

Contents

Fisheries Technologies: Commercialized

Asian Seabass Seed Production	1
Shining Barb: A New Variety of Ornamental Fish	3
CIBA Bhetkiahar	4
CIBA Shrimp Feed	5
Portable FRP Carp Hatchery	6
Portable Magur Hatchery	7
Fish Aggregating Devices (FAD): Concrete Moulded Modules for Laying of Artificial Reefs	8
Cadalmin™ Green Mussel Extract (Cadalmintm GMe)	11
Cadalmin™ Green Algal Extract (Cadalmintm GAe)	12
Chitin and Chitosan from Crustacean Waste	14
Matrix for Immobilization and Imaging of Bacteria	16
Micro- Analysis Kit for Detection of Ammonia, Nitrite and Phosphate in Aquaculture Systems	17
Kit for Measurement of pH and Dissolved Oxygen	18
CIFACURE: Controls Bacterial and Fungal Diseases of Ornamental Fishes	19
Immunoboost-C: Carp Immunostimulant to Improve Brood Health and Seed Production	20
CIFELOSTRESS: Anti-Stress Formulation for Fish Seed Transport	21
CIFA-CRYO: Manually Operated Low Cost Handy Cryofreezer for Gamete Cryopreservation	22
Ready-to-Serve Fish Curry in Retortable Pouches	23
Fish Kure: Extruded Snack Food from Fish	25
Fish Munch: Fish Fortified Snack	26

Fisheries Technologies: Ready for Commercialization

CIFABROOD: Broodstock Feed	27
Varna: Marine Ornamental Fish Feed	28
Kit for Detection of Chemolithoautotrophic Bacteria	29
Immunodot Technology for Detection of WSSV	30
Monoclonal Antibodies against Serum Immunoglobulin's of	31

Spot Agglutination Kit for Fish Diseases	32
<i>Macrobrachium rosenbergii</i> Nodavirus (MrNV) Diagnostic Kit	33
m-KRISHI® Fisheries Mobile Service	34
Herbarium Making Technology for Seaweeds and Seagrasses	35
Biostimulator for Ammonia Detoxification in Coastal	36
Aquaculture Systems	
Broodstock Development, Induced Breeding and Larval Production of Cobia, <i>Rachycentron canadum</i>	38
Breeding of Silver Pompano, <i>Trachynotus blochii</i>	39
Carp Culture in Pens	40
Fish Stock Management in Small Reservoirs of India	45
<i>In-situ</i> Fish Seed Production in Cages	48

1. Fisheries Technologies: Commercialized

Asian Seabass Seed Production

Salient technical features

Captive broodstock development, protocols for accelerating maturation and spawning under captive conditions, techniques for larval rearing, procedure for developing required livefeed – rotifers and artemia, techniques for weaning to formulated feed, grading, packing the fry and transportation achieved.

Performance results

- Year round breeding of Asian seabass under Recirculating Aquaculture System (RAS) with survival rate of 35% from hatchlings to fry and 60-70% fry to fingerlings in the nursery systems in tanks and hapa net cages achieved.
- Under polyculture system along with tilapia, attained production up to 3.0 tonnes/ha over a period of 10 months culture.
- Using formulated feed developed by CIBA, production of 4-5 tonnes/ha in the grow out system was attained.

By stocking hatchery produced seed, adopting improved farming technology, uniform sized fish with better market price can be produced.

Social benefits

This technology can be adopted by entrepreneurs of large holdings, small farmers, women SHG as livelihood option.

Status of commercialization/IP rights

Technology was transferred under the consultancy to Rajiv Gandhi Centre for Aquaculture (RGCA, MPEDA); and to Shri N. Sankara Rao, Bhimavaram.



Likely cost/economics

Cost of hatchery production of seed is ₹ 4 per piece. Grow out culture production cost is ₹ 120-140 per kg.

Contact

Director

Central Institute of Brackishwater Aquaculture
75, Santhome High Road, R. A. Puram, Chennai-600 028 Tamil Nadu
www.ciba.res.in

Phone: 91-44-24617523, 24616948, 24610565, 24610311

Fax: 91-44-24610311

email: director@ciba.res.in

Shining Barb: A New Variety of Ornamental Fish

Shining barb, a new variety of ornamental fish, developed by selective breeding of rosy barb, *Pethia conchonius* is released for field trial on experimental basis to the entrepreneurs. The glittering gold colour females and shining pink red colour males of shining barb appear much more attractive compared to the rosy barb variety. They are amenable to varied culture conditions. The shining and vibrant colours of the fish are expected to attract fanciers and traders and can fetch better price in domestic as well as export markets. With increase in demand it may also provide additional source of livelihood to the rural poor.

Benefits

The shining and vibrant color of the fish attracts the hobbyists as well as traders which can fetch good price in the domestic and export market.

Status of commercialization/IP rights

The technology is released for field trial on experimental basis and the MoU is signed with the implementing entrepreneur Tropical Aquaculture and Farming Systems (India), Udaipur, Rajasthan.



Contact

Director

Central Institute of Freshwater Aquaculture
Kausalyaganga, Bhubaneshwar-751 002 Odisha
www.cifa.org.in

Phone: 91-674-2465421,2465446

Fax: 91-674-674-2465407

email: cifa@ori.nic.in

CIBA Bhetkiahar

CIBA Bhetkiahar is the formulated pellet feed developed for the nursery and grow-out culture of Asian seabass, *Lates calcarifer*. CIBA Bhetkiahar is a standard feed containing 45-50% protein designed and developed to meet the dietary requirements of Asian seabass for optimum growth and good feed efficiency. The feeds were extensively tested in the experimental farms and also in selected farmers' fields in different states such as Andhra Pradesh and Tamil Nadu. With this feed seabass can be grown to 1 kg in 9-10 months with an FCR of 1.6-1.8.

Status of commercialization/IP rights

The feed technology is commercialized to M/s Ratna Agro-vet Feeds India Pvt. Ltd., Hyderabad, Andhra Pradesh.

Likely cost/economics

₹ 60 lakh for establishing sinking feed production unit with a capacity of 1-2 tonnes per hour and ₹ 1.5 crores for establishing extruder floating feed unit with a capacity of 2 tonnes per hour.



Seabass cultured using CIBA Bhetkiahar

Contact

Director

Central Institute of Brackishwater Aquaculture

75, Santhome High Road

R. A. Puram, Chennai-600 028 Tamil Nadu

www.ciba@res.in

Phone: 91-44-24617523, 24616948, 24610565, 24610311

Fax. No: 91-44-24610311

email: director@ciba.res.in

CIBA Shrimp Feed

CIBA has developed balanced shrimp feed formulations of starter, grower and finisher grade feeds separately for tiger shrimp and white shrimp based on their dietary nutritional requirements. The feed formulations contain vitamin and mineral mixtures developed exclusively for shrimps. Beside, the formulations also contain feed attractants and other feed additives required for faster growth of shrimp and gaining better feed conversion ratio (FCR). The raw materials selected include ingredients representing sources for proteins (animal and plant), lipids, carbohydrates, feed additives and binders. Multilocation demonstration results revealed that the feed is highly palatable and gives good growth with a FCR of 1.4-1.8 and it is highly cost effective compared to the existing shrimp feed. The use of indigenous machineries and raw materials reduces the cost of production and increases the profit margin of the entrepreneur substantially.

Status of commercialization/IP rights

CIBA shrimp feed technology commercialized with Bismi Feeds(P) Ltd, Nagapattinam, Tamil Nadu

Likely cost/economics

₹ 60 lakhs for establishing shrimp feed mill with a capacity to produce 1-2 tonnes per hour.



Contact

Director

Central Institute of Brackishwater Aquaculture
75, Santhome High Road, R.A. Puram, Chennai-600 028 Tamil Nadu
www.ciba.res.in
Phone: 91-44-24617523, 24616948, 24610565, 24610311
Fax: 91-44-24610311
email: director@ciba.res.in

Portable FRP Carp Hatchery

The portable FRP carp hatchery is designed for breeding of Indian major carps, viz. rohu (*Labeo rohita*), catla (*Catla catla*), mrigal (*Cirrhinus mrigala*), kalbasu (*Labeo calbasu*); and Chinese carps, viz. silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*) and common carp (*Cyprinus carpio*). The medium carps *Puntius* sp. and *Labeo bata* were also found suitable for breeding in the system.

The complete unit of the FRP hatchery consists of:

- (i) Breeding/ spawning pool,
- (ii) Hatching/ incubation pool,
- (iii) Egg/ spawn collection chamber, and
- (iv) Overhead storage tank/ water supply system.

The hatchery has many advantages like easy to transport to different locations, installation in less space, low water consumption per cycle of operation and easy to repair. The system is suitable for breeding of 10-12 kg of carps in a single operation. It has the capacity of hatching 1.0-1.2 million eggs per operation.

Status of commercialization/IP rights

The FRP carp hatchery technology was released to the nation by CIFA, Bhubaneswar. The technology is commercialized with M.R. Aquatech, Bhubaneswar, Odisha.

Likely cost/economics

₹ 45,200



Contact

Director

Central Institute for Freshwater Aquaculture, Bhubaneswar

Kausalyaganga, Bhubaneswar-751 002 Odisha

www.cifa.org.in

Phone: 0674-2465421, 2465446, 2465402

Fax: 0674-2465407

email: pjayasankar@yahoo.com; cifa@ori.nic.in

Portable Magur Hatchery

The portable magur hatchery is constructed using fibreglass reinforced plastic (FRP). It includes egg incubation and hatching units. The hatchery creates suitable environment for incubation and hatching of magur eggs. The percentage of hatching is high and a time 50,000 fertilized eggs can be incubated.

Status of commercialization/IP rights

Commercialized with M.R. Aquatech, Bhubaneshwar, Odisha.



Contact

Director

Central Institute of Freshwater Aquaculture
Kausalyaganga, Bhubaneshwar-751 002 Odisha

www.cifa.org.in

Phone: 91-674-2465421,2465446

Fax: 91-674-674-2465407

email: cifa@ori.nic.in

Fish Aggregating Devices (FAD): Concrete Moulded Modules for Laying of Artificial Reefs

Fish Aggregating Devices (FAD) made from concrete moulded modules are hardy and can withstand strong currents. The floral growth on the surface with associated fauna settles easily within 4-6 months (time necessary for maturation of the reef). With aggregation of fishes and other biota in and around the artificial reefs, increase availability of fishes and add to the income of artisanal fishermen particularly those involved in coastal fishing using hooks and lines. Further, this leads to a considerable reduction in scouting time which also saves fuel. Site selection through underwater survey and fixing of reef position using GPS, in consultation with fishermen (participatory approach) is of prime importance in the successful enhancement of natural resources through artificial reefs.

Grouper module

- Welded grills are prepared to the dimension of 1 m × 1 m with 6 mm M.S. rods for reinforcement, coated with zinc chromate paint and allowed to dry
- The grills are placed in the oiled M.S. Angle mould with 1.25 cm bottom cover
- The cement concrete with 1:1:2 ratio using 10 to 20 mm stone jelly mix is filled in the mould to 6.25 cm thickness and well consolidated
- After setting and removal of the mould, the sides are dressed and finished with 1:2 mortar and allowed to cure in freshwater for a minimum period of 7 days
- Casting of 1 m long 20 cm diameter R.C.C. pipes is done in a cylindrical mould with M.S. weld mesh cut in a cylindrical 1 m length shape as the inner reinforcement and cured in freshwater for 7 days
- The well cured 3 concrete plates are joined by welding the extended rods as triangle and the joints are dressed and finished with 1:2 cement mortar and chips
- Three numbers of 28 cm diameter pipes are placed in the triangle and fixed with plates by concrete mortar of 1:2 to avoid movement of the pipes
- The outer sides of the triangle is finished with stucco plastering
- The plastered finished cubes are cured in freshwater for a minimum period of 5 days

Well ring module

- The grills are prepared to the dimension of 76 cm diameter and 30 cm depth, with 3 round rings overlapping each other
- The grills are coated with zinc chromate paint

- After fixing the grills in the mould, cement concrete of 1:1:2 ratio mixed with 5 mm size stone jelly is filled in the mould with proper consolidation
- After setting and removal of the mould, the sides are dressed with 1:2 mortar and allowed to cure in freshwater for a minimum period of 7 days

Reef fish module

- Welded M.S. rod grills are prepared to the dimensions of 1.2 m × 1.2 m and are coated with zinc chromate paint
- 1.2 m × 1.2 m steel mould with 23 cm × 23 cm diameter square opening in the centre and 12 numbers of 15 cm diameter opening in the sides are prepared with coating of waste oil and the grill is placed in the mould with 1.25 cm bottom cover
- The mould is filled with 1:1:2 cement concrete mixed with 10 to 20 cm stone jelly to a thickness of 6.25 cm and consolidated
- After setting and removal of the mould, the sides are dressed with 1:2 mortar and allowed to cure in freshwater for a minimum period of 7 days
- The 3 well cured concrete plates are joined to form a triangular structure by welding the extended rods and the joints are dressed and finished with 1:2 cement mortar and chips
- The outer sides of the triangular structure are finished with stucco plastering
- The plastered finished structures are cured in freshwater for a minimum period of 5 days

Social/environmental benefits

Artificial reefs contribute to a great extent for enhancement of various biological resources and thereby increase in fish production. Installation of artificial reefs in the selected coastal districts will increase fish population in the inshore waters and fish catches after installation. This will also lead to an increase in the income of the artisanal fishermen, particularly during the lean seasons.

Status of commercialization/IP rights

Technology has been offered in consultancy mode to Tamil Nadu Fisheries Director, IFAD assisted PTSLP, (Tamil Nadu Corporation for Development of Women Ltd, Government of Tamil Nadu Undertaking), and Commissioner of Fisheries, Department of Fisheries, Government of Tamil Nadu



Likely cost/economics

Average cost of fabrication and deployment (including labour and boat hiring) calculated per module works out to approximately ₹ 6,000.

Contact

Director

Central Marine Fisheries Research Institute
Ernakulam North P.O. Cochin-682 018 Kerala

www.cmfri.org.in

Phone: 0484-2394867

Fax: 0484-2394909

email: director@cmfri.org.in

Cadalmin™ Green Mussel Extract (Cadalmi™GMe)

Cadalmin™GMe containing 100% natural marine bioactive anti-inflammatory ingredients from green mussel *Perna viridis*, combat's chronic joint pain, arthritis/inflammatory diseases and improves cardiovascular functioning. It is an effective green alternative to synthetic non-steroidal anti-inflammatory drugs and other products available in the market. Cadalmin™GMe is designed to find a unique way to prevent the degradation by air, moisture, heat and light and to maximize the activity. The product is free from trans fatty acids, free radicals, low molecular weight carbonyl compounds, and has been proved to be safe by a long term acute and chronic toxicity study on experimental subjects. The active principles in Cadalmin™GMe isolated from *P. viridis* competitively inhibit inflammatory COX_I, COX_{II} and LOX_v in an inflammation and oxidative stress reaction, resulting in decreased production of inflammatory prostaglandins and leukotrienes. This product is packaged as capsules.

Status of commercialization/IP rights

Commercialized with Accelerated Freeze Drying Company Pvt. Ltd., Bengaluru.

Patent applications filed entitled: Process to concentrate anti-inflammatory principles from green mussel *Perna viridis* L. and a product incorporating these ingredients (Application No. 2065/CHE/2010); Product containing anti-inflammatory principles from green mussel *Pernaviridis* L. and a process thereof (Application No.2066/CHE/2010)



Cadalmin™ Green Mussel extract
(Cadalmi™GMe for use against joint pain and arthritis)

Likely cost/Economics

₹ 2.30 per capsule

Contact

Director

Central Marine Fisheries Research Institute
Ernakulam North P.O. Cochin-682 018 Kerala

www.cmfri.org.in

Phone: 0484-2394867

Fax: 0484-2394909

email: director@cmfri.org.in

Cadalmin™ Green Algal Extract (Cadalmi™ GAe)

Cadalmin™ Green Algal extract (Cadalmi™ GAe) contains a unique blend of 100% natural marine bioactive anti-inflammatory ingredients extracted from selected seaweeds or marine macroalgae with ecofriendly “green” technology. The product is effective to combat arthritic pain and inflammatory diseases in human beings. The active principles in Cadalmi™ GAe competitively inhibit pro-inflammatory mediators, resulting in decreased production of inflammatory prostaglandins and leukotrienes, and its activity was found to be superior to some of the synthetic non-steroidal anti-inflammatory drugs available in the market. The mean lethal dose (LD_{50}) of Cadalmi™ GAe was found to be greater than 4,000 mg/kg body weight of the mammalian subjects that indicate the safety of the product. As part of the further safety assessment of the extract, feeding of Cadalmi™ GAe even at a dose up to 2,500 mg/kg body weight did not induce significant change in body weights, hematological indices, histopathological, and serum biochemical parameters between the control and treated groups indicating that it has no toxicity to the experimental animals. Cadalmi™ GAe was distributed to more than 400 patients suffering with chronic joint pain and arthritis, and questionnaire and clinical trial-based studies revealed that more than 98% of the respondents were satisfied with the product with about 70-85% relief in joint pain and arthritis. None of the respondents reported any side effects. The diagnostically useful autoantibody termed as Rheumatoid Factors (RFs), which are the most useful prognostic marker for rheumatoid arthritis, significantly reduced from more than 300 IU/mL to less than 20-35 IU/mL within a period of two months of consuming the product.

Status of commercialization/IP rights

Commercialized with Celestial Biolabs Limited, Hyderabad

Filed patent (Indian Patent Application Nos. 2064/CHE/2010, 5199/CHE/2012)



Likely cost/economics

Cost of production per capsule: ₹ 0.27 (Total number of capsules (each capsule of 0.5 g) produced from 100 tonnes of active ingredient are 20,00,00,000)

Contact

Director

Central Marine Fisheries Research Institute
Ernakulam North P.O. Cochin-682 018 Kerala

www.cmfri.org.in

Phone: 0484-2394867

Fax: 0484-2394909

email: director@cmfri.org.in

Chitin and Chitosan from Crustacean Waste

Chitosan is a linear polysaccharide composed of randomly distributed β -(1-4)-linked D-glucosamine (deacetylated unit) and N-acetyl-D-glucosamine (acetylated unit). Chitosan is produced commercially by deacetylation of chitin. Chitin ($C_8H_{13}O_5N$)_n is a long-chain polymer of a N-acetylglucosamine, a derivative of glucose. It is the main component of the the exoskeletons of arthropods, such as crustaceans (like the crab, lobster and shrimp). The shrimp processing industry in India turns out more than 1.25 lakh tonnes of head and shell waste per annum. Nearly 7,000 tonnes of chitin can be produced from the prawn shell which is thrown out as waste now. CIFT developed a method for the extraction of chitin from shrimp shell waste. The wet prawn shell collected from the peeling centers is initially converted into chitin which is then converted to chitosan by a chemical process of deacetylation. Then the alkali free, dried and powdered chitosan is bagged in polythene lined HDPE woven sacks.

Benefits

- Chitosan has various industrial applications like, biotechnology, food processing, pharmacy and medicine.
- Use of chitin for the production of glucosamine hydrochloride finds applications in antibiotics and baby food formulations.
- Chitosan can be used as sizing material for textiles.
- It can be used as a water/ wine clarifying agent and also in the preparation of cosmetics and pharmaceuticals, etc.
- Chitosan (in the form of microfined powder) impregnated gauze and film can be used for treatment of chronic wounds and external ulcers and to arrest/ minimize bleeding in brain surgery.



Status of commercialization/IP rights

Signed consultancy agreements with M/s. V.V. Biotech Pvt. Ltd., Ongole, Andhra Pradesh for technical assistance and guidance on extraction of chitin and chitosan from prawn shell waste.

Contact

Director

Central Institute of Fisheries Technology
Matsyapuri-P.O., Cochin-682 029 Kerala
www.cift.org.in

Phone: 0484-266880, 85

Fax: 0484-2668212

email: director@ciftmail.com

Matrix for Immobilization and Imaging of Bacteria

To use bacteria for the development of microbial products, bacteria must be immobilized in a matrix or filled with a filler material that can sustain the cell for longer time. A cost effective and environment friendly matrix and process were developed from abundantly available agro-waste-baggase for immobilization of bacteria. This can also be used as a low cost alternative to expensive filters and chemicals, for imaging bacteria through scanning electron microscope. Based on the requirement, liquid matrix can also be provided. The matrix was successfully tested with various bacterial strains under laboratory condition.

Retention time and shelf life of matrix can vary based on the bacteria to be immobilized or filled. Hence, prior to use, matrix has to be tested with the organisms to be immobilized or filled.

Environmental benefits

Matrix is a biodegradable substrate.

Status of commercialization/IP rights

Non exclusive license given to Shrimpex Biotech Services, Chennai.
Patent filed (Patent Application No. 633/CHE/2006).

Likely cost/economics

Unit production cost: ₹ 25/kg



Contact

Director

Central Institute of Brackishwater Aquaculture
75, Santhome High Road, R. A. Puram, Chennai-600 028 Tamil Nadu
www.ciba.res.in
Phone: 91-44-24617523, 24616948, 24610565, 24610311
Fax: 91-44-24610311
email: director@ciba.res.in

Micro-Analysis Kit for Detection of Ammonia, Nitrite and Phosphate in Aquaculture Systems

Micro analysis kit is tailor-made kit for analysis of ammonia, nitrite and phosphates, the three very important parameters, which are to be monitored regularly to maintain optimum water quality in the system. Based on the requirement, water parameters can be included or excluded. This kit was tested for variety of samples including freshwater, brackishwater and coastal waters. The main advantages of the kit includes: higher accuracy and sensitivity, longer shelf life of the reagents, easy calculation based on the order of kinetics, requirement of small volume of water samples, cost effective, user-friendly and easy-to-use in the laboratories. This is useful for aqua-farmers and hatchery operators for regular monitoring of these critical parameters in aquaculture, hatchery waters and related aquatic environment for maintaining optimum water quality in the system.

Environmental benefits

Regular monitoring of ammonia, nitrite and phosphates using this kit will help aqua-farmers to maintain these critical parameters in ponds and hence, help in environmental management.

Status of commercialization/IP rights

Commercialized to ShrimpeX Biotech Services, Chennai

Likely cost/economics

Unit production cost comes to approximately ₹ 50-100 for 50-100 reaction (each parameter). Predicted per unit selling price of product/services generated by the technology: ₹ 500-1,000 for 50-100 reaction (each parameter). Minimum capacity needed for commercial viability 1,000 kits per year.



Contact

Director

Central Institute of Brackishwater Aquaculture

75, Santhome High Road, R. A. Puram, Chennai-600 028 Tamil Nadu

www.ciba.res.in

Phone: 91-44-24617523, 24616948, 24610565, 24610311

Fax: 91-44-24610311

email: director@ciba.res.in

Kit for Measurement of pH and Dissolved Oxygen

In hatcheries and related aquatic environment pH and dissolved oxygen (DO), the abiotic stresses, are to be monitored regularly to maintain optimum water quality in the system. Kit was developed for detection of these parameters and tested for variety of samples including freshwater, brackishwater and coastal waters.

Environmental/other benefits

Regular monitoring of pH and DO using this kit will help aqua-farmers to maintain these critical parameters in ponds, which in turn helps in environmental management.

Status of commercialization/IP rights

Commercialized to Itarsi based enterprise and marketed under the brand name FisherMan's.



Likely cost/economics

Unit production cost is ₹ 50-100 for 50-100 reaction (each parameter). Predicted per unit selling price of product/services generated by the technology: ₹ 500-1,000 for 50-100 reaction (each parameter). Minimum capacity needed for commercial viability 1,000 kits per year.

Contact

Director

Central Institute of Brackishwater Aquaculture
75, Santhome High Road, R.A. Puram, Chennai-600 028 Tamil Nadu
www.ciba.res.in
Phone: 91-44-24617523, 24616948, 24610565, 24610311
Fax: 91-44-24610311
email: director@ciba.res.in

CIFACURE: Controls Bacterial and Fungal Diseases of Ornamental Fishes

CIFACURE is used for controlling common bacterial and fungal infections of freshwater ornamental fishes. This product can be used in the aquarium and other outdoor tanks for ornamental fish culture systems. It controls various bacterial diseases like haemorrhagic septicaemia, ulcers, fin rot, tail rot, eye disease and other fungal infections. It is packaged for marketing in 25 ml drop bottles.

Status of commercialization/IP rights

Commercialized with Durga Entreprises, Bhubaneswar, Odisha



Contact

Director

Central Institute of Freshwater Aquaculture
Kausalyaganga, Bhubaneswar-751002, Odisha
www.cifa.org.in

Phone: 91-674-2465421, 2465446,

Fax: 91-674-674-2465407

email: cifa@ori.nic.in

Immunoboost-C: Carp Immunostimulant to Improve Brood Health and Seed Production

Immunoboost-C is an immunostimulant to improve brood fish health and seed production in carps. It modulates fish immunity against microbial diseases and has been proven through extensive trials conducted at different locations. It is also used for treatment of spawn, fry and fingerlings during transportation.

Status of commercialization/IP rights

Commercialized with Star Aqua Lab, Medinapore, West Bengal.



Contact

Director

Central Institute of Freshwater Aquaculture
Kausalyaganga, Bhubaneshwar-751002 Odisha
www.cifa.org.in

Phone: 91-674-2465421,2465446

Fax: 91-674-674-2465407

email: cifa@ori.nic.in

CIFELOSTRESS: Anti-Stress Formulation for Fish Seed Transport

CIFELOSTRESS, the anti-stress formulation contains sedatives, buffers and electrolytes. The product helps to reduce transportation costs for fish seed by packing 1.5 times more seed. It helps to reduce mortality during and post transport. Farmers and fish transporter are benefited by application of this product while transporting fish seed.

Status of commercialization/IP rights

Technology transferred to Aqua Vet Laboratory.



Contact

Director

Central Institute of Fisheries Education
Versova, Mumbai-263 122 Maharashtra
www.cife.edu.in

Phone: 022-26363404

Fax: 022-26362573

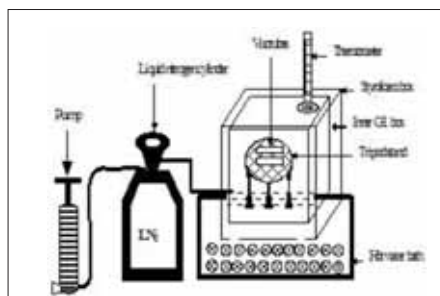
email: lakraws@hotmail.com

CIFA-CRYO: Manually Operated Low Cost Handy Cryofreezer for Gamete Cryopreservation

This cryofreezer is an improvement of “cryopreservation by keeping samples over liquid nitrogen fumes”. This handy cryofreezer has a great scope for utilization by farmers, researchers and also hatchery managers for cryopreservation of fish milt at farm locations. This cryofreezer utilizes less liquid nitrogen, thereby reducing the cost of cryopreservation.

Status of commercialization/IP rights

The know-how of the product commercialized to M/s Biotechnika on an exclusive basis.



Contact

Director

Central Institute for Freshwater Aquaculture
P.O. Kausalyaganga, Bhubaneswar-751 002 Odisha
www.cifa.org.in
Phone:- 0674-2465421,2465446,2465402
Fax: 0674-2465407
email: pjayasankar@yahoo.com; cifa@ori.nic.in

Ready-to-Serve Fish Curry in Retortable Pouches

Attempts of popularizing a ready-to-serve fish curry met with success and the main advantage of pouch over conventional metal cans is high surface area to volume ratio which permits faster heat transfer to the cold point. Thus, processing time is reduced and sterility is achieved with improved flavor, colour and texture compared to the products packed in metal cans.

Equipment and facilities required

- Over pressure retort with accessories
- Temperature recorder
- Sealing machine and minor equipments
- Minimum space requirement including built up area- 400 square meter
- Raw materials – Fish and other ingredients
- Man power
 - Women labour – 20
 - Men workers – 3
 - Supervisor – 1
 - Driver – 1
 - Technologist – 1

Output capacity of commercial product – 3,000 pouches/day (8 hours)

Special facilities required (Confirming to the norms of Food Safety and Standard Authority of India (FSSAI) or other standards)

Social benefits

Suitable for different varieties of fish.



Status of commercialization/IP rights

Technology licenced to:

- Forstar Frozen Foods, Mumbai
- Sara Spices, Kizhakamshalam, Kerala
- Britto Exports, Chennai
- Anns House of Sweets, Palai, Kerala

Nine patent applications filed.

Likely cost/economics

Cost of production	: ₹ 29.91/pouch at 100% capacity
Expected selling price	: ₹ 40/pouch
Expected sale	: ₹ 1,20,000/day at 100% capacity
Net profit	: ₹ 30,264.21/day at 100% capacity
Rate of return	: 38% (Considering production for 3 years)
Net profit ratio	: 25.22%

Contact

The Director
Central Institute of Fisheries Technology
Matsyapuri-P.O., Cochin-682 029 Kerala
www.cift.org.in
Phone: 0484-2666880, 85
Fax: 0484-2668212
email: director@ciftmail.com

Fish Kure: Extruded Snack Food from Fish

Fish Kure is a fish based extruded snack food product. Usually, extruded products are prepared using cereal flour, which have less protein content and are limited in some essential amino acid. By incorporating protein-rich fish mince instead of cereal, the product is protein enriched snack food.

The production process involves mixing of fish meat with cereal flours, spices and salt and extruded using a twin screw extruder. The dried and coated products are then packed in metalized polyester polyethylene pouches using nitrogen gas filling and the product is acceptable up to 3 months at ambient temperature.

Status of commercialization/IP rights

Memorandum of Agreement signed for technical assistance and advice relating to the production of 'Fish Kure' with M/s. Charis Food Products, Aroor, Alappuzha, Kerala.



Contact

Director

Central Institute of Fisheries Technology
Matsyapuri-P.O., Cochin- 682 029 Kerala
www.cift.org.in
Phone: 0484-266880, 85
Fax: 0484-2668212

Fish Munch: Fish Fortified Snack

Fish munch is an extruded fish product. Usually starch is used for extrusion because of its thermal tolerance behavior at high temperature. A temperature controlled twin screw extruder is used for this unique blend of starch and fish protein for extrusion. The extrusion parameters (feeding rate, moisture, barrel temperature, die diameter, screw speed) were optimized for maximum expansion. Three-layered laminated pouch of aluminum and polyester were developed for nitrogen packing and storage. The product has a shelf life of over 4 months. The product showed excellent consumer acceptance. Low cost fish were used to reduce the cost of product and to better utilize the commercially unimportant fishes.

Status of commercialization/IP rights

Technology transferred to Vijaya Infra Project (Pvt.) Ltd., Mumbai.



Contact

Director

Central Institute of Fisheries Education
Versova, Mumbai-263 122 Maharashtra
www.cife.edu.in

Phone: 022-26363404

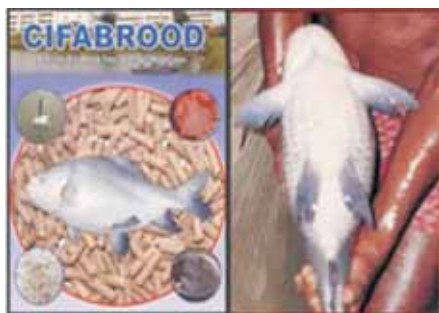
Fax: 022-26362573

email:- lakraws@hotmail.com

2. Fisheries Technologies: Ready for Commercialization

CIFABROOD: Broodstock Feed

CIFABROOD is brood fish diet which helps in attainment of early maturity in carps. The newly developed diet is readily accepted by carp broods, is palatable, water stable and adequately nutrient rich. It provides essential nutrients generally lacking in conventional feed or natural fish food organisms. It advances gonad growth and maturation and facilitates early spawning. Improves breeding response, ensures higher production of viable eggs and sperms. Remarkably improves hatching performance. It is suitable for multiple/repeated breeding in carp; enhances spent fish recovery; ensures better survival of seed and rapid growth during nursery rearing; and is economically viable and validated through repeated field trial.



Contact

Director

Central Institute of Freshwater Aquaculture
Kausalyanga, Bhubaneswar-751 002 Odisha

www.cifa.org.in

Phone: 91-674-2465421, 2465446

Fax: 91-674-2465407

email: cifa@ori.nic.in

Varna: Marine Ornamental Fish Feed

Varna is a slow sinking marine ornamental fish feed. It constitutes 38% protein, 9% fat, 39% carbohydrates, 7% ash (minerals) and less than 2% fibre. Ingredients are marine protein, soy protein, wheat flour, oil vitamins, minerals, colour imparting nutrients like carotenoids from natural sources, immune promoters, probiotics and antioxidants. The particle size is 0.25mm, 0.75 mm and 1 mm. Recommended usage of feed is 2-3 % of the fish body weight once in a day. The target users will be ornamental fish farmers and aquarium hobbyists.

Benefits

Capable of maintaining growth, health, colour and vigour of the fishes.

Likely cost/economics

- Total investment = ₹ 74.50 lakh (Project duration 20 years)
- Rate of return = 41.26%
- Profitability = 51.66%
- Market potential = ₹ 200 crore/year



Contact

Director

Central Marine Fisheries Research Institute
Ernakulam North P.O. Cochin-682 018 Kerala

www.cmfri.org.in

Phone: 0484-2394867

Fax: 0484-2394909

email: director@cmfri.org.in

Kit for Detection of Chemolithoautotrophic Bacteria

Chemolithoautotrophic bacteria such as nitrifying, denitrifying, nitrogen fixing and sulphur oxidizing bacteria are slow growing organisms and difficult to be detected in samples by traditional methods. The kit developed is accurate and sensitive to detect chemolithoautotrophs in aquaculture and related aquatic environments. This also enable DNA isolation from bacterial samples. Kit has an application in predictability and reliability of treatment process, bioremediation, wastewater treatment, screening of efficacy of bacterial products, and bioaugmentors.

Kit was tested for variety of environmental and bacterial samples and commercially available bioaugmentors.

Benefits

It can be widely used by researchers, entrepreneurs, biotech companies for detection of chemolithoautotrophs in their bioremediation studies and advance molecular biological research. It also serve as teaching kit for students in colleges/ research institutes /universities.



Likely cost/economics

- Unit production cost is approximately ₹ 2,000 (for detection of chemolithoautotrophs in 50 samples).
- For an entrepreneur investment anticipated for setting up a viable commercial venture is about ₹ 10 lakh.

Status of commercialization/IP rights

Patent filed, patent application No. 2021/CHE/2008.

Contact

Director

Central Institute of Brackishwater Aquaculture

75, Santhome High Road, R.A. Puram, Chennai-600 028 Tamil Nadu

www.ciba.res.in

Phone: 91-44-24617523, 24616948, 24610565, 24610311

Fax. No: 91-44-24610311

email: director@ciba.res.in

Immunodot Technology for Detection of WSSV

CIBA immunodot is a diagnostic kit developed by CIBA for early detection of white spot syndrome virus (WSSV) in shrimps by sensitive and accurate molecular diagnosis technique. CIBA immunodot assay is based on the antigen-antibody reaction between recombinant protein of WSSV VP28 gene against which polyclonal anti rVP28 antiserum was raised. The specific immunoreactivity of CIBA immunodot was confirmed by molecular techniques. Results could be obtained from shrimp pleopod and haemolymph extracts up to 1:100 dilutions with prominent immunodots indicating presence of WSSV in infected shrimps. The trial experiments conducted revealed detection of 76% of the nested PCR positive samples.

Environmental benefits

Presently, with no effective treatments available for prevention and cure of white spot disease in shrimps, good management practice with biosecurity measures is the only option which can reduce the risk of viral outbreaks in shrimps.

Contact

Director

Central Institute of Brackishwater Aquaculture
75, Santhome High Road, R.A. Puram, Chennai-600 028 Tamil Nadu
www.ciba.res.in
Phone: 91-44-24617523
(Direct) 24616948, 24610565, 24610311
Fax: 91-44-24610311
email: director@ciba.res.in

Monoclonal Antibodies against Serum Immunoglobulin's of *Channa striata* and *Labeo rohita*

Monoclonal antibodies against serum immunoglobulin's of *Channa striata* and *Labeo rohita* were developed for sero- surveillance in the candidate species. The MAbs can be used for monitoring humoral immune response following vaccination/infection as well as for quantification of Ig positive cells in lymphoid organs and blood. Monoclonal antibodies are highly species specific and can be used as secondary antibodies for monitoring humoral immune response. These will provide uniform and consistent results in comparison to polyclonal anti serum.

Benefits

These can be used for detecting antibodies against various pathogens.

Contact

Director

National Bureau of Fish Genetic Resources

Canal Ring Road, P.O. Dilkusha, Lucknow-226 002 Uttar Pradesh

www.nbfg.res.in

Phone: 0522-2442440, 2442441

Fax: 0522-2442403

email: nbfgr@sancharnet.in; director@nbfg.res.in; jkjena2@rediffmail.com

Spot Agglutination Kit for Fish Diseases

Spot agglutination kit is an on-farm diagnostic test for edwardsiellosis, aeromoniasis and bacterial gill disease of Indian major carps. It detects rapidly the diseases caused by *Aeromonas* and *Edwardsiella tarda*. Good for field and laboratory level demonstrations. The technology is useful for early and accurate diagnosis and will reduce the loss.

Likely cost/economics

₹ 1 per 10 samples (Spot agglutination kit)



Contact

Director

Central Institute of Freshwater Aquaculture
Kausalyanga, Bhubaneswar-751 002 Odisha
www.cifa.org.in

Phone: 91-674-2465421, 2465446

Fax: 91-674-2465407

email: cifa@ori.nic.in

***Macrobrachium rosenbergii* Nodavirus (MrNV) Diagnostic Kit**

Macrobrachium rosenbergii Nodavirus (MrNV) diagnostic kit, based on nested PCR method for RNA segment II, is a sensitive and specific diagnostic tool that can detect carriers and early or latent infections. Good on field and laboratory level demonstration. Technology will help in early and accurate diagnosis which will reduce the loss due to disease. Meets the biosafety standards.

Likely cost/economics

₹ 1,000 for single test (Nodavirus kit)



Contact

Director

Central Institute of Freshwater Aquaculture
Kausalyanga, Bhubaneswar-751 002 Odisha

www.cifa.org.in

Phone: 91-674-2465421, 2465446

Fax: 91-674-2465407

email: cifa@ori.nic.in

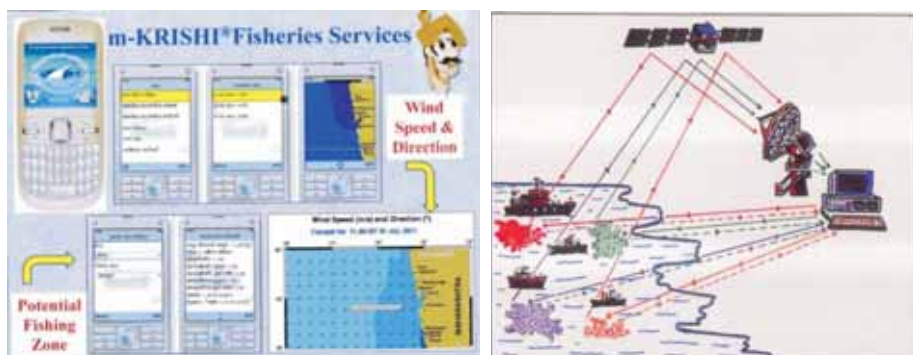
m-KRISHI® Fisheries Mobile Service

m-KRISHI® Fisheries Service, is backed up by collating, analysing and integrating thermal, wind speed and algal movement data, and packaged in a readily usable/ understandable mapping format for the fisher communities to identify potential fisheries zone (PFZ). This service, being mobile based, ensures continuity and dependability in reaching the communities most effectively and quickly as compared to other sources of dissemination. By including wind advisory along with PFZ advisory services, utility of this service to the stakeholders has substantially increased.

Mobile handsets were distributed to identify beneficiaries who can relay information to the community in selected villages. It is estimated that by using the service fishers are able to save on diesel and state government is likely to save on subsidy for diesel.

Status of commercialization status/IP rights

m-KRISHI® Fisheries Service patent filed by TCS.



Contact

Director

Central Marine Fisheries Research Institute
Ernakulam North P.O. Cochin-682 018 Kerala

www.cmfri.org.in

Phone: 0484-2394867

Fax: 0484-2394909

email: director@cmfri.org.in

Herbarium Making Technology for Seaweeds and Seagrasses

The new technique of laminating the herbaria after processing and preserving the plants has yielded excellent results. The laminated plant materials are preserved without much change in colour and texture. Herbarium of 72 species of seaweeds and 7 species of seagrass collected from the southeast and southwest coasts of India was prepared. The seaweeds include 21 species of green algae, 15 species of brown algae and 36 species of red algae. It is of immense use to students, researchers as well as for public information. CMFRI being included as one of the Designated National Repository by the National Biodiversity Authority is entrusted with the crucial role of preservation of biological resources and meet high standards of quality and expertise for the delivery of biological information.

Social benefits

This technique would go a long way in serving as an effective tool both in education and research.

Copyright status

The first e-book of CMFRI displaying the unique collection of herbaria of seaweeds and seagrasses was released and is Copyrighted to CMFRI.



Contact

Director

Central Marine Fisheries Research Institute
Ernakulam North P.O. Cochin-682 018 Kerala

www.cmfri.org.in

Phone: 0484-2394867

Fax: 0484-2394909

email: director@cmfri.org.in

Biostimulator for Ammonia Detoxification in Coastal Aquaculture Systems

Accumulation of toxic nitrogenous metabolites in shrimp can adversely affect productivity. Plants remediate pollutants by direct uptake of contaminants and subsequent accumulation of non phytotoxic metabolites into plant tissues and by releasing exudates and enzymes that stimulate microbial activity and biochemical transformation, which subsequently increase the bioremediation potential. This process is often referred to as plant assisted bioremediation. Agricultural waste bagasse, which is a complex native cellulosic fibrous waste left after extraction of juice from cane sugar, is an attractive agricultural byproduct for a pond supplement because of its low cost and general availability. A biostimulator was developed from abundantly available sugarcane bagasse for ammonia removal from zero-water exchange system of coastal shrimp aquaculture. Significant reduction in ammonia level was observed in the ponds treated with bagasse as biostimulator.

Bagasse is a biodegradable substrate, which harbours higher periphytic biomass than non-degradable ones. This could be because biodegradable substrates provide a better surface structure for periphytic species to attach to, or they may leach nutrients beneficial for the growth of periphyton, predominantly consisting of bacteria. The very low cost of this lignocellulosic material is a real advantage that renders it a suitable alternative for the remediation of ammonia, and this material could be beneficial for the treatment of aquaculture discharge water in tropical regions *in situ*.



Environmental benefits

Bagasse is biodegradable substrate and has no adverse impact on the environment. Ammonia detoxification using biostimulator helps in environmental management.

Likely cost/economics

₹ 5,000 per 10 kg

(Requirement: 10 kg for 1 ha pond depending on the metabolites load in water).

Additional income due to application of bagasse biostimulator is about ₹ 40,000-50,000.

Contact

Director

Central Institute of Brackishwater Aquaculture

75, Santhome High Road

R.A. Puram, Chennai-600 028 Tamil Nadu

www.ciba.res.in

Phone: 91-44-24617523, 24616948, 24610565, 24610311

Fax: 91-44-24610311

email: director@ciba.res.in

Broodstock Development, Induced Breeding and Larval Production of Cobia, *Rachycentron canadum*

Live fishes weighing about 10 kg were collected from commercial catches and transported to hatchery. The conditioned fishes were stocked and reared in cages and fed broodstock feed. Males and females about to reach spawning stage were isolated and stocked in separate cages. When the ova diameter of the female reaches around 700 microns, the fish are selected for inducing spawning. Spawning was induced by administering HCG in females and males. Successful spawning was achieved within 48 hours. Floating eggs were collected using 500 micron mesh and incubated in the incubation tanks. The eggs hatched after 22 hours of incubation at a water temperature of 28–30°C. The newly hatched larvae were transferred to larval storage tanks for shipment. The technology provides high fecundity and high survivability. The technology has been disseminated to the fish farmers in East Godavari districts of Andhra Pradesh.

Likely cost/economics

₹ 63.5 lakh (capital invested for the facility can be recovered fully within 38 months from the start of earning)



Contact

Director

Central Marine Fisheries Research Institute
Ernakulam North P.O. Cochin-682 018 Kerala

www.cmfri.org.in

Phone: 0484-2394867

Fax: 0484-2394909

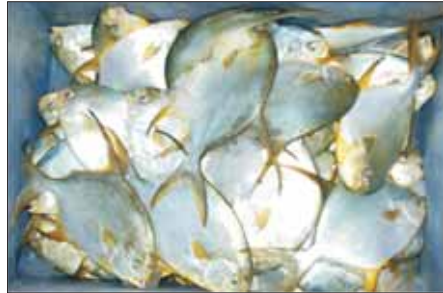
email: director@cmfri.org.in

Breeding of Silver Pompano, *Trachynotus blochii*

Silver pompano were successfully bred and seeds bulk transported. These seeds were stocked and fed with indigenous pellet feed, resulting in a survival of about more than 95% and in 8 months attained a size of 450-550 g. This fish tolerates a wide range of salinity from 5 ppt to 35 ppt which makes it a versatile and aquaculture friendly species. About 12,000 seed can be stocked in 1 ha and about 5 tonnes of fish can be harvested from each crop. Silver pompano fetches a farm gate price of about ₹ 200 per kg. The technology has been disseminated to the fish farmers of East Godavari districts of Andhra Pradesh.

Likely cost/economics

₹ 63.5 lakh (capital invested for the facility can be recovered fully within 38 months from the start of earning)



Contact

Director

Central Marine Fisheries Research Institute
Ernakulam North P.O. Cochin-682 018 Kerala

www.cmfri.org.in

Phone: 0484-2394867

Fax: 0484-2394909

email: director@cmfri.org.in

Carp Culture in Pens

Pens are useful to culture carps, in shallow, derelict and weed choked wetlands, where open water aquaculture is not possible and fishing is difficult. In pens fishes are held as captive stock and are reared up to marketable size, to augment fish production from wetlands, which are mostly not being utilized for fish production purposes. Culture of carps in pens in wetlands can be a profitable venture for local fishers. The pen culture technology was developed and standardized, and low-cost materials for construction of pens identified. The technology was successfully demonstrated in wetlands of Bihar, West Bengal and Asom, where fishers and fishermen co-operative societies adopted it.

Site selection

Before constructing pens, a detailed survey is undertaken with special emphasis on the kind of terrain and the nature of surrounding catchment. Ideal site is with 1.5-2.5 m depth, in shallow, marginal areas of wetlands. There should be atleast 1 m depth of water for 4-8 months. The shoreline should be of gentle slope with continuous water availability. The bottom should be reasonably firm.



Construction of pen

The pen can be square, rectangular, oval, elongated or horse-shoe shaped, depending upon the nature of shoreline, sediment type and depth of water body. For better management and easy operation pens can be in units of 0.1 to 0.2 ha. Depending on the requirement any number of such units can be put up. The pen structure consists of main pillar support, frames spanning over the supports, horizontal and inclined bracings, and screens with net linings. Locally available materials are used for construction of pen. The items required are bamboo/casuarina/wooden poles of 10-15 cm diameter for pillar; bamboo of 10 cm diameter split into two halves for frames spanning over the pillar supports; same type of bamboo for horizontal and inclined bracings; screens made of split bamboo or thin canes, nylon net material for lining the screen, rope, nails, knives, spades, hammer, etc. The area where the pen is to be erected is cleared of weeds, tree trunks, bushes, etc. The four corner pillars of the pen are hammered into the soil until they are firm. These pillars are tied with a rope to mark the outline of the pen. All the poles must remain at least 50 cm above the water level. The horizontal frames (full or half split bamboo) are fitted on to the poles using nails/ rope. The

screens are made prior to installation of the pen. The screens are made of split bamboo of 1.0 cm width and desired height depending on the height of water column. The split bamboo is woven at 1.0 cm interval to form long mats using coir or plastic rope. The bamboo screen is then lined with thin nylon net of 1 mm mesh, on one side and kept rolled until installation. These are fitted on to the pen frame by driving it at least 20 cm into the soil and fixing on to the frame, using rope.



Construction of a bamboo screen



Lining of bamboo screen



Transportation of bamboo screen



Fixing screens on frame

Pre-stocking preparation

The holes or gaps on the screen are plugged. Unwanted organisms from the pen are eradicated by repeated netting, using dragnets and cast nets. The pen area is then limed, using quick lime, with an initial dose of 200-300 kg per ha followed by monthly instalments of 50-70 kg per ha. One week after liming the pens are stocked with fish seeds.

Stocking

Suggested stocking density, species composition and size at stocking are as follows:

Species	Stocking (No./0.1 ha)	Species ratio (No.)	Stocking size
<i>Catla catla</i>	1000–1500	40	10–20 g or 100–150 mm
<i>Labeo rohita</i>		30	
<i>Cirrhinus mrigala</i>		30	



Weeding at pen area



Battery of pen in a wetland

Supplementary feeding

Since the objective of pen farming is to utilize natural productivity of the water body, the role of supplementary feeding is minimum. Rice bran and mustard oil cake can be given in a ratio of 1:1 at 5% of the total body weight of stocked fishes, twice daily. The feed is dispensed in perforated bags suspended in the water column or in suspended trays.



Preparation of Supplementary feed

Stock monitoring

Periodic monitoring of growth and state of health of the stocked fish is done fortnightly by sampling with a drag net. Raking of pen bottom every month and application of quick lime maintains fertility. Netting of fishes and bath in potassium permanganate solution (5 mg/l) prevents disease outbreak. Specific therapeutic treatment is given depending on the health status and appearance of symptoms of diseases in the stock.

Harvesting

The size of fish at harvest is determined by the local preference and market demand. Harvesting is done early in the morning by repeated netting with dragnets and cast nets.



Harvesting of fishes from pen



A haul of table size carps reared in pen

Production

The production of table size Indian major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*) is 400 kg per 0.1 ha per crop in 4 months.

Likely cost/economics

The economics of monoculture of carps in pens of 0.1 ha with 2 crops in each year is as given below:

S.No.	Item	Amount (₹)
I	Expenditure	
A	Fixed capital	
1.	Bamboo poles (140 nos. @ ₹ 70/bamboo)	9,800
2.	HDPE net (600m @ ₹ 15/m)	9,000
3.	Coal tar (80 l @ ₹ 23/ l)	1,840
4.	Tyre cord (20 kg @ ₹ 80/ kg)	1,600
5.	Wages for pen construction and installation (52 man-days @ ₹ 125/ man-day)	6,500
6.	Miscellaneous	2,500
	Sub total	31,240
B	Variable costs (for one crop)	
1.	Seed (1,250 carp fingerlings @ ₹ 1/seed)	1,250
2.	Feed	4,000
3.	Miscellaneous, including wages	3,000
	Sub total	8,250
C	Total costs	
1.	Variable cost (two crops/ year)	16,500
2.	Depreciation on fixed capital @ 33% per year	10,415
3.	Interest on fixed capital @ 12% per year	3,230
	Grand total	30,145
II	Gross income	
1.	Sale of produce in 2 crops (800 kg carp @ ₹ 55/kg)	44,000
III	Net Income (gross income - total costs)	13,855
	B: C ratio	1.46

Benefits/merits

Culture of carps in pens can generate gainful income from derelict water bodies. The marginal, shallow areas of wetlands can be utilized without disturbing it. The technology is also suitable in weed-choked areas where fishing is difficult. The pens can be easily fabricated using locally available low cost materials. Pen culture can serve as one of the low cost alternatives to costly land-based rearing systems. The bamboo screen can be effectively replaced with High Density Poly Ethylene (HDPE) net materials to improve the life of the screen.



Carp culture in HDPE net screen pen

Contact

Director

Central Inland Fisheries Research Institute
Barrackpore, Kolkata-700 120 West Bengal
www.cifri.org.in

Phone: 033-25920177

Fax: 033-25920388

email:-apsharma1@gmail.com, director@cifri.ernet.in

Fish Stock Management in Small Reservoirs of India

Reservoirs in India have a total water expanse of 3.15 million ha. Of this, small reservoirs (those of <1,000 ha area) have a spread of 1.48 million ha. Although these water bodies hold tremendous potential for fish production, currently majority of them are not contributing to the inland fish production to the extent they should. The average fish yield of these reservoirs is about 50 kg per ha against their estimated fish production potential of 100-200 kg per ha. Bridging or narrowing the gap between actual production and production potential would bring substantial increase in inland fish production, which can be achieved through system specific fish stock management protocols.

Fish stock management protocol

The fish stock management protocol include stocking of fish seeds at appropriate size and quantity; harvesting at appropriate size and schedule; selection of fast growing and economically important fish species based on assessment of water and soil quality. The physico-chemical parameters of water and soil and their ranges for low, medium and high productivity of reservoirs are given below.

Physico-chemical parameters of water and soil for low, medium and high productivity of a reservoirs

Parameters	Range	Productivity		
		Low	Medium	High
Water				
pH	6.5-9.2	<6.0	6.0-8.5	>8.5
Alkalinity (mg/l)	40-240	<40.0	40-90	>90.0
Nitrates (mg/l)	Tr.-0.93	Neg.	upto 0.2	0.2-0.5
Phosphates (mg/l)	Tr.-0.36	Neg.	upto 0.1	0.1-0.2
Conductivity (μ mhos)	76-474		upto 200	>200
Temperature (°C)	12.0-31.0	18	18.22	>22
Soil				
pH	6.0-8.8	<6.5	6.5-7.5	>7.5
Available P (mg/100 g)	0.47-6.2	<3.0	3.0-6.0	>6.0
Available N (mg/100 g)	13.0-65.0	<25.0	25-60	>60.0
Organic carbon (%)	0.6-3.2	<0.5	0.5-1.5	1.5-2.5

Tr., trace; Neg., negligible.

Based on water and soil parameters the fish yield potential of reservoirs is estimated. The existing fish biomass and species composition in the reservoir is assessed. The gap between the existing fish yield and potential fish yield is bridged through



Birds' eye views of two small reservoirs

stocking. Augmenting fish stock is one of the most common management measures followed for the reservoirs.

The appropriate quantity and species composition of stocking material are pre-requisites in reservoir fish stock management. The stocked species should be economically important and fast-growing to colonize all the diverse food niches. The basic principles for selecting a species for stocking are:

- Suitability to the environment for maintenance, growth and reproduction of the species
- Quick growth with highest efficiency of food utilization
- Species composition to utilize available food resources of the ecosystem fully
- Easy availability of fish seeds of desired species and size at right time

Depending upon the water levels and availability of water over the year, staggered stocking and staggered harvesting can also be adopted to enhance the fish yield and overall fish production from the reservoirs.

Likely cost/economics

The unit cost of fish production obtained in pilot scale studies and demonstrations conducted was around ₹ 12.25 per kg for Indian major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*). The yield expected is 150 kg per ha. The expected net return is ₹ 6,750 per ha of the water body at a cost:benefit ratio of 3.67. The management regimen is eco-friendly and involves low input cost.



Fish seed stocking in a reservoir



Fishing in a reservoir

Benefits/merits

Apart from allowing quick yield enhancement at minimum capital investment and environmental cost, the management protocol allows direct benefits to some of the weakest sections of our society. The benefits accrued due to increase in yield and income directly contribute to improve the quality of life of fishers who are depending on the reservoirs. Further, it has no environmental risks as the technology involves only stocking of fish seed and no application of feed, chemicals or fertilizers, hence, is environment friendly and sustainable. The fish feeds on natural food, viz. plankton and benthic organisms.

Contact

Director

Central Inland Fisheries Research Institute
Barrackpore, Kolkata-700 120 West Bengal
www.cifri.org.in

Phone: 033-25920177

Fax: 033-25920388

email:-apsharma1@gmail.com, director@cifri.ernet.in

***In-situ* Fish Seed Production in Cages**

A cage unit can be installed at a suitable pelagic zone in a reservoir to produce fingerlings. The cage unit in the reservoir can be exclusively used to raise fry to fingerling for subsequent stocking in the reservoir in order to ensure better survival and faster growth of stocked fish.

Cage unit

A unit of eight cages is viable for raising up to 75% of fingerlings required for a reservoir of 200 ha. Depending upon the area of reservoir and estimated seed requirement, more units can be installed. The various steps to be followed to establish this *in-situ* production unit are as under.

Fabrication of frame

Locally available bamboo is the easily available low cost material to construct the cage frame. Two frames are required—one above the other to hold the floats strongly. To make a battery holding eight cages each of 5 m × 3 m × 3 m, the battery should be of 13.75 m long and 11.05 m width.



Transportation of bamboo to site



Preparation of frame

Floating the frame

The battery of eight cages is floated in water with the support of empty iron or plastic drums. The drums are placed between the two frames mostly near corners towards joints to provide frames with balanced buoyancy. The iron drums are tightened enough with the frame using G.I. wires to withstand turbulent wave action in reservoir. The frames are properly placed at the selected site with anchors.



Floating of frame



Floating frame with floats

Installation of cages

Eight net-cages are hung in water from the frame forming one battery of cages. The lower bottom corners as well as the sides of the net cages are tied with the sinkers for perfect vertical hanging. The net-cages should remain at least 1-2 m above the lake basin to avoid damage.



Nylon cage



Installation of cages

Stocking

Healthy fish fry of carps of 12-15 mm or 25 mm are raised to fingerling for reservoir stocking. A stocking density of 250 fry of 12-18 mm size per m^3 is most suitable for cages. The seed are stocked during evening or early night hours with due conditioning and acclimatization. Prior to release seed are dipped in a salt/potassium permanganate solution as prophylactic measure.



Battery of cages

Grow out period

Raising carp fingerlings in cages requires 60 to 120 days, depending on its productivity and provision of supplementary feeding.



Polythene bags with fish seeds



Observing fish seeds

Supplementary feeding

Rice polish (RP) and mustard oil cake (MoC) (1:1) blended with available vitamins-and-minerals mix (0.01%) is given as supplementary feed in the form of flaky powder broadcast inside cages twice a day (at 0800 hrs and 1700 hrs) at about 3-5% of body weight.



Stocking of fish seeds in cage

Maintenance of cage and fish stock

- *Monitoring of water quality*– Regular monitoring of water quality undertaken for D.O., pH and ammonia.
- *Cleaning of net cages*– Cages are cleaned with soft coir brush fortnightly to remove any bio-fouling organisms.
- *Routine checking*– Loose twine, torn meshes, anchors, sinkers, etc. are checked in routine manner and immediate action taken to rectify any problem.
- *Fish health monitoring*– A routine health check-up of fish seed is done to overcome any untoward incident causing mass mortality of fry. Surfacing, lesions, rashes, spots, lumps, excessive mucus formation, wool like mat formation on the body, bulging eyes, fin and tail erosion, etc. in fry are the signs of ill health which require immediate attention.
- *Monitoring of growth rate*– The periodic monitoring of fish growth is important to formulate strategy for fish, feeding and harvesting schedule.



Feeding of fry in cages

Grading and release of fish seed

Fingerlings are removed batch-wise to avoid size overlap unnecessary consumption of feed, within the growing population. The fingerlings attaining a size of 70-80 mm should be removed leaving the smaller ones to grow. On an average, 70% of fry can be retrieved as fingerlings by following these management practices.



Harvest of fish fingerlings from the cage

Likely cost/economics

Two crops can be harvested annually from a battery of eight cages which is adequate to meet the 75% requirement of stocking materials of a water body of 200 ha per year.

Total cost of production for one crop is ₹ 28,407 with share of fixed cost at 21.36% and of variable cost at 78.64%.

The major components of variable cost were fish seed (42.24%), feed (11.14%) and labour (10.56%). The survival rate assumed to be moderate (70%) led to production of 70,000 fingerlings per crop. The cost of production was estimated at ₹ 0.40 per fingerling. Considering the fingerling price at ₹ 1 per fingerling, the benefit:cost ratio was estimated at 2.46 confirming the viability of the fingerlings production in cages in reservoirs.



Release of fish seed in reservoir

Contact

Director

Central Inland Fisheries Research Institute

Barrackpore, Kolkata-700120 West Bengal

www.cifri.org.in

Phone: 033-25920177

Fax: 033-25920388

email:-apsharma1@gmail.com, director@cifri.erner.in

[illegible]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, providing a guide for writing. There are no margins, text, or other markings on the paper.



भारतीय
ICAR

ISBN 817164152-0



9 788171 641529