CIFRI newsletter

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OBJECTIVE OF CIFRI

The Central Inland Fisheries Research Institute was formally established in March, 1947 under the Ministry of Food and Agriculture, Government of India. The Institute is since June, 1959, housed in its own buildings at Barrackpore on the left bank of the river Hooghly on an area covering about 5·2 ha. It came under the administrative control of the Indian Council of Agricultural Research on October 1, 1967. The Principal objective of the investigations conducted at the Institute is to

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RESEARCH HIGHLIGHTS

FISH SEED PRODUCTION

A major breakthrough in fish seed production took place when injection of pituitary gland extract of maturing carps caused fish to spawn in ponds. The technique has come to be known as 'Hypophysation' and was first achieved at the Freshwater Fish Culture Station of the Institute at Cuttack in 1957. This has already revolutionised culture fisheries in certain States of India where quality fish eed is obtained in large quantities through the technique both in private and public sectors. The technique has also helped fish farmers to meet their own requirements of fish seed. The pituitary extract has also been ampouled for use at a later date.

One and the same specimens of catla, rohu and mrigal have been experimentally induced to spawn twice, once at the commencement and next towards the end of the monsoon, thereby

RAFI AHMED KIDWAI MEMORIAL PRIZE

The Rafi Ahmed Kidwai Memorial Prize for Agricultural Research for the biennium 1972-73 was awarded jointly to Drs. Viswa Gopal Jhingran, Hiralal Chaudhuri and Viswa Raman Prasad Sinha, all working at the Central Inland Fisheries Research Institute, Barrackpore, for their outstanding contributions in the field of inland fisheries.

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Dr. V. G. Jhingran, Director of the Central Inland Fisheries Research Institute, Barrackpore receiving the Rafi Ahmed Kidwai Memorial Prize from the Union Minister for Agriculture & Irrigation, Shri Jagjivan Ram, in New Delhi on Friday, January 30, 1976.

not only nearly doubling the production of eggs from individual fish but also making progress towards domestication of the species.

The high mortality of eggs during hatching, which is a common feature in cloth *hapas* has been reduced to almost nil with the development of a 'Glass jar hatchery' having arrangements for continuous flow of water for constant aeration of eggs during rearing. Each hatchery jar can accommodate about 50,000 of eggs at a time. The use of the hatchery helps in economising the recurring expenditure on cloth *hapas*. Installation of this miniature "Seed Fish Factory" will be highly beneficial and profitable in areas where fish seed production is to be taken up on a commercial scale.

BREEDING TECHNIQUES OF SILVER AND GRASS CARP

Breeding of the silver and grass carps, through pituitary hormone injection which not only do not breed in confined waters but are also difficult to be bred in captivity, has been one of the outstanding achievements of the Institute in the field of fish breeding. The important steps involved such as the maintenance of brood fish stock at a low density (1,500 kg/ha or less), selection of female breeders by use of catheter, optimum doses of hormones, methods of stripping and hatching to achieve large scale success have been developed.

BOOST IN THE TECHNIQUE OF FINGERLING PRODUCTION

Larger number of water bodies in the country need to be stocked with fingerlings (100-150 mm). However, fingerling raising was at a very primitive stage so far. The stocking density of fry was increased to 0·125 million/ha with over 95% survival. With a view to maximising the rearing area, stocking density of fry of Indian major carps has been further increased to over 0·35 million/ha with the resultant survival of about 80% fingerlings. Though the survival rate of fingerlings in these experiments was somewhat lower, the overall yield of fingerlings in numbers is much higher.

NURSERY POND MANAGEMENT

A technique of rearing carp spawn to a high level of perfection has been evolved during the past 25 years. In the initial stages the survival rate was increased from, 2-20% to over 50%. But, in recent years the survival rate has been further increased to as high as 60-87% at a stocking rate of 2·5 to 6·5 million/ha using cobalt chloride (0·01 mg/day/fish) as an ingredient in the supplementary feed. In the most recent experiments, the stocking rate has been further enhanced (10 million/ha) maximising the use of nursery space. A numerical yield of 6·6 million fry/ha has been obtained under such a high rate of stocking.

Objective of CIFRI continued

study and elucidate the scientific principles which can be applied in the utilisation of all available inland waters of the country for maximising fish production. Such an objective entails evolving sound fish husbandry techniques along modern concepts of aquaculture; acquiring understanding of the biology of food fishes; conducting investigations on hydrology and ecology of different types of fishery waters; like those of rivers, lakes, reservoirs, estuaries etc., besides developing fishery management techniques relating to both fresh- and brackishwater environments. With a view to achieving these objectives, three major divisions *viz.*, Freshwater Fish Culture Division, Riverine and Lacustrine Division and Estuarine Fisheries Division were established at Cuttack, Allahabad and Barrackpore respectively to deal with the research problems of freshwater pond culture, riverine and lacustrine fisheries and estuarine culture and capture fisheries. The publication of the "CIFRI Newsletter" commencing from the month of September, 1976 highlights in brief the salient achievements of the Institute over the last two and a half decades in the fields of culture and capture fisheries. Further issues of the newsletter are aimed at portraying the progress of research, extension and other activities of the Institute to serve the long standing needs of the fish farmers, the entrepreneures and the educationalists alike. It is hoped that the "CIFRI Newsletter" will prove an effective information medium of the highlights of research to urban as well as rural readers.

CONTROL OF AQUATIC WEEDS

Different methods of weed clearance such as manual, mechanical, chemical and biological have been tried and their economics studied. Noxious weeds *viz., Eichhornia crassipes, Ipomoea camea, Nymphaea* spp., *Cyperus* spp. and *Pistia stratiotes* can be cleared with sodium salt formulations of 2,4-D without any adverse effects on fish or fish food organisms. Aqueous ammonia has also been found to control the submerged weeds.

However, an effective and cheaper method for controlling the submerged weeds is by biological control through grass carp. The fish consumes noxious weeds such as *Hydrilla, Najas, Ceratophyllum, Nechamendra, Utricularia, Nitella, Arulia, Spirodela, Lemna* and *Wolffia* voraciously.

In recent years the noxious floating aquatic weed, *Pistia stratiotes* L. has assumed menacing proportions in fish ponds in India. A biological control method of this pest through the use of insect larvae has been discovered at the Pond Culture Station of the Central Inland Fisheries Research Institute at Cuttack. It has been observed that larvae of *Erastroides curvifascia* Hampson (Lepidoptera : Noctuidae) take a heavy toll of the plant, the larval stage of the insect lasting for more than 50% of its entire life span of 27-35 days. When inoculated on host plants at 85 larvae/sq m they cleared 1,340 g of weeds in 30 days.

COMPOSITE FISH CULTURE

Considerable attention has been paid in recent years to increase the per hectare production from fish pond. Initial experiments with different combinations of Indian major carps (catla, rohu and mrigal) gave productions form 1,500-3,000 kg/ha/yr. However, when exotic carps (silver carp, grass carp and common carp) alone were cultured a production of about 3,000 kg/ha/yr was obtained but a combination of the Indian and exotic carps gave productions varying between 2,200 to 4,200 kg/ha/yr. Further trials in recent past with intensive fertilisation and supplementary feeding and a higher rate of stocking (7,500 fingerlings/ha) gave net production ranging from 8,000 to 9,000 kg/ha/yr. The significant feature of these experiments is the average size attained (over 1 kg) by each of the six species. The application of this technology to a fish farmer's pond in Orissa resulted in the net production of over 7,500 kg/ha/yr as against a production of about 1,000 kg/ha/yr usually obtained by him in the background of average production of 600 kg/ha/yr from fish ponds in India.

COLD WATER FISHERIES

Suitable methods have been evolved for preventing the mortality of ova, alevins, fry and adults of both brown and rainbow trouts and controlling the fungal infection in the hatchery troughs by flushing with chemicals like malachite green thus increasing the survival rate to as high as 98%. Investigations on the control of diseases like the "whirling disease" and infection of ectoparaitic ciliates have led to their control and subsequent improvement in the rate of survival.

RIVERINE AND ESTUARINE FISHERIES

The fish and fisheries of the Ganga, Krishna, Godavari, Narmada and Tapti river systems and the Hooghly-Matlah and Mahanadi estuarine systems have been studied in details.

A large number of spawn collection centres for the seed of major carps and culturable brackishwater fishes and prawn have been located on various river systems, estuarine and connected brackishwaters of the country. Spawn prospecting investigations in unexploited and productive spawn bearing stretches of the rivers were intensified since 1964 and over 60 carp spawn collection centres established on different river systems. Efficiency of spawn collection nets has also been studied and nets about five times more efficient than the conventional one have been evolved to suit different hydrological conditions. Spawning grounds of commercially important fishes *viz., Schizothorax* spp. and *Oreinus* spp. have been located in Sindh, Erin, Madhumati, Tricker, Nambal and Lidder streams of Kashmir.

Detailed studies on the biology and fisheries of *Hilsa ilisha* of the Hooghly estuary have been made. Investigations on the relative abundance of *Hilsa* larvae in the middle stretch of the Ganga river system have been carried out and the spawning grounds delimited. Successful artificial fecundation of hilsa has also been achieved leading to possibilities of its culture in ponds.

POND FERTILISATION

The efficiency of nitrogenous fertilisers has been tested in different soils with varying pH. Calcium ammonium nitrate has been found to be the best for acid soils and urea for slightly acid to neutral soils.

Role of trace elements in pond fertilisations has been studied. Zinc and cobalt in combination with inorganic and organic fertilisers gave nearly cent percent survival of common carp fry. The results indicated that both cobalt and zinc in combination with organic and inorganic fertilisers enhanced the growth of fry without effecting the water quality and thus could be adopted for inclusion in the fertilisation schedule of fish ponds.

WATER POLLUTION STUDIES

Characterisation of the principal types of effluents discharged into the Hooghly estuary, Ganga, Daha, Sone and Bhadra rivers have been done to assess the pollutional effects of various effluents. Adverse effects of pollution have been observed in the greatly reduced abundance and distribution of planktonic organisms, including fish eggs and larvae. Treatment methods for sulphate paper mill wastes using electric current and for hydrogenated vegetable oil plant effluents using ferric chloride have indicated that while pulp paper effluents are non-toxic, the wastes of tar, distillary, tannery and cycle rim factory are highly toxic.

The work of the three scientists has converged on the central theme of improved fish culture in inland waters which has resulted in technologies for increasing per hectare fish production. Their findings, especially on induced breeding by hypophysation and on composite fish culture, have been of immense practical importance and represent a major breakthrough in aquaculture in India. They have also made important contributions to the development of new concepts of fish culture. Their work on better rearing, induced breeding, improved nursery practices, composite culture, hybridisation and extraneous feeding of Indian and exotic carps has led to the initiation of rural aquaculture projects in West Bengal and Orissa.

They have participated in several national and international conferences and have on many occasions been invited by international organisations as specialists and consultants. They have provided leadership and guidance to a band of enthusiastic and devoted workers in the country in the field of inland fisheries.

INSTITUTE BASED ALL INDIA COORDINATED RESEARCH PROJECTS AND THEIR ACHIEVEMENTS

In mid-1971, four coordinated research projects, *viz.*, (i) Composite culture of Indian and exotic fishes ; (ii) Culture of air-breathing fishes in swamps ; (iii) Ecology and fisheries of freshwater reservoirs and (iv) Investigations on riverine carp spawn prospecting and collection techniques were initiated at the Institute. Besides, another coordinated project on Brackishwater Fish Farming was initiated in October, 1973.

In April, 1974 the coordinated project on Investigations on Riverine Carp Spawn Prospecting and Collection Technique was merged with the coordinated project on Composite Fish Culture of Indian and Exotic Fishes and the combined project was renamed as "All India Coordinated Research Project on Composite Fish Culture and Fish Seed Production". The achievements of the coordinated projects are briefly detailed as follows.

INDIGENOUS PLANTS AS FISH POISONS

With a view to finding out suitable substitute for the fish poison, Derris root powder, a number of indigenous plants were screened of which plants *viz.*, *Croton tiglium*, *Milletia pachycarpa*, *M. piscidia* and *Barringtonia acutangula* have been observed to be useful as fish poison. The seed powder of *B. acutangula* at 15 ppm is useful in killing unwanted fish within about two hours of treatment and has no harmful effect on fish food organisms. Natural detoxification of water takes place within 48 hours.

ALL INDIA COORDINATED RESEARCH PROJECT ON COMPOSITE FISH CULTURE AND FISH SEED PRODUCTION

The technology of composite fish culture has been applied under different agroclimatic conditions through the Institute based All India Co-ordinated Research Project on Composite Fish Culture and Fish Seed Production in West Bengal, Uttar Pradesh, Haryana. Tamilnadu, Maharashtra and Andhra Pradesh. Productions achieved at different centres ranged as 5,160 kg/ha/6½ months (Poona centre, Maharashtra); 5,535-7,748 kg/ha/18 months (Jaunpur centre, Uttar Pradesh); 5,737 kg/ha/yr (Kalyani, West Bengal) and 7,284 kg/ha/8 months (Karnal centre, Haryana). Grass carp has attained weight of 5.04 kg in one year at Kalyani, West Bengal. Composite fish culture techniques have also been applied to increase fish production in larger water bodies varying from 1.48 to 2.15 ha under the Operational Research Programme of the Institute at Anjana Fish Farm, Krishnanagar (West Bengal). Net productions ranging from 2,514-4,143 kg/ha/yr have been obtained at this centre. A total production of 20,232·23 kg, from 5.56 ha of water area was obtained during 1974-75. Fish production from these water areas has been increasing to about 8 times. Three years before, the rate of production was 460 kg/ha/yr only whereas now the average production from these water areas comes to over 3,637 kg/ha/yr. Silver carp (*Hypophthalmichthys molitrix*) at this centre contributed 16-20% towards the total fish production and the specimens attained a record weight of 3.3 kg in 11 months. Induced breeding of Indian and exotic carps has also been done at different centres of this project and 11.46 million of spawn has been produced during 1973-75 fish breeding seasons. A land mark in the history of inland fish culture was made in July, 1974 by successfully breeding the silver carp and the grass carp for the first time in bundh type of tank at Simlapal, Bankura, West Bengal. This achievement opens a new vista for large scale seed production of grass carp and silver carp.

ALL INDIA COORDINATED RESEARCH PROJECT ON AIR-BREATHING FISH CULTURE IN SWAMPS

Under the coordinated project on air-breathing fish culture, mixed culture of *Clarias batrachus*, *Heteropneustes fossilis* and *Anabas testudineus* stocked in a derelict swampy pond in Bihar @ 25,000/ha yielded a gross production of 1,200 kg/ha in 7 months without fertilisation and supplementary feeding. In Karnataka, a production of 3,159 kg/ha/8 months was obtained in the monoculture of *Channa marulius* stocked @ 10,000/ha in a swampy pond. Dried marine trash fish was used as a supplementary feed. These achievements significantly pin-point the possibilities of maximum exploitation of derelict and swampy water bodies through the controlled culture of air-breathing fishes. In Assam, cage culture experiments have yielded gross production at 35,000 to 50,000 kg/ha/200 days when computed over the production per sq metre cage area. It should be possible to achieve the target of 10 kg per sq metre area of cage per year. For producing seed of *Clarias batrachus* on mass scale, attempts were made at the Darbhanga Unit to breed the fish in specially prepared paddy field (3.5×3.0 m) with 15 to 20 cm of water depth by administering pituitary extract injection of Indian major carp @ 80-90 mg/kg body weight of the recipient fish. The experiment clicked well in the very first attempt and gave encouraging results and useful information for future consideration. The number of fry produced was estimated to be 1,200/pair of brooder.

IMPORTANT EXTENSION PAMPHLETS PUBLISHED BY THE INSTITUTE

1. Intensive fish farming
2. Techniques of nursery pond management
3. Induced breeding of major carps
4. Breeding of the common carp
5. Glass jar hatchery for carps
6. Technique of carp pituitary gland removal and ampouling for setting up pituitary banks
7. Central Inland Fisheries Research Institute and some of its contributions applicable to the fish farmers (in Bengali)
8. A brochure on CIFRI

All India Coordinated Research Project on Ecology and Fisheries of Freshwater Reservoirs

Studies conducted under the project have brought out that the influents and rich catchment area, rather than the reservoir basin soils influence the water quality and productivity of the reservoirs.

Studies on the dynamics of fish stocks have indicated that increase in fishing effort would result in greater yield in the reservoirs. The estimated fish yield in 1975 was 208 t in Bhavanisagar. An increase of 68% in fishing effort (from 1971-72 level) in Bhavanisagar has improved the catch by 121.4%. In Rihand, for an increase of 116.4% effort the increase in catch of catla was about 58%. In Govindsagar, 101% increase (from 1972-73) in the catch was brought about largely due to increase in mesh size. In Nagarjunasagar and Govindsagar, bays were more productive while in Bhavanisagar lotic zone was more productive. Breeding grounds of commercial fishes were located in Gobindsagar. In Rihand, three subspecies of *C. catla* were identified. One of the sub-species showed indications of food preference towards *Microcystis* sp. which forms a dominant fraction of plankton in Indian reservoirs and as such the above observation assumes great importance. A consignment of fry of silver carp was stocked in Getalsud in March, 1974 and has registered a growth of 1.7-2.1 kg in about 17 months. Silver carp has immense potentialities in reservoir fishery development in India.

ALL INDIA COORDINATED RESEARCH PROJECT ON BRACKISHWATER FISH FARMING

Rearing techniques for the grey mullets have been developed at the Brackishwater Experimental Fish Farm, Kakdwip under the All India Coordinated Research Project on Brackishwater Fish Farming. A survival to the tune of 92.89% at 0·5 million/ha stocking density has been achieved for *Mugil tade*. Rearing techniques of *Penaeus monodon* and *P. indicus* have also been developed.

The tehnique for culture of bagda, *Penaeus monodon*, developed recently, is very encouraging. By way of selective stocking of nearly identical sized juveniles @ 40,000/ha a production of 886 kg/ha/210 days was possible under experimental conditions through judicious manipulation of the stock and water management. In case the length of culture period is reduced to 160-180 days, two seperate crops totalling about 1,000 kg/ha/yr can be obtained.

In monoculture of *Mugil tade*, a production of 2,238 kg/ha/18 months could be obtained at a stocking density of 6,000/ha. The fish were fed with maize powder, wheat bran and mustard oilcake @ 10% of body weight during the first five months and later @ 5% of the body weight only.

Another important achievement has been the development of the technology of mixed farming of mullets and prawns. In a six species combination of prawns and fishes, (*Penaeus monodon, P. indicus* and *Metapenaeus monoceros* among prawns; *Liza parsia, Liza tade* and *Mugil cephalus* among mullets), a net production of 2,671 kg/ha/yr was achieved.

SYMPOSIA/SEMINARS/ WORKSHOPS/MEETINGS

Third workshop of the All India Co-ordinated Research Project on Composite Fish Culture and Fish Seed Production was held at the Poona subcentre on 26th February, 1976 followed by a group discussion on 28.2.76 to lay down a National Policy on major carp seed production. Participants from various State Fisheries Departments, Universities, ICAR, Government of India and other agencies participated in the workshop.

Dr. V. G. Jhingran, Director attended the FAO technical conference on Aquaculture held in Kyoto, Japan during 24th May to 5th June, 1976. Dr. Jhingran acted as a panel member for Session on "Artificial recruitment and transplantations". Dr. V. R. P. Sinha, Project Coordinator also acted as a panel member for Section I of the Session II on "Pond Culture of Fin Fish".

A Summer Institute on "Fish Seed Production and Mobilisation for Culture Fisheries of Inland Waters" was organised by the Central Inland Fisheries Research Institute in which the participants were acquainted with the modern technology of fish seed production and its mobilisation. The venue were Barrackpore (June 14 to June 30, 1976) and Cuttack (July 1-13,1976).

PUBLICITY

1,500 silver carp fry were distributed by the Cuttack Substation of the Institute among various enterprising fish farmers and the cooperative societies, with a view to enabling them to take up composite fish culture.

The Institute participated in exhibitions depicting its work and achievements from time to time at different places. So far, it has participated in 28 large exhibitions.

The Institute has already organised six *ad-hoc* training courses on composite fish culture and fish seed production for the benefit of extension workers of the State Fisheries Departments, fish farmers, bank officials, air-force officials, officials of the Fish Farmers' Development Agency and on brackishwater prawn & fish farming for the fishery operatives of West Bengal & Orissa.

An advisory service is maintained for the fish farmers at the headquarters. So far, about 400 fish farmers have received technical advice for the development of aquaculture.

The Institute organises and participates in Fish Farmer's Days where fish farmers' problems under field conditions, are discussed in detail, suggestions are offered and demonstrations given on modern aquaculture techniques.

For actually demonstrating under field conditions the practicability of composite fish culture as a sound commercial proposition to introduce aquaculture in a big way, two centres, one at Mirhati and the other at Nilgunj in the district of 24-Parganas, West Bengal were opened during 1973-74 where demonstrations were given on a number of occasions. The ponds when harvested in October, 1974 yielded gross production of about 4,500 & 5,300 kg/ha/yr respectively. Incidental to the management of the pond at Mirhati, 0·156 million common carp spawn was produced under controlled breeding in *hapas*. While demonstrating the technology of the culture of Indian major carps alone during 1974-76 a gross production of 5,564 kg/ha/15½ months has been obtained in the Nilgunj demonstration pond.

LIBRARY

SOME RECENT DEPARTMENTAL PUBLICATIONS

Studies on the distribution in time and space of the periphyton of a perennial pond at Cuttack, India by M. T. Philipose & ors. Bulletin No. 21, August, 1976.

Fish farmers' development agency officials' training in composite fish culture and fish seed production, April 1-10, 1976.

Summer Institute on "Fish seed production and mobilisation for culture fisheries of inland waters", June 14 to July 13, 1976.

Fishery operatives' training in brackishwater prawn and fish culture (organised by Central Inland Fisheries Research Institute & The Marine Products Export Development Authority, June 21-28, 1976).

Report on the freshwater fish culture industry of Japan - K. L. Sehgal. Misc. Contr. No. 11, December, 1974.

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