin, S. Jagan, R. Subburaj and G. Thiagarajan. 2011. Comparison of growth and survival of Asian seabass (*Lates calcarifer)* larvae feeding with rotifers *Brachionus calyciflorous* and *B.rubens*. Chennai Aquaculture Tech. Meet – CATEER'11, TANUVAS, Chennai, November 2011, pp. 208-209.

245.Kailasam M., A.R. Thirunavukkarasu, P. Stalin, M. Madhavi, J.K. Sundaray, G. Biswas, P. Kumar, R. Subburaj and G. Thiagarajan. 2011. Yolk and Oil globule utilisation in the larvae of spotted scat *Scatophagus argus* and Asian seabass *Lates calcariber*. In: Renaissance in fisheries: Outlook and strategies. Book of Abstract, 9th Indian Fisheries Forum, CMFRI, Kochi and Asian Fisheries Society,IndianBranch,19-23 Dec.,2011,Chennai,India, p.97.

246.Kalaimani, N., N. Chakravarthy, R. Shanmugham, A.R. Thirunavukkarasu, S.V. Alavandi and T.C. Santiago. 2008. Anti-oxidant status in embryonic, post-hatch and larval stages of Asian seabass (*Lates calcarifer*). *Fish Physiol. Biochem*., **34**: 151-158.

247.Kandan, S. 2009. Commercial seed production and farming of Asian seabass *lates calcarifer*. Winter School on Resent Advances in Breeding and Larviculture of Marine finfish and shellfish. Central Marine Fisheries Research Institute,Cochin, Kerala, India

248.Krishna Sukumaran and A.R, Thirunavukkarasu. 2009. Management of differential growth and cannibalism. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 85-90.

249.Krishna Sukumaran, A.R.Thirunavukkarasu, M. Kailasam, J.K. Sundaray, R. Subburaj and G. Thiagarajan. 2011. Effect of stocking density on size heterogeneity and sibling cannibalism in Asian seabass *Lates calcarifer* (Bloch, 1790) larvae. *Indian J. Fish*., **58**(3): 145-147.

250.Krishna Sukumaran, A.R.T. Arasu, R. Subburaj, G. Thiagarajan and S. Venu. 2012. Effect of feeding frequency on growth, survival, cannibalism and size heterogeneity in Asian seabass *Lates calcarifer* (Bloch, 1790) larvae. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 7.

251.Kumaresan, M., A.R.T. Arasu, N.K. Chadha, J.K. Sundaray and Prem Kumar. 2011. Analysis of salinity on hatching and larval survival of Asian seabass, *Lates calcarifer*. In: Renaissance in fisheries: Outlook and strategies, Book of Abstract, 9th Indian Fisheries Forum, CMFRI, Kochi and Asian Fisheries Society, Indian Branch, 19-23 Dec., 2011, Chennai, India. p. 81.

252.Nammalwar, P. and R. Marichamy 1997. Seabass hatchery. *Proc. Workshop National Aquaculture Week,* Aquaculture Foundation of India, Chennai. pp.149

253.Subburaj, R., G. Thiagarajan, A.R.T. Arasu, M. Kailasam and J.K. Sundaray. 2009. Seabass hatchery management protocol. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 95-104.

254.Subburaj, R., A.R. Thirunavukkarasu, M. Kailasam, P. Kumar, G. Thiagarajan, S. Venu and S. Elangeswaran. 2011. Influence of rearing system on survival and growth of Asian seabass (*Lates calcarifer*) larvae in hatchery conditions. In: Renaissance in fisheries: Outlook and strategies. Book of Abstract, 9th Indian Fisheries Forum, CMFRI, Kochi and Asian Fisheries Society, Indian Branch,19-23 Dec., 2011, Chennai, India. 381pp, p. 133

255.Thirunavukkarasu, A.R. 1997. Marine fin fish seed production. Paper presented in Indo-Egypt Workshop, CMFRI, Kochi, 8-9 December 1997.

256.Thirunavukkarasu, A.R. 2000. Seabass *Lates calcarifer* seed production and culture. *CIBA Extension Ser*., **20**: 1-6.

257.Thirunavukkarasu, A.R. 2003. Training manual on seabass (*Lates calcarifer*) seed production and culture. *CIBA Spl. Publ*. **8**.

258.Thirunavukkarasu, A.R, and M. Kailasam. 1999. Seed production technology for marine fishes. *Proc. First Natl. Seminar on Trends in Marine Biotechnology*. (Eds.) S. Lazarus, S.G. Prakash & S.G. Vincent, ICAS Publication No. **2**: 111-114.

259.Thirunavukkarasu, A.R, and M. Kailasam. 2009. Larval rearing. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 59-64.

260.Thirunavakarasu. A.R., M. Kailasam and Mathew Abraham. 2000. Technology for Asian seabass (*Lates calcarifer)* seed production and culture in India. In: National Seminar on "Sustainable Fisheries for Nutritional Security " held at Chennai during Nov.30- Decm.2, 2000.

261.Thirunavukkarasu, A.R., Mathew Abraham and M. Kailsam. 2004. Hand book of seed production and culture of Asian seabas, *Lates calcarifer* (Bloch). *CIBA Bull*., No. **18**: 1-58.

262.Thirunavukkarasu, A.R,, M. Kailasam and J.K. Sundaray. 2009. Success in hatchery development of seabass and its potential for commercial cage culture in India. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 71-80.

263.Thirunavukkarasu, A.R., Mathew Abraham, P. Kishore Chandra, M. Kailasam and S. Pereira. 1997. Breakthrough in the successful breeding and seed production of seabass (*Lates calcarifer*) at CIBA. *CIBA News*, **2**(3): 1-2.

Feed development

Live feed

264.Chandra Roy, B. and S. Dam Roy. 2009. Live Feed in Brackishwater Aquaculture. In: Training Manual on Brackishwater Aquaculture in Andaman, (Eds.) S. Dam Roy, K. Sarma & P. Krishnan, Central Agricultural Research Institute, Port Blair, pp. 32-34.

265.Kailasam, M. and A.R. Thirunavukkarasu, 2009. Life feed culture. . In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 65-74.

266.Kailasam, M., A.R.T. Arasu, J.K. Sundaray, S. Selvaraj and P. Stalin. 2007. Importance of rotifer (*Brachionus plicatilis*) for larviculture of brackishwater finfishes. In: National Seminar on current Biotechnology and Microbiology Research. 7-9 March 2007, Ayya Nadar Janaki Ammal College, Sivakasi, Tamil Nadu. Abs. p. 55.

267.Kailasam, M., A.R. Thirunavukkarasu, P. Stalin, S. Jagan, S. Selvaraj, R. Subburaj, G. Thiagarajan and K. Karaiyan. 2010. Studies on diversification in rotifers (*Brachionus* spp) and an evaluation on their culture potential and usefulness for saltwater fish larviculture. In: National Conference on Marine Biodiversity Present Status and Prospectus, 16-18 September, 2010, Tiruchirapalli. pp 140.

268.Kailasam M., A.R. Thirunavukkarasu, A.G. Ponniah, S. Selvaraj and P. Stalin. 2012. Recent advances in rotifer culture and its application for larviculture of finfishes. Manual on Advances in aquaculture technology, (Ed.) P.Santhanam, Bharadhidasan University, Tiruchirappalli, pp. 65-73.

269.Kailasam, M., A.R. Thirunavukkarasu, A.G. Ponniah, S. Selvaraj and P. Stalin 2015 Recent advances in rotifer culture and its application for larviculture of finfishes. In: Advances in Marine and Brackishwater Aquaculture, (Eds.) P. Santhanam, A.R. Thirunavukkarasu & P. Perumal, Springer India, pp 17-23.

270.Karthika, P., A.R.T. Arasu, P. Subramanian, M. Kailasam and J.K. Sundary. 2012. Comparative evaluation of the performance of Asian seabass (*Lates calcarifger*) fry on feeding with different live feed, brine shrimp, copepod and Daphnia on growth and survival. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 93.

271.Rajkumar, M. and K.P. Vasagam. 2006. Suitability of the copepod, *Acartia clausi* as a live feed for seabass larvae (*Lates calcarifer* Bloch): Compared to traditional live food organisms with special emphasis on the nutritional value. *Aquaculture*, **261**: 649-658.

272.Santhanam, P. and P. Perumal. 2012. Evaluating of the marine copepod *Oithona rigida* Giesbrecht as live feed for larviculture of Asian seabass *Lates calcarifer* Bloch with special reference to nutritional value, *Indian J Fish.,* **59**(2): 127-134.

273.Santhanam, P. and P. Perumal. 2012. Feeding, survival, egg production and hatching rate of the marine copepod *Oithona rigida* Giesbrecht (Copepoda; Cyclopoida) under experimental conditions., *J. Mar. Biol. Ass. India*, **54**(1): 38-44.

274.Santhanam, P., R. Nandakumar, S. Ananth, T. Jayalakshmi, P. Raju, P. Ananthi, A. S. Devi, S.D. Kumar and B.B. Prasath. 2012. A need for marine copepods culture. In: *Live Feed Production for Marine Hatchery Operation*, MPEDA**-**RGCA Extn**.** Ser**.,** 6**:** 74-88.

275.Santhanam, P., S. Ananth, R. Nandakumar, T. Jayalakshmi, M. Kaviyarasan and P. Perumal. 2015. Intensive indoor and outdoor pilot-scale culture of marine copepods. In: Advances in Marine and Brackishwater Aquaculture, (Eds.) P. Santhanam, A.R. Thirunavukkarasu & P. Perumal, Springer India, pp 33-42.

Compounded feed

276.Ahamad Ali, S. 2009. Entrepreneurship development in aqua feed production. In: Entrepreneurship development in coastal aquaculture, (Eds.) M. Kumaran & A.G. Ponniah, NFDB & CIBA, *CIBA Spl. Publ*., **46**: 48-54.

277.Ahamad Ali, S. and J. Syama Dayal. 2003. Nutrition and feeding of Asian seabass in hatchery, nusery and grow-out ponds. In: Fish production using brackishwater in Arid Eco-System, (Eds.) S.K. Garg & A.R.T. Arasu, *Proc. 3rd Interaction Workshop*, Hisar, India, pp. 189-194.

278.Ahamad Ali, S., K. Ambasankar, J. Syama Dayal, A.R. Thirunavukkarasu, and M. Kailasam. 2002. Preliminary studies on the formulation and presentation of compounded diet to Asian seabass. *Lates calcarifer* (Bloch). *Proc. the Fifth Indian Fisheries Forum*, (Eds.) S. Ayyappan, J.K. Jena & M. Mohan Joseph, Asian Fisheries Indian Branch, Mangalore, pp.73-76.

279.Ahamad Ali, S. and J. Syama Dayal and K. Ambasankar. 2009. Nutrition and feeding of Asian seabass in hatchery, nursery and grow-out ponds. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 105-110.

.

280.Ambasankar, K., S. Ahamad Ali and J. Syma Dayal. 2009. Nutritional requirements of Asian seabass, *Lates calcarifer.* In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 60-65.

281.Ambasankar, K., S. Ahamad Ali and J. Syma Dayal. 2009. Feeds and feeding of seabass in hatchery, nursery and grow out system using formulated feeds. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 66-70.

282.Ambasankar, K., J. Syama Dayal, S. Ahamad Ali, A. R. Thirunavukkarasu, M. Kailasam and J.K. Sundaray. 2011. Effect of varying levels of fish oil : lecithin on growth and survival of Asian seabass (*Lates calcarifer*) larvae fed a compounded micro diet. In: World Aquaculture Society Conference - Asian Pacific Aquaculture 2011 and Giant Prawn 2011. College of Fisheries (Kerala Agricultural University), Kochi, and Department of Fisheries (Govt. of Kerala). 255.

283.Ambasankar K., S. Ahamad Ali, J. Syama Dayal, S. Staline, S. Nandakumar and C. Raman. 2012. Effect of varying levels of moisture content on the extrusion properties of seabass feed in a twin screw extruder. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 125.

284.Ambasankar K., J. Syama Dayal, S. Ahamad Ali, A.R. Thirunavukkarasu, M. Kailasam. and J.K. Sundaray. 2012. Effect of varying levels of dietary salt on growth and survival of Asian seabass (*Lates calcarifer*) fry reared in freshwater. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 101.

285.De, D. and T.K. Ghoshal. 2009. Feeds and feeding management in brackishwater fish culture system. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 51-54.

286.De, D. and T.K. Ghoshal. 2009. Broodstock nutrition for shrimp and fish. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 94-101.

287.De, D. and T.K. Ghoshal. 2009. Identification of different feed ingredients used in aquafeed and quality assessment. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 160-164.

288.De D., T.K. Ghoshal, K. Ambasankar and J. Syama Dayal. 2012. Grow out culture of Asian seabass with farm made feed. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p 123

289.De, D., T.K. Ghoshal, R.A. Raja and S. Kumar. 2013. Growth performance, nutrient digestibility and digestive enzyme activity in Asian seabass, *Lates calcarifer* juveniles fed diets supplemented with cellulolytic and amylolytic gut bacteria isolated from brackishwater fish. *Aquacult. Res*., doi:10.1111/are.12325

290.Gaikwad A.B., A.R. Thirunavukkarasu, J.K. Sundaray, N.K. Chadha, R. Subburaj and G. Thiagarajan. 2012. Comparative analysis of biochemical constitutents of Asian seabass *Lates calcarifer* fry fed with live and formulated feed. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012.

291.Ghosh, D., T.V. Sathianandan and P. Vijayagopal. 2011. Feed formulation using linear programming for fry of catfish, milkfish, tilapia, Asian sea bass, and grouper in India. *J. Appl. Aqua*., **23**: 85-101

292.Ghoshal, T.K. and D. De. 2009a. Nutrient requirement and feed formulation for brackishwater finfishes and shrimps. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 43-50.

293.Ghoshal, T.K. and D. De. 2009b. Larval nutrition of shrimp and finfishes. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 70-74.

294.Ghoshal T. K., D. De, K. Ambasankar and J. Syama Dayal. 2011. Apparent digestibilities of mustard, sesame and sunflower oil cakes in Asian seabass, *Lates calcarifer*. In: Renaissance in fisheries: Outlook and strategies. Book of Abstract, 9th Indian Fisheries Forum, CMFRI, Kochi and Asian Fisheries Society, Indian Branch, 19-23 Dec., 2011, Chennai, India, p. 140

295.Ghoshal T. K., D. De, S. Kar, K. Ambasankar and J. Syama Dayal. 2012. Effect of untreated (raw) and treated (water soaked) mustard oil cake on performance of Asian seabass (*Lates calcarifer*). In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 121.

296.Nandakumar S., K. Ambasankar, J. Syama Dayal and S.M. Pillai. 2012. Evaluation of corn gluten meal (CGM) as a protein source in the diet of Asian seabass, *Lates calcarifer*. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 100.

297.Nandakumar S., K. Ambasankar, J. Syama Dayal, C. Raman and S. Ahamad Ali. 2012. Chicken waste meal as a replacer of fish meal in the diet of Asian seabass, *Lates calcarifer*. In: Renaissance in fisheries: Outlook and strategies. Book of Abstract, 9th Indian Fisheries Forum, CMFRI, Kochi and Asian Fisheries Society, Indian Branch, 19-23 Dec., 2011, Chennai, India. 381pp, p. 142.

298.Nandakumar, S., K. Ambasankar, J. Syama Dayal, C. Raman and S. Ahamad Ali. 2013. Fish meal replacement with chicken waste meal in Asian seabass (*Lates calcarifer*) feeds. *Indian J. Fish*., **60**(2):109-114.

299.Natarajan, M. 2009. Broodstock nutrition and feed management. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 47-52.

300.Natarajan, M., C. Gopal and A.R. Thirunaukkararasu. 2002. Studies on the development of nursery feeds for Asian seabass *Lates calcarifer* (Bloch). In: *Proc. the Fifth Indian Fisheries Forum*, (Eds.) S. Ayyappan, J.K. Jena and M. Mohan Joseph, pp. 81-83

301.Paulraj, R. 1997. *Hand book on Aquafarming: Aquaculture Feed.* Manual. MPEDA, Cochin, pp. 103.

302.Sarada, C., J. Syama Dayal, S. Ahamad Ali, A.R. Thirunavukkarasu and G. Venugopal. 2005. *Intl. J. Ecol. & Develop*, **4**(906): 38-50.

303.Stalin, P., M. Kailasam and A.R. Thirunavukkarasu. 2011. Effect of starvation on the digestive enzymes and growth in Asian seabass *Lates calcarifer* (Bloch) larvae. In: Renaissance in fisheries: Outlook and strategies. Book of Abstract, 9th Indian Fisheries Forum, CMFRI, Kochi and Asian Fisheries Society, Indian Branch, 19-23 Dec., 2011, Chennai, India. 381pp, p.144.

304.Syama Dayal, J., S. Ahamad Ali, K. Ambasankar and A.R. Thirunavukkarasu. 2002. Effect of certain substances as feed attractants for Asian seabass, *Lates calcarifer* (Bloch). The Fifth Indian Fisheries Forum, CIFE, Mumbai, 17-20 December 2002, Abstract No. 54.

305.Syama Dayal, J., S. Ahamad Ali, K. Ambasankar, A.R. Thirunavukkarasu and M. Kailasam. 2002. Effect of certain substances **as** feed attractants for Asian seabass, *Lates calcarifer* (Bloch). Proc. Sixth lndian Fisheries Forum, pp. 151-155.

306.Syama Dayal, J.. S. Ahamad Ali, A.R.Thirunavukkarasu. M. Kailasam and R. Subbural. 2003. Nutrient and aminoacid profiles of egg and larvae of Asian seabass *Lates calcarifer* (Bloch). *Fish Physiol. Biochem*., **29**: 141-147.

307.Syama Dayal, J., S. Ahamad Ali., K. Ambasankar, A.R. Thirunavakkarasu and M. Kailasam. 2006. Corn gluten meal as feed ingredient in Asian seabass, *Lates calcarifer*. XI1 Animal Nutrition Conference held at Anand. 7-9 January 2006.

308.Syama Dayal, J., A.G. Ponniah and K. Ambasankar. 2011. Fish as health food with special reference to Brackishwater shellfish and finfish. In: National Seminar on Recent Advances in Food Biotechnology and its applications, (Eds.) M.M.J.J. Cruz *et al*., Aarupadai Veedu Institute of Technology, Departmemt of Biotechnology, Paiyanoor, pp. 42-53.

309.Syamala, K., P.A. Khandagale and J.R. Dias. 2014. Feed management in cage culture. In: Training manual on “Cage culture of marine fin fish and shell fish in open sea”, Central Marine Fisheries Research Institute, Kochi, pp. 35-*43.*

310.Vasagam, K.P. Kumaraguru, K. Ambasankar and J. Syama Dayal. 2015. An overview of aquafeed formulation and processing. In: Advances in Marine and Brackishwater Aquaculture, (Eds.) P. Santhanam, A.R. Thirunavukkarasu & P. Perumal, Springer India, pp 227-240.

311.Vijayagopal, P. 2012. Marine fish nutrition, feed formulation, feed production and feeding. In: Hand book on open sea cage culture, (Eds.) K.K. Philipose, Jayasree Loka, S.R.K. Sharma & D. Divu, Central Marine Fisheries Research Institute, Karwar Research Centre, p. 47-58.

Live broodstock and seed transport

312.Anulekshmi, C., Sujit Sundaram and S.D. Kamble. 2014. *Collection, transportation and stocking of fish seed.* In: Training manual on “Cage culture of marine fin fish and shell fish in open sea”, Central Marine Fisheries Research Institute, Kochi, pp. 29-34.

313.Jayasree Loka and K.K. Philipose (2012). Transportation of fingerlings and juveniles of marine finfish. In: Handbook on Open sea Cage Culture, (Eds.) K.K. Philipose, Jayasree Loka, S.R.K. Sharma and D. Divu, Central Marine Fisheries Research Institute, Karwar Research Centre, p. 77-83.

314.Thirunavukkarsu, A.R. and M. Kailasam. 2009. Procurement, transport and acclimatization of fishes for broodstockm development. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 29-30.

Nursery rearing

315.Balamurugan R., A.R. Thirunavukkarasu, M. Kailasam, K. Ambasankar, P. Kumar, R. Subburaj and G. Thiagarajan. 2012. Influence of size on survival and growth under nursery rearing in pond culture system of Asian Seabass (*Lates calcarifer*) fry: An experience at Balasore, Odisha. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p 18.

316.Biswas, G. 2009. Pond based nursery rearing of seabass. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 66-69.

317.Biswas, G. and J.K. Sundaray. 2009. Pond based nursery rearing of sea bass. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 141-144.

318.Biswas, G., A. R. Thirunavukkarasu, J. K. Sundaray and M. Kailasam. 2008. Effect of stocking density on the growth dispersion in Asian seabass *Lates calcarifer* (Bloch) under nursery rearing. Presented in the 8th Indian Fisheries Forum held on 22nd to 26th November 2008 at CIFRI, Barrackpore, Kolkata

319.Biswas, G., A. R. Thirunavukkarasu, J. K. Sundaray and M. Kailasam. 2010. Optimization of feeding frequency of Asian seabass (*Lates calcarifer*) fry reared in net cages under brackishwater environment. *Aquaculture*, **305**: 26-31.

320.Gaikwad A. B., N.K. Chadha, A.R. Thirunavukkarasu, D. Sundaray, P.B. Sawant J.K. Sundaray, P. Kumar and A.R. Vijayan. 2012. Evaluation of the performance of seabass (*L. calcarifer*) fry reared feeding with artemia biomass produced using different agro by products. *National conference on Biotechnological Approaches in Aquaculture,* p. 63.

321.Joseph, S. 2009. Nursery rearing of seabass fry and importance of grading and seed transportation. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 44-49.

322.Kailasam, M., A.R. Thirunavukkarasu, J.K. Sundaray, Mathew Abraham, R. Subburaj, G. Thiagarajan and K. Karaiyan. 2006. Evaluation of different feeds for nursery rearing of Asian seabass *Lates calcarifer* (Bloch). *Indian J. Fish*., **53**(2): 185-190.

323.Krishna, Sukumaran, A.R. Thirunavukkarasu, M. Kailasam, P. Kumar, R. Subburaj and G. Thiagarajan. 2013. Pre-growout culture of Asian seabass *Lates calcarifer* (Bloch) in low volume cage in brackishwater Ashtamudi lake under participatory mode with traditional farmers. Second International Conference on Ecosystem Conservation and Sustainable Development (ECOCASD) 2013- Book of abstracts, Organized by Departments of Aquatic Biology & Fisheries, University of Kerala, Thiruvananthapuram, during 3 -5, Oct., 2013:. p 357

324.Kumar, P., A.R.T. Arasu. M. Kailasam, J,K, Sundary, R. Subburaj, G. Thiagarajan, A. Kuppan, V. Vijayan and R. Balamurugan. 2012. Nursery rearing of Asian seabass (*Lates calcarifer*): A potential livelihood option for small scale farmers. In: Global Symposium on Aquatic Resource for eradicating hunger and malnutrition – Opportunities and Challenges, 3-6 December 2012, Mangalore, Abstract PT-38.

325.Kumar, P., A.R. Thirunavukkarasu, M. Kailasam, R. Subburaj and G. Thiagarajan. 2013. Application of nursery rearing of seabass in sustainability of seabass farming. Hindi National Seminar, CIFE. pp73.

326.Mukhopadhyay, M.K. and H.K. Karmakar. 1981. Effect of salinity on food intake, growth and conversion efficiency in juveniles of *Lates calcarifer*. *J. Inland Fish. Soc. India* **13**(1):8-14.

327.Philipose, K.K., S.R.K. Sharma, N. Sadhu, N.G. Vaidya and and G. Syda Rao. 2010. Some aspects of nursery rearing of the Asian seabass (*Lates calcarifer*, Bloch) in indoor cement tanks. *Indian J. Fish*., **57**(4): 61-64.

328.Sharma, S.R.K., P. Dube and K.K. Philipose. 2012. Nursery rearing of Asian Seabass. In**:** Handbook on Open Sea Cage Culture. (Eds.), K.K. Philipose, Jeyasree Loka, S.R.K. Sharma and D. Divu, Central Marine Fisheries Research Institute, Karwar, pp. 72-76.

329.Singh, R.K., G.A. Shirgur and V.B. Mehta. 1990. Studies on comparative growth during fry stages in respect of *L. calcarifer* under provision of cultured zooplankton and different organic substances. *Proc*. *Nat. Seminar on Recent Advances in Hydrobiology*, pp. 119-128

330.Thiagarajan G., R. Subburaj, M. Kailasam, A.R. Thirunavukkarasu and K. Karaiyan. 2012. Nursery rearing of Asian seabass (*Lates calcarifer*) fry in open pond and hapa net cage – a comparative evaluation. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 29-30..

331.Thirunavukkarasu, A.R, and M. Kailasam. 2009. Nursery rearing. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu**,** M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 91-94.

Ecology of culture system

332.Bindu Sulochanan. 2013. Water quality criteria for aquaculture. In: Training manual on capture based aquaculture practices, (Eds.) Sujitha Thomas, A.P. Dinesh Babu, Prathibha Rohit, Geetha Sasikumar, K.M. Rajesh & Bindu Sulochanan, Mangalore Research Centre of Central Marine Fisheries Research Institute, p. 21-26.

333.Biswas, G. and P.S. Shyne Anand. 2009. Role of soil and water parameters in brackishwater culture ponds. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 55-58.

334.Chakraborty, S.K. 1996. Aquaculture potential of mangrove ecosystem of Sunderbans, West Bengal, India. *Proc. Seminar on Fisheries - A Multibillion Dollar Industry*, AFI & FTF, Chennai, pp. 72-83.

335.Jayasree, Loka, S.M. Sonali, L.S. Korabu and K.K. Philipose. 2012. Environmental monitoring in sea cage culture. In: Hand book on open sea cage culture, (Eds.) K.K. Philipose, Jayasree Loka, SR.K. Sharma & D. Divu, Central Marine Fisheries Research Institute, Karwar Research Centre, p. 118-124.

336.Kuthalingam, M.D.K., V. Sundararaj and V. Ramadhas 1982. Utilization of mangrove ecosystem for aquaculture in India. *Intl. Sym. Utilization of Coastal Ecosystems: Planning. Pollution and Productivity, Rio Grande (Brazil), 22 Nov 1982*. *Atlantica*. 5(2): 68.

337.Philipose, K.K., S.R.K. Sharma, Jayasree Loka, D. Divu, G. Syda Rao, N.G. Vaidya, S.S. Mhaddolkar, N. Sadhu and P. Dube. 2012. Observations on variations in physico-chemical water parameters of marine fish cage farm off Karwar. *Indian J. Fish*., **59**(1): 83-88.

338.Prema, D. 2009. Importance of water quality in marine life cage culture. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 81-86.

339.Prema, D., K.S. Sobhana, A. Laxminarayana, Imelda Joseph, Shoji Joseph, Boby Ignatius, R. Jeyabaskaran, A. Nandakumar, R. Khambadkar, P.S. Anilkumar, G. Shylaja and G. Syda Rao. 2010. Observations on selected characteristics of water and sediment at the open sea cage culture site of Asian seabass *Lates calcarifer* (Bloch) off Cochin, south-west coast of India. *Indian J. Fish*., **57**(4): 53-59.

340.Saraswathy, R., M. Muralidhar, K.K. Krishnani and B.P. Gupta. 2009. Soli and water quality requirements and their management in brackishwater aquaculture. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 145-152.

341.Saraswathy, R., M. Muralidhar, J.K. Sundaray, N. Lalitha and P. Kumararaj. 2015. Water quality management in fish hatchery and grow-out systems. In: Advances in Marine and Brackishwater Aquaculture, (Eds.) P. Santhanam, A.R. Thirunavukkarasu & P. Perumal, Springer India, pp 217-226

342.Sarma, K., S., Dam Roy and P. Krishnan. 2009. Water quality management in brackishwater ponds. In: Training Manual on Brackishwater Aquaculture in Andaman, (Eds.) S. Dam Roy, K. Sarma & P. Krishnan, Central Agricultural Research Institute, Port Blair, pp. 35-38.

343.Shyne Anand, P.S., Sujeet Kumar and A. Panigrahi. 2009. Identification of major phytoplankton groups present in brackishwater ponds. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl. Publ*., No. **41**: 181-187.

Culture-Prospects

344.Ayyappan, S. and A. Gopalakrishnan. 2008. Resilience in Fisheries and Sustainability of Aquaculture. In: Souvenir, 8th Indian Fisheries Forum, Kolkata, 22-26 November, 2008, p. 1-9.

345.Dam Roy, S. and R.C. Srivastava. 2009. Status of Brackishwater Fish Farming in India. In: Training Manual on Brackishwater Aquaculture in Andaman, (Eds.) S. Dam Roy, K. Sarma & P. Krishnan, Central Agricultural Research Institute, Port Blair, pp. 1-3.

346.David Kingston, S and C.B.T. Rajagopalasamy 1994. Sea bass - A promising candidate species for culture. *Seafood Export J.,* **25**(19): 23-26.

347.Devaraj, M. and K.K. Appukuttan. 2000. *Perspective on coastal aquaculture in India.* **In:** Marine Fisheries Research and Management, (Eds.) V.N. Pillai & N.G. Menon, CMFRI; Kochi, Kochi, pp. 677-687.

348.James, P.S.B.R. 1984. Scope for India with brackishwater fish culture in India with special reference to Karnataka. In: *Seminar on Inland Fisheries, 1984, Bangalore.*

349.Kumaran, M. and A.G. Ponniah. 2009. Entrepreneurship development concepts – An overview. In: Entrepreneurship development in coastal aquaculture, (Eds.) M. Kumaran & A.G. Ponniah, NFDB & CIBA, *CIBA Spl. Publ*., **46**: 1-9.

350.Krishnan, P., S. Dam Roy and K. Sarma. 2009. Brackishwater Fish Culture in Andaman. In: Training Manual on Brackishwater Aquaculture in Andaman, (Eds.) S. Dam Roy, K. Sarma & P. Krishnan, Central Agricultural Research Institute, Port Blair, pp. 15-19.

351.Lal Mohan, R.S. 1983. *Cultivable finfish resources. CMFRI Bull.,* **34**: 52-53.

352.Mahadevan, S. 1985. *Fin fish Culture. Mar. Fish. Infor. Serv. T & E Ser.,* **62**: 1-6.

353.Mathew Abraham and A.R.T. Arasu. 2003. Brackishwater aquaculture in inland areas – prospects and constraints. In: Fish production using brackishwater in Arid Eco-System, (Eds.) S.K. Garg & A.R.T. Arasu, *Proc. 3rd Interaction Workshop*, Hisar, India, pp. 173-176.

Pond culture

354.Algarswami, K. 1990. Status of coastal aquaculture in India. In: Aquaculture in Asia, (Ed.) M. Mohan Joseph, Asian Fisheries Society, Indian Branch, p. 163-190.

355.Algarswami, K. 1992. Research needs for brackishwater aquaculturte in India by 2000 A.D. In: Aquaculture Research needs for 2000 A.D., Oxford & IBH Publ. Co. Pvt. Ltd., pp. 83-94.

356.Alikunhi. K.H. 1957. Fish culture in India. Farm Bulletin, ICAR, New Delhi, No. 20: 1-144.

357.Anon , 1951. ICAR Madras Rural Piscicultural Scheme Progress Report (Period 1st April 1950 to 31st March 1951), 72 pp.

358.Anon. 1985. All India Coordinated Research Project on 'Brackishwater Fish Farming'. Draft Final Report, Compiled by A. Ghosh, CIFRI, Barrackpore, pp. 113.

359.Anon. 2013. Advances in Marine and Brackishwater Aquaculture, (Eds) P. Santhanam, A.R., Thirunavukkarasu & P. Perumal, Springer

360.Arasu, A.R.T. 2010. Asian seabass *Lates calcarifer* pond farming demonstation. *Fishing Chimes*, 30(1): 118-119.

361.Arasu, A.R.T. and Mathew Abraham. 2002. Asian seabass Lates catcarifer – An alternative candidate species for sustainable aquaculture. In: Souvenir: Responsible Brackishwater Aquaculture 8th March 2002, at Kakinada (MPEDA, CIFE, SPICAM)

362.Bensam, P. 1993. *Hand Book on Aquafarming: Part-I: Sea fishes.* Manual. MPEDA, Kochi, pp. 11-59.

363.Bensam, P. 2000. A review of marine finfish culture experiments in India. In: Marine Fisheries Research and Management (Eds.) V.N. Pillai & N.G. Menon, CMFRI; Kochi, pp. 802-817.

364.Biswas, G. 2009. Brackishwater finfish culture methods. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl. Publ.*, No. **41**: 21-25.

365.Biswas, G. 2009. Traditional farming of seabass in West Bengal. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ.*, **42**: 135-140.

366.Biswas G. and J.K. Sundaray. 2009. Culture of Asian seabass (*Lates calcarifer*). In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ.*, **42**: 105-116.

367.Biswas, G., A.R. Thirunavukkarasu, J.K. Sundaray and M. Kailasam. 2009. Farming of asian seabass, *Lates calcarifer* in West Bengal- prospects and future challenges. *Fishing Chimes*, **29**(7): 19-21 & 27.

368.Biswas, G., A.R. Thirunavukkarasu J.K. Sundaray and M. Kailasam. 2011. Culture of Asian seabass *Lates calcarifer* (Bloch) in brackishwater tide-fed ponds:growth and condition factor based on length and weight under two feeding systems. *Indian J. Fish*., **58**(2), 53-57

369.Chakraborti, R.K. and M.L. Bhowmik. 1985. Ecology and productivity of a brackishwaer paddy cum fish culture farm on River Hooghly. *J. Indian Soc. Coastal Agric*. *Res*., **3**(2): 137-148.

370.Chandrasekaran, V.S. 2010. Status of brackishwater aquaculture in India. In : Inland Fisheries of India. Souvenir, The Fisheries Technocrats Forum, Central Institute of Brackishwater Aquaculture & Coastal Aquaculture Society of India, Chennai, pp. 67-74.

371.Dam Roy, S., G. George, K. Sarma and P. Krishnan. 2009. Brackishwater Aquaculture in Inundated Areas of Andaman. In: Training Manual on Brackishwater Aquaculture in Andaman, (Eds.) S. Dam Roy, K. Sarma & P. Krishnan, Central Agricultural Research Institute, Port Blair, pp. 4-7.

372.Devaraj, M., V.K. Pillai, K.K. Appukuttan, C. Suseelan, V. Sriramachandra Murty, P. Kaladharan, G Sudhakara Rao, N.G,K. Pillai, N.N. Pillai, K. Balan, V. Chandrika, K.C. George and K.S. Sobhana. 1999. Packages of Practices for Sustainable, Ecofriendly Mariculture (Land-based Saline Aquaculture and Sea farming). In: Aquaculture and the Environment, (Ed.) M. Mohan Joseph, Asian Fisheries Society, Indian Branch, Mangalore, pp. 33-69.

373.Garg, S.K., Anita Bhatnagar, Alok Kalla and G.S. Dinodia. 2003. Use of inland saline water in finfish culture. In: Fish production using brackishwater in Arid Eco-System, (Eds.) S.K. Garg & A.R.T. Arasu, *Proc. 3rd Interaction Workshop*, Hisar, India, pp. 146-150.

374.Ghosh, A. 1971. Observations on the acclimatization and growth of the bhetki, *L. calcarifer* (Bloch) in freshwater ponds. *J. Inland Fish. Soc. India*, **3**: 123-124

375.Ghoshal, T.K. 2009. Present status of brackishwater aquaculture. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 3-5.

376.Hora. S. L. and K.K. Nair. 1944. Suggestions for the development of salt water ' Bheries or Bhasabadha' fisheries in the Sunderbans. Fisheries Development Pamphlet, Dept. of Fisheries, Bengal No I: 1- 22.

377.Hora, S.L. and T.V.R. Pillay, 1962. Handbook of fish culture in the Indo-Pacific region. *FAO Fish. Biol. Tech. Paper,* **14**: 1-204.

378.James, P.S.B.R. and R. Marichamy. 1987. Status of seabass (*Lates calcarifer*) culture In India. In: Management of wild and cultured Sea Bass/Barramundi (*Lates calcarifer*), Proc. Intl. Workshop held at Darwin, N.T. Australia, 24-30 September 1986, (Eds.) J.W. Copland and D.L. Grey, p. 74-79.

379.Jhingran, V.G. 1977. A note on the progress of work under co-ordinated project on brackishwater fish farming (ICAR), Central Inland Fisheries Research Institute, Barrackpore, 9 pp.

380.Kailasam, M., A.R.T. Arasu, J.K. Sundaray, Prem Kumar, G. Biswas, R. Subburaj and G. Thiagarajan. 20??. Culture of Asian seabass *Lates calcarifer* for sustainable aquaculture. In: Refresher training for officers of fisheries discipline, NABARD on recent trends in brackishwater aquaculture, *CIBA Spl. Publ.* **49**: 63-67.

381.Kailasam, M., T. Ravisankar and A.G. Ponniah. 2014. Recent advances in Brackishwater Finfish Aquaculture: Prospects and Constraints. In: Aquaculture – New possibilities and concerns, (Eds.) V.R.P. Sinha and P. Jayasankar, pp. 23-36

382.Karmakar D., V. Ragupathy, J.K. Sundaray, A.R. Thirunavukkarasu, M. Kailasam, K. Ambasankar, P. Kumar, R. Subburaj and G. Thiagarajan. 2012. Potential and Prospects of Asian Seabass (*Lates calcarifer*). Farming in West Bengal and initiative for improved farming techniques. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 14.

383.Krishna, Sukumaran, A.R. Thirunavukkarasu, M. Kailasam, J.K. Sundaray, R. Subburaj and G. Thiagarajan. 2011. Effect of stocking density on size heterogeneity and sibling cannibalism in Asian seabass *Lates calcarifer* (Bloch, 1790) larvae. *Indian J. Fish*., **58** (3), 145-147.

384.Krishna, Sukumaran, A.R. Thirunavukkarasu, R. Subburaj, G. Thiagarajan and S. Venu. 2012. Effect of feeding frequency on growth, survival, cannibalism and size 64eterogeneity in Asian seabass *Lates calcarifer* (Bloch). In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 7

385.Kuppan, A., R. Balamurugan, J.K. Sundaray, A.R. Thirunavukkarasu, M. Kailasam, K. Ambasankar, P. Kumar, R. Subburaj and G. Thiagarajan. 2012. Asian seabass (*Lates calcarifer*) farming prospects in Odisha: an experience in improved farming practices in Balasore. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 16.

386.Lal Mohan, R.S. and K. Nandakumaran. 1982. *Prawn and fish culture in polythene film lined ponds at Calicut sea shore. Proc. Symp. Coastal Aquaculture,* Mar. Biol. Ass. India, Part 1: 409-412.

387.Mahalakshmi, P., Prem Kumar, M. Kailasam, C. Gopal, R.V. Borichangar, H.G. Solanki and G.J. Vanza. 2015. Development of brackishwater aquaculture farming technology among tribal and other aqua farmers in Gujarat. *Fishing Chimes*, **34**(10): 20-23.

388.Marichamy, R., H. M. Kasim, V.S. Rengasamy, K.M.S. Ameer Hamsa and S. Rajapackiam 2000. Culture of seabass, *Lates calcarifer*. *In*: *Marine Fisheries Research and Management,* (Eds.) V.N. Pillai and N.G. Menon, CMFRI, Kochi. Pp. 818-825.

389.Nammalwar, P., R. Marichamy, G. Mohanraj, V.S. Rengasamy, A. Raju and V. Gandhi. 1996. A review of the systems for culture of marine fin fishes in India. In: Aquaculture for 2000 AD, (Ed.) Samuel Paul Raj, Palani Paramount Publ., Palani, Tamil Nadu, pp. 231-244.

390.Narasimham, K.A. and V. Kripa. 1995. *Candidate species, other than shrimps for coastal aquaculture.* In: Indaqua 95, 28 – 29 January 1995, Chennai, pp. 16.

391.Natarajan, M.V. 1987. Brackishwater fisheries development in Tamil Nadu. In: Brackishwater aquaculture development in India, (Eds.) U.K. Srivastava, B.H. Dholokia nd S. Vathsala, Concept Publ. Co., New Delhi, pp. 21-49.

392.Parulekar, A.H. and X.N. Verlencar. 1984. Status and prospects of fish farming in Goa. *Proc. Symp. Coastal Aquaculture*, Mar. Biol. Ass. India, Part **3**: 732-737

393.Pillay, T.V .R. 1954 . The ecology of a brackishwater ··bhcri wllh special rofercnce to the fish culture practices and the biotic intcraction. *Proc. Natl. Inst. Sci. India*, **20**(4): 399-427.

394.Pillay, T. V. R. 1990. Seabasses and seabreams In: Aquaculture: Principles and Practices, Fishing News Books. Oxford, England, p. 398-407.

395.Pillay, T.V.R. and B. Bose. 1957. Observations on the culture of brackishwater fishes in paddy fields of West Bengal. *Proc. Indo-Pacific Fish. Coun*., Session **7**: 187-192.

396.Ponniah, A.G. and T. Ravisankar. 2013. Importance of aquaculture in alleviating Farmers poverty and Improving their economy. In: *Climate Change and Sustainable Food Security*, (Eds.) P. K. Shetty, S. Ayyappan and M. S. Swaminathan, National Institute of Advanced Studies, Bangalore and Indian Council of Agricultural Research, New Delhi, pp. 185-197.

397.Ramasubramanian, R. and N. Chittibabu. 2011. Eco-friendly aquaculture in Sorlagodi, Andhra Pradesh – a case study. In: Current trends in Aquaculture Development, Its future, Prospects of Processing and Marketing. Souvenir, Society for Promotion of Integrated Coastal Areas Management, Kakinada, pp. 56-61.

398.Sangeeta, M.S. 2014. Integrated Khazan ecosystem involving Agriculture and Aquaculture. In: Khazan ecosystems of Goa – Building on indigenous solutions to cope up with global environmental change, Centre for Environment and Natural Resource management, Goa, Springer, pp. 39-43.

399.Shanthi, B., V.S. Chandrasekaran, S.M. Pillai, M. Kailasam, K. Ambasankar and P. Mahalakshmi. 2013. Development of alternate livelihood opportunities among the scheduled tribal women self help groups through aquaculture integrated with agro-based technologies. *Fishing Chimes*, **33**(3): 46-47.

400.Shanthi, B., M. Kailasam, V.S. Chandrasekaran, P. Mahalakshmi, C.P. Balasubramanian, K. Ambasankar, P. Ravichandran and A.G. Ponniah. 2014. Polyculture of mud crabs and Asian seabass by Irular tribal people in a community pond, CIBA, Chennai, Poster.

401.Shanthi, B., M. Kailasam, V.S. Chandrasekaran, P. Mahalakshmi, C.P. Balasubramanian, K. Ambasankar, P. Ravichandran and A.G. Ponniah. 2014. Opportunities for social mobilization among the Irular tribal people using common water bodies for aqua farming. CIBA e-Publication Series No. 27: 1-16.

402.Shyne Anand, P.S., Sujeet Kumar and A. Panigraghi. 2009. Role of microalgae in aquaculture. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 59-61.

403.Shyne Anand, P.S., G. Biswas and A. Panigraghi. 2009. Estimation of soil and water parameters. In: Training manual on Brackishwater Aquaculture, Kakdwip Research Centre of CIBA, Kakdwip, *CIBA Spl*. *Publ*., No. **41**: 170-172.

404.Silas, E.G. and P. Vedavyasa Rao. 1987. *Fish and Shellfish production through aquaculture in the brackish waters of India.* **In:** Brackish water Aquaculture Development in India. (Eds.) U.K. Srivastava, B.H. Dholakia and S. Vathsala, Concept Publ. Co., New Delhi, pp. 119-136.

405.Singh, R.K., V.B. Mehta and S.V. Majgaonkar. 1990. Prospects and status of Jitada (*L.calcarifer*) culture in Maharashtra. *Fishing Chimes*, **12**: 36-37.

406.Singh. R.K. 2000. Growth, survival and production of *Lates calcarifer* in a seasonal rain-fed coastal pond of the Konkan region. Aquaculture, 8: 55-60.

407.Sinha, V.R.P. 1992. Aquaculture research and development in India. In: Aquaculture Research needs for 2000 A.D., Oxford & IBH Publ. Co. Pvt. Ltd., pp. 9-24.

408.Sudhir Raizada, U.K. Maheswari, N.K. Chadha, Hasan Javed, A.S. Kumarnaik, Musharraf Ali, I.J. Singh and Sanjeevan Kumar. 2003. Innovations in inland saline aquaculture systems. In: Fish production using brackishwater in Arid Eco-System, (Eds.) S.K. Garg & A.R.T. Arasu, *Proc. 3rd Interaction Workshop*, Hisar, India, pp. 212-218.

409.Thirunavukkarasu, A.R.T. 2004. Prospects of Inland saline water Aquaculture. Summer School of Development of sustainable technology for fresh and saline water aquaculture, CCS Haryana Agriculture University, Hisar, 28-29 June 2004.

410.Thirunavukkarasu, A.R.T. 2004. Seabass seed production technology and culture. Summer School of Development of sustainable technology for fresh and saline water aquaculture, CCS Haryana Agriculture University, Hisar, 28-29 June 2004.

411.Thirunavukkarasu, A.R.T. 2005. Koduva Meen Valarppu. CIBA Extension Ser., 32: 1-6 (in Tamil language).

412.Thirunavukkarasu, A.R.T. 2012. Recent advancement in brackishwater aquaculture in India. In: Global Symposium on Aquatic Resource for eradicating hunger and malnutrition – Opportunities and Challenges, 3-6 December 2012, Mangalore, Abstract.

413.Thirunavukkarasu, A.R. 2013. Brackishwater aquaculture in India – An overview. In: Course Manual - Customized Training in Mariculture for Maldivian Officials. Central Marine Fisheries Research Institute, Kochi & The Commonwealth Secretariat, London, p.

414.Thirunavukkarasu, A.R. and M. Kailasam. 1998. Successful grow-out culture of CIBA hatchery-produced fry of seabass, *Lates calcarifer* in a farmer's ponds at Nagapatinam. *CIBA News*, **3**(4): 1-2.

415.Thirunavukkarasu, A.R. and M. Kailasam. 2009. Farming practices of Asian seabass *Lates calcarifer*. In: Training Programme on Asian seabass, fish seed production & culture, (Eds.) A.R. Thirunavukkarsu, M. Kailasam & J.K. Sundaray, NFDB & CIBA, *CIBA Spl. Publ*., **42**: 117-124.

416.Thirunavukkarasu, A.R., M. Kailasam and J.K. Sundaray. 2009. Aquaculture of Asian seabass- An opportunity for entrepreneurship. In: Entrepreneurship development in coastal aquaculture, (Eds.) M. Kumaran & A.G. Ponniah, NFDB & CIBA, *CIBA Spl. Publ*., **46**: 10-21.

417.Thirunavukkarasu, A.R., M. Kailasam and Mathew Abraham. 2002. Asian seabass *Lates calcarifer* an alternative candidate species for sustainable aquaculture. Souvenir, Workshop on Responsible Brackishwater Aquaculture, MPEDA, SPICAM and CIFE, Kakinada, pp.76-81.

418.Thirunavukkarasu, A.R., M. Kailasam, J.K. Sundaray, P. Kumar, R. Subburaj and G. Thiagarajan. 2010. Diversification of finfishes - an option for augmenting fish production through salt water aquaculture in Tamil Nadu. In: Souvenir - Inland Fisheries of India - Workshop on Sustainable development of capture and culture fisheries in Tamil Nadu, The Fisheries Technocrats Forum, Central Institute of Brackishwater Aquaculture & Coastal Aquaculture Society of India, Chennai, pp. 83-86.

419.Thirunavukkarasu, A.R., M. Kailasam, J.K. Sundaray, P. Kumar, G. Thiagarajan and R. Subburaj. 2010. Species diversification for sustainable saline water aquaculture-Prospects and problems. In: National Marine Biodiversity Present Status and Prospects, 16-18, September, 2010, Tiruchirappalli, pp. 11-13.

420.Thirunavukkarasu A. R., M. Kailasam, P. Kumar, K. Ambasankar, V.S. Arasu, R. Vijayan, R. Subburaj and G. Thiagarajan. 2011. An innovative culture practice for enhancing Asian seabass *Lates calcarifer* farming in pond culture system. In: Renaissance in fisheries: Outlook and strategies. Book of Abstract, 9th Indian Fisheries Forum, CMFRI, Kochi and Asian Fisheries Society,Indian Branch, 19-23 Dec., 2011, Chennai, India. p. 95.

421.Thirunavukkarasu A. R., M. Kailasam, J.K. Sundaray, Krishna Sukumaran, P. Kumar, R. Subburaj and G. Thiagarajan. 2011. Scope for seabass farming in India. Chennai Aquaculture Tech. Meet – CATEER'11, TANUVAS, Chennai, 16-17, November 2011, pp. 4-9.

422.Thirunavukkarasu, A.R., M. Kailasam, P. Kumar, R. Subburaj and G. Thiagarajan. 2013. Innovation of seabass culture in salt affected area. Hindi National Seminar, CIFE. P. 43.

423.Varghese, B. and S. Dam Roy. 2009. Design and Construction of Brackishwater Farm. In: Training Manual on Brackishwater Aquaculture in Andaman, (Eds.) S. Dam Roy, K. Sarma & P. Krishnan, Central Agricultural Research Institute, Port Blair, pp. 8-11.

424.Venugopal, G., J. Syama Dayal, K. Murlaimohan, P. Ramireddi, S. Ahamed Ali, A.R. Thirunavukkarasu and C. Sarada. 2003. Length-weight relationship in the Asian seabass *Lates calcarifer* (Bloch) under culture condition. *J. Indian Fish. Asso*., **30**: 61-64.

425.Vimala, D.D., A.R.T. Arasu, M. Kailasam, T. Ravisankar and M. Kumaran. 2013. "koduva meen valarppom kodi nanmai peruvom", CIBA Extension series No.45 (in Tamil language).

Cage culture

426.Anil, M.K., B. Santhosh, S. Jasmine, K.N. Saleela, Rani Mary George, G.H.J. Kingsly, C. Unnikrishnan, G.H. Rao and G. Syda Rao. 2010. Growth performance of the seabass *Lates calcarifer* (Blotch) in sea cage at Vizhinjam Bay along the south-west coast of India. *Indian J. Fish*., **57**(4): 65-69.

427.Anon. 2007. Asian seabass *Lates calcarifer* – Cage culture in ponds in India. *Aqua Culture Asia Pacific Magazine*, November/December 2007, p. 5.

428.Anon. 2010. Sea cage farming: Harvest festival conducted by CMFRI and NFDB. *Fishing Chimes*, **30**.

429.Bensam, P. and P. Nammalwar. 1991. Seed production and commercial culture of Sea bass *Lates calcarifer* (Bloch) at Singapore and its lesson for India. *Mar. Fish. Infor*. *Serv., T&E Ser*., No. **109**: 5-11.

430.Biswas, G., A.R. Thirunavukkarasu, J.K. Sundaray and M. Kailasam. 2010. Optimization of feeding frequency of Asian seabass (*Lates calcarifer*) fry reared in net cages under brackishwater environment. *Aquaculture*, **305**, 26-31.

431.CMFRI. 2010. Harvest of open sea cage farmed Asian Sea bass *Lates calcarifer* at Chemmencherry near Chennai. *Fishing Chimes*, **30**(9): 43-45.

432.CMFRI. 2009. Successful open sea cage culture demonstration at Balasore, Orissa. A new horizon in mariculture. *Cadalmin, CMFRI News Letter*, **123**:

433.Dash, B., M. Suresh Kumar and G. Syda Rao. 2009. Integration of seaweed (*Kappaphycus alvarezii*) and pearl oyster (*Pinctada fucata*) along with Asian seabass (*Lates calcarifer*) in open sea floating cage off Andhra Pradesh coast. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 57-59.

434.Deshmukh, V.D. 2014 Increasing fish production by mariculture in Maharashtra. In: Training manual on “Cage culture of marine fin fish and shell fish in open sea”, Central Marine Fisheries Research Institute, Kochi, pp. 1-5.

435.Dineshbabu, A.P. 2012. Cage farming of finfishes in estuaries. In: Hand book on pen sea cage culture, (Eds.) K.K. Philipose, Jayasree Loka, SR.K. harma & D. Divu, Central Marine Fisheries Research Institute, Karwar Research Centre, p. 137-144.

436.Dineshbabu, A.P. 2013. Technologies for fisheries enhancement**.** In: Training manual on capture based aquaculture practices, (Eds.) Sujitha Thomas, A.P. Dinesh Babu, Prathibha Rohit, Geetha Sasikumar, K.M. Rajesh & Bindu Sulochanan, Mangalore Research Centre of Central Marine Fisheries Research Institute, p. 10-20.

437.Dineshbabu, A.P., Sujitha Thomas, P.S. Swathi Lekshmi, and S. Geetha. 2012. Adoption of sustainable capture based aquaculture practices by traditional fishermen of Karnataka. *Indian J. Fish*., **59**(1): 49-52.

438.Divu, D., K.S. Rao and K.K. Philipose. 2012. Fish growth parameters and their monitoring. In: Hand book on pen sea cage culture, (Eds.) K.K. Philipose, Jayasree Loka, SR.K. harma & D. Divu, Central Marine Fisheries Research Institute, Karwar Research Centre, p. 112-117.

439.Gopakumar, G. 2009. History of cage culture, cage culture operations, advantages and disadvantages of cages and current global status of cage farming. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 8-12.

440.Gopakumar, G. 2010. Mariculture Technologies for Augmenting Marine Resources. In: Coastal Fishery Resources of India - Conservation and sustainable utilisation. (Eds.) B. Meenakumari, M.R. Boopendranath, Leela Edwin, T.V. Sankar, Nikita Gopal and George Ninan, Society of Fisheries Technologists, pp. 39-58.

441.Gopakumar, G. 2013. Mariculture Technologies for enhancing livelihood options in the Coastal Sector. In: Winter School in ICT oriented Strategic Extension for Responsible Fisheries Management, (Eds.)C. Ramachandran et al., Central Marine Fisheries Research Institute, Kochi, p. 89-103

442.Gopalakrishnan. V. 1972. Collection of brackishwater fish seed from the Hooghly estuary. Seminar on Productiun o! quality fish seed for fish culture. Central Inland Fisheries Research Institute, Barrackpore. P. 232-247.

443.ICAR. 2011. Chapter 21. Cage and pen culture. In: Hand book of fisheries and aquaculture, Directorate of Knowledge Management in Agriculture, Indian Council of Agriculture, New Delhi, pp. 469-499.

444.ICAR. 2011. Chapter 25. Mariculture. In: Hand book of fisheries and aquaculture, Directorate of Knowledge Management in Agriculture, Indian Council of Agriculture, New Delhi, pp. 561-590.

445.Ignatius, B. 2009. Principles and practices of cage mooring. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 33-37.

446.Ignatius, B. 2009. Grow out culture of seabass in cages. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 99-101.

447.Imelda, Joseph. 2009. Important management measures in cage culture. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 50-56.

448.Imelda, Joseph, S. Joseph, B. Ignatius, G. Syda Rao, K.S. Sobhana, D. Prema and Moly Varghese. 2010. A pilot study on culture of Asian seabass Lates calcarifer (Bloch) in open sea cage at Munambam, Cochin coast, India. *Indian J. Fish*., **57**(3): 29-33.

449.Jayasankar, J. 2009. Geographic information systems and site selection issues of open sea cage culture. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 111-119.

450.Jayasree Loka, N.G. Vaidya and K.K. Philipose. 2012. Site and species selection criteria for cage culture. In: Hand book on open sea cage culture, (Eds.) K.K. Philipose, Jayasree Loka, SR.K. harma & D. Divu, Central Marine Fisheries Research Institute, Karwar Research Centre, p. 26-37.

451.Joseph, S. 2009. Open sea Cage culture: carrying capacity and stocking in the grow out system. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 102-105.

452.Kandan, S. 2009. Commercialization of Asian seabass, *Lates calcarifer*, as a candidate species for cage culture in India. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 13-16.

453.Kandan, S. 2015 Culture of seabass (*Lates calcarifer*) in cages in ponds. In: Advances in Marine and Brackishwater Aquaculture, (Eds.) P.Santhanam, A.R. Thirunavukkarasu & P. Perumal, Springer India, pp 87-93.

454.Kizhakudan, Joe, K. 2010. Open sea cage farming of Asian sea bass Lates calcarifer in the Bay of Bengal, off Chennai. In: Course Manual on National Training on Sea cage farming, NFDB-CMFRI HRD Programme, Vizhinjam Research Centre of Central marine Fisheries Research Institute, Vizhinjam, p. 91-97.

455.Mohan Joseph, M. 2005. Prospects for open sea cage farming in India. *Fishing Chimes*, **25** (1). Pp. 25-28.

456.Mojjada. S.K., Imelda Joesph, G. Maheswarudu, R. Ranjan, B. Dash, S. Ghosh and G. Syda Rao. 2012. Open sea mariculture of Asian seabass *Lates calcarifer* (Bloch, 1790) in marine floating cage at Balasore, Odisha, north-east coast of India. *Indian J. Fish*., **59**(3): 89-93.

457.Mojjada, S.K., B. Dash, P. Pattnaik, M. Anbarasu and Imelda Joseph. 2013. Effect of stocking density on growth and survival of hatchery reared fry of Asian seabass, *Lates calcarifer* (Bloch) under captive conditions. *Indian J. Fish*., **60** (1). Pp. 71-75.

458.MPEDA. 2007. Breakthrough in Asian Seabass ***(****Lates calcarifer****)*** aquaculture in cages in pond in India. *MPEDA Newsletter*, 12 (9-10): 28-29.

459.Nammalwar, P. 2005. Finfish mariculture in India. *Proc. Ocean Life Food & Medicine Expo*, Aquaculture Foundation of India, Chennai, p. 304-310.

460.Philipose, K.K. and S.R.K. Sharma. 2012. Development of innovative low cost cagesfor promoting open sea Cage Culture along the Indian coast. In: Hand book on pen sea cage culture, (Eds.) K.K. Philipose, Jayasree Loka, SR.K. Sharma & D. Divu, Central Marine Fisheries Research Institute, Karwar Research Centre, p. 37-41.

461.Philipose, K.K., S.R.K. Sharma, Jayasree Loka, D. Divu, N. Sadhu and P. Dube. 2013. Culture of Asian seabass (*Lates calcarifer*, Bloch) in open sea floating net cages off Karwar, South India. *Indian J. Fish*., **60**(1): 67-70.

462.Philipose, K.K., D. Divu, S.R.K. Sharma, N.G. Vaidya, N. Sadhu and P. Dube. 2013. Length-weight relationship of Asian seabass, *Lates calcarifer* (Bloch) reared in open sea floating cages. Indian J. Fish., **60**(1): 139-140.

463.Philipose, K.K., S.R.K. Sharma and Jayasree Loka. 2013. Open sea cage culture for marine finfish and shell fishes. In: Training manual on capture based aquaculture practices, (Eds.) Sujitha Thomas, A.P. Dinesh Babu, Prathibha Rohit, Geetha Sasikumar, K.M. Rajesh & Bindu Sulochanan, Mangalore Research Centre of Central Marine Fisheries Research Institute, p. 15-20.

464.Prasadam. R.D., K.V. Ramakrishna and K. Raman. 1984. Pen and cage culture of fish and prawns in lagoon ecosystem (Pulical/Ennore) 1982-85. Central Inland Fisheries Research Institute, Barrackpore, Annual Report 1984.

465.Purushottama, G.B. 2014. Open sea cage culture of marine fin fish and shell fishes in India. In: Training manual on "Cage culture of marine fin fish and shell fish in open sea", Central Marine Fisheries Research Institute, Kochi, pp. *6-12.*

466.Rajesh, K.M. 2013. Development initiatives in aquaculture. In: Training manual on capture based aquaculture practices, (Eds.) Sujitha Thomas, A.P. Dinesh Babu, Prathibha Rohit, Geetha Sasikumar, K.M. Rajesh & Bindu Sulochanan, Mangalore Research Centre of Central Marine Fisheries Research Institute, p. 58-65.

467.Ramachandran, C. 2009. Open sea cage culture in India-A sociological perspective. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 94-98.

468.Rohit, Prathibha. 2013. Overview of mariculture in India. In: Training manual on capture based aquaculture practices, (Eds.) Sujitha Thomas, A.P. Dinesh Babu, Prathibha Rohit, Geetha Sasikumar, K.M. Rajesh & Bindu Sulochanan, Mangalore Research Centre of Central Marine Fisheries Research Institute, p. 5-9.

469.Rao, G. Syda. 2009. Development of sustainable capture based aquaculture: A profitable option for high value sea food production. In: Souvenir, 8th Indian Fisheries Forum, Kolkata, 22-26 November, 2008, p. 79-84.

470.Rao, G. Syda. 2009. Capture based Aquaculture: Mariculture Initiatives by CMFRI. *Fishing Chimes*, **29**(1): 32-36.

471.Rao, G. Syda. 2009. Overview on mariculture and the opportunities and challenges of cage culture in India. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 1-8.

472.Rao, G. Syda. 2012. Cage Culture -Mariculture Technology of the Millennium in India. In: Hand book on open sea cage culture, (Eds.) K.K. Philipose, Jayasree Loka, SR.K. harma & D. Divu, Central Marine Fisheries Research Institute, Karwar Research Centre, p. 1-14.

473.Rao, G. Syda and Imelda Joseph. 2011. Cage culture of marine finfish and shellfish. In: Current trends in Aquaculture Development, Its future, Prospects of Processing and Marketing. Souvenir, Society for Promotion of Integrated Coastal Areas Management, Kakinada, pp.7-13.

474.Rao, G. Syda and G. Gopakumar. 2012. Mariculture research and development in India - Frontier Areas. In: India International Seafood Show 2012, 29 February - 2 March 2012, Chennai.

475.Rao, G. Syda, Imelda Joseph, K.K. Philipose and M. Suresh Kumar. 2013. Cage aquaculture in India. Central Marine Fisheries Research Institute, Cochin. 240 pp.

476.Sadhu, N., S.R.K. Sharma, S. Joseph, P. Dube and K.K. Philipose. 2014. Chronic stress due to high stocking density in open sea cage farming induces variation in biochemical and immunological functions in Asian seabass *(Lates calcarifer,* Bloch). *Fish Physio. Biochem*., **40**(4): 1105-1113.

477.Saly N. Thomas. 2009. Netting specifications and maintenance of cages for finfish culture. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 23-32.

478.Sambasivan, M.K. 2012. Different types of netting materials & their properties. In: Hand book on open sea cage culture, (Eds.) K.K. Philipose, Jayasree Loka, SR.K. harma & D. Divu, Central Marine Fisheries Research Institute, Karwar Research Centre, p. 42-46.

479.Shylaja, G. 2009. Engineering aspects to be taken care in cage culture of seabass (Cage designs and materials, Mooring materials, Net load calculations etc.). In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 17-22.

480.Singh, V.V., C. Anulekshmi, G.B. Purushottama, S. Ramkumar, K. Syamala and V.D. Mhatre. 2014. Cage culture in Maharashtra: present and future prospects. In: Training manual on "Cage culture of marine fin fish and shell fish in open sea", Central Marine Fisheries Research Institute, Kochi, pp. 72-*74.*

481.Singh, V.V., N.A. Pawar and U.H. Rane. 2014. Grow-out culture in sea cages. In: Training manual on "Cage culture of marine fin fish and shell fish in open sea", Central Marine Fisheries Research Institute, Kochi, pp. 44-*47.*

482.Sujitha Thomas and A.P. Dinesh Babu. 2013. Concept of CBA, requirements and practices. In: Training manual on capture based aquaculture practices, (Eds.) Sujitha Thomas, A.P. Dinesh Babu, Prathibha Rohit, Geetha Sasikumar, K.M. Rajesh & Bindu Sulochanan, Mangalore Research Centre of Central Marine Fisheries Research Institute, p. 27-46.

483.Thampi Sam Raj, Y.C. and Jaideep Kumar. 2010. New technology initiatives of Rajiv Gandhi Centre for Aquaculture (RGCA) to strengthen the aquaculture production base for export of marine products from India. In: Souvenir - Inland Fisheries of India - Workshop on Sustainable development of capture and culture fisheries in Tamil Nadu, The Fisheries Technocrats Forum, Central Institute of Brackishwater Aquaculture & Coastal Aquaculture Society of India, Chennai, pp. 99-105.

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484.Arasu V. S., R. Balamurugan, V. Ragupathy, R. Vijayan, A.R. Thirunavukkarasu, P. Kumar, M. Kailasam, R. Subburaj and G. Thiagarajan. 2011. Polyculture of mud crab and Asian seabass in tide fed farm – An innovative practice for sustainable aquaculture. In: Renaissance in fisheries: Outlook and strategies. Book of Abstract, 9th Indian Fisheries Forum, CMFRI, Kochi and Asian Fisheries Society, Indian Branch, 19-23 Dec., 2011, Chennai, India. p. 91.

485.MPEDA. 2011. RGCA Seabass/Mud Crab Demonstration Project, Karaikal, Puducherry. *MPEDA Newsletter*, July 2011, p. 19-20

486.Singh, R.K. and G.A. Shirgur. 1994. Pond culture of Jitada (*L. calcarifer*) and Tilapia (*Oreochromis mossambicus*) at Panvel in Raigad district of Maharashtra. *Proc. Natl*. *Seminar on Aquacrop*, Nov, 16-18 held at C.I.F.E., Mumbai, pp. 136-138.

487.Singh, R.K., P.E. Shingare, J.B. Chavan, S.Q. Siddiqui and S.G. Belsare. 2001. Effect of *Lates calcarifer* seed stocking on the survival and production of Indian major carps reared in a freshwater coastal pond in Konkan region. *J. Indian Fish. Asso*., **28**: 73-78.

488.Vijayan R., V. Ragupathy, R. Balamurugan, A.R. Thirunavukkarasu, M. Kailasam, P. Kumar, K. Ambasankar, R. Subburaj and G. Thiagarajan. 2012. An innovative initiative for integrated farming of Asian Seabass (*Lates calcarifer*) with Tiger Shrimp – an experience in brackishwater pond culture in Machilipatnam. In: National Conference on New Vistas in Indian Aquaculture, Book of Abstracts. Coastal Aquaculture Society of India, Chennai and Central Institute of Brackishwater Aquaculture, Chennai, 23-24 February 2012, p. 20.

Economy

489.Chand, S., K. Sarma, S. Murugesan and S. Dam Roy. 2009. Economics of brackishwater farming. In: Training Manual on Brackishwater Aquaculture in Andaman, (Eds.) S. Dam Roy, K. Sarma & P. Krishnan, Central Agricultural Research Institute, Port Blair, pp. 44-46.

490.Narayanakumar, B. 2009. Economic analysis of cage culture of sea bass. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 120-122.

491.Ponnusamy, K. 2009. Entrepreneurship development through Agri-Clinics and Agri business management initiative. In: Entrepreneurship development in coastal aquaculture, (Eds.) M. Kumaran & A.G. Ponniah, NFDB & CIBA, *CIBA Spl. Publ*., **46**: 117-124.

492.Ramkumar, S. and V.D. Mhatre. 2014. Marketing and economic feasibility of open sea cage culture. In: Training manual on “Cage culture of marine fin fish and shell fish in open sea”, Central Marine Fisheries Research Institute, Kochi, pp. *65-71.*

493.Ravisankar, T. 2009. Prospects of Asian Sea bass (*Lates calcarifer*) for export and domestic marketing. In: Training manual – Winter School on Seed Production and Culture of Brackishwater Finfishes with special reference to Asian Sea bass (*Lates calcarifer*), (Eds.) A.R.T. Arasu, M. Kailasam and J.K. Sundaray, Central Institute of Brackishwater Aquaculture, Chennai. 198-203 pp.

494.Ravisankar, T. and A.R. Thirunavukkarsu. 2010. Market prospects of farmed Asian seabass *Lates calcarifer* (Bloch). *Indian J. Fish*., **57**(3): 49-53.

495.Ravisankar, T., G. Venkateswarlu, S. Rengarajan, A. Kuppan and S. Raja. 2012. An estimate of demand for Asian seabass in different states of India. In: *National Conference* on New Vistas in Indian Aquaculture in commemoration of Silver Jubilee Celebration of CIBA 2012, Book of Abstracts, p.171.

496.Sathiadhos, R. 2009. Growth in fleet size and investment in marine fisheries and scope for open sea mariculture. In: Course Manual on National Training on cage culture of seabass, (Eds.) Imelda Joseph, V. Edwin Joseph & V. Susmitha, CMFRI & NFDB, p. 106-110.

497.Shanthi, B., V.S. Chandrasekaran, A.R. Thirunavukarasu, M. Kailasam, M. Muralidar, T. Ravisankar, C. Sarada and M. Krishnan. 2005. Social and 'Morale' Dimensions of Aquaculture Experience from an Action Programme, Project No. CIBA/TTEIS/03, Central Institute of Brackishwater Aquaculture, Chennai, India, *Case Study* No.CIBA/TTEIS/2,April, 2005.1 O+lll P.

Compendium and bibliography

498.Kumar, Prem, M. Kailasam, J.K. Sundary, A.R.T. Arasu and Krishna Sukumaran. 2013. Compendium on Asian seabass, *Lates calcarifer*: Contribution from CIBA and bibliography. Central Institute of Brckishwater Aquacualture, Chennai, 370 pp.

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Aqua Industry-4
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