

GOVERNMENT OF INDIA
CENTRAL INLAND FISHERIES
RESEARCH STATION

ORIGIN, ORGANISATION AND FUNCTIONS
AND
ANNUAL REPORT
OF THE
CHIEF RESEARCH OFFICER

For the Year 1952-53

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CENTRAL INLAND FISHERIES RESEARCH STATION, CALCUTTA—ITS ORIGIN, ORGANISATION AND FUNCTIONS

WITH the growing food scarcity in the country both during and after World War II, fish-farming assumed importance and urgency. There was immediate need for harnessing all cultivable waters in the country for food production. But as the fundamentals of practical fish-farming as a science and an industry were inadequately known in the country, there was urgent need for organising fishery research on an all-India basis. The Ministry of Agriculture of the Government of India therefore sanctioned an interim scheme, which later covered a five-year period, for research on inland fishery problems. Although the institution came into formal existence at Calcutta in March 1947, the post-partition financial and other stringencies in the country made it impossible to have the necessary minimum trained staff and equipment till about the middle of 1949, when the office and laboratories of the Research Station were established in certain available temporary hutments of the Defence Department in and outside the compound of the Calcutta Corporation Water Works at Pulta near Barrackpore.*

The objective of the Research Station is to elucidate the general scientific principles which can be applied in the utilisation of all available inland waters for the maximum possible production of fish for food in the country. This objective can be gained by careful investigations of the habits of various food fishes and of the hydrobiological and other environmental factors influencing the fisheries in various parts of the country.

As the scientific work of the Station relates to fish and fisheries in three different types of environment which do not occur all in one place, it is organised in three sections, *viz.*, the Pond Culture Section with its headquarters at Cuttack (Orissa) with ample fish-seed resources in the Mahanadi river system, the Riverine and Lacustrine Section with headquarters at Allahabad (Uttar Pradesh) and with a good number of fishing centres on the Ganga-Yamuna river system, and the Estuarine Section at Calcutta (West Bengal) in close proximity to the extensive Hooghly-Matlah estuarine system.

The technical staff consists of one Chief Research Officer, who is also the administrative head of the Research Station, three Research Officers in charge of the technical work of the sections assisted by one Assistant

* Owing to the construction of new buildings at Barrackpore, the Research Station has been temporarily shifted to 47/1, Strand Road, Calcutta 7.

Research Officer each and two Research Assistants qualified in zoology. The chemical, botanical and pathological aspects of fish and fisheries are attended to by three Assistant Research Officers assisted by five Research Assistants, qualified in those subjects. Technical work of a routine nature in the field and in the laboratory is attended to by four Laboratory and Field Assistants and Six Laboratory Boys. The Chief Research Officer is assisted in his administrative work by suitable ministerial staff.

A fishery training section with facilities to train every year a dozen candidates in the theory and practice of inland fisheries has been a necessary adjunct of the Station since 1948 in view of the lack of suitably trained personnel in many States to initiate fishery development programmes. Normally a Technical Officer of the grade of Assistant Research Officer is in charge of the Training Course assisted by an Assistant Fisheries Training Superintendent with training in fish and fisheries.

The research work carried out at the Pond Culture Section at Cuttack is directed towards elucidating problems relating to the efficient exploitation of the inland fish-seed resources and their proper utilisation in the economy of pond culture of fish, nursery management and farming operations, the environmental requirements of an optimum level of survival, growth and healthy condition of the fish in ponds, the spawning requirements of fish, fish associations, diseases of fish and their control, etc.

The Riverine and Lacustrine Section deals with problems relating to the location and assessment of fish spawning and collection centres and of the fisheries for major carps, cat-fishes, etc., the study of the effect of industrial and domestic effluents on fish life in our rivers, the influence of dams and weirs on fish and fisheries, and to the studies on the growth, condition, food, etc., of economically important fishes in large rivers and reservoirs.

The Estuarine Section conducts research on the various aspects of the biology of economically important estuarine fishes such as Hilsa, Mulletts, the so-called Indian Salmon, the fresh-water eel, and of the edible prawns and crabs, the hydrobiology of the estuaries and its bearing on the estuarine fisheries of the Gangetic delta, studies relating to the location, exploitation and utilisation of salt-water fish seed resources, and other allied problems which have a bearing on the estuarine fisheries of the country.

Wherever possible, a close liaison is maintained in the technical programmes of work between this Research Station and the corresponding organisations of the Fisheries departments of W. Bengal, Bihar and Orissa, in particular, and of other inland States with potential resources in fish and fisheries, in general.

As inadequacy or total lack of fish-seed resources in several States made a uniformly wide-spread programme of fish production in the country difficult, one of the officers of the Pond Culture Section of this Research Station had been empowered by the Government of India since 1951 to act as an Hony. Adviser to a local Fish Seed Syndicate, which imports in the spawning season (June-September) large quantities of fish-seed and fish-fry of major carps from important spawn-collecting centres in West Bengal and other places and maintains them in suitable nurseries for export. The same officer acts as the Movement Sponsoring Officer for the Government of India, Ministry of Food and Agriculture, and arranges for the export of fish spawn and fish fry to deficit States by rail or road, or by air, thus ensuring a more or less uniform distribution of fish-seed in the country. Roughly over a crore and fifteen lakhs of major carp fish fry and 47 *kunkas* of spawn of the same species have thus been distributed to various States since the scheme was inaugurated.

A Fisheries Extension Unit (consisting of 1 Officer, 1 Extension Assistant, 2 Field Assistants and 1 Peon) has recently been attached to this Station with a view to educate fish farmers and the general public in the scientific methods of pisciculture as tried and tested at this Research Station and elsewhere in the country.

The Research Station maintains a library, containing over 1,000 volumes of books and periodicals dealing with fish and fisheries, general biology, and the closely allied physical sciences.

The Station is equipped with a diesel-engined motor launch (32' × 8·7' × 3·05'), rowing boats, etc., for collection of hydrobiological data in the Hooghly river, and a live-fish carrying truck, in addition to the requisite fishing gear, optical and other instruments, chemicals, glassware, etc., for technical work in all the sections. A diesel-engined river launch is under construction for riverine fishery research at the Allahabad sub-station, and a station wagon to transport technical staff to the field and for extension work has been purchased.

The principal officers and scientific staff of the Central Inland Fisheries Research Station are:—

(1) AT HEADQUARTERS STATION—CALCUTTA

Chief Research Officer and Head of the Department	..	Dr. H. Srinivasa Rao
Research Officer B. S. Bhimachar (Estuarine)
Assistant Research Officers	..	Shri Y. R. Tripathi (Fish Pathology)
		Miss K. K. Sarojini (Biology of Mulletts)

Senior Research Assistant	..	Shri K. H. Sujansingani (Statistics)
Research Assistants V. R. Pantulu (Fishery Biology)
		.. J. C. Malhotra (Zooplankton)
		.. N. Dutta (Phytoplankton)
		.. A. K. Banerjee (Fishery Engineering)
		.. B. B. Bose (Chemistry—Hydrology)
		.. M: Mydeen Kunju (Fishery Biology— Prawns and Crabs)
		.. A. N. Ghosh (Fishery Biology—Fish)
Laboratory and Field Assistants		Shri R. M. Bhowmick
		.. D. D. Malo

(2) AT SUB-STATION, CUTTACK (POND CULTURE SECTION)

Research Officer and Officer-in-Charge	..	Shri K. H. Alikunhi (Pond Culture)
Assistant Research Officers	..	Shri S. M. Banerjee (Chemistry—Hydro- logy)
		Dr. M. T. Philipose (Botany—Freshwater algæ)
Senior Research Assistants	..	Miss Eva Mitra (Botany—Macrophyta)
		Shri H. L. Chaudhuri (Fishery Biology)
Research Assistants V. Ramachandran (Chemistry)
		.. M. A. Vijayalakshmanan (Zoology)
Laboratory and Field Assistant		Shri P. K. Sthanapati

(3) AT SUB-STATION, ALLAHABAD (RIVERINE AND LACUSTRINE SECTION)

Research Officer and Officer-in-Charge	..	Dr. V. G. Jhingran (Riverine and Lacus- trine biology)
Assistant Research Officer	..	Dr. M. P. Motwani (Fishery Biology)
Research Assistants	..	Shri S. J. Karamchandani (Zoology)
		.. R. D. Chakravarti (Zoology)
		.. Parimal Ray (Chemistry)
Laboratory and Field Assistant	..	G. C. Chatterjee

(4) FISHERIES EXTENSION UNIT

Fisheries Extension Officer	..	Shri K. N. Das
Fisheries Extension Assistant K. B. Lal Saxena

(5) FISHERIES TRAINING SECTION

Assistant Fisheries Training .. Shri A. David (Senior Research Assistant,
Superintendent Fishery Biology)

LIST OF SCIENTIFIC PAPERS BY THE MEMBERS OF THE TECHNICAL STAFF OF THE
CENTRAL INLAND FISHERIES RESEARCH STATION, CALCUTTA

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May 1954.

ANNUAL REPORT ON THE WORK OF THE
CENTRAL INLAND FISHERIES RESEARCH
STATION FOR THE YEAR 1952-53

POND CULTURE SECTION

THE main work of this section is to solve the numerous difficulties and problems of the practical pisciculturist with a view to aid him in producing the maximum amount of *fish as food* with the minimum of expenditure. Fish seed or fry of major carps have to be collected every year from rivers in the rainy season, conditioned and fed in suitable nurseries until they are fit to be transported to ponds, tanks and reservoirs, where they are grown until marketable.

The work of the sub-station at Cuttack during the year was confined mainly to experiments with fish fry in the nursery ponds and laboratory cisterns placed at the disposal of the technical staff by the Orissa State Fisheries Department. The problems of pisciculture in natural ponds in various parts of the State are referred to the sub-station by the State Fisheries Department for solution, and experiments are first conducted in cement cisterns in the laboratory and later in the experimental ponds, and then the results obtained are applied and tested in the field in various places in the State.

Mortality of carp fry in nursery ponds.—The first problem referred to the sub-station was the high rate of mortality of fish fry in natural ponds which reduced the yield of fish to *the barest minimum*. The experiments conducted at the sub-station have so far demonstrated the following : (1) the mortality is mainly due to lack of food for the fry once their natural enemies are eliminated, (2) the most natural food for such fry consisted of minute animalcules, not minute plants as has been supposed, (3) the production of this natural food can be stimulated by proper and systematic manuring, (4) abundance of submerged macrovegetation adversely affects survival of fry, (5) moderate stocking of fry as against high or low stocking reduces cost as well as mortality of fry, (6) the feeding capacity of fry bears some relation to available sunlight and the continuous availability of food and that therefore the rate of survival of fry will depend on the mode of conditioning and the reduction of the duration between collection and stocking of fry, (7) the natural food of fish fry, *viz.*, zooplankton should be supplemented by artificial food of finely powdered groundnut or other oilcakes, rice-bran,

etc., (8) while wide and sudden fluctuations of pH between 6.0 and 11.0 cause only temporary discomfort and maladjustment of fry to their environment, a drop in the pH below 6.0 is lethal, (9) the rate of oxygen consumption is directly proportional to age, size or weight of fry and fingerlings, thus limiting the size and number of fry or fingerlings which can be transported in containers of a given size, (10) incidence of insect predators in ponds can be controlled by an emulsion of oil (mustard) and waste soap, or by very low doses (0.01 p.p.m.) of gamma-hexa-chloro-cyclo-hexane without harm to the fry, (11) the interrelationship between surface weeds and algal bloom and submerged weeds and the use of the former to control the two latter, (12) the effectiveness of weedicides (like copper sulphate) in acid than in alkaline waters, (13) the dependence of growth of fry and fingerlings on an alkaline medium, which seems to be favourable, and (14) the necessity for adopting a judicious programme of fry stocking for different types of water based on the mutual compatibility of species of fish and their optimum density. As the productivity of fish in natural waters is thus dependent on a great variety of physico-chemical and biological conditions, it seems essential that a thorough survey of such waters should precede stocking operations. Such a survey is being attempted in selected representative areas of the Orissa State so as to arrive at a rational programme of stocking which would minimise effort and cost and at the same time increase production. However, the results obtained in the Orissa State seem capable of application to the other parts of the country on suitable modifications based on a thorough knowledge of the hydrology and the biota of the different waters concerned.

A hand-book on Fish Culture has been prepared outlining the main principles involved in pisciculture to serve as a general guide to fish farmers.

Spawning of major carps in confined waters.—The hydrological and other environmental conditions which induce the major carps to spawn, have been the subject of some considerable controversy. In order to throw some light on the problem, attempts were made, during the monsoons, to simulate the supposed favourable spawning conditions in a state of nature in the ponds at Cuttack which were provided with adjacent connected shallows for breeders to play in. But the number of breeders obtained for experiments was too inadequate to admit of drawing general conclusions.

The role of fish-poison in the elimination of predatory fishes, etc., in nursery and other ponds.—In sound fish cultural practices, eradication of

unwanted predatory animals including fishes of little or no food value is a necessary and important preliminary which is effected usually by the dewatering of ponds and the picking out of the unwanted fish. Certain poisons have also been used to eliminate them, but the chief objection to this method of elimination had been that the economic and uneconomic species are equally affected by the poison. Laboratory and field experiments conducted at the Cuttack Sub-Station have, however, shown that different species of fish fry are affected differently by the well-known insecticide, Derris powder (Rotenone), in very low concentrations (0.01 p.p.m.) and that the stunned fish can be salvaged and revived if required, or destroyed if not wanted to maintain the balance of life in the ponds. This method can be applied even in large-sized ponds over 2 acres in extent, if they are partitioned by bunds. The poisoned fish can be conditioned in flowing water within 5-6 hrs., and then transported over long distances with negligible mortality.

The culture of predatory fish as food.—Observations made during the year point to the possibility of profitable cultivation of certain predatory fishes such as the murrel and the climbing perch (*Anabas testudineus*) which are valued as food in certain parts of the country. An accidental intrusion of the climbing perch in certain well-prepared carp nurseries near Cuttack showed that it was a prolific breeder, producing as many as three thousand fingerlings.

Studies on plankton.—The fluctuations in the composition and abundance of the various phyto- and zoo-planktonic organisms in the experimental ponds at Cuttack and the hydrological factors responsible for them are being studied in detail.

Studies on breeding habits, development, etc., of fishes.—Life in a pond is usually maintained in a state of balance to which all organisms, whether classed as important, useless, or unimportant, contribute in various ways. There are certain species of fish which, though uneconomic from the human standpoint, play an important role in the maintenance of biotic balance in a given area of water, and a deliberate control of the same by the pisciculturists is rendered possible only by a precise knowledge of their habits and life-histories. Studies relating to the breeding habits, development, etc., of certain freshwater food fishes of minor importance, such as *Labeo bata* and *Mugil corsula*, and of certain weed fishes, such as *Chela phulo*, *Labeo angra*, *Labeo pangasia*, and *Ambassis nama* have been conducted.

Supply of fish-seed to the deficit areas.—During the year under review 35,36,470 fish fry were supplied by this Station through the Hon. Adviser

of the Fish Seed Syndicate and Movement Sponsoring Officer for Agricultural Production, who is an Assistant Research Officer of the Pond Culture Section. Of this number, 1,07,770 fry were despatched by air chiefly to Assam, with negligible mortality. Only 3,220 were sent by air to places as far as Bangalore, Ernakulam and Penang. The rest were despatched to other States in Western and Southern India by train, the mortality varying between 2% and 20%, depending upon unforeseen transport delays *en-route*.

The details of the despatches are as follows:—

Madhya Pradesh	..	29,06,200	} By train
Bombay	..	2,20,000	
West Bengal	..	16,500	
Bhopal	..	2,20,000	
Madras	..	66,000	
Assam	..	1,04,550	} By air
Bangalore	..	2,300	
Ernakulam	..	340	
Penang	..	580	
		35,36,470	

RIVERINE AND LACUSTRINE SECTION

A beginning was made in the year under review to assess the yield of fish seed at four selected centres in Bihar. It was seen, from the results obtained so far, that the intensity of spawning varied from centre to centre and that the spawn in these centres were of a mixed kind, belonging to economic as well as uneconomic species of carps.

Growth studies.—Large samples of scales of major carps have been collected from the commercial catches at the various fishing centres in Bihar, since these appear to show promise of yielding reliable information on the growth of the fishes.

Condition studies.—In order to assess the well-being of a population of fish in a given environment, or to be able to compare the condition of fish in different environments or of different populations, it is first of all essential to fix a standard for comparison. It was, therefore, proposed to fix the ponderal index of the various species of major carps in the Ganga river as the standard. The necessary data relating to the ponderal index of the major carps in the Ganga are being collected.

Survival rate of carp fry transported in sealed containers with oxygen.—From the data collected on the survival of fry despatched by this Research Station to various places in India, it has been computed that about 1,150 fry ranging from 19 mm. to 24 mm. in length can be transported without mortality in sealed 4-gallon kerosene tins $\frac{1}{3}$ filled with oxygen, over distances involving not more than 16 hours' journey.

Laboratory experiments conducted to estimate the oxygen requirements of Rohu (*Labeo rohita*) showed that the rate of oxygen consumption is directly proportional to the weight of fish in the container, irrespective of their number.

Stream pollution at Dehri-on-Sone by the effluents of the Dalmianagar Factory.—Qualitative and quantitative analysis of plankton samples from various centres in the river show that the pollution of the water in the river caused by the factory effluents extends only to 3–4 miles downstream, beyond which the effect of the effluent is not felt at all. Even in the zone of intense pollution, some oligochaete worms and a species of septate fungus were found living adapted to the prevailing polluted conditions, which may therefore serve as indicators of extreme pollution.

ESTUARINE SECTION

The work of this Section has been confined during most part of the year to certain easily accessible areas by rail, river or road in West Bengal and Orissa States, and was concerned chiefly with Hilsa, Mulletts, the so-called Indian Salmon, and the Indian freshwater migratory Eel. With the active co-operation of the West Bengal Fisheries Directorate it has, however, been possible to make a preliminary survey of the fish and fisheries of the Hooghly estuary in the Sunderban area in the month of December, 1952.

Hilsa (Hilsa ilisha).—The migratory habits of the fish were studied in a little more detail confirming the observation of the previous years that the fish actively migrate twice in a year, the earlier spring migration being at the close of winter (February) and the later migration in the flood season (July–September). It has been found that the earlier migration is of much less intensity than the later, and that the spring migrants are of a much smaller size than the monsoon migrants. Whether this difference in size of fish denotes that the two sets of migrants belong to two different races or not is at present unknown.

The observations on the food of the fish in different ages show that while the larval Hilsa feed mainly on zooplankton (copepods and nauplius

larvæ), the juvenile and adult Hilsa feed on both phyto- and zoo-plankton when both are available.

A study of the growth of Hilsa from rings formed on scales has been inconclusive except for the inference that the rings represent temporary arrests in growth due to, at present, unknown causes.

Observations on the fisheries in the Sundarbans in December showed that the enormous quantities of Hilsa (8·5" to 12·0" in length) caught by the fishermen from the Hooghly estuary do not find their way to Calcutta for want of adequate supplies of ice for preservation at the fishing centres and of quick and adequate transport.

Mulletts.—Continued field observation on, and ova maturation studies of, the two most important species of mullets (*Mugil parsia* and *M. speigleri*) have shown that the two breed in different seasons, the former from December-March and the latter from July-September. *M. parsia* attains sexual maturity when it is about 110 mm. long and spawn more than once in one spawning season. A biometric study of *M. parsia* and the closely allied *M. dussumieri* has revealed that the latter is not a distinct species at all, but possibly only a different race.

Experiments on the acclimatisation of mullet fry to fresh water and on their transport indicate the possibility of culture of mullet fry in inland waters in the appropriate season. From a detailed study of the food and feeding habits of mullets, it is found that plankton-feeding fish will be the most appropriate compatibles for culture along with mullets in brackishwater farms.

Indian Salmon (Eleutheronema tetradactylum).—The study of the food habits of fish of a wide range of size (from 7 mm. to 493 mm.) has confirmed its carnivorous habits indicating a change in food preferences at three different stages in its life as follows:—

(1) Stage I, 7–30 mm. long—feeds mainly on planktonic copepods and mysids,

(2) Stage II, 31–60 mm. long—prefers planktonic shrimps and megalopa and fish larvæ, and

(3) Stage III, 61 mm. long and above—feeds mainly on large crustacea, fish and polychæte worms.

Indian freshwater eel (Anguilla bengalensis).—Large collections of this eel from the Hooghly river at regular fortnightly intervals, in ranges of size from elvers 50 mm. long to adults twenty times or more in length, have been made, with a view to study the growth and feeding habits of the eel. The study

of gut contents shows that it is a carnivore feeding on fish, prawns, crabs molluscs and worms. Study of the scales of the eels indicates their first appearance in elvers 112 mm. long on both sides of the lateral line of the tail region. Certain rings found on scales, otoliths, and vertebræ of the fish are possibly connected with growth, but no correlation has yet been possible between these and the rate of growth. There are indications of sex differentiation in eels about 30 mm. long. The study of a large series of larval eels from several estuarine and coastal waters of India is likely to throw more light on the development of the eels of our waters.

Chilka Lake fisheries.—The study of fish production data relating to the Chilka Lake collected in 1948–50 was completed in the year under review, revealing a gradual decline in the weight of fish taken per acre of the Lake. There has also been a marked decline in the production of dried fish and in the local consumption owing to the heavy demand for fresh fish in the Calcutta market.

Crab fishery.—Data are being collected on the fishery and biology of the crab, *Scylla serrata*, which forms an important fishery in the Hooghly-Matla System.

Hydrology and plankton of estuarine waters.—A study of the collections of plankton and water samples from various points in the Hooghly between Diamond Harbour and Barrackpore shows a predominantly marine element in the plankton during the greater part of the year and their displacement by the freshwater element in the monsoon months. The copepods and diatoms have been studied in greater detail because of their common occurrence and importance as food of fish. It is proposed to prepare suitable keys for their identification.

EXTENSION WORK

Close liaison was maintained between the Orissa Fisheries Department and the sub-station at Cuttack. Free advice has been tendered whenever required by the various State Governments, Government or private institutions, and individuals on the subject of pisciculture based on the study of extensive literature and on practical experience gained in the laboratory and in the field.