



CIFRI

NEWSLETTER

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SPECTACULAR PRODUCTION RATE OF SHRIMP USING A NEW FORMULATED FEED

A spectacular production rate of 1 to 1.5 t/ha of prized tiger shrimp was achieved from experimental ponds at Kakdwip Centre of CIFRI in a short span of eight to twelve weeks against 200-400 kg/ha in 3-4 months under the earlier system. The new technique entails an innovative feed formula, effective stock manipulation and a continuous monitoring of the environment. This unprecedented production rate heralds a significant landmark in the shrimp culture technology in the country. The experiment is being extended to larger ponds for standardisation of the technique. Since quality seed and feed are essential preludes for launching an intensive shrimp production system, CIFRI has been giving considerable stress on these areas for the last five years.

CIFRI achieved a breakthrough in mass scale production of brackishwater shrimp seed in 1984 accompanied by similar breakthrough in shrimp feed which is capable of boosting shrimp production to 2 t in 2 to 3 months.

The formulated shrimp feed is based on diverse sources of animal proteins, essential fatty acids, growth promoting substances, minerals and vitamins and it meets the basic nutritional requirements of penaeid prawns.

In the absence of a suitable shrimp feed, the country could produce shrimps only of the order of 200-400 kg/ha in 3-6 months. The new feed opens fair possibilities of production of 2 t/ha in a single crop of 2 to 3 months. Two to three crops can easily be taken in a year depending upon location and tidal regime and favourable salinity.

This twin breakthroughs came about at a time when the marine shrimp production in India has reached a plateau with little immediate prospect of additional yield. Country's coastal shrimp resources are also already overexploited.

India is thus hardly in a position to exploit the vast export market available in Japan and USA for shrimps. Against this scenario, it has become necessary to accelerate India's effort for shrimp production through intensive culture. Govt. of India is planning to take up intensive shrimp culture during the Seventh Plan in an area of 10,000 ha to boost shrimp export. CIFRI's shrimp feed formulation holds the key to achieve many fold hike in production from brackishwater shrimp culture systems alone and help retain the country's position as the foremost shrimp exporting country in the world.



RESEARCH HIGHLIGHTS

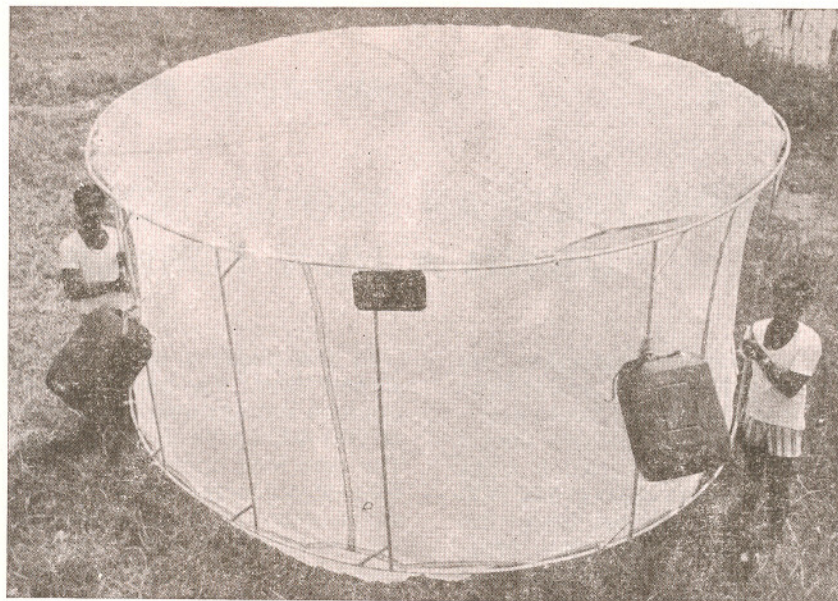
CAGE CULTURE—NEW CIRCULAR NET CAGE DESIGNED

A circular net cage for culture of carps/air-breathing fishes has been designed at the Bangalore Centre of CIFRI. This can be profitably used for seed raising and table size fish production in large open waters or derelict water bodies from where the retrieval of the fish is difficult.

The cage has three components—the cage frame, the net and the floats. Three iron conduit pipes (diameter 20 mm, gauge 16) of length 2.64 m each made into a ring with nut and bolt arrangements from the upper, lower and middle pieces of the frame. These arch pieces are welded together with three 1.5 m long vertical pipes. The size of the cage can be adjusted by increasing or decreasing the diameter and number of the arches and the length of vertical bars.

The fish holding chamber is made of synthetic net of suitable mesh size. The net is stitched like a cylindrical bag with a round bottom, stretched and fastened to the frame. The net-cage is closed at the top too, keeping a slit for handling the fish. Three floats of polythene jerry or any other suitable material with a bouyancy of 25 kg each are tied to the vertical pieces of the frame at a height of one meter away from the bottom ring. A cage thus floated will have a surface area of 5 m², volume of 7.5 m³ and an under-water volume of 5 m³.

The system will be free floating and can be positioned in any



open water by anchoring. A number of such cages can be floated together for easy management. Being a little away from shore, the system also has the protection from trespassers.

These cages being circular in

shape offer least obstruction in movement of fishes inside the cage. The sampling of fishes also becomes easier in such type of cages. Moreover, such cages being closed at the top are free from predation by birds and snakes.

New Office for the National Bureau of Fish Genetic Resources:

The office of the National Bureau of Fish Genetic Resources which was hitherto functioning at the CIFRI Sub-station, 24, Pannalal Road, Allahabad has been shifted to its new Office with effect from 15.4.85 at:

B-209, Mehduari Colony
Teliyarganj
Allahabad-211 002

Krishna Godavari Unit Shifted

The K. G. Unit of CIFRI at Tadepalligudem has been shifted to its new site at Eluru. The new address will be:

Central Inland Fisheries
Research Centre
Sastri Bhavan
D.M.C. Home Street
Kandukurivari thota
Patehbada
Eluru-534 002
West Godavari District
Andhra Pradesh

CIFRI'S ENNORE HATCHERY MODEL READY FOR PILOT SCALE DEMONSTRATION

At Kathivakkam village near Ennore, 18 km north of Madras is situated CIFRI's Shrimp Hatchery Complex. This hatchery complex was instrumental in the successful breeding and mass scale seed production of the prized tiger shrimp, *Penaeus monodon* (CIFRI Newsletter VII, 5). Seed production of white prawn, *Penaeus indicus*, estuarine crab, *Portunus pelagicus* and mullet, *Liza parsia* was also accomplished in this modern hatchery.

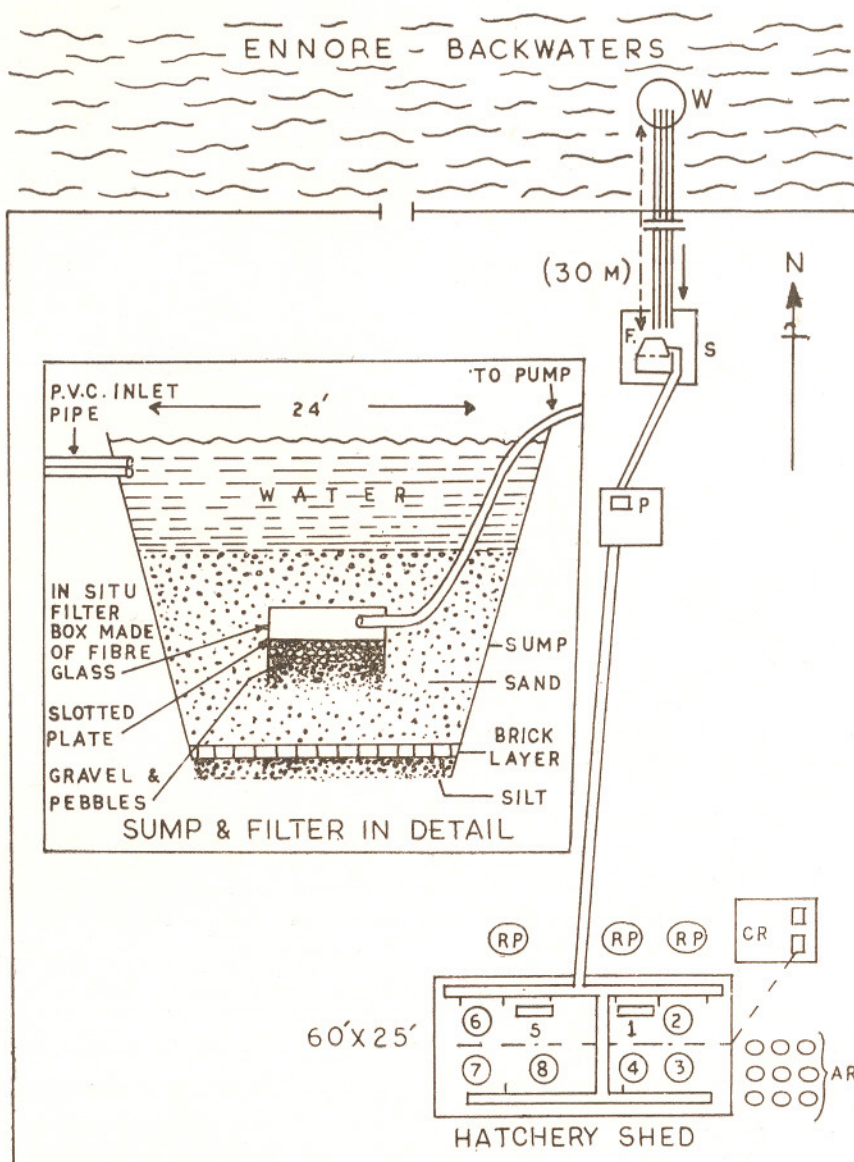
Ennore hatchery is the outcome of CIFRI's sustained research endeavour during the last 5 years to evolve an appropriate shrimp hatchery technology. We are now in a position to set up pilot stage production units along the coastal belts of the country. Availability of quality seed is one of the nagging constraints in any ambitious venture to boost the production of shrimps from culture systems. CIFRI's Ennore hatchery model thus fills up a technology gap in shrimp seed production in the country. The hatchery model comprises *in situ* filtration system, aeration system, larval feed production unit and a core hatchery facility.

Location

The hatchery is located near Kathivakkam village on an area of 0.5 ha in the backdrop of Ennore backwaters 18 km north of Madras city. It is housed one km away from the bar mouth on the southern shore of the backwaters.

Water supply and the filtration system

The drawing point of the water is protected by a concrete ring.



- | | |
|---|------------------------------------|
| 1-8 — Larval tanks | CR — Compressor room |
| F — In situ filter | P — Pump house & overhead tank |
| S — Sump | W — Well (Concrete ring enclosure) |
| — — Pipe line | RP — Reservoir pool |
| AR — Plastic pools for algae & rotifers | |

Measurements

- | | |
|--------|-----------------------|
| Sump | — 720 × 360 × 210 cm. |
| Filter | — 60 × 30 × 40 cm. |
| Plot | — 82.5 × 55.8 m. |

LAYOUT OF CIFRI'S SHRIMP HATCHERY MODEL AT ENNORE

REPORT

The water is drawn into a sump having a depth of 2.1 m through a pair of rigid PVC pipes, 30 m long and 90 mm in diameter. The pipe is closable at both ends with rigid PVC end-caps.

A SWS filtration system is installed in the sump and connected to a 2 HP pump with a capacity of 13,500 l/hr. The filtered water is pumped into an overhead tank of 7 t capacity. Three portable plastic pools of 3.6 m dia and 90 cm height serve as additional reservoirs with a total capacity of about 27 t. PVC pipes of 50 mm and 40 mm diameter connect the sump with the overhead tank and the hatchery.

The filtration unit consists of a fibre glass box (60×30×40 cm) with an open base and a false ceiling formed of slotted plate made of fibre glass, held in position with four brass bolts.

The filtration unit is buried open-end down and surrounded

by filter bed material comprising gravel, coarse sand and fine sand. The entire bed functions as a biological filter within 2-3 weeks after installation and can remove particulate material down to 1 micron in size.

Aeration System

The hatchery is provided with two air compressors with an air displacement capacity of 6.3 and 4.75 cft per minute. Compressed air is conveyed through 12 mm diameter flexible PVC tubing to the main duct of 40 mm dia rigid PVC tube from where it is conveyed by 25 mm dia rigid pipes and supplied to the rearing tanks through 3 mm flexible tubes and air diffusing stones. A Honda generator of 1.5 kw capacity is kept standby to be used to maintain aeration in case of a power failure.

The Core Hatchery

The facilities include feed cul-

ture tanks, hatching tanks and larval rearing tanks of varying dimensions. A series of portable plastic pools of 1.2m diameter and 60 cm height kept outdoor are used for culturing algae and rotifers. Inoculum for the outdoor pools are developed in plastic tubes of 35 l capacity. Inoculum for diatoms are developed in 10 l capacity glass jars. Mass production of diatoms were done in 300 l capacity outdoor tanks. Six portable plastic pools of 600 l capacity each are used for hatching the eggs. The hatched-out nauplii are reared in 1.5 tonne capacity fibre glass tanks. The entire system is housed in a semi-permanent shed with light roofing material supported by vertical poles. About 3,00,000 larvae could be reared in this system in single operation with an expected survival of 40-45% up to P₁₂ stage. The whole set up costs only Rs. 85,000/- excluding the cost of land.

EXTENSION

Advisory Services

Seventy-two fish farmers, 4 private agencies, 4 voluntary agencies and 23 Government and autonomous agencies availed of the expert advice rendered by the Institute.

Over one hundred visitors to the Institute were briefed on the recent advances in inland aquaculture and the activities of CIFRI. The visitors included students, trainees, farmers, scientists, etc.

Media Coverage

Activities of CIFRI particularly relating to shrimp feed evolved at CIFRI and the consequent, unprecedented level of brackish-water shrimp production obtained at Kakdwip Research Farm, were given wide coverage in leading newspapers of the country. The production demonstration was also covered by AIR and Door-darshan, Calcutta.

Publications

The following two articles by CIFRI Extension Scientists appeared in a special issue of *Sabujsona*, a Bengali fortnightly issued on 16.7.85.

- Adhunik mach chaser nanadik* (various aspects of modern fish culture) and
- Baro jalashaya kachay O ghe-rate mach chas* (fish culture in cages and pens in large water bodies).

DEMONSTRATION ON PULSES & OILSEEDS

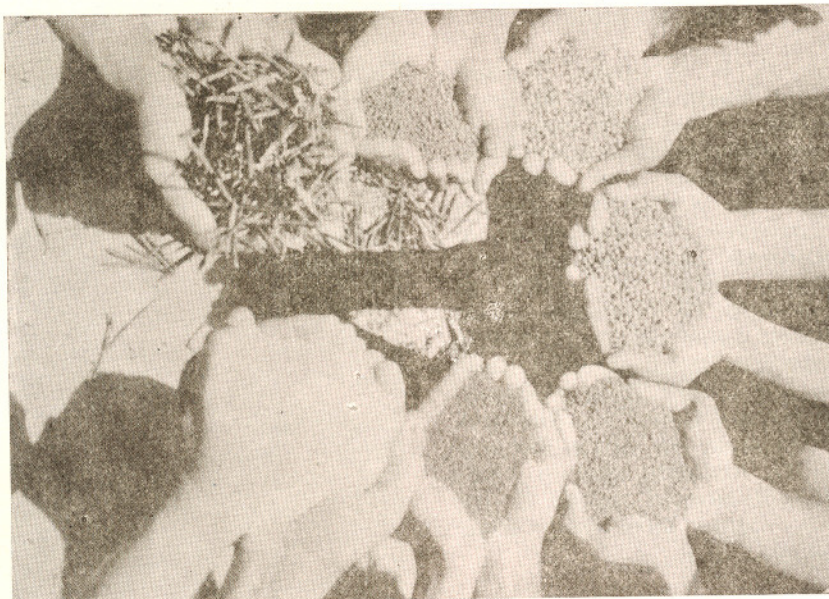
CIFRI has taken up demonstration programme in pulses and oilseeds through KVK in lower Sunderbans in dryland condition and the efforts resulted in appreciable success.

The production of pulses *Cajanus cajan* and *Phascolus mungo* have increased from 2.0 to 6.0 quintals and 3.0 to 7.5 q/ha with the use of varieties like B 7 and T 51 respectively. Similarly the yield of oilseeds has also gone up with a production of *Brassica campestris* (Mustard for variety B-9), *B. juncea* (Mustard rai variety B-85) *Sesamum indicum* (Variety B-9) and Sunflower (variety EC 68414) increased from 3.0 to 7.5 q/ha, 4.0 to 9.0 q/ha, 6.0—12.0 q/ha and 6.0—9.0 q/ha respectively.

The programme has already generated great interest among the local farmers.

Training Imparted

A 2-day training course on *composite fish culture* was organised by the Extension Section for a batch of 17 fish farmers sponsored by NDRI at Kulia Farm, Kalyani during 25-26 June, 1985.



Training in *induced maturation of penaeid prawn* was imparted to Shri A. A. Vyas, Gujarat State Department of Fisheries during 15.7.85 to 31.7.85 at the Madras Centre.

Two Assistant Fisheries Officers, M/s. V. K. Raju & M. K. Pillai of Tata Chemicals Ltd., Mithapur, Gujarat also were trained in *induced maturation of penaeid prawn*

at Puri Centre of the Institute from 15.7.85 to 10.8.85.

Extension Talks

The scientists of the Extension Section delivered many talks during the period covering several aspects of freshwater fish farming. The audience included farmers, fisheries officials, members of voluntary agencies, etc.

SEMINAR/SYMPOSIUM

On an invitation from University of Faizabad, U.P., Dr. H. C. Joshi, scientist at Barrackpore attended the *National Seminar on Man and Environment* which was held during 25-26 May, 1985. The Seminar was sponsored by the National Environment Science Academy. Dr. Joshi presented a paper in the Seminar entitled 'Pesticide residue in the Hooghly Estuary and some fish ponds in the Sunderbans region of West Bengal'.

Dr. A. V. Natarajan, Director and

the Scientists viz., Dr. P. Das, S/Shri K. Raman and Apurba Ghosh participated in an MPEDA sponsored Seminar on *Present Status of Prawn Farming in India* which was held at Bhubaneswar during 8-9 May, 1985. Dr. Das, as a member attended the Action Plan Recommendation Committee meetings also.

A paper entitled '*Economic and environmental considerations of a coastal ecosystem—A case study in respect of Sunderbans, West Bengal*' by A. V. Natarajan and

Apurba Ghosh, was also presented at the seminar.

Dr. P. Das, S/Shri U. Bhaumik and P. K. Pandit, scientists of the Extension Section participated in a *Seminar on Fisheries Development* held at YMCA, Ranaghat on 16.7.85 organised by the FFDA, Nadia. Three lectures were delivered by the scientists in the Seminar which were attended by over 200 fish farmers, extension personnel and development officers.

MANPOWER DEVELOPMENT

DR. NATARAJAN VISITS SOUTH EAST ASIAN COUNTRIES

Dr. A. V. Natarajan, Director, Central Inland Fisheries Research Institute, Barrackpore visited the major aquaculture centres in Thailand, Malaysia and Indonesia under the FAO/UNDP country programme, 'Intensification of Freshwater Fish Culture and Training' from 10-7-1985 to 24-7-1985. Dr. Natarajan visited different hatcheries, and breeding facilities in Bangpre District, Chon Bori and U Thai Thani provinces, Rayong and Bangkok in Thailand. In Malaysia, he visited Penang, Glugor, Malacca; and in Indonesia, he covered Jakarta, Bogor, Cina Gara, Lido and Pasar Minggu.

In a report, released at the end of his tour, Dr. Natarajan has identified certain areas of aquaculture practised in South East Asian Countries meriting attention in our country. He considered that India would benefit by adopting Thailand model of backyard hatchery for giant freshwater prawn which may be especially suitable for the educated unemployed. He was impressed by the progress made in Thailand and Malaysia on the seed production of sea bass. He observed that it was possible to adopt this method in our country. Culture of *Pangasius pangasius* in cages yield a production rate of $1\frac{1}{2}$ t per cage of 27 sq. m. in Thailand and this technology is suitable for adoption in our country. Pen culture of this fish in swampy waters of beels in Eastern Uttar Pradesh, Northern Bihar, West Bengal and Assam also offers bright prospects. He observed that *Clarias macrocephalus* grows faster and bigger in comparison to *C. batrachus* of our country and deserves experimental observations on their ecological compatibility with *C. batrachus*. He also



A view of the cage culture installations for *Pangasius sutchi* at U Thai Thani in river Sakae, Krang, Thailand

noted that some ingredients of the Indonesian model of frog hatchery and culture system for *R. cates-biana* can be incorporated into

the CIFRI model of hatchery and production system for *R. tigrina* and other commercial species of frog.

Shri S. Patnaik awarded FAO/ UNDP Fellowship

Shri S. Patnaik, Scientist at FARTC, Dhauli received an FAO/UNDP sponsored six-month Training Programme (January-June 1985) at the University of Florida, USA. The area of his study programme included *utilization of aquatic weeds for biomass production and biological control of insects and inter-species competition*. He was also trained in biogas production in addition to the domestic and industrial waste treatment. Shri Patnaik also had a study visit to the University of California during the tenure of his fellowship.



Dr. P. K. Mukhopadhyay & Dr. V. Pathak, Scientists at Barrackpore attended a training course on 'Safety aspects in the research applications of ionising radiation' during 13-31 March 1985 at the Division of Radiological protection, BARC at Trombay. The course covered aspects like radiation protection in research labora-

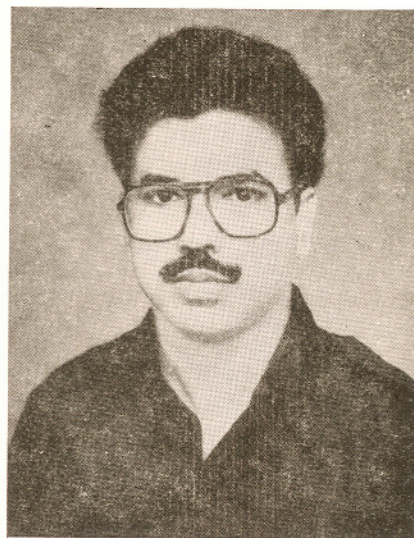
tories, radiation hazard evaluation and control, radiation biology, production of radio isotopes, interaction of radiation with matter, etc. The practical part of the training also included the contamination monitoring and radiation protection survey, Beta and Gamma ray absorption etc.

Mr. R. K. Das, Scientist at Barrackpore attended a one-month course in 'different techniques in microbiology' under Prof. S. K. Mazumder (Food Technology & Biochemical Engineering) at Jadavpur University. The duration of course was from 3.5.85 to 2.6.85.

HONOURS, AWARDS

Naskar gets Ph.D.

Shri Kumud Ranjan Naskar, Scientist-2 of Rahara Research Centre is awarded the degree of Doctor of Philosophy by the University of Calcutta, based on his thesis entitled "Floristic studies of the District 24-Parganas in West Bengal (India) with special reference to the Mangrove Vegetation of Sunderbans". In this thesis Dr. Naskar has described 1175 angiosperm species under 680 genera and 154 families. Ecological adaptations, economic importance and common uses of the flora are discussed in addition to their taxonomic position. A key for identification for all the 1175 plant species also is given.



STAFF NEWS

Transfers

The following transfers were made during May to August 1985

Name	Designation	From	To
Dr. M. Y. Kamal	Scientist-3	Barrackpore	ICAR HQ Delhi
Shri B. V. Govind	Scientist-3	Nagarjunasagar	Bangalore
Dr. T. Ramaprabhu	Scientist-3	Dhauli	Bangalore
Shri D. Nath	Scientist-2	Barrackpore	Kakdwip
Shri V. K. Murugesan	Scientist-2	Patna	Pollachi
Shri C. Saha	Scientist-2	Dhauli	Barrackpore
Dr. G. N. Chattopadhyay	Scientist-2	Rahara	Barrackpore
Shri K. V. Rao	Scientist-2	Tadepalligudem	Eluru
Shri Ch. Gopalakrishnayya	Scientist-2	Nagarjunasagar	Eluru
Dr. M. Ramakrishnaiah	Scientist-2	Nagarjunasagar	Eluru

STAFF NEWS

Name	Designation	From	To
Shri R. M. Rao	Scientist-2	Badampudi	Eluru
Shri C. B. Joshi	Scientist-2	Bilaspur	Bhimtal
Shri B. C. Jha	Scientist-1	Bilaspur	Muzaffarpur
Dr. P. K. Ghosh	Scientist-1	Kakdwip	Calcutta
Shri S. K. Mandal	Scientist-1	Kakdwip	Barrackpore
Shri R. K. Singh	Scientist-1	Guwahati	CRRI, Cuttack
Shri J. B. Rao	Scientist-1	Badampudi	Kakinada
Shri A. Mukherjee	Scientist-1	Ranchi	Kakdwip
Shri S. N. Singh	Scientist-1	Ranchi	Muzaffarpur
Shri P. N. Jaitly	Scientist-1	Ranchi	Dhauli
Shri D. N. Mishra	Scientist-1	Jaunpur	Karnal
Shri T. S. Ram Raju	T-5	Tadepalligudem	Eluru
Shri K. Subba Rao	T-5	Tadepalligudem	Eluru
Shri S. P. Shastri	Assistant	Nagarjunasagar	Eluru
Shri C. Lakra	T-1-3	Ranchi	Patna
Shri D. P. Verma	T-1-3	Jaunpur	Buxar
Shri Sripal Singh	Junior Clerk	Barrackpore	CIRG, Mathura
Shri K. Mani	Junior Clerk	Nagarjunasagar	Eluru
Shri G. Santa Rao	Junior Clerk	Badampudi	Kakinada
Shri Ambika Lal	Junior Clerk	Jaunpur	Allahabad
Shri Bakshi Ram	Lab-Boy	Bilaspur	Bhimtal
Shri S. Kotaiah	Lab-cum-Fieldman	Nagarjunasagar	Eluru
Smt. B. Sakuntala	Messenger	Rahara	Barrackpore
Shri N. K. Barman	Fisherman	Kalyani	Rahara
Shri Japhu Ram	Fisherman	Harwan	Bhimtal
Shri Sant Ram	Fisherman	Harwan	Bhimtal
Shri Lakhmi Ram	Watchman	Muzaffarpur	Karnal
Shri Lalita Prasad	Watchman	Jaunpur	Muzaffarpur
Shri L. Somulu	SS Gr.-II	Tadepalligudem	Eluru
Shri K. Dharma Raju	SS Gr.-II	Tadepalligudem	Eluru
Shri P. N. Rao	Safaiwala	Tadepalligudem	Eluru
Shri B. T. Rao	Watchman	Tadepalligudem	Eluru
Shri A. Kistaiah	SS. Gr.-II	Nagarjunasagar	Eluru
Shri S. Jaan	Fisherman	Nagarjunasagar	Eluru
Shri P. Sayalu	Fisherman	Nagarjunasagar	Eluru
Shri A. Gangaih	Fisherman	Nagarjunasagar	Eluru
Shri U. Satyanarayana	Fisherman	Nagarjunasagar	Eluru
Shri P. Atchayya	Fisherman	Nagarjunasagar	Eluru
Shri Y. Rajagopala Rao	Fisherman	Badampudi	Kakinada
Shri M. B. Naik	Fisherman	Badampudi	Kakinada
Shri R. Yesiah	Fisherman	Badampudi	Kakinada
Shri P. Seshanna	Fisherman	Badampudi	Kakinada
Shri R. Rajendram	Fisherman	Badampudi	Kakinada
Shri M. P. Bind	Fisherman	Ranchi	Bhagalpur

STAFF NEWS

Name	Designation	From	To
Shri K. P. Ram	Fisherman	Ranchi	Bhagalpur
Shri J. Mukhia	Fisherman	Ranchi	Bhagalpur
Shri J. Khalko	Messenger	Ranchi	Allahabad
Shri B. R. Munda	Fieldman	Ranchi	Buxar
Sri Ram	Fisherman	Jaunpur	Allahabad (BFGR)
Bajdhari Malla	Watchman	Jaunpur	Karnal
Karan Raj	Fisherman	Jaunpur	Karnal
Shri M. L. Mallah	Watchman	Jaunpur	Allahabad (BFGR)

Promotions

The following promotions were made on the basis of 5-yearly assessments

Name	From	To	w.e.f.
Dr. A. K. Mondal	S-2	S-3	1-7-81
Shri Apurba Ghosh	S-2	S-3	1-7-82
Shri K. O. Joseph	S	S-1	1-7-82
Shri M. A. V. Lakshmanan	T-7	T-8	1-7-82
Shri N. C. Basu	T-6	T-8	1-7-82

Appointment

Shri R. A. Gupta is appointed as Scientist-3 under the Central Sector Scheme for development of Inland Fisheries Statistics at Barrackpore.

Library

BOOKS RECEIVED

Bal, D. V. & K. V. Rao
Marine Fisheries

Swaminathan, M. S. & Ors. ed.
Science and integrated rural development (Focal theme discussed at 63rd Indian Science Congress; Volume containing some selected papers).

Sethna, H. N. & Ors. ed.
Survey, conservation and utilisation of resources (Focal theme discussed at 64th Indian Science Congress; Volume containing some selected papers).

Mehrotra, R. C. & Ors. ed.
Science and technology in India during the coming decade(s) (Focal theme discussed at the 66th Indian Science Congress Session; Volume containing some selected papers).

Menon, M. G. K. & Archana Sharma ed.
Basic research as an integral component of self-reliant base of science and technology (Selected papers presented on the focal theme at the 69th session of the Indian Science Congress Association at Mysore, January 3-8, 1982).

LIBRARY

Sharma, A. K. & Archana Sharma ed.
Impact of the development of science and technology on environment (Selected papers presented on the focal theme at the 68th session of the Indian Science Congress Association at Varanasi, January 3-7, 1981).

Mason, C. F.
Biology of freshwater pollution.

Roberts, R. J., ed.
Microbial diseases of fish.

Ahne, W. ed.
Fish diseases (Third COPRAQ-Session).

Cushing, D. H.
Climate and fisheries.

Altschul Aaron M. & Harold L. Wilcke, ed.
New protein foods, Vol. 3. Animal Protein Supplies, Part A.

Resh, Vincent H. & David M. Rosenberg.
The ecology of aquatic insects.

LeCren, E. D. & R. H. Lowe-McConnell.
The functioning of freshwater ecosystems (International Biological Programme 22).

Talwar, P. K. & R. K. Kacker.
Commercial sea fishes of India.

Kulshrestha, S. K., V. Kumar & M. C. Bhatnagar, ed.
Effects of pesticides on aquatic fauna: Proceedings of the Seminar held at Government Postgraduate College, Mhow-453 441 in June, 1983: Technical papers.

New Michael B.
Giant prawn farming.

Kabata, Z.
Parasites and diseases of fish cultured in the tropics.

Potts, G. W. & R. J. Wootton, eds.
Fish reproduction: Strategies and tactics.

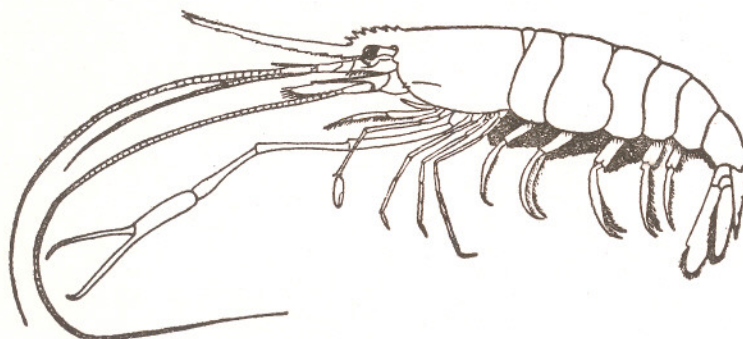
Hoar, W. S. & D. J. Randall & E. M. Donaldson, ed.
Fish physiology, Volume 9: Reproduction. Part A: Endocrine tissues and hormones.

JOURNALS RECEIVED

Acta Amazonia, **11** (1), 1984.
Agricultural Situation in India, **39** (10) & **40** (1), 1985.
Agricultural Wastes, **9** (1-4) - **11** (1-4), 1984.
AID Research and Development Abstracts, **12** (1), 1984.
Amazoniana, **8** (4), 1984.
American Fisheries Society—special publication No. 14, 1984.
Aquaculture, **42** (2), 1984.
Aquatic Toxicology, **6** (3), 1985.
ASPAC Newsletter, Nos. 83-87, 1985.
Australian Journal of Biological Sciences, **37** (5-6), 1984.
Australian Journal of Marine and Freshwater Research, **36** (1), 1985.
Australian Journal of Zoology, **33** (1), 1985.
Bamidgeh, **36** (4), 1985.
Bio-Energy Renewals, **3** (1-2), 1984.
Biblogical Abstracts, **78** (8-12), 1984 and **79** (2-4), 1985.
Biological Bulletin, **167** (2), 1984.
Biometrics, **40** (2), 1984.
Bulletin of the Faculty of Fisheries, Hokaido University, **34** (1), 1985.
Bulletin of Marine Science, **38** (3), 1984.
Bulletin of Tokai Regional Fisheries Research Laboratory, No. 114, 1984.
Bulletin VUR Vodnany, **20** (3-4), 1984 & **21** (1), 1985.
Canadian Journal of Fisheries and Aquatic Sciences, **41** (11-12), 1984 & **42** (1-2), 1985.
Contributions in Marine Science, **27**, 1984.
Copeia, No. 4, 1984, No. 1-2, 1985.
Crustaceana, **47** (3), 1984.
Current Science, **54** (6-15), 1985.
Central Marine Fisheries Research Institute, special publication No. 17, 19, 21-23, 1984 & 1985.

Docklady Biological Sciences, **277** (1-6), 1984.
Environmental Conservation, **11** (4), 1984.
Environmental Pollution, **36** (4), 1985.
Environment International, **10** (5-6), 1984 & **11** (1), 1985.
Estuaries, **7** (4A & 4B) 1984 & **8** (1), 1985.
Extension Bulletin, Nos. 212, 214, 1984.
Fertilizer News, May-July, 1985.
FINS: Fisheries News, **18** (1), 1985.
Fisheries: A Bulletin of the American Fisheries, **9** (5), 1984.
Fisheries and Fish Breeding in Israel, **17** (3), 1985.
Fisheries Research, **3** (2), 1985.
Fishery Technology, **22** (1), 1985.
Fishing Chimes, **5** (1-4), 1985.
Fish Farming International, **12** (5-7), 1985.
Food Research Quarterly, **44** (4), 1984 & **45** (1), 1985.
Freshwater Biology, **14** (1-6), 1984.
Genetical Research, **44** (2-3), 1984.
Geobios, **12** (3-4), 1985.
Genetic Technology News, **5** (4-8), 1985.
Guide to Current Literature in Environmental Health Engineering and Science, **15** (10-11), 1984.
Gulf Research Report, **7** (4), 1984.
Haryana Kheti, **17** (4-8), 1985.
Heredity, **53** (2-3), 1984.
Hydrobiological Journal, **21** (1), 1985.
Indian Science Abstracts, **20** (10-12) 1984.
Indian Journal of Agricultural Chemistry, **15** (1), 1982.
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