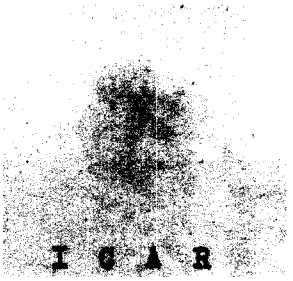
RESEARCH PROJECTS 1970

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
MARINE FISHERIES P. O., MANDAPAM CAMP.

INDIAN COUNCIL OF AGRICULTURAL RESEARCH



CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

RESEARCH PROJECTS

1970

Central Marine Fisheries Research Institute

Marine Fisheries P.O.,

Mandapam Camp

Ramanathapuram District

India

C O N T E N T S

CONTENTS

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Sample Survey for estimating all India marine fish production and effort put in.

Project Code No: FSS/FS/1.1.

Division: Fishery Survey and Statistics. Location: 39 Zonal Headquarters along the East and West coast of India with Headquarters for compilation and analysis at Ernakulam.

Title of major project, if any: Assessment of Marine Fishery Resources

Personnel (Name and designation)

Project Leader:

Dr. R.V.Nair, Fishery Scientist

Associates:

1. D. Chakraborty, Jr.Fishery Scientist
2. C.R. Shanmughavelu, Asst. Fishery Scientist
3. S.K. Dharmaraja, Asst. Fishery Scientist
4. Research Assistants 2
5. Survey Assistants 2
6. Computors 6
7. Field Staff 55

Objectives:

Assessment of region-wise and variety-wise yield of marine fish for development, conservation and management of marine fishery resources.

Total duration: Continuing Date of initiation: 1969

Brief resume of literature:

In a developing country where fishing is still not much advanced and is in the hands of a large number of illiterate fishermen and fishing is done by a large number of small indigenous boats and landings take place all along the coast line throughout the day and even sometimes during the night, adoption of suitable sampling technique seems to be the only choice of collection of data on catch and effort which are basic requirements for the assessment of the stock.

Pilot surveys had been conducted by ICAR and C.M.F.R.I. with a view to evolving suitable sampling technique in early fifties. The important references are indicated below:

1. Bal, D.V. and S.K. Banerji — 1951 A Survey of the Sea fisheries of India Proc. Indo-Pacific Fish. Coun. Sec. II: 75-79.

2. Banerji, S.K. — 1968 Estimation of Marine Fish Production, Symposium on Current Status of Fishery Statistics, Journal of the Indian Society of Agricultural Statistics, Vol. 20, No.2, December.

3. Chakraborty, D. — 1967 Statistics in Fishery research and development. Souvenir, 20th anniversary, C.M.F.R.I., 1967: 130-132.

4. Nair, R.V. and S.K. Banerji — 1968 A survey of the statistics of marine fish catch in India from 1950 to 1962. Indian Journal of Fisheries, Vol.12, No.1.

5. Panse, V.G. and K.V.R. Sastry — 1960 Sample survey for fishery statistics, ETAP Report No.1247.

6. Sukhatme, P.V., V.G. Panse and K.V.R. Sastry — 1958 Sampling technique for estimating catch of Sea fish in India. Biometrics 14, 78-96.

Plan of Work:

The design involved space-time stratification. A number of geographically contiguous landing centres from the stratum in space. A 10-day period is the time stratum. On the west coast excepting Kerala, 3 Centres will be selected at random during the 10-day period and 2 days are to be devoted to each centre for field work. On the first day during the afternoon observations will be taken on the number of fishing units landing catch and a subsample of fishing units will be examined in detail for catch and other ancillary information like gear, man-power, time engaged in fishing etc. On the second day field work will be done in the forenoon. Night catches will be collected by enquiry on the day when field work is done in the forenoon. The primary unit of sampling is thus a centre day. In Kerala instead of forenoon and afternoon observations, data will be collected on 9-12 hrs. and 15-18 hrs. on the first day and 6-9 and 12-15 hrs. on the 2nd day. Night catches will be collected for each day by enquiry. The primary sampling unit is Centre-group of two days. On the east coast the same method will be followed as in Kerala.

From the samples, estimates will be made for the primary units. Stratum estimates and their pe ntage error will be arrived at from those of primary units.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Sample survey for estimating size composition of the catches of some of the commercially important fishes.

Project Code No: FSS/FS/ 1.2

Division: Fishery Survey and Statistics

Location: 39 Zonal Headquarters along the east and west coast of India with Headquarters for compilation and analysis at Ernakulam.

Title of major project, if any: Assessment of Marine Fishery Resources.

Personnel (Name and designation)

Project Leader:

Dr. R.V. Nair, Fishery Scientist

Associates:

1. D. Chakraborty, Jr. Fishery Scientist
2. C.R. Shanmughavelu, Asst. Fishery Scientist
3. S.K. Dharmaraja, Asst. Fishery Scientist
4. Research Assistants 2
5. Survey Assistants 2
6. Computors 6
7. Field staff 55

Objective: To study the size and age composition of commercially important fishes.

Total duration: Continuing

Date of initiation: 1969.

Brief resume of literature:

The size composition of landings is necessary for proper appraisal of a fishery. The relevant literature is given below:

1. Hennemuth, R.C. 1957 An analysis of methods of sampling to determine the size composition of commercial lands of yellowfin tuna. Bull. Inter. Amer. Trop. Tuna Comm. 2(5): 174-243.

2. Pope, J.A. 1956 An outline of sampling techniques. Rapp. Cons. int. Explor. Mer. 140(1): 11-20.

Plan of work:

The work will be carried out in conjunction with Project No. FSS/FS/1.1. Generally 25 specimens from the first fishing unit examined and containing oil sardine/mackerel/Bombay duck will be measured. The maximum number of specimens measured in a day will be 100. The weight of the sample will be obtained by actual weighment. From the size composition of the sample and its weight, the size composition of landings of oil sardine/mackerel/Bombay duck will be obtained for the centre-day or centre group of two days, from which zonal estimates will be arrived at.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Inventory of fishing potential.

Project Code No. FSS/FS/1.3

Division: Fishery Survey and Statistics

Location: 39 Zonal Headquarters along the east and west coast of India with Headquarters for compilation and analysis at Ernakulam.

Title of major project, if any: Assessment of Marine Fishery Resources.

Personnel (Name and Designation)

Project Leader:
Dr. R.V. Nair, Fishery Scientist

Associates:
1. D. Chakraborty, Jr. Fishery Scientist
2. C.R. Shanmughavelu, Asst. Fishery Scientist
3. S.K. Dharmaraja, Asst. Fishery Scientist
4. Research Assistants 2
5. Survey Assistants 2
6. Computors 6
7. Field staff 55

Objectives:

Village-wise data on fishermen population, fishing units of different types and information on fish landing centres constitute the frame of surveys conducted by this Institute. These also will bring out the nature of changing pattern of fishing industry and its consequent impact on fishermen.

Total duration: One year

Date of initiation: 1970 - 4th Survey

Brief resume of literature: No literature is available on this line.

Plan of work:

Investigators will collect data by house to house visit in all the marine fishing villages in India. The data will include number of marine fishing villages, marine fishermen population, number of active marine fishermen and number of fishing crafts and gear.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R)
Mandapam Camp

Title of project: Estimation of prawn catches from the backwaters of Kerala.

Project Code No.: FSS/FS/1.4

Division: Fishery Survey and Statistics. Location: Cochin

Title of major project, if any: Assessment of Marine Fishery Resources.

Personnel (Name and designation)

Project Leader:

Dr. R.V. Nair, Fishery Scientist

Associates:

1. D. Chakraborty, Jr. Fishery Scientist
2. Vacant.
3. Vacant.

Objectives:

A considerable amount of catch is taken from the backwaters but no estimates from the same are available. Since the prawns spend a part of the life in backwaters it is necessary to have such estimates.

Total duration: Continuing Date of initiation: June 1970.

Brief resume of literature:

Marine prawns of this area are exploited in different stages of their life cycle. Juveniles of most of these species support a thriving fishery in the backwaters which are considered as the nursery grounds of these species. There is no reliable estimate of the quantity of juveniles exploited from these environments.

1. Ganapathy, P.N and M. Subramanyam — 1964 — The prawn fishery in Godavary estuary. J. Zool. Soc. India, Vol. 16(1 & 2).

2. Menon, M.K and K. Raman — 1962 — Observations on the prawn fishery of the Cochin backwaters with special reference to the stake net catches. Indian J. Fish. Vol.VIII, No. 1 : 1-23.

3. Panikkar, N.K. and M.K. Menon. 1955 Prawn fisheries of India. Proc. Indo-Pac. Fish. Coun. Symposium on Prawn Fisheries, Sec. II and III, 328-346.

4. Subrahmanyam, M 1964 Fluctuations in prawn landings in the Godavari estuarine system. Proc. Indo-Pacif. Fish. Counc. 11th Sess., Sec. II: 44-48.

Plan of Work:

1. Collection of catch of sample units as per sampling scheme along with ancilliary information.

2. Estimation of catch and other information.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R)
Mandapam Camp

Title of project: Stock assessment and estimation of potential yield of commercially important fishes.

Project Code No: FSS/ST/1.1

Division: Fishery Survey and Statistics Location: Ernakulam

Title of major project, if any: Assessment of Marine Fisheries Resources

Personnel (Name and designation)

Project Leader:

S.K. Banerji, Fishery Scientist

Associates:

T.S. Krishnan, Research Assistant and other scientific workers on the respective fisheries.

Objectives:

Annual assessment of the stocks of commercially important fishes is essential for a rational exploitation of these stocks. The Fifth meeting of the ICAR panel has indicated the importance for such stock assessments. The aim of this project is to find out the effect of fishing on the stocks of commercially important fish and hence determine the level of exploitation which will give the optimum sustained yields from the exploited stocks.

Total duration: 5 years Date of initiation: 1970

Brief resume of literature:

The pioneering work of Baranov (1918) was the first attempt to build up mathematical model linking yield with growth, recruitment and mortality rates in order to determine the effect of fishing on a fish stock and to assess the optimum yield derivable from the North Sea plaice along with the associated level of exploitation. The model was further developed and made more realistic by Beverton and Holt (1957) and applied to plaice and haddock fisheries of the North Sea. The model has since been used widely to make assessment of ground fish stocks in temperate waters. Schaefer (1953, 1954) developed another model suitable for tropical pelagic fisheries and applied the same for assessment of tuna stocks of the Pacific. Annual assessment of exploited fish stock using such models has become an important aspect of fisheries research in all countries.

The preliminary work along these lines to make assessment of two of our most important pelagic fisheries, namely, oil sardine and mackerel has recently been undertaken. The assessment of stocks of numerous other

commercially important fisheries are yet to be undertaken. It is proposed to undertake such studies with respect to oil sardine, mackerel, prawns and Bombay duck in the first instance.

Banerji, S.K.	1968	An assessment of the exploited pelagic fisheries of the Indian seas Symp. on the Living Resources of the Seas Around India. Central Marine Fisheries Research Institute: Cochin Dec. 7-10, 1968.
Banerji, S.K. and T.S. Krishnan		Preliminary assessment of oil sardine population along the West Coast of India. (MS)
Bavanov	1918	On the question of biological basis of fisheries. Nauchnuyii issledovalelskii iktislogisheskii Institut Investiia 1(1): 81-128
Beverton, R.J.H and S.J. Holt	1957	On the dynamies of exploited fish populations. Fish. Invest. Lond. Ser. II: 19
Schaefer, M.B.	1953	Fisheries dynamies and the concept of maximum equilibrium catch - Proc. Calif. Caribb. Fish. Inst. 6th annual session 53-64
———	1954	Some aspects of the dynamies of populations important in the managemnt of commercial marine fisheries. Bull. Interam. Trop. Tuna. Comm.1(2)

Plan work: The plan of work consists of the following stages:-

1) Analysis of monthly data on fish size. Estimation of age and growth. Expression of growth by suitable mathematical equation.
2) Based on the sample size composition data mentioned above, conversion of available catch data (by weight) to size/age composition in number for every fishing season.
3) Estimation of relative abundance of various age groups for every fishing season.
4) Estimation of fishing and mortality rates.
5) Building up suitable mathematical model linking yield with other vital parameters (Recruitment, growth and mortality rates) and estimating the maximum potential yield from each fishery along with the associated level of exploitation.
6) Utilization of the collected biological data by other scientific workers in the respective fields.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on catch and effort trends of the oil sardine fishery.

Project Code No. FB/PE/Sa. 1.1

Division: Fishery Biology

Location: Karwar, Mangalore, Kozhikode and Cochin.

Title of major project, if any: Sardine Investigations.

Personnel (Name and Designation)

Project Leader:

M.S. Prabhu,
Jr. Fishery Scientist

Associates:

*1. B.T. Antony Raja, Jr. Fishery Scientist
2. V. Balan, Assistant Fishery Scientist
3. M.H. Dhulkhed, Asst. Fishery Scientist
4. G.G. Annigeri, Survey Assistant (S.G)
5. S. Rengaswamy, Technical Assistant
6. One Assistant Fishery Scientist (Vacant)

Objectives:

To study the variations in the relative abundance of oil sardine in space and time off the west coast.

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

The oil sardine Sardinella longiceps ranks first among the commercial fishes in India and hence an integrated programme of research is essential to study the annual and long term fluctuations in this fishery.

Accounts on the oil sardine investigations at Cochin, Kozhikode and Mangalore were prepared and submitted for publication by the concerned workers.

The catch and effort trends of oil sardine by different gears, both monthwise and quarterwise were estimated at all the centres. The fluctuations in the fishery in relation to weather conditions and availability of shoals in different depth zones were also studied.

The earlier account on the subjects by Nair (1952,1958,1960 a & b), Nair and Subramanyan (1955), Sekharan (1955 & 1962), Sekharan & Dhulkhed (1967), Prabhu (1967), Prabhu & Dhulkhed (1967), Prabhu, Dhulkhed and Balan (MSS) are of interest here. Among the publications abroad, those of Clark and Marr (1955), Marr (1960) and Nakai (1960) are some of the notable ones.

Plan of work:

Data on the catch and effort by different gears at all the centres will be collected regularly by the random sampling method for estimating the oil sardine catch in terms of weight and numbers.

* He will be an associate under Projects, FB/PE/Sa. 1.2 to 1.4 also.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Regional, seasonal and annual fluctuations in the age composition and growth rate trends in oil sardine, Sardinella longiceps

Project Code No. FB/PE/Sa. 1.2

Division: Fishery Biology Location: Karwar, Mangalore, Kozhikode and Ernakulam.

Title of major project, if any: Sardine Investigations.

Personnel (Name and Designation)

Project Leader:
Dr. M.S. Prabhu,
Jr. Fishery Scientist

Associates:
1. V. Balan, Asst. Fishery Scientist
2. M.H. Dhulkhed, Asst. Fishery Scientist
3. G.G. Annigeri, Survey Assistant (S.G)
4. V.S. Rengaswamy, Technical Assistant
5. One Assistant Fishery Scientist (Vacant)

Objectives:

To determine the age and growth of the exploited oil sardine stocks.

Total duration: Continuing Date of initiation: 1969.

Brief resume of literature:

Valuable additions to our knowledge on the age attained by oil sardine at different lengths were made from studies on length frequency distribution and scales. The seasonal variations in the progression of modes were also studied at the different centres. Papers based on the work under this project were submitted for publication by the concerned workers.

The accounts published earlier by Nair (1949, 1953 & 1960), Balan (1959 & 1964), Prabhu (1967) and Bensam (1964) are of interest. Age studies by Walford & Mosher (1943), Phillips (1948) on Pacific pilchard and Blackburn (1949) on Australian Pilchard are also of interest in this connection.

Plan of work:

Determination of age of oil sardine from length frequency and scale studies. Investigations on the age composition of the different size groups constituting the fishery based on the routine data collected at the different centres.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Studies on the variability in sex-ratio, maturation and fecundity of oil sardine, Sardinella longiceps.

Project Code No. FB/PE/Sa. 1.3

Division: Fishery Biology Location: Karwar, Mangalore, Kozhikode, and Ernakulam.

Title of major project, if any: Sardine Investigations.

Personnel (Name and Designation)

Project Leader:
Dr. M.S. Prabhu,
Jr. Fishery Scientist

Associates:
1. V. Balan, Asst. Fishery Scientist.
2. M.H. Dhulkhed, Asst. Fishery Scientist
3. G.C. Annigeri, Survey Assistant (S.C)
4. V.S. Hengaswamy, Technical Assistant
5. One Asst. Fishery Scientist (Vacant)

Objectives:

To understand the fluctuations in the sex-ratio composition and segregation of sex, if any, spawning habits and egg laying capacity of oil sardine.

Total duration: Continuing Date of initiation: 1969

Brief resume of literature:

Knowledge of these aspects being an essential prerequisite for assessing the catch and also the fluctuations in the occurrence of different year classes, some observations have already been made.

It has been found that the period of dominance of oil sardine in Inderterminate stage of maturity varied from place to place. However, a more or less uniform trend in the occurrence of oil sardine in other stages of maturity was noticed at most of the centres. The sex-ratio also was noticed to vary from place to place though females were found to out number males.

The contributions of Nair (1960), Antony Raja (1964) and Balan (1969) are of interest. Among the publications from other countries, those of Clark (1957), Ahlstrom (1960), Davies (1956) and Blackburn (1960) are of special interest.

Plan of work:

Samples of oil sardine drawn from different gears and in various stages of maturity will be analysed for studying the sex-ratio, maturity and fecundity.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Migration studies on the oil sardine, Sardinella longiceps

Project Code No. FB/PE/Sa. 1.4

Division: Fishery Biology Location: Karwar, Mangalore, Kozhikode and Ernakulam.

Title of major project, if any: Sardine Investigations.

Personnel (Name and Designation)

Project Leader:
M.S. Prabhu,
Jr. Fishery Scientist

Associates:
1. V. Balan, Asst. Fishery Scientist
2. M.H. Dhulkhed, Asst. Fishery Scientist
3. G.G. Annigeri, Survey Assistant (S.G)
4. V.S. Rengaswamy, Technical Assistant
5. One Asst. Fishery Scientist (Vacant)

Objectives:

To find out the nature of movements of oil sardine both during or outside the season along the coast both in the shallow and deeper waters.

Total duration: Continuing Date of initiation: Already in progress

Brief resume of literature:

Oil sardine being a migratory species, it is essential that studies on their movements towards and along the coastal waters are undertaken for the proper exploitation of the fishery. These studies would also throw light on the growth rate of this species.

Tagging has been carried out at Karwar, Mangalore and Ernakulam and some interesting cases of recovery throwing light on the movement and growth of oil sardine have been reported.

The preparation of a comprehensive report on the tagging work done so farwas initiated and the account is nearing completion for publication as a special Bulletin of the CMFRI.

The observation made by Hornell & Nayudu (1923), Panikkar (1949), Chidambaram (1950), Nair and Chidambaram (1951), Balan (1961), Hamre et al (1966), Pillai (1959) and Pillai et al (1962) are worth mentioning here. Among the reports published abroad, those of Blackburn (1941), Davies (1957), Nomura (1958), Tinbergen (1951), Bron (Ed-1957), Kesteven (Ed. 1960), Clark & Janssen (1945), FAO/UN (1965), Vrooman et al (1966), Bandhukul (1961) and Chirastit (1962) are of special interest.

Plan of work:

Regular field trips will be made to tag and release oil sardine at all the centres depending upon the availability of live fish suitable for the purpose. All the personnel engaged in the sardine and mackerel investigations will participate in this programme.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Biology and Fishery of the lesser sardines.

Project Code No. FB/PE/Sa. 1.5

Division: Fishery Biology

Location: Mandapam, Madras, Karwar, Vizhinjam and Port Blair.

Title of major project, if any: Sardine Investigations.

Personnel (Name and Designation)

Project Leader:

B.T. Antony Raja,
Jr. Fishery Scientist

Associates:

1. K. Rangarajan, Assistant Fishery Scientist
2. Syed Basheeruddin, Asst. Fishery Scientist
3. P. Sam Bennet, Assistant Fishery Scientist
4. R.Marichamy, Research Assistant
5. S Lazarus, Survey Assistant

Objectives: To study the fishery and biology of the lesser sardines as Sardinella fimbriata, S. albella, S. gibbosa, S. sirm and Harengula ovalis

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

Lesser sardines constitute an important fishery along the east and west coasts of India. At certain centres heavy catches are landed throughout the year. It is therefore essential that the work on the biology and fishery of important species is intensified.

1. Nair, R.V. 1951. Studies on the life-history, bionomics and fishery of white sardine, Kowala coval (Cuv.). Proc. Indo-Pacific. Fish. Counc. Sec. II: 103-118.
2. Sekharan, K.V. 1955 Observations on the 'Choodai' fishery of Mandapam area. Indian J. Fish. 2(1): 113-131.
3. Sekharan, K.V. 1959 Size groups of 'Choodai' taken by different nets and in different localities. Indian J. Fish. 6(1):1-29.
4. Dharmamba, M. 1959 Studies on the maturation and spawning habits of some common clupeoids of Lawson's Bay, Waltair. Indian J. Fish. 6(2): 374-378.
5. Bennet, P.S. 1962 Further observations on the fishery and biology of Choodai (Sardinella spp.) Mandapam area. Indian J. Fish. 8(1) (1961): 152-168.
6. Sekharan, K.V. 1967 The Choodai. Souvenir, 20th Anniversary, CMFRI pp. 67-69

Plan of work:

A. Estimation of catch and effort of the different species at all centres.

B. Studies on the various biological aspects, such as size composition, growth rate, maturity, sex ratio, food and feeding habits.

C. Tagging for studying the migration of the commercially important

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Study of catch and effort trends in mackerel, Rastrelliger kanagurta.

Project Code No. FB/PE/Ma. 2.1

Division: Fishery Biology

Location: Karwar, Mangalore, Kozhikode, Cochin, Vizhinjam, Port Blair and Mandapam.

Title of major project, if any: Mackerel Investigations.

Personnel (Name and Designation)

Project Leader:
G. Seshappa,
Fishery Scientist

Associates:
1. K.V. Sekharan, Junior Fishery Scientist
2. K.V. Narayana Rao, Jr. Fishery Scientist
3. V. Balakrishnan, Asst. Fishery Scientist
4. P. Vijayaraghavan, Asst. Fishery Scientist
5. K. Rengarajan, Asst. Fishery Scientist
6. A.Noble, Assistant Fishery Scientist
7. V.N. Bande, Research Assistant (S.G)
8. T.M. Yohannan, Research Assistant

Objectives:

To study the variations in the relative abundance of the mackerel in space and time off the west coast.

Total duration: Continuing

Date of initiation: 1969.

Justification:

The mackerel is a very important commercial fish and the study of its catch fluctuations is essential in any programme of fishery biological studies.

Plan of work:

Data on catch and effort by different gears at all the centres will be collected regularly by the random sampling method for estimating the catch in terms of weight and numbers.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Regional, seasonal and annual fluctuations in the age composition and growth rate trends in the mackerel, Rastrelliger kanagurta.

Project Code No. FB/PE/Ma. 2.2

Division: Fishery Biology

Location: Karwar, Mangalore, Kozhikode, Cochin, Vizhingam, Mandapam, Port Blair.

Title of major project, if any: Mackerel Investigations.

Personnel (Name and Designation)

Project Leader:

G. Seshappa,
Fishery Scientist

Associates:

1. K.V. Sekharan, Junior Fishery Scientist
2. K.V. Narayana Rao, Jr. Fishery Scientist
3. V. Balakrishnan, Asst. Fishery Scientist
4. P. Vijayaraghavan, Asst. Fishery Scientist
5. K. Rengarajan, Assistant Fishery Scientist
6. A. Noble, Assistant Fishery Scientist
7. V.N. Bande, Research Assistant (S.G)
8. T.M. Yohannan, Research Assistant

Objectives:

To determine the age and growth of the exploited mackerel stocks.

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

The knowledge of age and growth trends is necessary for evolving any policy for the proper exploitation and management of the fishery on a long term basis. This species is tropical and sub tropical in distribution. It is commercially important not only in India but also in Pakistan, Burma, Thailand (14% of the marine catch), Malaysia (12% of the marine catch), Philippines (4% of the marine catch) and Indonesia. There are two views regarding its growth rate. Sekharan (Indian J. Fish., 5, 1958) and Holt (Rastrelliger training Centre, Bangkok, 1959) hold the view that it grows to 12-15 cm at the end of the first year of life and 22 cm at the end of the second year. But George and Banerji (Indian J. Fish., 11, 1964) are of the opinion that it grows to 22 cm at the end of the first year of life. Seshappa (Curr. Sci., 1958) found growth checks on the scales of fish more than

22 cm in length. No work on the growth of this fish has been done in countries other than India. But some work on other aspects of the biology of the fish especially maturity and fecundity hasbeen done in Malaysia and Thailand (Pathansali, IPFC, 12th Session, 1966; Boonprakob, IPFC, 12th session, 1968)

Plan of work:

Determination of the age of mackerel from the length frequencies, scale studies and other hard parts wherever possible. Investigation of the age composition in the fishery on the basis of routine data collected.

At Port Blair observations on biology of R. brachysoma also will be made.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Qualitative and quantitative variation in the food composition and feeding habits of the mackerel, Rastrelliger kanagurta.

Project Code No. FB/PE/Ma. 2.3

Division: Fishery Biology

Location: Mangalore, Calicut, Cochin, Vizhinjam, Mandapam

Title of major project, if any: Mackerel Investigations.

Personnel (Name and Designation)

Project Leader:
G. Seshappa,
Fishery Scientist

Associates:
1. K.V. Narayana Rao, Jr. Fishery Scientist
2. P. Vijayaraghavan, Asst. Fishery Scientist
3. A. Noble, Assistant Fishery Scientist
4. P. Livingston, Research Assistant
5. T.M. Yohannan, Research Assistant

Objectives:
To assess variability of the food composition and to correlate the same with plankton and fishery.

Total duration: Continuing Date of initiation: 1969.

Brief resume of literature:
Knowledge of the food composition in relation to plankton will be helpful in understanding variations in fishery trends.
References to earlier work given below:

1. Devenesen, D.W and V. John 1940 Curr. Sci. 9: 462
2. Bhimachar, B.S and P.C. George 1952 Proc. Ind. Acad. Sci. 36: 105
3. Pradhan, L.B 1956 Indian J. Fish. 3(1): 141
4. Rao, K.V.N 1962 Scombroid Sym. Part II : 574
5. Jones, S and H. Rosa 1965 FAO Synopsis No.29

Plan of work:

1. Analysis of stomach contents
2. Correlation with catch trends and plankton.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Studies on the variability in sex ratio, maturation and fecundity in the mackerel, Rastrelliger kanagurta.

Project Code No. FB/PE/Ma. 2.4

Division: Fishery Biology **Location:** Karwar, Kozhikode, Mangalore, Cochin, Vizhinjam

Title of major project, if any: Mackerel Investigations.

Personnel (Name and Designation)

Project Leader:
G. Seshappa,
Fishery Scientist

Associates:
1. K.V. Narayana Rao, Junior Fishery Scientist
2. P. Vijayaraghavan, Asst. Fishery Scientist
3. A. Noble, Assistant Fishery Scientist
4. V.N. Bande, Research Assistant (S.G)
5. P. Livingston, Research Assistant
6. T.M.Yohannan, Research Assistant

Objectives:

To understand the nature of variations in sex composition, maturation and egg production.

Total duration: Continuing **Date of initiation:** 1969.

Brief resume of literature:

Knowledge of this is essential for understanding the relationship between fecundity and recruitment to fishable stocks and hence the possible fishery prospects.

1. Rao, R.V et al	1962	Indian J. Fish.	9: 653
2. Banerji, S.K	1963	ibid	10: 182
3. Pradhan, L.B	1956	ibid	3: 141
4. Sekharan, K.V.	1958	ibid	5: 1
5. Sekharan, K.V.	1962	ibid	9: 714
6. Sette	1943 ,1950	U.S. Fish. Bull.	No.50(38): 51(41)
7. Steven	1949, 1952	J.M.B.A. U.K.	28: 30
8. Chidambaram, K, et al	1952	Proc. Ind. Acad.Sci.	35: 43
9. Pathansali, D	1966	IPFC 12th Session	
10. Seshappa, G	1958	Curr. Sci.	27: 262
11. George, K.C and S.K. Banerji	1964	Indian J. Fish.	11: 621.

Plan of work:

1. Sex analysis from random samples.
2. Estimation of maturity stages and fecundity also from randon specimens.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Migration studies in the mackerel, Rastrelliger kanagurta.

Project Code No. FB/PE/Ma. 2.5

Division: Fishery Biology Location: Karwar, Kozhikode, Mangalore, Cochin, Vizhinjam and Mandapam

Title of major project, if any: Mackerel Investigations.

Personnel (Name and Designation)

Project Leader:
G. Seshappa,
Fishery Scientist

Associates:
1. K.V. Sekharan, Junior Fishery Scientist
2. K.V.Narayana Rao, Jr. Fishery Scientist
3. V. Balakrishnan, Asst. Fishery Scientist
4. A. Noble, Assistant Fishery Scientist
5. V.N. Bande, Research Assistant (S.G)
6. P. Livingston, Research Assistant
7. T.M. Yohannan, Research Assistant

Objectives:

To find out the nature of movements of mackerel both during and outside the season among the different water masses along our coasts both near the shore and deeper waters.

Total duration : Continuing Date of initiation: Already in progress

Brief resume of literature:

We do not know at present where the mackerel shoals remain during the off-season period. The day to day catch fluctuations of the fish at different centres during the season will also be closely related to the movements of the shoals. Correct understanding of these trends will be helpful in oroper exploitation of the resource.

George, K.C 1965 Journ. Mar. Biol. Ass. of India 7(1):219

Plan of work:

Tagging to be done periodically according to the facilities and availability of the fish at different centres. Data on recaptured fish to be studied.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Fishery and biology of commercially important anchovies

Project Code No. FB/PE/An. 3.1

Division: Fishery Biology **Location:** Madras, Waltair, Port Blair and Vizhinjam

Title of major project, if any: Anchovy Investigations.

Personnel (Name and Designation)

Project Leader:

P.R.S. Tampi,
Junior Fishery Scientist

Associates:

1. G. Luther, Assistant Fishery Scientist
2. V. Ramamohana Rao, Asst.Fishery Scientist
3. R.Marichamy, Research Assistant

Objectives:

To obtain a correct picture of the fishery, factors relating to fluctuations and seasonal abundance. To study the biology of some of the commercially important species of Anchovies

Total duration: Continuing Date of initiation : 1969.

Brief resume of literature:

Anchovies form an important commercial fishery. In Madras coast alone they vary annually from 10,000 to 20,000 metric tons. They occur irregularly throughout the year. This group mainly comprises Anchoviella Stolephorus, Thryssa and Thryssina. The species distribution varies from place to place. A satisfactory understanding of the composition of the Anchovies is necessary and this is to be followed by a study of the biology of some of the important species under each genus. The distribution of this species is extensive, occurring throughout the tropical and sub tropical regions. Notable among the workers who studied the systematics are Babu Rao (1961), Whitehead (1967) and George (1958). Work done in India on the biology of this group is largely confined to the eggs and larvae by Bal and Pradhan (1946, 1947 and 1951) Bapat (1955), Chacko (1950, 1954), Gopinath (1946), John (1951), Nair (1946, 1952), Vijayaraghavan (1957) and others. Among other aspects

of biology Dharmamba (1960) studied the maturation and spawning habits in S. commersoni and Venkataraghavan (1960) on the food of a few species of Stolephorus. Notable among the workers abroad are Delsman (1921 - 34) Tester (1951 - 55), Kow (1950, 1965, 66, 1966-67) Tiews et al. (1968) and Haitt (1951).

Plan of work:

At Madras a thorough study of the composition of the different genera and species of Anchovies will be attempted before taking up the biological studies on the component species. The catch trends and the biology of Stolephorus spp. will be studied at Vizhinjam and Waltair. Similar work will be carried out on Thrissina at Port Blair.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Biology and fishery of the Bombay duck, Harpodon nehereus

Project Code No. FB/BDO/Bd. 1.1

Division: Fishery Biology | Location of work: Bombay, Veraval (Jaffrabad)

Title of major project: Bombay Duck investigations

Personnel (Name and designation)

Project Leader:

S.V. Bapat,
Jr. Fishery Scientist

Associates:

1. A. Kurian, Research Assistant
2. Research Assistant - Vacant

Objectives:

To study the fluctuations in the catches year after year as in any other major fishery.

To examine the catch for size composition and carry out biological investigations on age, rate of growth, reproduction and spawning behaviour of the Bombay duck.

To study the effect of fishing on the exploited stocks.

Total duration: continuing | Date of initiation: 1969

Brief resume of literature:

In the forties of this century Bombay duck contributed to 2-3% only to the all-India marine fish landings. With the increase in the number of mechanized boats, the catches have enormously increased and in the sixties they have stabilised around 90 thousand tonnes a year, thus gaining the position of a major fishery. On the west coast where it is most abundant it forms 10-13% of the total marine fish landings. Some work has already appeared in the following publication, but many aspects of biology and fishery are yet to be covered.

1. Bapat, S.V., S.K. Banerji and D.V. Bal — 1952 Observations on the biology of Harpodon nehereus (Ham.). J. Zool. Soc. India, 3:341.

2. Bapat, S.V. — 1967 The Bombay duck. Souvenir, CMFRI, P.48

Plan of work:

1. Observations on seasonal and regional Bombay duck landings at selected centres.

2. Biological studies on age and growth, food and feeding, reproduction and breeding periodicity.

3. Delimitation of different stocks by meristic and morphometric methods.

4. Population studies to determine the effect of fishing on the exploited stocks.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Study of catch trends in ribbon fish fishery

Project Code No. FB/PE/Rf. 4.1 FB/BDO/Rf. 2.1

Division: Fishery Biology **Location of work:** Madras, Kakinada, Tuticorin, Kozhikode

Title of major project: Ribbon fish investigations

Personnel (Name and designation)

Project Leader:

P.R.S. Tampi,
Jr. Fishery Scientist

Associates:

1. P.T. Meenakshisundaram, Assistant Fishery Scientist
2. J.C. Gnanamuthu, Research Assistant (S.G.)
3. K.A. Narasimham, Research Assistant (S.G.)
4. Research Assistant - Vacant
5. Junior Scientific Asst. 1

Objectives:

To study the nature and distribution of the ribbon fish stocks and to understand the fishery in order to make a proper assessment of our resources.

Total duration: Continuing **Date of initiation:** 1969

Brief resume of literature:

Ribbon fishes contribute one of the most important food fishes. Their annual landings in Madras coast during the season lasting 4-5 months in a year have been estimated to vary between 8000 and 25000 M. tons. These account for more than half of the all India catch of ribbon fish and constitute 12-36% of the total annual marine fish catch of Tamil Nadu. Some important ferences on this subject are given below:

1. Devanesan, D.W. and K. Chidambaram 1952 The common food fishes of the Madras State. Govt. Press, Madras. 38-39.

2. James, P.S.B.R. 1967 The Ribbon fishes of the family Trichiuridae of India. Memoir I. Marine Biological Association of India. 1-226.

3. Rosa, H. Jr. 1957 A synopsis of biological data on the species of Trichiuridae. FB/57/T, F.A.O. Fish Div. Biol. Br., Rome, 1-81.

4. Vijayagupta, M. 1968 Studies on the taxonomy and fishery of ribbon fishes (Trichiuridae) of the Hooghly estuarine system. Proc. Zool. Soc. Calcutta, 21:137-147.

Plan of work:

Collection of landing data and examination of the catches for species composition at different centres on the east and the west coasts of India.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project:	Biology of commercially important ribbon fishes
Project Code No..	FB/BDO/Rf. 2.2
Division: Fishery Biology	Location of work: Madras, Kakinada, Tuticorin, Kozhikode
Title of major project:	Ribbon fish investigations

Personnel (Name and designation)

Project Leader:

P.R.S. Tampi,
Jr. Fishery Scientist

Associates:

1. P.T. Meenakshisundaram, Asst. Fishery Scientist
2. J.C. Gnanamuthu, Research Assistant (S.G.)
3. K.A. Narasimham, Research Assistant (S.G.)
4. Research Assistant - Vacant
5. Junior Scientific Assistant 1

Objectives:

To study the biology of the commercially important ribbon fishes to get the optimum catches without adverse effects on their stocks.

Total duration: Continuing	Date of initiation: 1969

Brief resume of literature:

Prabhu's account (1955) is perhaps the first comprehensive study on the biology of the ribbon fishes but since its publication our knowledge on the subject has far advanced. The monograph by James (1967) on the Trichiuridae deals with many aspects of biology such as comparative morphology, food and feeding, reproduction in different members constituting the commercial fish catches. Ekman's (1927) on the eggs and larvae of ribbon fishes is the only reliable account on the early stages of these fishes. Biological data have been compiled in an exhaustive synopsis by Rosa (1957). Our knowledge of age and growth, breeding periodicity, spawning grounds and movement of the shoals is yet very incomplete. Hence detailed investigations separately on each of

the important ribbon fish species are contemplated.

1. Delsman, R.C. 1927 Fish egg and larvae from the Java Sea. II The general Trichiurus. Treubia, 9(4): 338-351.

2. James, P.S.B.R. 1967 The Ribbon fishes of the family Trichiuridae of India. Memoir I. Marine Biological Association of India. 1-226.

3. Prabhu, M.S. 1955 Some aspects of the biology of the Ribbon fish, Trichiurus haumela (Forskal). Indian J. Fish., 2(2):132-163.

4. Rosa, H. Jr. 1957 A synopsis of biological data on the species of Trichiuridae. FB/57/T, F.A.O. Fish Div. Biol. Br., Rome, 1-81.

Plan of work:

Depending upon the regional importance, the biology of Eupleurogrammus intermedius, Lepturacanthus savala and Trichiurus lepturus will be studied. These studies will include age determination, food and feeding, maturity and spawning and life history stages of the different species.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Study of catch trends in Carangid fishes

Project Code No. FB/EDO/Ca. 3.1

Division: Fishery Biology **Location of work:** Waltair, Vizhinjam, Kozhikode

Title of major project: Carangid investigations

Personnel (Name and designation)

Project Leader

S. Reuben,
Survey Assistant (S.G.)

Associates

1. P.V. Sreenivasan, Research Assistant
2. Research Assistant - Vacant

Objectives:

To study variations in abundance of carangids in time and space in order to locate new and unexploited fishery resources.

Total duration: Continuing **Date of initiation:** 1969

Brief resume of literature:

Carangids form an important fishery resource. Only meagre information is available in regard to their relative abundance in the inshore and offshore waters. This investigation will help finding out the distribution pattern of the fishes of the group in different grounds and periods of time. Only a few reports are available on the carangid fisheries in general (Devanesan and Chidambaram, 1948; Chacko and Mathew, 1956; Krishna moorthy, 1957; Tandon, 1962; and James 1967) from the southern coasts of India. Where carangids form important fisheries in other countries some valuable information is available; Williams (1956) studied these fishes from the East African waters and Watanabe (1965) from Japanese waters.

Plan of work:

1. Observations on the landings and species composition of Carangids, landed by different boats, including trawlers.

2. Estimation of catch and catch per unit of effort of carangids fished from different grounds in different periods of time by different types of fishing gear.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Fishery biology of the commercially important Carangid species.

Project Code No. FB/BDO/Ca. 3.2

Division: Fishery Biology

Location of work: Waltair, Vizhinjam, Kozhikode

Title of major project: Carangid investigations

Personnel (Name and designation)

Project Leader:

S. Reuben,
Survey Assistant (S.G.)

Associates:

1. P.V. Sreenivasan, Research Assistant
2. Research Assistant - Vacant

Objectives:

To study the fishery biology of Carangoides malabaricus, Caranx crumenophthalmus and other species.

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

There is pausity of information on the biology of Carangids although they are widely distributed and support good fisheries both on the east and west coasts of India. The earlier work on the subject includes studies on Selar kalla by Venkataraman (1962) and Kagwade (1965), on Selaroides leptolepis (Tandon, 1959, 1960, 1961 and 1962) and on Chorinemus lysan (James, 1967). Similar work has been carried out abroad on Decapterus spp. (Soemato, 1958, 1960) from the Indo-Pacific region and on some species of Caranx of the Atlantic region (Berry, 1959).

Plan of work:

1. Studies on age and growth by length frequency measurements.

2. Investigations on feeding habits maturation, size at first maturity, spawning, sex-ratios, fecundity etc. in Carangoides malabaricus at Waltair, Caranx crumenophthalmus at Kozhikode and other carangid species at Vizhinjam.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Fishery and biology of the tunas

Project Code No. FB/BDO/Stb. 4.1

Division: Fishery Biology Location of work: Vizhinjam, Cochin, Bombay, Minicoy.

Title of major project: Seer, Tuna and bill fish investigations

Personnel (Name and designation)

Project Leader	Associates
M.D.K. Kuthalingam, Asst. Fishery Scientist	D.M. Punwani, Asst. Fishery Scientist M.S. Rajagopalan, Asst. Fishery K.K. Appukuttan, Res. Asst/Scientist Jr. Scientific Assistant 1

Objectives:

To study the regional and seasonal catch trends of the tunas.

To study the biology of regionally important tunas constituting the catches, as Euthynnus affinis, and Katsuwonus pelamis.

Total duration: 5 years Date of initiation: 1970

Brief resume of literature:

Detailed investigations on the biology and fisheries of the group would be useful in the rational exploitation and scientific management of these resources. In India much work has been done on the systematics of this group (Jones and Silas, 1964 - Proc. Sym. on Scombroid fishes, Mar. biol Ass. India). Although preliminary observations on the fishery, length composition and certain aspects of the biology of some species have so far been made (Bennet, P.S. 1964 - Proc. Symp. Scombroid fishes, Pt.2:708; Rao, K.V.N, 1964, Ibid., p 733 and Jones, S. 1960, Indian J. Fish 7: p), detailed studies on the biology have not so far been taken up.

Plan of work:

1. Examination of the fish landings for species composition of tunas at selected centres of observations.
2. Investigations to be carried out on: catch and effort; length-weight composition; growth pattern; and spawning behaviour etc.
3. At Cochin biology and fishery of E. affinis will be studied in detail, and at Minicoy on Katsuwonus pelamis.
4. Bait fishes of tunas also will be studied at Minicoy.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Systematics and biology of the common Cynoglossids

Project Code No. FB/BDO/Ff. 5.1

Division: Fishery Biology Location of work: Kozhikode

Title of major project: Flatfish investigations

Personnel (Name and designation)

Project Leader:

G. Seshappa,
Fishery Scientist

Associates:

Objectives:

To understand the biology of the tonguesoles and to study the variability in the different species. This is a very important group of inshore bottom fishes on the west coast. A preliminary study of C. semifasciatus has already been done and the other Cynoglossids also require study.

Total duration: 5 years Date of initiation: 1970

Justification:

This is a very important group of inshore bottom fishes on the west coast and detailed knowledge about them will be valuable for fishery biology. Scientifically the group is extremely interesting because of various peculiarities in morphology and life-history. A preliminary morphometric and systematic study of five important species has already been done and this has justified more extensive and intensive work.

Plan of work:

Collection of samples from different centres and study in the laboratory.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Fishery and biology of Cynoglossus semifasciatus

Project Code No. FB/BDO/Ff. 5.2

Division: Fishery Biology Location of work: Mangalore
Kozhikode

Title of major project: Flatfish investigations

Personnel (Name and designation)

Project Leader:

G. Seshappa,
Fishery Scientist

Associates:

1. A.C.C. Victor, Research Assistant

Objectives:

Evaluation of fishery fluctuations; study of year class strengths, variations in sex composition, maturity, fecundity and food components of this species in relation to environmental factors.

Total duration: Continuing Date of initiation: 1969

Justification:

Knowledge of various aspects included in the programme are essential for understanding the nature of stocks and the fluctuations in the same. The following are the reference for earlier work on the subject:

1. Seshappa, G. and B.S. Bhimachar 1951 Age determination studies in fishes by means of scales with special reference to the Malabar sole. Cur. Sci., 20, 260-262.

2. _____ 1954 Studies on the age and growth of the Malabar sole, Cynoglossus semifasciatus Day. Indian J. Fish, 1:145-162.

3. _____ 1955 Studies on the fishery and biology of the Malabar sole, Cynoglossus semifasciatus Day. Indian J. Fish. 2(1):180-230.

Plan of work:

1. Estimation of catch trends in relation to gears and places.
2. Estimation of size and age trends in the catches.
3. Analysis of samples for sex ratio and maturity.
4. Examination of stomach contents.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Quantitative and Qualitative assessment of fishery resources of the offshore and deepsea fishing grounds.

Project Code No. FB/EDO/Gf. 6.1

Division: Fishery Biology. Location: Bombay, Karwar, Mangalore, Cochin, Vizhinjam, Tuticorin, Mandapam, Waltair.

Title of major project, if any: Groundfish fishery Investigations.

Personnel (Name and Designation)

Project Leader:

K. Virabhadra Rao,
Fishery Scientist.

Associates:

1. T. Tholasilingam, Jr. Fishery Scientist
2. S.V. Bapat, Junior Fishery Scientist
3. K.V. Sekharan, Jr. Fishery Scientist
4. B. Krishnamurthy, Jr. Fishery Scientist
5. M.V. Pai, Assistant Fishery Scientist
6. M.D.K.Kuthalingam, Asst. Fishery Scientist
7. P.V. Kagwade, Assistant Fishery Scientist
8. D.M.Punwani, Assistant Fishery Scientist
9. K.C. George, Assistant Fishery Scientist
10. K. Venkatasubba Rao, Asst.Fishery Scientist
11. M.G. Dayanandan, Asst. Fishery Scientist
12. V. Ramamohana Rao, Asst. Fishery Scientist
13. P. Mozumdar, Research Assistant (S.G)
14. T. Appa Rao, Research Assistant (S.G)
15. K.Hanumantha Rao, Research Assist. (S.G)
16. K. Dorairaj, Research Assistant (S.G)
17. S. Reuben, Survey Assistant (S.G)
18. P. Devadoss, Research Assistant
19. M.K. George, Research Assistant
20. Alexander Kurian, Research Assistant
21. K. Prabhakaran Nair, Research Assistant
22. Junior Scientific Assistants - 5

Objectives:

To evaluate area-wise and region-wise abundance of demersal fishery resources on the continental shelf and the slope of the east and west coasts for different periods of time.

To chart out productive areas for total yields and individual groups of demersal fishes.

To determine the biological and environmental factors responsible for catch fluctuations.

Total duration: Continuing Date of initiation: 1969

Brief resume of literature:

Exploitation of the offshore waters, employing power fishing vessels equipped with trawls and other types of gear has come into vogue in the past seven decades only in this country. The fishing operations carried out in the earlier period were not very successful, but those in the latter part, particularly in the recent past two decades have yielded such tangible results as to pave the way for successful commercial fishing by powered vessels. Apart from the Governmental effort in exploratory fishing operations from different bases, the private sector too has shown much interest in this venture and started commercial fishing with large and medium sized powered vessels from fishing bases at Cochin, Bombay and Visakhapatnam. There are besides nearly 7000 mechanised craft all along the coast. Information on when, where and how much yields of total fishes and category-wise of fishes and prawns could be obtained is furnished by the catch-trends of these vessels. This information is very much necessary to plan out fishing operations avoiding waste of fishing effort in unproductive areas or during unfavourable periods of the year. The discovery of new and productive areas from time to time by exploratory surveys will promote expansion of developmental programmes.

In the Northwestern Division from Bombay to Dwarka the regional abundance of trawl fishes has been assessed for the period 1949-55 (1). Subsequently a fuller picture of the fishery potential of this division upto Kutch has emerged from commercial bull trawling carried out between 1956-1963, (2,3 and 4). In the period 1961-1967, the exploratory fishing by the Government of India vessels has furnished information on the fish and prawn distribution on the continental shelf in 1° latitude zones from 15° N to 24° N (5). Exploratory fishing in this region has also enabled furnishing information on the relative fishing efficiency of vessels of different specifications (6). A very comprehensive account of the distribution pattern of demersal fishes and prawns is given by Rao and others (4) in respect of the other geographical divisions also viz., South-western Division (7,8,9 and 10), the Northeastern Division (11 and 12) and South-eastern Division (13).

The fish distribution pattern is constantly subject to changes and the catch trends have therefore to be studied on a continuous basis. The deeper depths beyond the 50 fathom line have been little explored and we know nothing of the productivity of the continental slope except in the south western coast where recently rich deep sea spiny lobster (Fcurulus sewelli) and deep sea prawn grounds have been located (14 and 15). Practically we know little of the species of the pelagic oceanic complex constituted by the tunas and bill fishes although preliminary observations have indicated that their resources are fairly high in the Indian Ocean(14).

1. Jayaraman, R., G. Seshappa, K.H. Mohamed and S.V. Bapat 1959
Observations on the trawl fisheries of the Bombay and Saurashtra waters, 1949-50 to 1954-55. Indian J. Fish., 6: 58-144.

2. Rao, K. Virabhadra, P.T. Meenakshisundaram and K. Dorairaj 1966
Relative abundance of trawl fishes in the Bombay-Saurashtra waters. J. Mar. biol. Ass. India 8: 205-212.

3. Rao, K. Virabhadra 1967
Exploratory fishing. Souvenir, 20th Anniversary, Central Marine Fisheries Research Institute, Mandapam Camp: 25-36.

4. Rao, K. Virabhadra 1969
Distribution pattern of the major exploited marine fishery resources of India. Bull. cent.mar. Res.Inst., 6: 69 pp.

5. Rao, K.Virabhadra, K. Dorairaj, P.V. Kagwade and D.M. Punwani 1968. Results of the exploratory fishing operations of the Government of India vessels at Bombay base for the period 1961-67. Paper submitted at the Symposium on Demersal Fisheries at the 13th Session of IPFC, Brisbane, Australia, October 1968. Preprint IPFC/C68/Sym 28: 43 pp.

6. Rao, K. Virabhadra and P.T. Meenakshisundaram 1967
Determination of the relative fishing powers (power factors) of the vessels of the Government of India deep sea fishing station, based at Bombay. Indian J. Fish., 11(1)A: 157-174.

7. Bapat, S.V., N. Radhakrishnan and K.N.R. Kartha 1968
A survey of trawl fish resources off Karwar, India. Proc. Indo-Pacif. Fish. Coun., 13th Sess., IPFC/C68/Sym 26: 24 pp.

8. Tholasilingam, T., G. Venkataraman, K.N.K.Kartha and P.K. Nair 1968
Results of exploratory trawl fishing on the continental slope of the South-west coast of India by MFV 'Kalava'. Indian J. Fish. 11 A(2): 548-558 (1964).

9. Tholasilingam, T and G. Venkataraman 1968
A study of the fishery and estimation of relative abundance of ground fish off Cochin. Indian J. Fish., 11A (2): 709-734.

10. Tholasilingam, T., K.C. George, M.G. Dayanandan, P.Karunakaran Nair and K.Nandakumaran 1968
Exploratory trawl fishing and ground fish resources along the Kerala coast and adjacent waters. Paper presented at the Symposium on the Living Resources of the Seas around India, Cochin Central Marine Fisheries Research Institute, Mandapam Camp 9-10

11. Kuthalingam, M.D.K., P. Mozumder and (Late) A.K. Chatterjee 1968
Offshore fisheries resources of the Bay of Bengal Sandheads to Gopalpur. Ibid: 13-14.

12. Sekharan, K.V., M.S. Muthu, K.V.S. Rao, V.R. Rao, P. Mozumder and S Reuben 1968
Exploratory trawling on the continental shelf along the northwest part of the Bay of Bengal. Ibid., 11.

13. Pai, M.V., and P.K.Mahadevan Pillai 1968
Trawl fishery potential of the southwest coast of India. Ibid., 11.

14. Silas, E.G. 1969
Exploratory fishing by R.V. Varuna. Bull. cent. mar. Fish. Res. Inst. 12: 86 pp.

15. Mohamed, K.H. and C. Suseelan 1968
The deep-sea prawn resources of the southwest coast of India. Paper presented at the Symposium on the living Resources of the seas around India, Cochin. Central Marine Fisheries Research Institute, Mandapam Camp: 27.

Plan of work:

A. Drawing up exploratory programmes for fishing vessels.

B. Vessel-wise, area-wise, depth-wise and season-wise analysis of catch data, including estimation of catch-per-unit of effort in respect of total fish and categories of fishes.

C. Charting out productive areas based on catch per unit of effort.

D. Comparison of the catches and catch rates of the exploratory vessels with those of the commercial fishing vessels.

E. Biological investigations of the trawl fishes to determine the size and age composition, breeding periodicity, growth rates and size at recruitment to commercial catches.

F. Participation in the fishing voyages to collect biological and environmental data of the fishing grounds.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Determination of the relative fishing powers of the exploratory vessels.

Project Code No. FB/BDO/Gf. 6.2

Division: Fishery Biology Location: Mandapam Camp, Bombay.

Title of major project, if any: Groundfish fisheries Investigations.

Personnel (Name and Designation)

Project Leader:
K. Virabhadra Rao,
Fishery Scientist

Associates:
1. K. Dorairaj, Research Assistant (S.G)
2. K. Prabhakaran Nair, Research Assistant

Objectives:
To determine the relative fishing powers of some of the fishing vessels of the Government of India, Deep Sea Fishing Station.

Total duration: Continuing Date of initiation: 1969.

Brief resume of literature:

The exploratory fishing vessels operating from different bases vary greatly in their gross tonnage, net tonnage, break horse power, length of body, draught etc. even though most of them use very similar types of otter trawls. The fishing capacity of the different types of vessels depending upon their specifications varies a great deal. Standardisation of the fishing time according to their fishing powers (1 and 2) is very essential, for assessing ground productivity and seasonal abundance with reference to fishery yields. Work on this project was initiated in 1963 and some useful results have been obtained in respect of three of the exploratory fishing vessels of Bombay base viz., M.F.V. Jheenga, M.F.V. Bumili and M.L. Meera (3).

1. Beverton, R.J.H. and Holt, S.J. 1957 - On the dynamics of exploited fish populations. Fish. Invest. Ser.II: 172-179

2. Gulland, J.A. 1956 - On the Fishing Effort in English Demersal Fisheries. Fish. Invest., Ser. II, 20(5)

3. Rao, K. Virabhadra and P.T. Meenakshisundaram 1967 - Determination of the relative fishing powers (power factors) of the vessels of the Government of India Deep Sea Fishing Station based at Bombay. Indian J. Fish., 11(1) A: 157-174.

Plan of work:

A) Analysis of catch data of simultaneous fishing operations in the same areas and in the same months by different fishing vessels. For this purpose the operations of M.T. Kalyani IV, M.T. Kalyani V, M.F.V. Meenabharathi and a few smaller vessels will be taken.

B) The ratio of catches obtained in 100 hours of fishing effort by catch of the different vessels will be worked out to represent their power factors.

C) Power factor values will be compared with gross tonnage, net tonnage B.H.P. and length of the vessels for the purpose of finding out suitable indices which are proportional to the relative power factor values.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE,
(I.C.A.R.)
Mandapam Camp

Title of Project: Estimation of the total demersal fishery resources and potential sustainable yields of the continental shelf bordering the east and west coasts.

Project Code No. FB/BDO/Gf. 6.3

Division: Fishery Biology Location: Mandapam Camp.

Title of major project, if any: Groundfish fisheries Investigations.

Personnel (Name and Designation)

Project Leader:
K. Virabhadra Rao,
Fishery Scientist.

Associates:
K. Dorai raj,
Research Assistant (Selection Grade)

Objectives:

To make on objective assessment of the exploitable demersal fisheries resources on the continental shelf.

Total duration: Two years in the first instance Date of initiation: 1970.

Brief resume of literature:

It is necessary to ascertain the density distribution of total and individual groups of fishes on the shelf in different regions for formulation of programmes for exploitation. The expansion of the developmental programmes depends upon the regional abundance of the resources. Objective assessment of the resources on regional basis helps rational exploitation regulating fishing intensity.

Plan of work:

A) Estimation of the total exploitable area of the shelf in each region.

B) Estimation of square area per trawling hour (mouth width of the trawl will be basis for calculation) and catch per trawling hour.

C) Computation of total resources for a region based on the extent of area and the yield rate per hectare.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp.

Title of Project: Studies on the fishery biology of Muraenesox talabonoides.

Project Code No. ME/BIO/Sc. 7.1

Division: Fishery Biology Location: Bombay.

Title of major project, if any: Eel Investigations.

Personnel (Name and Designation)

Project Leader: Associates:

M.K. George, Research Assistant

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Objectives:

To study the biology of the eel, Muraenesox talabonoides, with reference to its fishery.

Total duration: Initially for 3 years Date of initiation: 1969

Brief resume of literature:

Information on the biological aspects of Muraenesox talabonoides, which is the commonest eel species obtained in the trawl and other types of gear from the North-Western coastal and offshore waters is lacking. This species has a wide distribution over Indo-Pacific region and is of International importance. There is the possibility of increasing production by an adequate study of its distribution, habits, habitat etc. Taxonomy and distribution of the commercial eel species is fairly known from published works. Studies on aspects of biology in relation to fishery are not attempted by any other organisations in India. However, racial studies, etc. of eel species occurring in the landings is attempted in Hongkong and the work is in progress. Some important references on the subject are given below:

1. Bal, D.V and K.H. Mohamed 1957 - A systematic account of the eels of Bombay. J. Bombay Nat. Hist. Soc. 54(3): 732-740

2. Nair, R.V and K.H. Mohamed 1960 - Studies on the leptocephali of Bombay waters: the metamorphosing stages of Muraenesox talabonoides. Proc. Indian Acad. Sci. 52 B: 147-168.

3. Williamson, G.R. 1967 - Conger Pike Eels (Muraenesox sps.) provide potential for development. Ocean Fisheries, Oct.1967 Vol.3(4)

Plan of work:

Distribution in time and space, growth rate, maturation, breeding biology and population dynamics will be studied.

These studies will be based on the inshore and offshore fish landings at Bombay.

* Coordinator: P.V. Kagwade, Asst. Fishery Scientist.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the fishery and biology of commercially important sciaenids.

Project Code No. FB/BDO/Sc. 8.1

Division: Fishery Biology

Location: Veraval, Bombay, Kozhikode, Cochin, Mandapam, Madras, Waltair.

Title of major project, if any: Sciaenid fishery Investigations.

Personnel (Name and Designation)

Project Leader:

T. Tholasilingam,
Jr. Fishery Scientist

Associates:

1. V. Sadasivan, Jr. Fishery Scientist
2. S.J. Rajan, Asst. Fishery Scientist
3. T. Appa Rao, Research Assistant (S.G.)
4. R.S. Lalmohan, Survey Assistant (S.G)
5. P. Devadoss, Research Assistant
6. K.V. Somasekaran Nair, Research Assistant
7. K. Prabhakaran Nair, Research Assistant
8. Junior Scientific Assistants - Two

Objectives:

To study the catch trends, biology and fishery of commercially important sciaenids.

Total duration: Continuing Date of initiation: 1969

Brief resume of literature:

The bulk of the ground fish is constituted by a number of sciaenid groups in all regions. The major sciaenids like Pseudosciaena diacanthus and Otolithoides brunneus are high quality fishes growing to a very large size. The latter species is showing some declining trends in the past ten years. The lesser group of smaller sciaenids like Otolithus ruber, O. argenteus, Johnius dussumieri, J. carruta, Pseudosciaena sina, P. aneus P. axillaries, P. vogleri, etc. form the enormous proportion in the total landings of demersal fishes. While some aspects of biology of P.diacanthus and a few other species are so far partially studied, there is no information on the fishery and biology of a large number of other species. It is therefore necessary to study the biological aspects which have bearing on these fisheries. Similar studies are undertaken in all the tropical waters where these groups abound. Some of the papers published on sciaenids are given below:

1. Annigeri, G.G. 1963. Maturation of the intraovarian eggs and the spawning periodicities in a few fishes of Mangalore based on ova-diameter measurements. Indian J. Fish., Vol. x, No.1: 23-32.

2. Bal, D.V. and Bapat, S.V 1949. The food habits of some young Sciaenids, Proc. 36th Indian Sc. Congr. 162-163.

3. Jacob, P.K and B. Krishnamurthy 1948 Sciaenids of the west coast of Madras province. J. Bombay nat. Hist. Soc. 47: 663-668.

4. Narayanan Kutty, M 1961. Scales and otoliths of the 'Koth' Otolithoides brunneus (Day) as age indicators. Indian J. Fish. Vol. VIII (1): 145-151.

5. Rao, T. Appa 1967. Maturity and spawning habits of some sciaenids in offshore waters at Visakhapatanam. Indian J. Fish 11 A(1): 122-126.

6. Rao, K. Venkatasubba 1962. Studies on the age determination of 'Ghol', Pseudosciaena diacanthus (Lacepede) by means of scales and otoliths. Indian J. Fish. 8(1): 121-126.

7. Yazdani, G.M. 1966. On systematic position of Sciaena ophiceps Alcock, with a key to the genera of the Indian Sciaenidae. Jour. Zool. Soc. India 15(1): 64-65.

Plan of work:

Study of catch trends of sciaenids in the inshore and offshore fish landings in respect of the selected species.

Study of food and feeding habits, age, growth, spawning, breeding behaviour, etc.

Study of morphometric characters.

Biological studies on Otolithus ruber will be made at Veraval and Kozhikode, on O. argenteus at Cochin, on Johinus dussumieri at Veraval and Bombay, on J. carruta at Kozhikode, on Pseudosciaena sina at Kozhikode, Cochin and Madras, on P. aneus at Madras and Waltair, on P. ogleri at Madras, on P. axillaries at Kozhikode, on P. diacanthus at Bombay, on Sciaena dussumieri at Kozhikode and on Otolithoides brunneus at Bombay. In addition to biological work on Wak dussumieri and Pennalius aneus, taxonomy of the group as a whole will be attempted at Mandapam.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Catch trends and species composition of silver bellies and silver biddies.

Project Code No. FB/BDO/Sb. 9.1

Division: Fishery Biology **Location of work:** Mandapam , Madras, Waltair

Title of major project, if any: Silver belly investigations

Personnel (Name and designation)

Project Leader:

G. Venkataraman,
Jr. Fishery Scientist

Associates:

1. K. Venkatasubba Rao, Assistant Fishery Scientist
2. J.C. Gnanamuthu, Research Assistant(S.G.)
3. Junior Scientific Assistant 1

Objectives:

To study the catch trends and species composition of silver bellies and silver biddies.

Total duration: Continuing **Date of initiation:** 1969

Brief resume of literature:

Silver bellies and silver biddies constitute an important fishery along the east and west coasts of India. They form sizable proportion in the trawler catches also. Investigations on the subject will be very useful in the assessment of the catch potential and the proper exploitation and management of the resources. Some references on the different species of silver bellies and silver biddies reported from Indian waters are given below:

1. Bhimachar, B.S. and G. Venkataraman 1952 A preliminary study of the fish population along the Malabar coast. Proc. Nat. Inst. Sci., 18(6):627-655.

2. Basheeruddin, S. and K.N. Nayar — 1962 A preliminary study of the juvenile fishes of the coastal waters off Madras city. Indian J. Fish., 6(1): 169-180.

3. James, P.S.B.R. — 1969 Leiognathus leucisous (Gunther) and L. smithursti (Ramsay Ogilby) (Family Leiognathidae: Pisces) - Two new records from Indian seas. J. Mar. biol. Ass. India, 9(2):300.

Plan of work:

1. Collection of data on the total landings, species composition of silver bellies and silver biddies.

2. Estimation of catch per unit effort from different regions.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project:	Studies on the fishery biology of common silver bellies and silver biddies.
Project Code No.	FB/BDO/Sb. 9.2
Division: Fishery Biology	Location of work: Mandapam, Madras, Waltair
Title of major project, if any:	Silver belly investigations

Personnel (Name and designation)

Project Leader:

G. Venkataraman,
Jr. Fishery Scientist

Associates:

1. K. Venkatasubba Rao, Assistant Fishery Scientist
2. J.C. Gnanamuthu, Research Assistant (S.G.)
3. Junior Scientific Assistant 1

Objectives:

To study the fishery biology of some common silver bellies and silver biddies.

Total duration: Continuing	Date of initiation: 1969

Brief resume of literature:

As silver bellies and silver biddies form a sizable part of the commercial fishery, it is essential to gather information on the various aspects of their biology such as age, rate of growth, food and feeding habits, for rational exploitations of the fishery resources.

Some aspects of the biology of two species of Leiognathus namely, L. splendens and L. bindus have been worked out by Arora (1951) and Balan (1963). The food and feeding habits of a few species of Leiognathus, Secutor and Gerres have been studied by Venkataraman (1960), Kuthalingam (1958) and Chacko (1949). Physiological studies concerning the reproductive cycles and lipid levels in L. splendens have been made by Satyanarayana Rao (1967).

1. Arora , H.L. 1951 A contribution to the biology of Silver belly, Leiognathus splendens (Cuv.). Sec. II. Proc. Indo-Pacific Fish. Counc. 1-6.

2. Balan V. 1962 Biology of the Silver belly, Leiognathus bindus (Val.) of the Calicut Coast. Indian J. Fish. 10(1):

3. Chacko P.I. 1949 Food and feeding habits of the fishes of the Gulf of Mannar. Proc. Indian Acad. Sci. 29:83.

4. Kuthalingam M.D.K. 1958 The food and feeding habits of some young Silver bellies. J. Mad. Uni. 1:13-22.

5. Satyanarayana Rao K. 1967 Reproductive cycles and lipid levels in L. splendens (Cuvier). J. Mar. biol. Ass. India, 9(2):303-332.

6. Venkataraman G. 1960 Studies in the food and feeding relationships of the Inshore fishes off Calicut on the Malabar coast. Indian J. Fish, 7:275-306.

Plan of work:

1. Determination of age and rate of growth by length frequency method.

2. Studies on food and feeding habits, maturity, fecundity and spawning by standard methods.

Biological studies will be carried out on Secutor insidiator at Madras and on Leiognathus bindus at Waltair. Work at Mandapam will be confined to some common species of Silver biddies.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the fishery and biology of the commercially important perches.

Project Code No. FB/BDO/Pc. 10.1

Division: Fishery Biology

Location: Waltair, Madras, Mandapam, Port Blair, Cochin and Bombay.

Title of major project, if any: Percoid fishery Investigations.

Personnel (Name and Designation)

Project Leader:

B.Krishnamoorthi,
Jr. Fishery Scientist

Associates:

1. K.V. Narayana Rao, Jr.Fishery Scientist
2. K. Rengarajan, Asst. Fishery Scientist
3. P.T.Meenakshisundaram, Asst. Fishery Scientist
4. Syed Basheeruddin, Asst. Fishery Scientist
5. K.C. George, Asst. Fishery Scientist
6. C.R. Shanmughavelu, Asst. Fishery Scientist
7. M.G. Dayanandan, Asst. Fishery Scientist
8. P. Nammalwar, Research Assistant
9. Lab.-cum-Field Assistant - One

Objectives:

To study the fishery and biology of Lactarius lactarius, Nemipterus japonicus, Pomadasys hasta, Platycephalus sp., Lutianus kasmira, Lutjanus lineolatus and other species.

Total duration: Continuing Date of initation: 1969

Brief resume of work:

Perches as a group form a commercial fishery of regional importance. The magnitude of catches from the offshore fishing grounds is considerably high. Very little is known on the fishery and biology of a large number of species of this group. The present study will help understanding the size and age composition of the commercial fish species of the group, their growth pattern, food and feeding habits etc. Some references on this subject are given below:

1. Krishnamoorthy, B An assessment of Nemipterus fishery off Andhra coast based on exploratory trawl fishing. Proc. Symp. Living Resources of the seas around India (In Press)

2. Prabhu, M.S. 1954 The perch fishery by special traps in the area around Mandapam in the Gulf of Mannar and Palk Bay. Indian J. Fish. 1: 94.

3. Alverson, D.L and Sigurd, J.D. 1961 A review on the taxonomy and biology of the Pacific Ocean Perch and its fishery.

4. Mio Shi - Ichi 1965 The determination of the age and growth of Nemipterus virgatus (Houff.). Bull. Jap. reg. Fish. Res. Lab. No.15: 79.

Plan of work:

1. Estimation of catch abundance in inshore and offshore landings.

2. Analysis of commercial catches for determining age, growth rate and size composition of the populations supporting the fishery.

3. Quantitative and qualitative study of stomach contents to determine the food habits and food preferences.

4. Study of sex ratio, spawning periodicity, fecundity and breeding habits.

5. Statistical analysis of some of the morphometric and meristic characters.

Biological studies on L. lactarius will be carried out at Mandapam and Madras; on M. japonicus at Cochin, Madras and Waltair; on Platycephalus sp. at Cochin; on P. hasta at Bombay and L. kasmira at Port Blair. In addition to the work on L. lineolatus, studies on taxonomy and fishery biology of the other commercially important species of snappers of the family Lutjanidae, will be carried out at Mandapam.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)

Title of Project: Fishery trends and species composition of cat fishes

Project Code No.FB/BDO/Cf. 11.1

Division: Fishery Biology Location of work: Bombay, Waltair

Title of major projects, if any: Cat fishes investigations

Personnel (Name and designation)

Project Leader:

B. Krishnamoorthy,
Jr. Fishery Scientist

Associates:

1. A.S. Kaikini, Asst. Fishery Scientist
2. P. Mujumdar, Research Assistant (S.G.)
3. K. Hanumanta Rao, Research Assistant (S.G.)

Objectives:

To study variations in catch trends in space and time of cat fish species constituting the commercial catches.

Total duration: Continuing Date of initiation: 1969

Justification:

Cat fishes form an important fishery resource. They are abundant in certain regions. The study of catch trends will help in increasing the total output in regions where the fishery is of importance.

Plan of work:

1. Observations on the cat fish catches by exploratory and commercial vessels for species composition.

2. Estimation of the catches and catch per unit effort from different regions and different grounds.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the fishery biology of the common cat fishes

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Project Code No. FB/BDO/Cf. 11.2

Division: Fishery Biology Location of work: Bombay, Waltair

Title of major project, if any: Cat fish investigations

Personnel (Name and designation)

Project Leader:

B. Krishnamoorthy,
Jr. Fishery Scientist

Associates:

1. A.S. Kaikini, Asst. Fishery Scientist
2. P. Mujumdar, Research Assistant (S.G.)
3. K. Hanumanta Rao, Research Assistant (S.G.)

Objectives:

To study the various aspects of the fishery biology of Tachysurus thalassinus, T. tenuispinis and T. dussumeri.

Total duration: Continuing Date of initiation: 1969

Brief resume of literature:

The existing knowledge on this subject is meagre. Detailed investigations on the biology are necessary for formulating development programmes for rational exploitation of the resource. Brief notes, based on the casual observations on the maturity and food of T. thalassinus and a few related species in the Indian region are available (Jenkins, 1910; Raj, 1916; Chidambaram, 1941, Devanesan and Chidambaram, 1948). Singh and Rege (1968) have made a preliminary study of the annual growth of T. sona at Bombay. Some work has also been done on the parental care and food of some of the species occurring in Ceylon (Willy, 1919, Pertwee, 1913) and in west Africa (Longhurst, 1957).

Plan of work:

1. Study of food by examination of stomach contents.
2. Determination of age and rate of growth by length frequency and other methods.
3. Studies on maturity, fecundity and spawning.

T. thalassinus and T. tenuispinis will be studied at Waltair and T. dussumeri at Bombay.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Biology and fishery of the chief Polynemids

Project Code No. FB/BDO/Pol. 12.1

Division: Fishery Biology Location of work: Bombay, Mandapam

Title of major project, if any: Polynemid investigations

Personnel (Name and designation)

Project Leader:

Mrs. P.V. Kagwade,
Asst. Fishery Scientist

Associates:

1. K. Dorairaj, Research Assistant (S.G.)

Objectives:

To study the fishery and biology of polynemid fishes, with a view to understanding the causes behind fluctuations in catch abundance.

Total duration: Initially for 3 years Date of initiation: 1969

Brief resume of literature:

In the world polynemid fisheries, India ranks high occupying first or second place. Some species like Polydactylus indicus ('Dara') and Eleutheronema tetradactylum ('Rawas') are highly esteemed table fishes and grow to over a metre in size. Some of the smaller species too like Polynemus heptadactylus ('Shende') and Polynemus sextarius support fisheries of some importance. 'Dara' has declined considerably in the catches in recent years and the causes behind these are not yet known. Detailed account of the biology of P. heptadactylus has now been known based on the work of this Institute in the earlier period. It is necessary to understand fully the biological aspects of the larger species like 'Dara' and 'Rawas'. Work on these lines is not attempted by any other organisation in India.

There is a fairly good knowledge about the food composition and spawning in P. indicus and E. tetradactylum. The age of P. indicus has been determined for the first three years of its life by the length frequency method. There are good indications of scales being useful in reading the age of this fish upto 7 years. The presence of hermaphroditism has been reported in all these three species. There is differential size distribution in P. indicus.

A broad biology of two polynemids Pentanemus quinquarius (Bloch) and Galeoides decadactylus (L.) from West Africa has been studied. Based on these studies valuable information on the growth, maturation, sex ratio and change in these two species are now available. Length frequency and spawning have also been studied on Polydactylus opercularis and P. approximaus, from offshore waters of the Eastern Tropical Ocean. Some important references are given below:

1. Kagwade, P.V. 1968 Polynemid fishery resources of India. I.C.A.R. symposium on the living resources of the seas around India. (Abstract appeared in Adv. Abstr. Contr. Fish. Aquat. Sci. India, 2 (4):70-71

2. Karndikar, K.R. and Palekar, V.C. 1950 Studies on the ovaries of Polynemus tetradactylus (Shaw) in relation to its spawning habits. J. Univ. Bombay, 19 (3):21.

3. Malhotra, J.C. 1953 The food and the feeding habits of the so-called Indian Salmon, Eleutheronema tetradactylum (Shaw). J. Zool. Soc. India, 5:139-52.

4. Mohamed, K.H. 1955 Preliminary observations on the biology and fisheries of the thread-fin, Polydactylus indicus Shaw in the Bombay and Saurashtra waters. Indian J. Fish. 2:164-179.

5. Nayak, P.D. 1959 Occurrence of hermaphroditism in Polynemus heptadactylus. Cuv. & Val. J. Mar. biol. Ass. India, 1(2), 257-259.

6. Klawe, W.L. and Alverson, F.G. 1964 Occurrence of two species of young thread-fin, Polydactylus opercularis, in the offshore waters of the eastern tropical Pacific Ocean. Pacific Science, 18, (2):166-173.

7. Longhurst, A.R. 1965 The biology of West African polynemid fishes. J. Cons., 30(1):58-74.

8. Qureshi, M.R. and Burney, M.A. 1952 A preliminary report on the trawling in Pakistan. Invest. Report No.1, Government of Pakistan Press, Karachi.

Plan of work:

1. Study the catch trends of polynemid species individually, from the inshore and offshore fisheries.

2. Investigate biological aspects as age and growth by length frequency method and reading the growth checks on the scales and otoliths, longevity, length weight relationship, food and feeding habits and maturation by standard methods.

3. Study of morphometric and meristic characters to ascertain the racial stocks, if any.

4. Work at Mandapam will be confined to the fishery and biology of Polynemus sextarius.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the fishery and biology of white pomfret Pampus argenteus

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Project Code No. FB/BDO/Pom. 13.1

Division: Fishery Biology Location of work: Bombay, Veraval

Title of major project, if any: Pomfret investigations

Personnel (Name and designation)

Project Leader:

Asst. Fishery Scientist - Vacant

Associates:

1. Kuber Vidyasagar , Research Assistant (S.G.)

Objectives:

To study the biology and fishery of Pampus argenteus

Total duration: Initially for 3 years Date of initiation: 1970

Brief resume of literature:

Pomfret is one of our most valuable fishes and it forms good fishery at Bombay and Veraval, constituting nearly 3% of the marine fish landings. Only preliminary studies have so far been carried out on P. argenteus. It is therefore essential to collect information on the life history and biology of this species. Some references on the subject are given below:

1. Sivaprakasam, T.E. 1965 Observations on the maturation and spawning of the brown pomfret, Parastromateus niger (Bloch) in Saurashtra waters. J. Bombay nat. Hist. Soc., 62(2):245-253.

2. _____ 1967 Observations on the food and feeding habits of Parastromateus niger of the Saurashtra coast. Indian J. Fish, 10:

3. Kuthalingam, M.D.K. 1967 Observations on the fishery and biology of the silver pomfret, Pampus argenteus (Euphrasen) from the Bay of Bengal. Indian J. Fish, 10:

Plan of work:

1. Observe the seasonal catch trends.
2. Carry out biological investigations on feeding, breeding habits, maturation etc.
3. Determination of age, growth and recruitment rates.
4. Study of size/age composition of the catches.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project:	Investigations on pelagic and bathypelagic fishes with special reference to their taxonomy, distribution and spawning behaviour
Project Code No.	FB/EDO/Dis. 14.1
Division: Fishery Biology	Location: Cochin
Title of major project, if any:	Fish distribution in relation to oceanographic conditions.

Personnel (Name and designation)

Project Leader:

E.G. Silas,*
Jr. Fishery Scientist

Associates:

1. M.S. Rajagopalan, Asst. Fishery Scientist
2. V. Kunjukrishna Pillai, Research Assistant
3. G.S.D. Selvaraj, Research Assistant
4. M. Meiyappan, Research Assistant
5. A. Regunathan, Research Assistant
6. M. Rajagopalan, Tech. Assistant

Objectives:

To investigate the qualitative aspects of demersal, midwater and pelagic fishes caught by various exploratory fishing gears employed by R.V. Varuna and other vessels associated with her from the continental shelf, the continental slope and the oceanic waters.

To study the demersal fish complexes and associated organisms occurring in relation to different depth zones of the continental shelf and continental slope.

To investigate aspects of the biology particularly, the feeding habit and reproduction in the more dominant species of the different fish complexes at different depth zones.

To investigate ... maturity and spawning behaviour of pelagic and deep water fishes caught in exploratory surveys.

To assess the potential fishery resources based on exploratory surveys and also in relation to hydrographic conditions.

To study the importance of exploratory surveys in obtaining correlation between the ichthyofauna and the abundance of fish eggs and larvae.

Total duration: 4 years Date of initiation: 1969

Brief resume of literature:

Till very recently, large scale exploratory fishing in Indian seas have been confined to demersal fishing from depths upto 75 M on the continental shelf. Since 1963 a systematic programme of exploration of the deep waters especially the continental shelf edge and the upper continental slope off the South West coast of India for the demersal fish resources was undertaken (75 to 450 M) by R.V. Varuna and other vessels of the I.N.P. These surveys have thrown light on the important demersal fishing grounds and potential demersal fish resources. Several fishes, crustaceans and molluscs hitherto unknown from these waters are found to occur in fairly abundant concentration in deep waters.

For the first time during the exploratory fishing cruises of R.V. Varuna and other vessels associated with her, drift nets and purse seines have been used for pelagic fishes such as tunas with interesting results.

1. Rao, K.V. 1969 Bull. cent. mar. Fish. Res. Inst. No.6, pp.1-69.

2. Silas, E.G. 1969 Ibid., No.12, pp.1-86.

3. Silas, E.G., G.S.D. Selvaraj and A. Regunathan 1969 Curr. Sci. 38(5):105-6.

4. Silas, E.G. and N.K. Prasad 1969 Curr. Sci. 38(20):484-486.

5. George, M.J and P.V. Rao, 1966 Proc. symposium on Crustacea Pt.I:pp.327-336.

Plan of work:

Since several species of fish obtained from the continental slope and oceanic waters are new distributional records for India, the preparation of suitable taxonomic information will facilitate their future identification. Such documentation will also be helpful in the identification of eggs and larvae of fishes from the plankton.

1. Regular participation in the exploratory surveys for obtaining samples of most of the abundant species for investigations on feeding habits and spawning behaviour.

2. Echo surveys to be carried out for investigation of fish concentrations and fishing grounds.

3. Assessment of potential fishery resources based on exploratory fishing data.

*Cordinator: Head of the Division of Fishery Biology

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of the Project: Stock assessment of prawns and shrimps

Project Code No. FB/CF/Pr. 1.1

Division: Fishery Biology

Location: West coast of India - Veraval, Bombay, Karwar, Mangalore, Kozhikode, Cochin, Colachel.
East coast of India - Mandapam, Madras, Kakinada.

Title of major project, if any: Prawn and Shrimp investigations

Personnel (Name and designation)

Project Leader:

K.H. Mohamed, Fishery Scientist

Associates:

1. S. Ramamurthy, Asst. Fishery Scientist
2. M.S. Muthu, Asst. Fishery Scientist
3. Mydeen Kunju, Asst. Fishery Scientist
4. K. Radhakrishna, Asst. Fishery Scientist
5. P. Vedavyasa Rao, Asst. Fishery Scientist
6. V.M. Deshmukh, Asst. Fishery Scientist
7. C.S. Gopinadha Pillai, Sr. Research Assistant.
8. M.M. Thomas, Research Assistant (S.G.)
9. N. Neelakanta Pillai, Research Assistant (S.G.)
10. M. Aravindakshan, Research Assistant (S.G.)
11. K.Y. Telang, Research Assistant (S.G.)
12. Kuber Vidyasagar, Research Assistant (S.G.)
13. G. Sudhakar Rao, Research Assistant (S.G.)
14. N. Surendranatha Kurup, Research Assistant
15. K.N. Rajan, Research Assistant
16. C. Suseelan, Research Assistant
17. D. Sivalingam, Research Assistant

18. P.E. Samson Manickom, Research Assistant
19. K. Devarajan, Research Assistant
20. K.K. Sukumaran, Research Assistant
21. K.V. George, Survey Assistant
22. K. Rajasekharan Nair, Survey Assistant
23. M. Kathirvel, Survey Assistant
24. Laboratory cum Field Assistants 2

Objectives:

To collect and maintain accurate resources data in respect of all important species of prawns and shrimps in order to study the intensity and sequence of occurrence in the commercial catches. To keep watch on the effect of fishing on stock and to advise management policies as and when required to ensure maximum sustained yield.

Total duration: Continuing Date of initiation: 1969

Brief resume of literature:

Prawns and shrimps form 96.42% of the average annual crustacean production, which amounts to 10.89% of the annual marine fish production. In the annual landings of prawns and shrimps from 1957 to 1969 although showed minor fluctuations in a few years, the data depict a general rising trend and the fluctuations are found to be random in nature.

Trend of prawn landings and their fluctuations at different centres of the coasts, percentage contribution, seasonal occurrence and distribution, size composition of each species contributing to the fishery have been studied.

The population structure and effects of exploitation on prawn stock of some areas have been studied to some extent. The prawn catch from the marine region consists mainly of the 0-year and 1st year class in the case of smaller species such as Metapenaeus dobsoni and Parapenaeopsis stylifera and 1st and 2nd year class in the case of larger species such as M. affinis, M. monoceros and P. indicus. In M. dobsoni it has been shown that fluctuation in the catch is mainly due to the abundance of 0-year class. Estimates of mortality rate of M. dobsoni has been studied. Data are, however, incomplete in the case of other commercially important species.

1. Panikkar, N.K. and M.K. Menon 1956 Proc. Indo-Pacif. Fish. Counc., 6(3): 328-344.

2. Banerji, S.K. and M.J. George 1967 Proc. Symp. on Crustacea, Mar. biol. Ass. India, Part II: 634-648.

3. George, M.J., K. Raman and P. Karunakaran Nair 1968 Indian J. Fish. 10A(2):462-499.

4. George, M.J., S.K. Banerji and K.H. Mohamed 1968 FAO Fish. Rep. 57(2):265-284.

5. Prawn Fisheries of India, Central Marine Fisheries Research Institute, Bull. 14, 1-303.

Plan of work:

1. Regular random samples of prawns landed by different gears will be obtained separately from three different environments viz., estuaries, inshore seas and offshore seas. These collections will be made from different centres on both the coasts of India.

2. The collections will be analysed in detail in the laboratory and all biological data on each of the species will be recorded. Size distribution, sex ratio, maturity etc. will be recorded for each species.

3. Mean size of all commercial species of prawns will be estimated and recorded on yearly basis from each of the centres.

4. The data will be maintained in a specially designed form in permanent registers.

5. Significant fluctuations in mean size and annual catch if noted will be immediately reported.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Biology and life history of the prawns of genus Penaeus.

Project Code No.FB/CF/Pr. 1.2

Division: Fishery Biology

Location: Karwar, Cochin, Mandapam, Kakinada

Title of the major project, if any: Prawn and shrimp investigations

Personnel (Name and designation)

Project Leader:

K.H. Mohamed, Fishery Scientist.

Associates:

1. M.S. Muthu, Asst. Fishery Scientist (on long leave)
2. M.M. Thomas, Research Assistant (S.G.)
3. K.Y. Telang, Research Assistant (S.G.)
4. K. Devarajan, Research Assistant

Objectives:

To elucidate the various biological aspects such as age and growth, food and feeding habits, maturation, spawning and fecundity, migration and behaviour of the commercially important prawns of the genus namely, 1) P. indicus, 2) P. merguiensis, 3) P. monodon, 4) P. semisulcatus. The life history of the species to be worked out in detail.

Total duration: 4 years

Date of initiation: 1969

Brief resume of literature:

Eight species of the genus are represented in Indian waters and most of them support commercial fisheries in many parts of the Indo-Pacific region. The biology of the Indian prawn Penaeus indicus which is the backbone of India's prawn export industry, has been investigated only to some extent. Different opinions have been expressed regarding the age and rate of growth, age and size at first sexual maturity and breeding seasons. The migratory pattern of the species in the fishing grounds and their recruitment have not been fully investigated. The spawning grounds have not been demarcated so far, although it is known to breed in the offshore waters.

Available literature on the various aspects of the biology and life history of P. monodon and P. semisulcatus and P. merguiensis is scanty. Food and feeding habits of the species have been studied. These species migrate into the estuaries and backwaters early in life but their movement

in the sea has not been followed. No information is available on their age and growth, maturation, spawning and reproduction. Some important reference are indicated below:

1. Hall, D.N.F. 1962 Observations on the taxonomy and biology of some Indo-West Pacific Penaeidae (Crustacea, Decapoda). Fish. Publ. Colonial Off., London, 17:1-229.

2. Gopalakrishnan, V. 1952 Food and feeding habits of Penaeus indicus. M. Biw. J. Madras Univ., 22B(1):

3. George, M.J. 1962 Observations on the size group of Penaeus indicus (Milne Edwards) in the commercial catches of different nets from the backwaters of Cochin. Ibid., 9(2):468-475.

4. Panikkar, N.K. and M.K. Menon 1956 Prawn fisheries of India. Proc. Indo-Pacific Fish. Counc., 6(3):328-344.

5. Mohamed, K.H. 1967a A synopsis of biological data on penaeid prawn Penaeus indicus H. Milne Edwards 1837. FAO World Scientific Conference on the Biology and Culture of Shrimps and Prawns, Mexico, FR:BSCP/SS/4.

6. _____ 1967b A synopsis of biological data on jumbo tiger prawn Penaeus monodon Fabricius 1798. Ibid., FR:BSCP/SS/3.

7. George, M.J. and K.H. Mohamed 1966 An assessment of marine prawn fishery resources of Kanyakumari District, South-west coast of India. Proc. Indo-Pacif. Fish. Counc. 12th Sess.

8. Delmendo, M.N. and H.R. Rabanal 1956 Rate of growth of the Sugpo (jumbo tiger shrimp) Penaeus monodon Fabricius with notes on its culture in brackish water ponds. Indo-Pacif. Fish. Coun., 6th Sess., 5:12 pp.

9. Yesuda, J. 1956 Shrimps of Seto Inland Sea of Japan. Proc. Indo-Pacif. Fish. Counc., 6th Session, Sections II and III:378-386.

10. Kubo, I. 1956 A review of the biology and systematics of shrimps and prawns of Japan. Proc. Indo-Pacif. Fish. Counc., 6th Sess. (2'3):16.

Plan of work:

1. Regular samples will be collected from commercial catches and detailed analysis of size, sex and maturity will be carried out.

2. Age and rate of growth will be determined by length frequency method and if possible by direct observation.

3. Food and feeding habits of each species will be studied by analysing the stomach contents and by direct observation.

4. Spawning behaviour and fluctuation in the spawning population will be recorded by analysing the distribution of maturing stages of prawns in the catches.

5. Migration pattern to be studied from the data on size and distribution of species at different depths and areas.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of the Project: Biology and life history of the prawns of the genus Metapenaeus.

Project Code No.FB/CF/Pr. 1.3

Division: Fishery Biology

Location: Veraval, Koshikode Mangalore, Kakinada.

Title of the major project, if any: Prawn and shrimp investigations

Personnel (Name and designation)

Project Leader:

M. Mydeen Kunju,
Asst. Fishery Scientist

Associates:

1. V.M. Deshmukh, Asst. Fishery Scientist
2. G. Sudhakar Rao, Research Assistant (S.G.)
3. N. Surendranatha Kurup, Research Assistant

Objectives:

To elucidate various biological aspects such as age and growth, food and feeding habits, maturation, spawning and fecundity, migration and behaviour of the commercially important species of the genus namely, 1) M. affinis, 2) M. monoceros, 3) M. dobsoni and 4) M. brevicornis. The life history of the species to be worked out in detail.

Total duration: 4 years

Date of initiation: 1969

Brief resume of literature:

From the fisheries point of view, species belonging to the genus are most important as they contribute to the bulk of the catches in many centres. Considerable information on the biology and life history of M. dobsoni has been gathered. Growth, movement, reproduction, behaviour, sex ratio, recruitment and mortality of the species has been studied especially from Cochin.

Some observations have been made on the growth, food and feeding, breeding season and reproduction of some of the species of the genus. However, the data obtained so far are incomplete and no definite conclusions have been arrived at.

1. George, M.J. 1967 A synopsis of biological data on Penaeid prawn Metapenaeus dobsoni (Miers) 1878. FAO World Scientific Conference on the Biology and Culture of Shrimps and Prawns, Mexico, 12-24, June, 1967.

2. _____ 1967 A synopsis of biological data on Penaeid prawn Metapenaeus monoceros (Fabricius), 1798). Ibid.

3. _____ 1967 A synopsis of biological data on Penaeid prawn Metapenaeus affinis (H. Milne Edwards, 1837). Ibid.

4. _____ 1967 A synopsis of biological data on Penaeid prawn Metapenaeus brevicornis (H. Milne Edwards, 1837). Ibid.

5. Hall, D.N.F. 1962 Observations on the taxonomy and biology of some Indo-West Pacific Penaeidae (Crustacea, Decapoda). Fish. Publ. Colonial Off., London, 17:1-229.

6. Menon, M.K. 1951 The life history and bionomics of an Indian penaeid prawn Metapenaeus dobsoni Miers. Proc. Indo-Pacif. Fish. Counc., 3rd meeting, Sec. II:80-93.

7. _____ 1955 Notes on the bionomics and fishery of the prawns Metapenaeus dobsoni on the south-west coast of India. Indian J. Fish., 2(1):41-56.

8. Rajyalakshmi, T. 1961 Observations on the biology and fishery of Metapenaeus brevicornis (M. Edw.) in the Hooghly estuarine system, Indian J. Fish., 8(2):383-403.

Plan of work:

1. Regular samples will be collected from commercial catches and detailed analysis of size, sex and maturity will be carried out.

2. Age and rate of growth will be determined by length frequency method and if possible by direct observation.

3. Food and feeding habits of each species will be studied by analysing the stomach contents and by direct observation.

4. Spawning behaviour and fluctuation in the spawning population will be recorded by analysing the distribution of maturing stages of prawns in the catches.

5. Migration pattern to be studied from the data on size and distribution of species at different depths and areas.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of the Project: Biology and life history of the prawns of the genus Parapenaeopsis

Project Code No: FB/CF/Pr. 1.4

Division: Fishery Biology

Location: Bombay, Kozhikode, Cochin

Title of the major project, if any: Prawn and shrimp investigations

Personnel (Name and designation)

Project Leader:

P. Vedavyasa Rao,
Asst. Fishery Scientist

Associates:

1. K.N. Rajan, Research Assistant
2. D. Sivalingam, Research Assistant

Objectives:

To elucidate various biological aspects such as age and growth, food and feeding habits, maturation, spawning and fecundity, migration and behaviour of the commercially important species of the genus namely, P. stylifera, P. sculptilis and P. hardwikii. The life history of each of the species is to be worked out in detail.

Total duration: 4 years

Date of initiation: 1969

Brief resume of literature:

Unlike the other penaeid prawns of the country Parapenaeopsis stylifera is purely a marine form spending all its life in the sea. Food and feeding habits of the species have been observed. The estimation of growth by length frequency distribution has been made, but in some areas faster growth rate has been recorded. Studies on reproduction, spawning and movement have been carried out.

Some observations in the biology of P. sculptilis have been made. Food and feeding habits of the species occurring in the Malaysian region has been studied, but no observation has been made from the Indian region. Age and growth have been estimated. The species does not appear to have extensive migration and that it does not move far from the river mouth. No detailed study on the maturation and spawning has been made.

Very little information is available in the biology of P. hardwikii from the Indian region. In Malaysian waters the species breeds in deeper waters and the young ones migrate to shallow inshore waters where a portion of their life is spent. Food and feeding and growth have been studied.

1. Hall, D.N.F. 1962 Observations on the taxonomy and biology of some Indo-West Pacific Penaeidae (Crustacea, Decapoda). Fish. Publ. Colonial Off., London, 17:1-229.

2. Kirkegaard, I and R.H. Walker 1967 Synopsis of biological data on rainbow prawn Parapenaeopsis sculptilis (Heller) 1862. Australian/New Zealand Meeting on Decapod Crustacea, Sydney, ANZDC 67/3/9.

3. Menon, M.K. 1953 Notes on the bionomics and fishery of the prawn Parapenaeopsis stylifera (M. Edw.) on the Malabar coast. J. Zool. Soc. India, 5(1):153-162.

4. Mohamed, K.H. 1967a Penaeid prawns in the commercial shrimp fisheries of Bombay with notes on species and size fluctuations. Proc. Symp. Crustacea, Mar. biol. Ass. India, Part IV: 1408-1418.

5. C.M.F.R.I. 1969 Prawn Fisheries of India, Central Marine Fisheries Research Institute, Bull. 14: 1-303.

6. Rajyalakshmi, T. 1966 On the age and growth of some estuarine prawns. Proc. Indo-Pacif. Fish. Coun., 11(II): 52-83 (1964).

7. Rao, P. Vedavyasa 1967 A synopsis of biological data on penaeid prawn Parapenaeopsis stylifera (H. Milne-Edwards) 1837. FAO World Scientific Conference on the biology and culture of Shrimps and Prawns, Mexico, 12-24 June, 1967.

Plan of work:

1. Regular samples will be collected from commercial catches and detailed analysis of size, sex and maturity will be carried out.

2. Age and rate of growth will be determined by length frequency method and if possible by direct observation.

3. Food and feeding habits of each species will be studied by analysing the stomach contents and by direct observation.

4. Spawning behaviour and fluctuation in the spawning population will be recorded by analysing the distribution of maturing stages of prawns in the catches.

5. Migration pattern to be studied from the data on size and distribution of species at different depths and areas.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Biology and life history of Solenocera indica

Project Code No.FB/CF/Pr. 1.5

Division: Fishery Biology Location: Bombay

Title of major project, if any: Prawn and shrimp investigations

Personnel (Name and designation)

Project Leader:

K.N. Rajan, Research Assistant

Associates:

1. K.K. Sukumaran, Research Assistant

Objectives:

To elucidate various biological aspects such as age and growth, food and feeding habits, maturation, spawning and fecundity, migration and behaviour and also to trace the life-cycle of the species.

Total duration: 4 years Date of initiation: 1969

Brief resume of literature:

This prawn is commercially exploited only around Bombay although it is distributed throughout the Indian coasts. Out side India this enjoys some commercial importance in Hong Kong. Informations regarding its biology and life history are only of a preliminary nature. Brief accounts on certain aspects like food and feeding, growth, movements, reproduction etc. are available but a comprehensive study remains to be carried out.

1. Cheung, T.S. 1963 The natural history of the commercial species of Hong Kong Penaeidae (Crustacea, Decapoda) Ann. mag. Nat. Hist., (13)6:401-433.

2. Kunju, M.M. 1967 Observations on the prawn fishery of the Maharashtra coast. Proc. Symp. Crustacea, Mar. biol. Ass. India, Part. IV:1382-1397.

3. _____ 1968 Some aspects of the biology of Solenocera indica Nataraj. FAO Fish. Rep., 57(2):

Plan of work:

1. Regular samples will be collected from commercial catches and detailed analysis of size, sex and maturity will be carried out.

2. Age and rate of growth will be determined by length frequency method and if possible by direct observation.

3. Food and feeding habits will be studied by analysing the stomach contents and by direct observation.

4. Spawning behaviour and fluctuation in the spawning population will be recorded by analysing the distribution of maturing stages of prawns in the catches.

5. Migration pattern to be studied from the data on size and distribution of species at different depths and areas.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of the Project: Studies on the fishery, biology and life history of the various species of genus Acetes.

Project Code No.FB/CF/Pr. 1.6

Division: Fishery Biology Location: Bombay

Title of major project, if any: Prawn and shrimp investigations

Personnel (Name and designation)

Project Leader:

K. Radhakrishna,
Asst. Fishery Scientist

Associates:

1. K.N. Rajan, Research Assistant
2. K.K. Sukumaran, Research Assistant

Objectives:

To elucidate the fishery importance and all aspects pertaining to the biology of different species. Life history of the individual species to be worked out in detail.

Total duration: 4 years Date of initiation: 1970

Brief resume of literature:

The systematics of this group has been worked out by many authors. Among the six species that occur in Indian coasts, only Acetes indicus is so far known to have fishery significance. This species is commercially fished from the estuaries and inshore areas of West Bengal, Madras and northern section of the west coast. No information is available on the biology and development of this species although very fragmentary notes are on record about the eggs, larvae and reproduction of other allied species.

1. C.M.F.R.I. 1969 Prawn Fisheries of India, Central Marine Fisheries Research Institute, Bull. 14: 1-303

2. Menon, M.K. 1933 The life histories of Decapod Crustacea from Madras. Bull. Madras Govt. Mus. n.s. Nat. Hist. Sec., 3(3):45 pp.

3. Nataraj, S. 1947 On some species of Acetes (Crustacea, Sergestidae) from Travancore. Rec. Indian Mus., 45:139-147.

Plan of work:

1. Regular samples will be collected from commercial catches and detailed analysis of size, sex and maturity will be carried out.

2. Age and rate of growth will be determined by length frequency method and if possible by direct observation.

3. Food and feeding habits of the species will be studied by analysing the stomach contents.

4. Spawning behaviour and fluctuation in the spawning population will be recorded by analysing the distribution of maturing stages of the specimens in the catches.

5. Migration pattern to be studied from the data on size and distribution of species at different depths and areas.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of the Project: Biology and life history of non-penaeid prawns

Project Code No.FB/CF/Pr. 1.7

Division: Fishery Biology Location: Veraval, Bombay

Title of major project, if any: Prawn and shrimp investigations

Personnel (Name and designation)

Project Leader:

V.M. Deshmukh,
Asst. Fishery Scientist

Associates:

1. K.K. Sukumaran, Research Assistant

Objectives:

To elucidate the various biological aspects such as age and growth, food and feeding habits, maturation, spawning and fecundity, migration and behaviour of the important non-penaeid prawns -(1) Hippolysmata ensirostris (2) Palaemon styliferus and (3) P. tennuipes. The life history of each of the species is to be worked out in detail.

Total duration: 4 years Date of initiation: 1969

Brief resume of literature:

Hippolysmata ensirostris, Palaemon styliferus and P. tennuipes are the commercially important non-penaeid prawns of our coasts.

H. ensirostris is of fishery value only in India along the coasts of Gujrat, Maharashtra, Andhra and W. Bengal. Incubating eggs, early larval stages and the post larva of this species have been described from the inshore areas of Cannanore and Orissa respectively. No biological information is available on this species.

P. tennuipes forms a fishery in Bombay and to some extent in Gujarat, Orissa and W. Bengal. Eggs and the first three larval stages have been described. Several factors influencing the success or failure of the fishery have been reported.

1. Kunju, M.M. 1956 Preliminary studies on the biology of the palaemonid prawn Leander styliferus Milne-Edwards. Proc. Indo-Pacif. Fish. Counc., 6(3):404-416.

2. _____. 1967 Observations on the prawn fishery of the Maharashtra coast. Proc. Symp. Crustacea, Mar. biol. Ass. India, Part IV:1382-1397.

3. Pillay, S.V. 1966a Early development and larval stages of Palaemon tenuipes Henderson. J. mar. biol. Ass. India, 8(2):329-338.

4. _____ 1966b Some observations on the early larval stages of Hippolysmata vittata (Stimpson). Ibid., 8(1):152-158.

Plan of work:

1. Regular samples will be collected from commercial catches and detailed analysis of size, sex and maturity will be carried out.

2. Age and rate of growth will be determined by length frequency method and if possible by direct observation.

3. Food and feeding habits of each species will be studied by analysing the stomach contents and by direct observation.

4. Spawning behaviour and fluctuation in the spawning population will be recorded by analysing the distribution of maturing stages of prawns in the catches.

5. Migration pattern to be studied from the data on size and distribution of species at different depths and areas.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Biology and life history of the species of the genus Macrobrachium.

Project Code No.FB/CF/Pr. 1.8

Division: Fishery Biology Location: Cochin

Title of major project, if any: Prawn and shrimp investigations

Personnel (Name and designation)

Project Leader:

P. Vedavyasa Rao,
Asst. Fishery Scientist

Associates:

N. Neelakanta Pillai, Research Assistant (S.G.)

Objectives:

To collect and identify available species of the genus Macrobrachium and to elucidate the details of the life history of the different species with a view to determine the possibility of culturing them in ponds and rivers.

Total duration: 5 years Date of initiation: 1969

Brief resume of literature:

Altogether 34 species of Macrobrachium have been recorded from India. 3 species viz., M. rosenbergii, M. malcolmsonii and M. idae are considered to be of commercial significance in the catches obtained from the backwaters and rivers of India. Although life history of M. rosenbergii is well-known and the larval stages isolated in the laboratory conditions, it has not been possible to rear and culture them in commercial practice. It is generally accepted that if suitable culture techniques are evolved it would be possible to breed and culture this species in commercial quantities. In this connection the work carried out in Malaya is of importance. In our laboratory it has been possible to rear the hatchlings up to the 4th stage. The work is being continued.

1. Ling, S.W., and A.B.O. Merican 1961 Notes on the life and habits of the adults and larval stages of Macrobrachium rosenbergii de Man. Proc. Indo-Pacific Fish. Coun., 9th Session, 2:55-61.

2. Menon, K.M. 1938 The early larval stages of two species of Palaemon. Proc. Ind. Acad. Sci., 8:288-294.

3. Nataraj, S. 1947 Preliminary observations on the binomics, reproduction and embryonic stages of Palaemonidae Heller Crustacea, Decapoda. Rec. Indian Mus. Vol.XLV. 1947.

4. Rajyalakshmi, T. 1961 Studies on maturation and breeding in some estuarine Palaemonid prawns. Proc. nat. Inst. Sci., India, 27(4):179-88.

5. Raman, K. 1964 On the location of a nursery ground of the giant prawn Macrobrachium rosenbergii de Man. Curr. Sci., 33(1):27-28.

6. _____ 1967 Observations on the fishery and biology of the giant freshwater prawn Macrobrachium rosenbergii de Man. Proceedings of the Symposium on Crustacea, Part II, 634-669.

7. Rao, R. Mallikarjuna 1965 Breeding behaviour in Macrobrachium rosenbergii de Man. Fish. Tech., 2(1): 19-25.

8. _____ 1967 Studies on the biology of Macrobrachium rosenbergii de Man of the Hooghly estuary with notes on its fishery. Proc. Nat. Inst. Sci. India, 33(5 & 6):252-279.

Plan of work:

1. Obtain frequent collections from backwaters and rivers and identify all species of Macrobrachium.

2. Assess the available resources at various centres.

3. Obtain berried females of different species and get them breed in the laboratory tanks.

4. Rear the larvae through different stages till attainment of adulthood.

5. Experiment and find suitable food for the developing juvenile stages.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Studies on distribution pattern of commercial prawns of West coast of India - Charting of prawn fishing grounds.

Project Code No. FB/CF/Pr. 1.9

Division: Fishery Biology Location: Cochin

Title of major project, if any: Prawn and shrimp Investigations.

Personnel (Name and designation)

Project Leader:

* Jr. Fishery Scientist-Vacant

Associates:

1. C. Suseelan, Research Assistant
2. K. Devarajan, Research Assistant

Objectives:

To study the intensity of prawn resources and their distribution at various depths and areas covered by trawlers and to prepare maps showing the distribution.

Total duration: 5 years Date of initiation: 1969.

Brief resume of literature:

Some information on the regional abundance of prawns based by the trawler landings on some areas of the continental shelf along the east and west coast of India are available. But all the available work on charting of prawn fishing grounds are of a general nature. No importance is given to species-wise distribution or depth-wise abundance of each species of prawns. So the present work is aimed to find out the most productive prawn fishing grounds for each species at different depth regions and areas. The work is to be carried out by analysing the trawler catches of New India Fisheries Company's vessels. Having a number of vessels under their operations they cover almost all the prawn fishing grounds of west coast of India throughout all the seasons.

1. Cheung, T.S. 1959 Distribution of penaeid prawns in waters around Hong Kong. First International Oceanographic Congress New York, Reprints: 224-228.

* Coordinator: K.H. Mohamed, Fishery Scientist

2. George, M.J and K.H. Mohamed	1966	An assessment of marine prawn fishery resources of Kanyakumari District, South West Coast of India, Proc. Indo-Pacific Fish. Counc. 12th Sess.
3. _____, S.K. Banerji and K.H.Mohamed	1968	Size distribution and movement of the commercial prawns of the south west coast of India. FAO Fish. Rep. 57 (2): 265-284.
4. Kagwade, P.V.	1967	Prawn catches by mechanised vessels in the trawling grounds of Bombay and Saurashtra. Proc. Symp. Crustacea., Mar. biol. Ass. India, 4: 1348-1381.
5. Mohamed, K.H.	1967	Penaeid prawns in the commercial Shrimp fisheries of Bombay with notes on species and size fluctuations. Proc. Symp. Crustacea., Mar. biol. Ass. India, Part IV: 1408-1418.
6. Rao, K. Virabhadra	1968	Distribution pattern of the major exploited marine fishery resources of India. Symp. on the Living Resources of the Seas Around India, Abstract No.3: also Bull. cent. mar. Fish. Res. Inst., No.6: 1-69 (1969).
7. _____ and K. Dorairaj	1969	Prawn grounds on the continental shelf fished by trawlers. Prawn Fisheries of India, Bull. cent. mar. Fish. Res. Inst., No.14: 211-234.

Plan of work:

1. The log data obtained from the trawlers of the Government of India and private Companies will be analysed giving special emphasis to the catches of prawns and its relation to the fish trawled at different depths, areas, seasons, time and period of operations.

2. Intensity of catch of each species obtained from different areas and depths will be charted out on a detailed map for different seasons.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Studies on deep-water prawns - fishery, biology and distribution.

Project Code No. FB/CF/Pr. 1.10

Division: Fishery Biology Location: Cochin

Title of major project, if any: Prawn and shrimp Investigations

Personnel (Name and designation)

Project Leader:

K.H. Mohamed, Fishery Scientist

Associates:

1. P. Vedavyasa Rao, Asst. Fishery Scientist
2. C. Suseelan, Research Assistant

Objectives:

To determine the seasonal, geographic and bathymetric distribution of commercial prawns of India and to prepare maps showing their distribution. To study the Biology of various species.

Total duration: Continuing Date of initiation: 1969

Brief resume of literature:

Some information on the regional abundance of prawns based on the exploratory fishing carried out by many vessels on some areas of the continental shelf along the east and west coast of India is available. But no fishing has been carried out in the deep waters off the coast except for the brief survey carried out by R.I.M.S.'INVESTIGATOR' and reported on by Alcock and others at the beginning of this centuary. Between 1959 and 1961 exploratory fishing vessels took few deep water trawl hauls along the edge of the continental shelf off the Kerala coast. From 1961, larger vessels of the Indo-Norwegian Project conducted systematic exploratory survey and the investigations carried out so far have brought to light the rich prawn grounds off the south west coast of India. Prawn fauna of these grounds consisted mostly of Pandalids and a few species of penaeids.

1. Alcock, A. 1901 A descriptive catalogue of the Indian deep-sea Crustacea, Decapoda, Macrura and Anomala in the Indian Museum, being a reversed revised account of the

deep-sea species collected by the Royal Marine Survey Ship 'Investigator', Calcutta, India, 286 pp.

2. George, M.J. 1966 On a collection of penaeid prawns from the offshore waters off the south-west coast of India. Proc. Symp. Crustacea. Mar. biol. Ass. India, Pt. I: 337-346.

3. _____ and P.V. Rao 1966 On some decapod Crustaceans from the south-west coast of India. Proc. Symp. Crustacea. Mar. biol. Ass. India, Pt. I: 327-336.

4. Mohamed, K.H. and C. Suseelan 1968 The deep-sea prawn resources off the south-west coast of India. Abstracts of papers presented at the Symposium on the living resources of the seas around India. Central Marine Fisheries Research Institute, Mandapam Camp: 27.

5. Suseelan, C and K.H. Mohamed 1968 On the occurrence of Plesionika ensis (A.Milne Edwards) (Pandalidae; Crustacea) in the Arabian sea with notes on its biology and fishery potentialities. J. mar. biol. Ass. India, 10(1): 88-94.

6. C.M.F.R.I. 1969 Prawn Fisheries of India, Bull. cent. mar. fish. Res. Inst. 14

Plan of work:

1. Participate in the deep-water fishing cruises of the exploratory vessels and make observations on the catches.

2. Systematic collections of all the species will be made and faunistic investigations will be carried out.

3. Samples will be subjected to detailed analysis for all biological aspects.

4. Density of population of each of the spcies will be determined and commercial prospects evaluated.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Ecology of the prawn grounds

Project Code No. FB/CF/Pr. 1.11

Division: Fishery Biology Location: Cochin, Mangalore

Title of major project, if any: Prawn and Shrimp Investigation

Personnel (Name and designation)

Project Leader:
S. Ramamurthy,
Assistant Fishery Scientist.

Associated:
1. M. Aravindakshan, Research Assistant (Selection Grade)
2. K. Rajasekharan Nair, Survey Assistant

Objectives:

To study the physical and chemical factors of the prawn grounds and the animal assemblages associated with the same. To assess how far these factors influence the magnitude of the prawn fishery of the area.

Total duration: 5 years. Date of initiation: 1969

Brief resume of literature:

Extensive studies on bottom fauna have been conducted in Europe and in U.S.A. Studies on bottom fauna of English channel have revealed that temperature acts as a limiting factor in the distribution of bottom fauna. Turbidity also may be a factor in the case of suspension feeders. High concentration of silt and clay affect suspension feeders more than deposit feeders.

In India studies have been conducted on the brackish water ecology by many workers. Some work has also been done on the bottom fauna of the inshore waters of Kerala coast. However, no corelation so far been shown between the various physico-chemical as well as biological factor and the prawn fisheries. Some data have been collected from Cochin backwaters where stake net fishery for prawn is concentrated.

1. Holme, N.A 1961 Bottom fauna of English channel. J. Mar. biol. Ass., U.K. 41: 397-401

2. Kurian, C.V. 1953 A preliminary survey of the bottom and bottom deposits of the Travancore

coast, within 15 fathoms line. Proc. Nat. Inst. Sci. India, 19: 747-776.

3. Panikkar, N.K. and R.G. Iyer — 1937 — The brackish water fauna of Madras. Proc. Indian Acad. Sci. 6: 284-337.

4. Rochford, D.J. — 1951 — Studies in Australian estuarine hydrology. Aust. J.Mar. Freshw. Res. 2(1)

5. Sanders, H.L. — 1958 — Benthic studies in Buzzards Bay. Bull. Bingham Oceanogr. Coll. 15: 345-414.

Plan of work:

Examination of dredge and grab collections from fixed stations and from prawn fishing grounds for associated fauna.

Collection of environmental data such as temperature, salinity, oxygen, total phosphate and adsorbed phosphate.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Quantitative assessment of the rate of immigration and emigration of larval and juvenile penaeid prawns in estuaries and backwaters.

Project Code No. FB/CF/Pr 1.14

Division: Fishery Biology Location: Cochin, Korapuza, Mangalore, Kakinada.

Title of major project, if any: Prawn and Shrimp Investigations

Personnel (Name and Designation)

Project Leader:

K.H. Mohamed,
Fishery Scientist

Associates:

1. S. Ramamurthy, Asst. Fishery Scientist
2. P. Vedavyasa Rao, Asst. Fishery Scientist
3. N.Neelakanta Pillai, Research Assistant (Selection Grade)
4. G. Sudhakara Rao, Research Assistant (Selection Grade)
5. C. Suseelan, Research Assistant
6. D. Sivalingam, Research Assistant
7. M. Kathirvel, Survey Assistant

Objectives:

To study the abundance of larval and juvenile prawns that entered and leave the nursery area and to measure their numbers, size composition and other biological characteristics. To understand the influence of tides and lunar phases in the recruitment of larvae and juveniles.

To investigate the relationship between the abundance of larvae and the commercial prawn landings of the area.

Total duration: 5 years Date of initiation: 1969

Brief resume of literature:

Extensive investigation have been carried out on the dynamics of larval and juvenile shrimp population in the nursery grounds in the south eastern coast of United States. The differences in population density and

species composition, relationship of juvenile shrimp population to the fisheries for adults have been discussed in detail.

Information on prawn catches from important estuaries and backwaters of India and relationships of the catch with the tidal flow is available. It has also been shown the abundance of larvae could be used as an index for predicting the success or failure of the commercial prawn fishery of the area. Lunar and diurnal periodicity in relation to the prawn abundance and migration of juveniles has been studied.

1. Baxter, K.N.	1962	Abundance of post larval shrimp one index of future shrimping success. Proc. Gulf Carib. Fish. Inst. Fifteath Annual Sess. No.1962: 79-87.
2. George, M.J.	1963	Post larval abundance as a possible index of fishing success in the prawn Metapenaeus dobsoni (Miers) Indian J. Fish. 10A(1): 135-39.
3. Gopinath , K.	1953	Some interesting methods of fishing in the backwaters of Travancore J. Bombay Nat. Hist. Soc. 51: 466-71.
4. Menon, M.K. and K. Raman	1961	Observation on the prawn fishery of the Cochin backwaters with special reference to the stake net catches. Indian J. Fish. 8(1): 1-23.
5. Panikkar, N.K. and M.K. Menon	1955	Prawn Fisheries of India. Proc. Indo-Pac. Fish. Coun. Symposium on Prawn Fisheries Sec. II and III, 328-46.
6. Subrahmanyam, M.	1965	Lunar diurnal and tidal periodicity in relation to the prawn abundance and migration in Godavari estuarine system. Fish. Tech., 2(1): 26-41.
7. Wheeler, J.F.G.	1937	Further observations on lunar periodicity J. Linn. Soc. (Zool.), 40(272)

Plan of Work:

1. Plankton from fixed station in the estuary and backwaters will be collected and the samples will be analysed for the penaeid larvae belonging to different species. Temperature and salinity data will be recorded for understanding their effect on the larval abundance.

2. Regular observation on the stake net catches will be made and prawn samples collected will be analysed in detail for biological characteristics.

3. The catch data from the centre will be maintained to understand the fluctuation in the prawn landings of the centre.

4. Experimental operations of stake nets will be carried out during low and high tides and full and new moon periods. The samples from these catches will be analysed to study the rate of immigration and emigration of juvenile prawns.

5. The above plan of work (item No.4) will be supplemented by experimental fishing by specially designed try net.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Larval history of penaeid prawns

Project Code No. FB/CF/Pr. 1.12

Division: Fishery Biology

Location: Cochin, Kakinada, Madras.

Title of major project, if any: Prawn and Shrimp Investigation

Personnel (Name and Designation)

Project Leader:

*Junior Fishery Scientist - Vacant

Associates:

1. P. Vedavyasa Rao, Asst. Fishery Scientist
2. M.S. Muthu (on leave) Asst. Fishery Scientist
3. Vacant

Objectives:

To elucidate salient features of early life history of commercial penaeid prawns and to find out differentiating characteristics of various larval and post larval stages. To study the seasonal occurrence and abundance of larvae.

Total duration: 5 years

Date of initiation: 1969

Brief resume of literature:

During the last 20 years great strides have been made, especially in Japan and U.S.A. on the larval development of the important species of prawns. But information on the larval history of the commercial penaeid prawns of India is limited to the descriptions of a few early stages and 1st post larval stage of P. indicus, complete larval stages of M. dobsoni and 1st post larval stage of M. monoceros, M. affinis and P. stylifera. Abundance of post larvae of 3 species from Cochin backwaters has also been studied. Attempts in rearing prawn larvae from eggs have not so far met with success in India.

1. Cook, L. 1966 A generic key to the protozoea, mysis and post larval stages of the littoral penaeidae of the North Western Gulf of Mexico. Fish. Bull. Fish. Wild. Serv. U.S. 65(2): 437-47.

* Coordinator: K.H. Mohamed, Fishery Scientist

2. George, M.J.	1962	On the breeding of penaeids and the recruitment of their postlarvae into the backwaters of Cochin. Indian J. Fish. 9(1): 110-16.
3. Hudinaga, M.	1942	Reproduction, development and rearing of Penaeus japonicus Bate. Jap. J. Zool. 10(2): 305-393.
4. Menon, M.K.	1937	Decapod larvae from the Madras plankton. Bull. Madras Govt. Mus. (Nat. Hist.) 3(5): 1-55.
5. _____	1951	The life history and bionomics of an Indian penaeid prawn Metapenaeus dobsoni (Miers). Proc. Indo-Pacif. Fish. Counc. 3(2): 80-93.
6. Subrahmanyan, C.B.	1965	On the unusual occurrence of penaeid eggs in the inshore waters of Madras. J. mar. biol. Ass. India, 7(1):83-88.
7. Mohamed, K.H., P. Vedavyasa Rao and M.J. George	1968	Postlarvae of penaeid prawns of south-west coast of India with a key to their identification. FAO Fish. Rep. 57 (2): 487-503.

Plan of work:

1. Regular plankton will be collected from the marine region. After sorting the penaeid larvae from the plankton, they will be reared in the laboratory to different stages.

2. The plankton samples would be analysed for studying the abundance and distribution of the larvae in the area.

3. Temperature and salinity data from the places of plankton collection will be collected and correlated with the abundance of larvae.

4. Frequent trips on board the vessels will be made to collect gravid females and these prawns will be brought to the laboratory and kept in suitable aquaria with a view to get them spawned under laboratory condition. The development of larval stages hatched from eggs will be followed and studied.

5. Suitability of different food material for rearing the larval stages will be determined.

CENTRAL MARINE FISHERIES RESEARCH INSPITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Mark recovery experiments on prawns.

Project Code No: FB/CF/Pr. 1.13

Division: Fishery Biology **Location:** Cochin

Title of major project, if any: Prawn and Shrimp Investigation

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Personnel (Name and designation)

Project Leader:

* Junior Fishery Scientist - Vacant

Associates:

1. P. Vedavyasa Rao, Asst. Fishery Scientist
2. N. Neelakanta Pillai, Research Assistant(Selection Grade)
3. K.V. George, Survey Assistant

Objectives:

To study the migratory movements and rate of growth of different species of prawns.

Total duration: 3 years Date of initiation: 1970.

Brief resume of literature:

The Petersen disc tagging as well as the stain injection method has been used intensively in the mark recovery experiments on commercial shrimps of the Gulf of Mexico and south Atlantic by several Agencies, and much valuable data on migration of these shrimps have been obtained. The typical inshore - offshore movements and the migration of juveniles from the estuaries to offshore waters and the growth of shrimp have been traced by the recoveries obtained.

Preliminary experiments using 3 different stains have been conducted in India in order to determine the suitability of the stains and also to select the proper species. It has been found that for the smaller species like Metapenaeus dobsoni the staining method is not suited and that in the bigger species like Penaeus indicus the method could be used with advantage.

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* Coordinator: K.H. Mohamed, Fishery Scientist.

1. Costello, T.J.	1959	Marking shrimp with biological stain. Proc. Gulf & Carib. Fish. Inst., 11th ann. Sess., 1-6.
2. _____ and D.M. Allen	1960	Notes on the migration and growth of pink shrimp (Penaeus duoraum). Proc. Gulf & Carib. Fish. Inst. 12th Ann. Sess. 5-9.
3. Dawson, C.E.	1957	Studies on the marking of commercial shrimp with biological stains U.S. Fish. & Wildl. Serv. Spec. Sci. Rep. Fish. No.231: 24 pp.
4. George, M.J.	1968	Mark-recovery experiments in Crustacean. Proc. Symp. on Crustacea, Mar. biol. Ass. India, Pt. IV: 1284-1295.
6. Lindner, M.J. and W.W. Anderson	1962	Growth, migration, spawning and size distribution of shrimp Penaeus stiliferus U.S. Fish & Wildl. Serv. Spec. Sci. Rep., Fish Bull. 106,56: 553-645.

Plan of work:

Techniques of marking will be perfected before the prawn field is made available for stain release or otherwise mark release experiments.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on paddy field prawn culture practices

Project Code No. FB/CF/Pr. 1.15

Division: Fishery Biology Location: Cochin, Kagal (Karwar)

Title of major project, if any: Prawn and Shrimp investigations

Personnel (Name and designation)

Project Leader:

K.Y. Telang,
Research Assistant (S.G.)

Associates:

1. K.V. George, Survey Assistant

Objectives:

To collect data on prawn resources of paddy-cum-prawn culture fields and to compare the suitability of different types of fields.

Total duration: 4 years Date of initiation: 1969

Brief resume of literature:

Culture of tiger prawns in the brackish water ponds along the coast of Philippines and Singapore has been reported. Some investigations have been carried out on different aspects of the paddy field prawn culture practices existing in the south west coast of India. At present nearly 4,500 ha of paddy fields are utilized for prawn culture in Kerala.

1. Gopinath, K. 1956 Prawn culture in the rice fields of Travancore-Cochin, India. Proc. Indo-Pacif. Fish. Coun., 6(3):419-424.

2. George, M.J., K.H. Mohamed and N.N. Pillai 1968 Observations on the paddy field prawn filtration of Kerala, India. FAO Fish. Rep. (57) Vol.2

3. Hudinaga, M. 1942 Reproduction, development and rearing of Penaeus japonicus Bate. Jap. J. Zool. 10(2):305-393.

4. Menon, M.K. 1954 On the paddy field prawn fishery of Travancore-Cochin and an experiment in prawn culture. Proc. Indo-Pac. Fish. Coun. 5(2):131-135.

5. Panikkar, N.K. and M.K. Menon. 1955 Prawn fisheries of India. Proc. Indo-Pac. Fish. Coun., Symposium on prawn fisheries Sec. II and III, 328-346.

6. Priscilla Caces Borja and S.B. Rasalan 1968 A review of the culture of SUGPO, Penaeus monodon Fabricius, in the Philippines, FAO Fisheries Reports No.57, Vol.2

Plan of work:

1. Regular random samples of prawns from different fields are to be collected fortnightly during the full moon and new moon periods (Thakkom) and samples to be studied in the laboratory for length, weight, sex and stages of sexual maturity.

2. In order to find out the productivity of the fields, hydrography data such as temperature, salinity, oxygen etc. will be estimated by regular collection of water samples.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of the Project: Environmental studies in relation to prawn fishery of Vembanad Lake.

Project Code No. FB/CF/Pr. 1.16

Division: Fishery Biology Location: Cochin

Title of major project, if any: Prawn and shrimp investigations.

Personnel (Name and designation)

Project Leader:

A.V.S. Murty,
Fishery Scientist

Associates:

1. G. Subba Raju, Asst. Fishery Scientist
2. D. Sadananda Rao, Asst. Fishery Scientist
3. K.V. George, Survey Assistant
4. K.J. Joseph, Survey Assistant

Objectives:

To study the environmental factors such as salinity, temperature, nutrients and organic productivity influencing the prawn fishery of the lake.

Total duration: 3 years Date of initiation: 1969

Brief resume of literature:

The northern part of Vembanad Lake upto Azhikode is a fertile area for prawn fishery. Regular surveys are necessary for studying the prawn fishery of the lake in relation to environmental factors.

Plan of work:

1. Try net samples will be taken from fixed station of the lake.
2. Hydrographic observations will be made from the same station.
3. Deck incubation for a fixed time of water samples with radio active carbon will be carried out.
4. Plankton samples also will be collected from same stations.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Fishery and biology of the lobsters of the shallow waters

Project Code No. FB/CF/Lob/2.1

Division: Fishery Biology Location: Calachel, Kozhikode

Title of major project, if any: Lobster investigations

Personnel (Name and designation)

Project Leader:

K.H. Mohamed,
Fishery Scientist

Associates:

1. P. Vedavyasa Rao, Asst. Fishery Scientist
2. Laboratory cum Field Assistant 1

Objectives:

To collect and maintain catch data in order to study the intensity and sequence of occurrence in the commercial catches.

To elucidate the various biological aspects such as age and growth, food and feeding habits, maturation, fecundity and spawning migration and behaviour of the commercially important lobster, Panulirus homarus.

Total duration: Continuing Date of initiation: 1969

Brief resume of literature:

Different aspects of the biology and fishery of P. homarus of the south west coast of India have been under investigation by C.M.F.R.I. Growth and movement of the lobster have been studied by length frequency method and tagging. It was observed that the rate of growth of this lobster is comparatively faster than in the other allied species studied from other parts of the world. Some data on the spawning behaviour, food and feeding habits are available. The complete life history of the species is yet to be elucidated. The 1st phyllosoma larval stage has been described. Accounts on fishery, fishing methods and gears and tackles employed in fishing are given..

1. Balasubramanyan, R., A.V.V. Sathyanarayana and K.A. Sadanandan 1960 A preliminary account of experimental rock-lobster fishing conducted along the south west coast of India with bottom set gill nets. Indian J. Fish., 7:407-422.

2. _____	1961	A further account of the rock lobster fishing experiments with bottom set gill nets. Ibid., 8: 269-290.
3. George, M.J.	1967	Observations on the biology and fishery of the spiny lobster Panulirus homarus (Linn.). Proc. of the Symp. Crustacea. Mar. biol. Ass. India, Part IV:1308-1316.
4. Miyamoto, H. and Sheriff, A.T.	1961	Lobster Fishery off the south west coast of India. Anchor Hook and trap fisheries. Indian J. Fish., 8: 252-268.
5. Mohamed, K.H. and M.J. George	1967	Results of the tagging experiments on the Indian spiny lobster Panulirus homarus (Linnaeus) - movement and growth. Paper presented at Australian/New Zealand meeting on Decapod Crustacea, C.S.I.R.O. Australia, 24-28, October 1967.

Plan of work:

1. Regular observations on lobster landings will be made to record the magnitude of the fishery.

2. Age and rate of growth will be determined by length frequency method and if possible by direct observation.

3. Food and feeding habits of the species will be studied by analysing the stomach contents and by direct observation.

4. Spawning behaviour and fluctuation in the spawning population will be recorded by analysing the distribution of maturing stages of the lobster in the catches.

5. Detailed studies on the migration pattern to be carried out by tagging experiments and from the data on size and distribution of the species at different depths and areas.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of the Project: Fishery and biology of the deep-sea lobsters

Project Code No. FB/CF/Lob/2.2

Division: Fishery Biology Location: Cochin

Title of major project, if any: Lobster investigations

Personnel (Name and designation)

Project Leader:

P. Vedavyasa Rao,
Asst. Fishery Scientist

Associate :

C. Suseelan, Research Assistant

Objectives:

To determine the seasonal, geographic and bathymetric distribution of the deep-sea spiny lobsters of India and to prepare map showing their distribution. To study the biology of the species.

Total duration: Continuing Date of initiation: 1969

Brief resume of literature:

Although the occurrence of deep-sea lobsters off the coast of India has been recorded as early as 1894, only the recent exploratory fishing operations carried out along the continental edge and slope off our coast have revealed the existence of deep-sea lobster resources of commercial worth. Large concentrations of Puerulus sewelli have been found on the south-west coast of India, off Quilon and south-east coast off Mandapam and Tuticorin. Lesser quantities occur throughout the area explored. Being a new resource, very little information has been gathered on the fishery and biology of the species, except for its geographical and bathymetric distribution.

1. John, C.C. and C.V. Kurian — 1959 A preliminary note on the occurrence of deep water prawn and spiny lobster off the Kerala coast. Bull. Cent. Res. Inst. Trivandrum, Ser. C, 7(1):155-162.

2. Holthuis, L.B. — 1966 On spiny lobsters of the genera Palinurellus, Linuparus and Puerulus (Crustacea, Decapoda, Palinuridae). Proc. Symp. Crustacea, Mar. biol. Ass. India, Part I:

3. Rao, P. Vedavyasa and M.J. George — 1968 The deep-sea spiny lobster, Puerulus sewelli Ramadan: Its commercial potentialities. Abstracts of papers presented at the symposium on the living resources of the seas around India, Central Marine Fisheries Research Institute:27

Plan of work:

1. Participate in the deep water fishing cruises of the exploratory/ research vessels and make observations on the catches.

2. Systematic collections of the catches will be made and the samples will be subjected to detailed analysis for all biological aspects.

3. Density of the populations of the species will be determined and commercial prospects evaluated.

MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of the Project: Fishery and biology of the commercially important crabs.

Project Code No. FB/CF/Cra/3.1

Division: Fishery Biology

Location: Cochin, Kakinada, Mandapam

Title of major project, if any: Crab investigations

Personnel (Name and designation)

Project Leader:

G. Sudhakara Rao,
Research Assistant (S.G.)

Associates:

1. M. Kathirvel, Survey Assistant
Research Assistant (vacant)

Objectives:

To collect and maintain catch data in order to study the intensity and sequence of occurrence in the commercial catches.

To elucidate the salient features of the biology such as age and growth, food and feeding, maturation and spawning, migration and behaviour of the commercially important species viz. Portunus pelagicus and Scylla serrata.

Total duration: 4 years

Date of initiation: 1970

Brief resume of literature:

Edible crabs inhabiting the coastal waters support localised sustenance fishery of considerable importance. General account of crab fisheries of Bombay, Mangalore, Malabar, Mandapam, West Bengal and Chilka lake are available. These accounts deal with the bionomics, species composition, seasons, gear employed, methods of fishing and disposal.

1. Chopra, B.N. 1939 Some food prawns and crabs of India and their fisheries. J. Bombay Nat. Hist. Soc., 41(2):221-234.

2. George, P.C. and K. Ramesh Nayak 1961 Observation on the crab fishery of Mangalore coast. Indian J. Fish., 8(1):

3. Hora, S.L. 1935 Crab fishing at Uttarbhag, Lower Bengal. Curr. Sci. 3(11):543-546.

4. Menon, M.K.	1952	A note on the bionomics and fishery of the swimming crab Neptunus sanguinolentus (Herbst) on the Malabar coast. J. Zool. Soc. India, 4(2):177-184.
5. Prasad, R.R. and P.R.S. Tampi	1951	An account of the fishery and fishing methods for Neptunus pelagicus (Linnaein) near Mandapam. J. Zool. Soc. India, 3(2):
6. Rai, H.S.	1933	The shell fisheries of Bombay Presidency Part II: J. Bombay Nat. Hist. Soc. 51: 674-689.
7. Rao, P. Vedavyasa, M.M. Thomas and G. Sudhakara Rao	1968	The crab fishery resources of India. Proc. Symp. on the Living Resources of the Seas around India, Abstract:25-26.

Plan of work:

1. Regular samples will be collected from commercial and experimental catches and detailed analysis of size, sex and maturity will be carried out.

2. Age and growth rate will be determined by size frequency studies and if possible by direct observations.

3. Food and feeding habits of each species will be studied by analysing the stomach contents and by direct observations.

4. Spawning behaviour and fluctuations in the spawning population will be recorded by analysing the distribution of maturity stages of crabs in the catches.

5. Migration pattern will be studied from the data on size and distribution of species at different depths and areas.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on chanks and pearl oysters with reference to ecology of sea bottom.

Project Code No. FB/MF/Mf. 1.1

Division: Fishery Biology Location: Tuticorin

Title of major project, if any: Molluscan fisheries Investigations.

Personnel (Name and Designation)

Project Leader:

K.Nagappan Nayar,
Jr. Fishery Scientist

Associates:

1. S. Mahadevan,
Assistant Fishery Scientist.

Objectives:

1. Surveying the population of chanks and pearl oysters and charting the beds so that fishery management can be planned.

2. Ecological observations on a few pearl banks and chank beds using SCUBA

(a) Quantitative assessment of the fauna and the population of pearl oysters in the rocky bottom

(b) observations on the abundance of oyster enemies with particular reference to Modiolus, Pentaceraster and Octopi

(c) Quantitative estimation of chank population and size composition of chanks in beds

(d) Study of the fauna and flora of the chank beds with particular reference to food of chanks

(e) Studies on the movement of chanks.

Total duration: Continuing Date of initation: 1969.

Brief resume of literature:

Two of the most important shell fisheries in this area of the coast of India viz., Pearl oysters and chanks can be developed and exploited by constant observations made to locate the spat settlement of oysters and finding out the potential untapped chank fishing grounds. The fishermen who are skin divers will be directly benefited by the information so obtained and passed on. The information on pearl oysters given periodically will help maintaining a vigil to save the population from destruction by natural and other causes and help us to harvest the ripe oysters in proper

time. Animals of the rocky bottom and the studies on the assessment of their population, habits and habitat will be of immense use to the fishery biologists.

1. Mahadevan, S and K. Nagappan Nayar	1966	Underwater ecological observations in the Gulf of Mannar off Tuticorin. VI On the habitat, movement and breeding of the chank, Xancus pyrum. J. mar. biol. Ass. India 8(1).
2. Mahadevan, S and K.Nagappan Nayar	1968	General topography and ecology of the rocky bottom. J. mar. biol. Ass. India 9(1): 147-163.
3. Turner, J.L. and D.W. Kelly	1966	Ecological studies on the Sacromanto-San Joaquin delta. Fish. Bull. 136 U.S. Dept. of Fish. and Game.
4. Turner, C.H., E.E. Ebert and R.R. Giren	1964	An ecological survey of a marine environment prior to installation of a submarine outfall. Calif. Fish. Game. 50 3 July 1964.
5. Forster, G.R.	1954	Preliminary note on a survey of stock point rocks with self contained diving apparatus. J. Mar. biol. Ass. (U.K), 33: 341-44.
6. Forster, G.R.	1958	Underwater observations on the fauna of shallow rocky areas in the neighbourhood of Plymouth. J. Mar. Biol. Ass. (U.K) 37: 473-82.

Plan of work:

The area to be studied for the survey work will be the zone south of Pinnakayal (lat. 8°25' - 8°35'N) and a total of 16 months will be spent in the survey. Work during this period will be devided into 2 phases. The first phase will involve cursory survey of the sea bottom at intervals of 600 metres starting from 10 m. depth ending with 27 m. depth. This will help us to know the nature of distribution of fauna and flora progressively and the changing pattern of distribution of the fauna and flora also. During the second phase of work special observations will be made concentrating on the rocky bottom encountered so as to enable us to chart out the rocky beds. This will also help us to know about the settlement of pearl oyster population.

The area to be studied for the ecological work will be devided into 4 zones, covering the areas from Manapad to Tuticorin and stations will be established in chank beds and pearl banks in the shoreward areas as well as in offshore formation. The distribution pattern and the population of pearl oysters and chanks are proposed to be studied. This work will occupy 24 months. Side by side with this, experiments on chank movements and growth rate of chanks are also proposed to be conducted.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the ecology of the sea bottom with particular reference to the polychaete fauna of the chank grounds and other areas.

Project Code No. FB/MF/Mf. 1.2

Division: Fishery Biology Location of work: Tuticorin

Title of major project, if any: Molluscan fisheries investigations.

Personnel (Name and designation)

Project Leader: Associates:

K. Ramdoss, Survey Assistant *

Objectives:

To study the polychaete fauna of chank beds and other areas, the food and feeding habits of chanks and to assess the bottom fauna and plankton of the inshore areas.

Total duration: 3 years Date of initiation: 1969

Justification:

The food of chanks has not been studied so far in detail. The polychaetes are considered to be major item in the food of chanks. It is of practical importance to determine the food item of chanks, since it will help to locate the areas where chanks are found in good numbers. Therefore it is proposed to study the polychaete fauna of the sea bottom and the food and feeding habits of chanks. It is also proposed to study ecology of the Tuticorin Bay to assess the bottom fauna and plankton of the inshore areas, as detailed investigations have not been carried out

Plan of work:

1. The polychaete fauna of the chank grounds and other areas off Tuticorin, Vaipar, Pinnakayal and Tiruchendur will be studied.
2. Information on the food and feeding habits of chanks will be collected.
3. Studies on the bottom fauna, plankton and hydrological condtion of the inshore area of the Tuticorin bay will be made at two stations.

*Coordinator: K. Nagappan Nayar, Jr. Fishery Scientist

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
MANDAPAM CAMP

Title of Project: Studies on some aspects of the biology of the edible Oyster, Crassostrea madrasensis (Preston).

Project Code No. FB/ME/Mf. 1.3

Division: Fishery Biology Location: Mandapam Camp

Title of major project, if any: Molluscan Fisheries Investigations.

Personnel (Name and Designation)

Project Leader: Associates:

K. Satyanarayana Rao,
Asst. Fishery Scientist

Objectives:

To obtain information on the breeding period, development, growth, factors influencing reproduction and growth, height-weight relationship, seasonal changes in meat weight of Crassostrea madrasensis (Preston) of Athankarai estuary, biochemical changes in oysters and ecology of the oysters.

Total duration: 3 years. Date of initiation: 1970.

Brief resume of literature:

Growth and reproduction in the European and American oysters have been studied extensively (Moore 1898, Orton 1926, 1937, Ingle 1950, Menzel 1951, Korringa 1953, Ramson 1949, Orton 1927, Coe 1932, Loosanoff 1942, 1962, Loosanoff and Davis 1952). Similar work has been done in the case of Crassostrea spp. of Madras, Ennore and Kelwa (Rao 1951,1956, Rao and Nayar 1956, Durve 1965). In view of the fact that growth and reproductive processes in oysters vary in different areas these aspects have been taken up for study in the case of Crassostrea madrasensis of Athankarai estuary. The information will be helpful for oyster culture and management. The development of the Indian oyster C. madrasensis has not been studied. Little is known about the fauna associated with oysters in India. Some work been done on the probable relation between growth and reproduction of Indian oysters and the environmental factors, salinity and temperature (Rao and Nayar, 1956, Rao 1956) and biochemical changes in oysters (Venkataraman and Chari, 1951, Durve and Bal, 1961).

1. Coe, W.R.	1932	Biol. Bull., 63: 419-441.
2. Durve, V.S.	1965	J.Mar. biol. Ass. India, 7: 328-341.
3. _____ and Bal, D.V.	1961	J. zool. soc. India, 13: 70-77.
4. Ingle, R.M.	1950	Science, 4: 25-31.
5. Korringa, P.	1953	Quart. Rev. Biol., 27: 266-308 and 339-365.
6. Loosanoff, V.L.	1942	Biol. Bull., 82: 195-206.
7. _____	1962	Ibid., 122: 86-94.
8. _____ and Davis,H.C.	1952	Ibid., 103: 80-96.
9. Menzel, R.W.	1951	Science, 113: 719-721.
10. Moore, H.F.	1898	Rept. U.S. Com. Fish and Fisheries for 1897. 23: 263-340.
11. Orton, J.H.	1926	Report on survey of the Fal Estuary Oyster beds.
12. _____	1927	J.Mar. Biol. Ass. U.K., 14: 967-1045.
13. _____	1937	Oyster Biology and Oyster Culture. Edward Arnold and Co., London. 211 pp.
14. Ranson, G.	1949	Bull. Mus. Hist. nat. Paris, 21.
15. Rao, K.V.	1951	Proc. Ind. Acad.Sci., 33B: 231-256.
16. _____	1956	Ibid., 44B: 332-356.
17. _____ and Nayar, K.N.	1956	Indian J. Fish., 3: 231-260.
18. Venkataraman, R and Chari S.T.	1951	Ind . Jour. Med. Res., 39: 533-541.

Plan of work:

Reproduction in Crassostrea madrasensis will be studied by microscopic examination of gonads, growth of oysters by the size frequency method, development by artificial fertilization and rearing of the fertilized eggs in the laboratory. The variations in salinity and temperature of the water over the oysters will be determined. The lipid, protein and carbohydrate contents of oysters will be estimated using appropriate biochemical methods to find out the nature of the quantitative changes in these basic organic materials in relation to maturation of gonads. The fauna that exists on the oysters will be studied.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp.

Title of Project: Studies on the Molluscan fauna with special reference to bivalves.

Project Code No. FB/ME/Mf. 1.4

Division: Fishery Biology **Location:** Minicoy

Title of major project: Molluscan fisheries Investigations.

Personnel (Name and Designation)

Project Leader:

K.K. Appukuttan,
Research Assistant.

Associates:

1. Junior Scientific Assistant - One

Objectives:

To study the taxonomy and distribution of the molluscan fauna and the coral and wood boring bivalves of Minicoy.

Total duration: Initially for 3 years **Date of initiation:** 1970.

Justification:

Minicoy has a rich molluscan fauna. No attempts have been made to study the molluscan resources of this area and the destructive efforts of the bivalves on the coral reefs and fishing boats. It is therefore proposed to take up this work for detailed study.

Plan of work:

(1) Bivalves and other molluscs of Minicoy will be collected and identified.

(2) Information on their distribution and abundance will be gathered.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on Turbo intercostalis and other intertidal and subtidal gastropods.

Project Code No. FB/MF/Mf. 1.5

Division: Fishery Biology **Location:** Mandapam Camp

Title of major project, if any: Molluscan fisheries Investigations.

Personnel (Name and Designation)

Project Leader:

K.S. Sundaram,
Research Assistant.

Associates:

Objectives:

1. To study the biology of Turbo intercostalis
2. To study the ecology of intertidal and subtidal species of gastropods occurring in the Gulf of Mannar and Palk Bay in the vicinity of Mandapam.

Total duration: 2 years. **Date of initiation:** 1970.

Brief resume of literature:

T. intercostalis is a common prosobranchiate gastropod occurring in the littoral zone of Mandapam coast. The flesh of this snail is used as food and the shell is utilized for ornamental purposes and as an article of commerce. Hornell (1917) briefly discussed the habits and utility of T. intercostalis and there are very few works on the biology of Indian prosobranchiate molluscs.

Detailed studies have been made in different parts of the world on the ecology of intertidal animals (Stephenson and Stephenson, 1949; Doty, 1957 and Lewis, 1964). Very few attempts have been made in India to study the ecology of intertidal molluscs (Ganapati and Lakshmana Rao 1962; Satyanarayana Rao and Suryanarayana Rao, 1952).

Plan of work:

1) The morphological characteristics, growth rate, age, food and feeding, breeding habits, distribution, predators and fishery of T. intercostalis will be studied.

2) The zonation pattern of gastropods in different localities around Mandapam will be studied.

3) Information on habits, habitats, distribution and abundance of various species of gastropods will be collected.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on taxonomy, biology and fishery of cephalopods

Project Code No. FB/MF/Mf. 1.6

Division: Fishery Biology

Location of work: Cochin and Mandapam

Title of major project: Molluscan Fisheries investigations

Personnel (Name and designation)

Project Leader:

E.G. Silas,
Jr. Fishery Scientist

Associates:

1. R. Sarvesan, Research Assistant

Objectives:

To study the abundance of commercially important species of pelagic squids off west coast and Laccadives such as species of Symplectoteuthis.

To study the systematics and fishery biological aspects of commercially important cephalopods of Gulf of Mannar and Palk Bay.

Total duration: 3 years

Date of initiation: 1969

Brief resume of literature:

The cephalopod resources of the seas bordering India is under exploited. Recent exploratory fishing has brought to light the availability of several species of cephalopods which indicates possibility for commercial exploitation. A perusal of earlier literature on Indian cephalopods reveals the paucity of our knowledge of their systematics, biology and distribution. Coastal and oceanic squids form an important part of the food of fishes. In some areas in the Pacific Ocean squids support major fisheries. It is also known that some species of squids are characteristically associated with particular water masses. In the Indian region the important contribution on cephalopods are by Rao (1959) and Silas (1968). Some relevant reference on cephalopods are given below:

1. Adam, W. 1939 Rec. Indian Mus., 41:61-110

2. Hoyle, W.E. 1886 Rept. Sci. Res. Voy. 'Challenger', Zool., 16:1-1246.

3. Massy, A.L. 1916 Rec. Indian Mus., 12:185-247.

4. Pichford, G.E. 1952 Discovery Reports, 26:197-210.

5. Rao, K.V. 1954 Indian J. Fish., I:37-66.

6. Silas, E.G. 1968 Proc. Sym. on Mollusca, Mar. biol. Ass. India, I:277-359.

7. Voss, G.L. 1963 Bull. U.S. Nat. Mus., 234:1-180.

Plan of work:

Collection of adult pelagic squids with drift nets and other fishing gears; survey of resources and study of special and vertical distribution of oceanic squids in their various stages of life history. Collection and sorting of cephalopoda from plankton collections made during the cruises of R.V. Varuna off the west coast of India and the Lacoadive sea; study the distribution and abundance of larval cephalopods in relation to hydrographic factors.

Collection and identification of cephalopods from commercial landings. Age and growth, length-weight relationship, food and feeding habits, breeding, fecundity, life history and fishery of Loligo duacelli along with general biology of Sepia aculeata and Octopus dollfusi will be studied at Mandapam.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE,
(I.C.A.R.)
Mandapam Camp.

Title of Project: Factors controlling the movements of Prawns.

Project Code No. FB/PH/Phy. 1.1

Division: Fishery Biology Location: Cochin

Title of major project, if any: Physiological investigations.

Personnel (Name and Designation)

Project Leader:

M. Dharmamba
Research Assistant (Selection Grade)

Objectives:

To study factors viz. salinity, temperature, etc. controlling the movements of penaeid prawns.

To study the neuroendocrine mechanisms controlling the process of osmoregulation in the prawns.

Total duration: 5 years Date of initiation: 1970

Brief resume of literature:

Prawns form an important fishery contributing about 10.5% of the total marine fish landings. Many of the prawns are known to breed in sea and migrate as postlarvae or juveniles to brackish waters or inshore waters for feeding and growth, and return to sea for further growth and breeding. Therefore, it is of interest to study the factors controlling the movements of prawns since any knowledge on this aspect would be useful in the correct assessment of the catch and exploitation.

Knowledge of factors controlling the movements of prawns is limited. Very little work has been done in India with reference to osmotic behaviour and osmoregulation of a few species of penaeid prawns (Panikkar, 1948; Panikkar and Viswanathan, 1948; Rao, 1958; Reddy, 1963; Gnanamuthu, 1966; Kunju, 1967 and Raman, 1967).

Plan of work:

Correlation of the distribution of prawns in space and time with hydrological conditions.

Collection of data on temperature and salinity from the areas of study.

Collection of prawn samples for the study of the electrolyte composition of their body fluid and tissues. Study Sodium, Pottassium, Calcium and chloride content of the body fluid and tissues. Determine osmolarity of the body fluid.

Correlate electrolyte composition of the body fluid and tissues with the hydrographical conditions of the area of study (external environment).

Study the influence of endocrines on osmoregulation of prawns.

Study efforts of removal of specific endocrine organs on the electrolyte composition and osmolarity of the body fluid in various salinity environments.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp.

Title of Project: Studies on some aspects of the physiology of the Prawn Penaeus semisulcatus.

Project Code No. FB/PH/Phy. 1.2

Division: Fishery Biology Location: Mandapam Camp

Title of major project, if any: Physiological Investigations.

Personnel (Name and Designation)

Project Leader: Associates:

K. Satyanarayana Rao,
Asst. Fishery Scientist

Objectives:

To study the metabolic rate of Penaeus semisulcatus in relation to body weight and salinity of the medium, salinity tolerance of the prawns and osmotic behaviour of the prawns which are exposed to varying salinities in estuaries and backwaters.

Total duration: 3 years. Date of initiation: 1970.

Brief resume of literature:

The metabolic rate of the prawn Metapenaeus monoceros has been found to be higher in sub and supranormal salinities (Pampapathi Rao 1958). The oxygen consumption of Penaeus indicus has been studied in relation to body weight and oxygen tension (Subrahmanyam 1962). The oxygen consumption of Penaeus indicus and P. semisulcatus has been determined in relation to starvation and level of ambient oxygen (Narayanan Kutty, 1969). Hypo-osmotic regulation has been recorded in Penaeid prawns by Panikkar (1949). It has been shown that hypo-osmotic regulation is brough about by active regulation of chlorides in Metapenaeus monoceros (Panikkar and Viswanathan 1948). The available information on the physiology of prawns of the Indian region is quite limited. A knowledge of the metabolic rate of prawns in relation to body weight and salinity of the medium, salinity tolerance of the prawns and osmotic behaviour is necessary for successful prawn culture. Therefore, these aspects have been taken up for study in Penaeus semisulcatus.

1. Narayanan Kutty, M 1969 - Proc. World Scient. Conf. on the Biology and culture of Shrimps and Prawns, FAO Fisheries Reports 57(3):957-969.

2. Pampapathi Rao, K 1958 - J. exp. Biol., 35: 307-13.

3. Panikkar, N.K 1949 - Proceedings of the 2nd Meeting of the Indo-Pacific Fisheries Council, Cromulla, Section I, 168-175.

4. Panikkar, N.K and Viswanathan, R 1948 - Nature, 161: 137-138.

5. Subrahmanyam, C.B 1962 - Proc. Indian Acad. Sci.(B), 55: 152-161.

Plan of work: The oxygen consumption of Penaeus semisulcatus in relation to body weight and salinity of the medium will be investigated. The salinity tolerance of the prawns, the osmotic pressure of blood and internal chloride and sodium concentrations in relation to the concentrations in the external medium will be studied.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Investigations on endocrine control of osmoregulation in teleosts.

Project Code No. FB/PH/Phy. 1.3.

Division: Fishery Biology Location: Cochin

Title of major project, if any: Physiological Investigations.

Personnel (Name and Designation)

Project Leader:
M. Dharmamba
Research Assistant (Selection Grade)

Objectives:

To study the effect of hormones on mineral balance of Chanos chanos and/or Mugil sp.

To study site(s) of action of hormones effect on target organs (histo-physiological and biochemical studies)

To study source of pituitary hormones involved in osmoregulation, based on response of endocrines to experimental manipulations (histo-physiological studies)

Total duration: 5 years. Date of initation: 1970.

Brief resume of literature:

It is of interest to study the various hormones involved and their interrelationship in controlling the process of osmoregulation in teleosts especially in food-fishes with reference to marine environment. The study would enable to understand the migratory habits of some fishes.

Studies on endocrine control of osmoregulation are based on investigations of very few teleostean species viz. Fundulus heteroclitus, F. kansal, Poecilea latipinne, Xiphophorus maculatus, Tilapia mossambica, Gambusia sp. Anguilla anguilla, A. rostrata, Carassius auratus and Gastascteus aculeatus. Maetz (1968) has reviewed the work done on the endocrine control of osmoregulation in fishes. No work has been done on these lines in India. Little is known about the endocrine control of osmoregulation in milk fish or mullets which are euryhaline marine teleosts and form good food fishes.

Observations from studies of endocrine control of osmoregulation might be utilised in acclimatization of certain important food-fishes to hypotonic or hypertonic environment, with administration of exogenous hormones essential for osmoregulation in these media.

Plan of work:

I. Studies on mineral balance of milk fish and / or mullets.

1. Normal fish :

(a) Time study of acclimatization to fresh water and from fresh water to sea water with reference to plasma electrolytes (estimation of cations - Sodium, Pottasium, Calcium and anion-chloride) and plasma osmolarity (vapour pressure or freezing point of the body fluid as criterion of determination)

(b) Measurement of rate of turnover of internal sodium in sea water using Na^{22}.

(c) Effect of prolactin, ACTH or cortisol on plasma electrolytes, plasma osmolarity and turnover rate of internal sodium.

2. Hypophysectomised fish:

(a) Effect of hypophysectomy - time study with reference to survival of fish, plasma electrolytes, plasma osmolarity and turnover rate of Na.

(b) Effect of prolactin, ACTH or cortisol or the parameters mentioned in 2(a)

II. Site(s) of action of hormones - histophysiological and biochemical studies.

1. Effect of hypophysectomy on gills (structure and Na-k-activated ATP ax activity), kidney and scales in fish adapted to fresh water and sea water

2. Effect of prolactin, ACTH or cortisol on gill and scale mucous cells, kidney structure and Na-k-activated ATP ax activity of gills.

III. Cellular source of pituitary hormones.

1. Source of "Prolactin"
2. Source of ACTH

} histophysiological studies.

3. "Prolactin": Study of pituitary eta cells (prolactin secreting) of fish from different environments in nature and comparison with results from experimental work.

Observations from studies of endocrine control of osmoregulation might be utilised in acclimatization of certain important food-fishes to hypotonic or hypertonic environment, with administration of exogenous hormones essential for osmoregulation in these media.

Plan of work:

I. Studies on mineral balance of milk fish and / or mullets.

1. Normal fish :

(a) Time study of acclimatization to fresh water and from fresh water to sea water with reference to plasma electrolytes (estimation of cations - Sodium, Pottasium, Calcium and anion-chloride) and plasma osmolarity (vapour pressure or freezing point of the body fluid as criterion of determination)

(b) Measurement of rate of turnover of internal sodium in sea water using Na^{22}.

(c) Effect of prolactin, ACTH or cortisol on plasma electrolytes, plasma osmolarity and turnover rate of internal sodium.

2. Hypophysectomised fish:

(a) Effect of hypophysectomy - time study with reference to survival of fish, plasma electrolytes, plasma osmolarity and turnover rate of Na.

(b) Effect of prolactin, ACTH or cortisol or the parameters mentioned in 2(a)

II. Site(s) of action of hormones - histophysiological and biochemical studies.

1. Effect of hypophysectomy on gills (structure and Na-k-activated ATP ax activity), kidney and scales in fish adapted to fresh water and sea water

2. Effect of prolactin, ACTH or cortisol on gill and scale mucous cells, kidney structure and Na-k-activated ATP ax activity of gills.

III. Cellular source of pituitary hormones.

1. Source of "Prolactin"
2. Source of ACTH

} histophysiological studies.

3. "Prolactin": Study of pituitary eta cells (prolactin secreting) of fish from different environments in nature and comparison with results from experimental work.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R)
Mandapam Camp

Title of project: Determination of primary production at different stations along the west coast of India

Project Code No. MBO/MB/Pp. 1.1

Division: Marine Biology and Oceanography Location: Cochin, Bombay

Title of major project, if any: Primary Production Studies.

Personnel (Name and Designation)

Project Leader:

Junior Fishery Scientist - Vacant

Associates:

1. K. Radhakrishna, Asst. Fishery Scientist
2. P.V. Ramachandran Nair, Asst. Fishery Scientist
3. K.J. Joseph, Survey Assistant
4. D.C.V. Easterson, Research Asst.
5. One Jr. Scientific Assistant

Objectives: To assess the potential productivity and fishery resources on the west coast of India.

Total duration : 5 years Date of initiation: 1969.

Brief resume of literature:

Radioactive Carbon (C^{14}) is being increasingly used by Fisheries Laboratories throughout the world in order to understand the organic productivity in the sea. By assessing the magnitude of annual production and the seasonal variation, the potential harvest can be estimated. This method had been successfully applied in the inshore waters of Gulf of Mannar after a four-year study of the productivity of those areas.

1. Steemann Nielsen, E and E.A. Jensen. Primary Production. Galathea Repts. I (1967)
2. Prasad, R.R & P.V.R. Nair. Studies on Primary production - 1. Gulf of Mannar. J. mar. biol. Ass. India, 1963.

Plan of work: Undertake regular cruises on the west coast. Measure light penetration and determine the depth of the euphotic zone. Collect water samples from different light depths. Incubate them either in situ or in simulated in situ conditions or in constant light depending on the convenience and determine the unit volume production. By integrating these values production per unit area is determined which is ultimately used for computing the potential harvest either by comparison with intensely exploited waters or by tracing the carbon production through various trophic levels.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: The use of phytoplankton pigments as an index of productivity.

Project Code No. MBO/MB/Pp. 1.2

Division: Marine Biology and Oceanography Location: Cochin and Bombay

Title of major project, if any: Primary Production Studies.

Personnel (Name and Designation)

Project Leader:
Junior Fishery Scientist - Vacant

Associates:
1. K. Radhakrishna, Asst. Fishery Scientist
2. P.V. Ramachandran Nair, Asst. Fishery Scientist
3. K.J. Joseph, Survey Assistant
4. D.C.V. Easterson, Research Asst.
5. One Jr. Scientific Assistant.

Objectives:
To estimate the standing crop of Phytoplankton organisms with reference to productive potential

Total duration: 3 years Date of initiation: 1970.

Brief resume of literature:
Chlorophyll estimations are made along with C^{14} primary production measurements in order to have a proper interpretation of C^{14} data. This study was carried out first by Richards and Thompson. They estimated the plankton population by Spectrophotometer method. Yentsch and Menzel developed a method by which chlorophyll and phaeophytin concentrations could be measured.

1. Richards and Thompson 1952 The estimation and characterization of plankton populations by pigment analysis - II. A spectrophotometric method for the estimation of plankton pigments. J. Mar. Res. 11: 156-172.

2. Yentsch, C.S. and D.W. Menzel 1963 A method for determination of phytoplankton chlorophyll and phaeophytin by fluorescence. Deep Sea Res: 221-231.

Plan of work: During regular cruises on the West Coast 1-2 litres of water samples would be collected from the same depths where C^{14} sampling would be made. It is then filtered through membrance filter and extracted with 90% acetone. The concentration of chlorophyll a, b and c and carotenoids would be determined spectrophotometrically. These data would be compared with C^{14} values (carbon fixed) in order to obtain information on the relation between pigments and production. These data will be further compared with data from culture experiments.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Culturing of phytoplankton organisms including nannoplankton.

Project Code No. MBO/MB/Pp. 1.3

Division: Marine Biology and Oceanography Location: Cochin

Title of major project, if any: Primary Production Studies.

Personnel (Name and Designation)

Project Leader:

P.V. Ramachandran Nair
Assistant Fishery Scientist

Associates:

1. K.J. Joseph, Survey Assistant
2. One Junior Scientific Assistant

Objectives:

To develop and maintain healthy axenic cultures of phytoplankton organisms for in vitro experiments. These experiments would be aimed at solving the physiological problems that are encountered in field studies. Also for feeding larval organisms.

Total duration: 3 years. Date of initiation: 1970.

Brief resume of literature:

Cultures isolated from natural plankton as well as from animal tissues where they occur as symbionts are being studied in many laboratories. They are used for feeding experiments with larval forms of organisms and other experiments for elucidating problems connected with primary productivity.

1. Aruga, Y. Ecological studies and matter production of phytoplankton 1. Seasonal changes in photosynthesis of natural phytoplankton. Bot. Mag. Tokyo 78: 280-288
2. Aruga, Y. Ecological studies of photosynthesis and matter production of phytoplankton 11. Photosynthesis of algae in relation to light intensity and temperature. Bot. Mag. Tokyo 78: 360-365
3. L. Provasoli, J.J., A. McLaughlin and M.R. Droop. The development of Artificial Media for Marine Algae Archiv fur Mikrobiologie, Bd. 25, S. 392-428 (1957)

Plan of work: Fresh plankton to be inoculated in enriched sea water. The surviving species are isolated and recultured till pure stains are obtained. These are to be maintained under diffused light and bubbling of air. New cultures in the developing phase are taken which will be between 4-7 days and subjected to the experiments in the laboratory. Each individual experiment is designed according to the exigencies of the problem.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Studies on the photosynthetic characteristics and magnitude of respiration using cultures of phytoplankton.

Project Code No. MBO/MB/Pp. 1.4

Division: Marine Biology and Oceanography Location: Cochin

Title of major project, if any: Primary Production Studies.

Personnel (Name and Designation)

Project Leader:

P.V. Ramachandran Nair,
Assistant Fishery Scientist

Associates:

1. K.J.Joseph, Survey Assistant
2. One Jr. Scientific Assistant.

Objectives:

For interpretation of the data collected during cruises from in situ and simulated in situ C^{14} experiments by comparing with in vitro productivity experiments using cultures.

Total duration: 3 years Date of initiation: 1970.

Brief resume of literature:

For the estimation of potential production on the sea mainly two techniques have been used: the oxygen method introduced by Gaarder and Gran (1927) and the C^{14} method introduced by Steemann Nielsen (1953). In the C^{14} method only carbon fixation in particulate matter is determined, and as such under estimates the total carbon assimilation. G.E. Fogg in his experiments with cultures has shown that under certain circumstances as much as 50% of the total uptake of carbon has been found in the extracellular products.

1. Gaarder, T and Gran, H.H. 1927 "Investigations of the production of plankton in Oslo Fjord" Rapp. Et Proc-Verb. 42: 3

2. Steemann Nielsen,E 1952 " The use of radioactive carbon (C^{14}) for measuring organic production in the sea" J. du Cons; 18(2): 117-40.

3. Fogg, G.E. 1958 "Extracellular products of phytoplankton and the estimation of primary production" Rapp. et. Proc-Verb; 56-60.

Plan of work:

Unialgal cultures grown in various media to be used for the experiments. Concentration, salinity initial oxygen and carbondioxide content of the sample to be determined. One ampoule of C^{14} is added to each bottle of culture. These to be incubated for a fixed time using water thermostat. Dark bottles to be used simultaneously with clear bottles. 10 ml of sample is filtered through millipore filters. Oxygen content determined by Winkler method. Dark bottles are used along with clear bottles. In this way it is possible to determine both respiration and photosynthesis. To make respiration correction photosynthesis is measured at different light intensities and extrapolated.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Qualitative and Quantitative studies on Phytoplankton of Offshore and Oceanic waters.

Project Code No. MBO/MB/Pl. 2.1

Division: Marine Biology and Oceanography Location: Cochin.

Title of major project if any: Planktological Investigations.

Personnel (Name and Designation)

Project Leader:
R. Subrahmanyan,
Fishery Scientist

Associates:
1. C.P. Gopinathan, Research Assistant
2. Laboratory cum Field Assistant - One

Objectives:

To study horizontal distribution of quantity of phytoplankton and the species, and their seasonal fluctuations. These studies give an idea of the fertility of the waters which in its turn provide information on organisms in the subsequent links and potential fishery finally.

Total duration: 5 years initially. Date of initiation: 1969.

Brief resume of literature:

The only detailed work on these aspects hasbeen done for inshore area on the west coast in India. There are no accounts for the oceanic waters; none on ecological aspects and as regards systematics only few cursory accounts by some expeditions. Much work has been done on these aspects in Europe, U.K., East and West coasts of America and Japanese waters.

1. Harvey H.W., et al. 1935. Plankton production and its control. J.M.B.A., U.K., vol. No.2, pp. 407-442.

2. Marshall, S.M and Orr, A.P. 1927. The relation of the plankton to some chemical and physical factors in the Clyde Sea area. J.M.B.A., U.K., xiv(4): 837-68.

3. Riley, G.A. 1938-1950. (Number of papers on plankton studies on the East coast of N. America).

4. Allen, W.E. 1928-1946. (Number of papers on plankton studies on the West coast of America).

5. Kokubo, S and Collaborators 1931-1938. (Number of papers of plankton of Japanese waters.

6. Venkataraman, G 1939. A systematic account of some south Indian diatoms. Proc. Ind. Acad. Sci. vol.x, No.6, sec.B, 1939.

7. Subrahmanyan, R 1946. A systematic account of the marine plankton diatoms of the Madras coast. Proc. Acad. Sci. vol. xxiv, 1946.

8. _____ 1959-1965. Studies on the phytoplankton of the west coast of India. Part I, II, III and IV.

9. _____ 1963-1965. Studies on the phytoplankton of the east coast of India. Part I and II.

10. _____ 1968. The Dinophyceae of the Indian Seas, Part I. Genus Ceratium Schrank. Mem. II, Mar. biol. Ass. India; Part II. Family Peridiniaceae. Mem. II., Mar. biol. Ass. India (In Press)

11. Castracane, 1876. Report on the Diatomaceae collected by H.M.S. Challenger during the years 1873-76. Rep. chall. Expdn. 1876, 2, Botany.

12. Karsten, G 1907. Das Phytoplankton des Atlantischen Oceans nach dem Material der Deutscher Tiefsee-Expeditions. 1898-99. Wiss. Engebn. d. Deutschen Tiefsee-Expedn. duf. dem Dampfer "Valdivia" 1898-99, 1907 (1905), 2, Tiel 2, Lief 1.

Plan of work:

Identification of phytoplankton elements belonging to several classes of algae, determination of displacement volume of standard plankton collections; enumeration of different species in the samples. Study abundance, seasonal variation, and distribution of species; relationship to physico - chemical factors and with fisheries.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on phytoplankton of the inshore waters.

Project Code No. MBO/MB/Pl. 2.2

Division: Marine Biology and Oceanography Location: Cochin, Kozhikode

Title of major project, if any: Planktological Investigations

Personnel (Name and Designation)

Project Leader:

R. Subrahmanyan,
Fishery Scientist

Associates:

1. V.S. Krishnamurty Chennubhotla,
Assistant Fishery Scientist

Objectives:

To study phytoplankton production in relation to fluctuations in fish landings.

Total duration: Continuing Date of initiation: 1969

Justification:

The previous investigations on the plankton off the west coast were by Hornell and Nayudu 1923, Menon 1945, Chidambaram and Menon 1945, Gonzalves 1947 and George 1953 (a), but a detailed study of the phytoplankton was made by Subrahmanyan 1959. He established the importance of phytoplankton in the fisheries of this region and amongst these phytoplankton organisms, certain selected ones like Fragilaria oceanica were cited as the indicator species for the occurrence of oil sardine shoals.

These studies have also shown that the phytoplankton production which could support fisheries is much greater than the actual fish landings. This indicates that there is vast scope for increased exploitation of the fishery resources.

Plan of work:

Weekly samples of plankton will be collected by using standard nets from inshore waters.

The standing crop will be estimated by displacement and dry weight methods. Studies will also be made by plant pigment units and neumerical counting.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Qualitative and Quantitative studies on the phytoplankton of brackish waters off Cochin.

Project Code No. MBO/AB/PL. 1.3

Division: Marine Biology and Oceanography Location: Cochin

Title of major project, if any: Planktological Investigations.

Personnel (Name and Designation)

Project Leader:
R. Subrahmanyan,
Fishery Scientist.

Associates:
1. C.P. Gopinathan
Research Assistant.

Objectives:

No previous work has been carried out on the phytoplankton of Cochin backwaters. The present study will be of value to understand the pattern of distribution of different species of phytoplankton occurring in the brackish environment which is under the influence of the sea at one end and freshwater at the head and tidal influence added. The habitat is one of interest to prawn fisheries as young ones of these prawns pass part of their life in this.

Total duration: 3 years. Date of initiation: 1970.

Brief resume of literature:

The only account on the plankton of Cochin backwaters was given by George, M.J (1958). Except this, there are no other accounts on plankton, especially on phytoplankton.

1. George, P.C. 1953. Observations on the planktological and hydrological conditions of the Korapuzha estuary, Malabar District. Proc. Ind. Sci. Congr. pt, iii, sec, vii., p. 184.

2. George, M.J. 1958. Observations on the plankton of the Cochin backwaters. Indian J. Fish. 5: 375-401.

3. Subrahmanyan, R 1946. A systematic account of the marine plankton diatoms of the Madras coast. Proc. Acad. Sci. vol. xxiv, 1946.

4. _____ 1958. Phytoplankton organisms of the Arabian sea off the west coast of India. J. Ind. Bot. Soc. vol.xxxvii, No.4.

Plan of work:

Weekly collections of phytoplankton will be made from fixed stations in the Cochin backwaters. Temperature data will be collected at these stations itself and water samples collected for analysis.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on plankton of the Inshore waters (General)

Project Code No. MBO/MB/Pl. 2.4

Division: Marine Biology and Oceanography

Location: Bombay, Karwar, Mangalore, Kozhikode, Cochin, Madras, Port Blair.

Title of major project, if any: Planktological Investigations.

Personnel (Name and Designation)

Project Leader:

K.N.Krishna Kartha,
Assistant Fishery Scientist

Associates:

1. K. Rengarajan, Asst.Fishery Scientist
2. N.S. Radhakrishnan, Assistant Fishery Scientist
3. K.G. Girijavallabhan, Research Assistant (S.G.)
4. R. Marichamy, Research Assistant
5. D.C.V. Easterson, Research Asst.
6. Field Investigator - One.

Total duration: Continuing

Date of initiation: 1969

Justification:

It is needless to say that the zooplanktonic organisms play an important role in the fish life. Some fish are selective feeders. Changes in environment determine species abundance of food organisms. The relationship between species abundance in zooplankton and the fish species depending on them forms an important study in the fishery biology.

Plan of work:

Assessment of standing crop by displacement volume, dry weight and neumerical counts. At Kozhikode detailed studies will be made on copepods and at Madras on the fish eggs and larvae. Seasonal abundance of the juvenile fish species also will be studied at Madras.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Investigations on the standing crop of zooplankton off the west coast of India and the Laccadive Sea.

Project Code No. MBO/MB/Pl. 2.5

Division: Marine Biology and Oceanography Location: Cochin

Title of major project, if any: Planktological Investigations

Personnel (Name and Designation)

Project Leader:

E.G. Silas,
Junior Fishery Scientist

Associates:

Other members of the scientific staff handling plankton collections.

Objectives:

To investigate the standing crop of zooplankton which form the major food of many fishes and understand their seasonal variations off the west coast of India and the Laccadive Sea.

Total duration: 2 years. Date of initiation: 1969.

Brief resume of literature:

Displacement volumes of plankton enables a rapid estimation of the standing crop which may indicate areas of high productivity. Studies covering a period of several years over a wide area including inshore and offshore waters have not been undertaken in this region. However, the available information is restricted to selected inshore centres. Information from oceanic areas based on observations made during international expeditions are scattered both in space and time.

1. George, P.C. 1963 J. Zool. Soc. India, 5(1): pp. 76-107.
2. Isaacs, J.D., A. Fleminger, and J.K. Miller 1969. CALCOFI Atlas No.10: pp. 1-252.
3. Prasad, R.R. 1954 Indian J. Fish., 1(1): 1-36.
4. _____ 1956 Ibid., 3(1): 1-42
5. _____ 1968a IIOE Plankton Atlas, 1(1): Maps 1-18(NIO/CSIR, New Delhi).
6. _____ 1968b Ibid., 1(2): Maps 1-9 (NIO/CSIR, New Delhi)
7. Subrahmanyan, R 196 1959 Proc. Indian Acad. Sci., 50B(3&4): pp. 113-187; 189-252.

Plan of work:

1. Determination of displacement volume of zooplankton samples collected during research cruises of R.V. VARUNA from off the south west coast and the Laccadive Sea for estimating the standing crop and biomass.

2. Monthly, seasonal and year to year fluctuations of the standing crop of zooplankton in neritic and oceanic waters to be estimated.

3. Preparation of charts indicating seasonal fluctuations of the zooplankton biomass off the south west coast and the Laccadive Sea.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Studies on the fish eggs and larvae from the plankton of the south west coast of India and the Laccadive Sea.

Project Code No. MBO/MB/Pl. 2.6

Division: Marine Biology and Oceanography **Location:** Cochin

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Title of major project, if any: Planktological Investigations.

Personnel (Name and Designation)

Coordinator:

R.V. Nair,
Director

Associates:

1. E.G. Silas, Junior Fishery Scientist
2. M.S. Rajagopalan, Asst. Fishery Scientist
3. V.K. Pillai, Research Assistant
4. G.S.D. Selvaraj, Research Assistant
5. M. Meiyappan, Research Assistant
6. A. Regunathan, Research Assistant
7. M. Rajagopalan, Technical Assistant
8. Field Investigator - One

Objectives:

Quantitative assessment of total fish eggs and larvae in the plankton as well as the major constituents.

To locate spawning grounds and to study the spawning seasons and spawning intensities.

To estimate the recruitment to the stock of future fishery of the south west coast and the Laccadive Sea.

To make detailed life-history studies on important species.

Preparation of charts showing distribution of fish eggs and larvae in space and time.

To study the influence of environmental factors affecting the abundance and distribution of fish eggs and larvae.

Total duration: 5 years. **Date of initiation:** 1969

Brief resume of literature:

Investigations on fish eggs and larvae from Indian Seas have dealt chiefly with the qualitative aspects such as the descriptive stages of eggs and larvae of some species. Very little information is available on the quantitative and seasonal abundance of fish eggs and larvae. One serious drawback has been the lack of information on the specific identity of fish eggs and larvae which is partly due to the paucity of information of the ichthyofauna.

1. Ahlstrom, E.H. 1954 Fish. Bull. U.S. Fish Wildl. Serv., 93 (56): pp.83-140.

2. _____ 1959 Ibid., 161: pp. 107-146; 165:pp.185-213.

3. Jones, S and P. Bensam 1968 Bull. Cent. Mar. Fish. Res. Inst., No.3: pp. 1-154 (Literature on Indian works on fish eggs and larvae is available in this publication)

4. Mito, S 1961 Sci. Bull. Fac. Agri. Kyushu Univ., 18(3): 285-310.

5. Silas, E.G and K.C. George 1970 J. Mar. biol. Ass. India, 11(1).

6. Delsman, H.C. 1922-1938 Fish eggs and larvae from the Java Sea. Nos. 1-24. Published as a Series in Trebuia, Vols. 2 to 16.

Plan of work:

1. Collecting and sorting of fish eggs and larvae from the plankton samples obtained during the research cruises of R.V. VARUNA.

2. Estimation of abundance of total fish eggs and larvae for preparation of synoptic charts.

3. The subsorting of fish eggs and larvae and the study of the seasonal abundance and fluctuations of major constituent species.

4. Description of various life-history stages.

5. Preparation of an aid to the identification of the fish eggs and larvae.

6. To conduct artificial fertilization by stripping specimens in running condition and to rear the larvae under laboratory conditions for establishing specific identity.

7. To study the occurrence and distribution of fish eggs and larvae in relation to environmental factors.

8. To determine spawning period and locate spawning grounds.

9. To conduct egg surveys to study the recruitment to the stock of various commercial fisheries

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CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Bioscattering and identification of the biological constituents of the Deep Scattering Layers (D.S.L.)

Project Code No. MBO/MB/Pl. 2.7

Division: Marine Biology and Oceanography Location: Cochin

Title of major project, if any: Planktological Investigations

Personnel (Name and Designation)

Project Leader:

E.G. Silas,
Jr. Fishery Scientist

Associates:

Other scientific workers participating in the cruises.

Objectives:

To identify the biological constituents of the D.S.L., in order to find out their importance as forage for pelagic fishes, such as tunas.

Total duration: 4 years. Date of initiation: 1969.

Brief resume of literature:

The study of the Deep Scattering Layers is a recent development resulting from the use of acoustic devices on ships. The importance of the D.S.L. in the trophic cycle in the ocean hasbeen stressed in recent works, but very little information is available on the subject from the Indian Seas.

1. Andreeva, B. and Yu G. Chindonova 1964 Okeanologia, 1: 112-124.
2. Boden, B.P. 1950 U.S. Navy Electronic Lab. Rept No.186: pp.1-29.
3. Clarke, G.L and R.H. Backus 1964 Bull. Inst. Oceanogr. Monaco, 64 (1318): pp. 1-36.
4. Barham, E.C. 1963 Science, 140 (3568): pp. 826-828.
5. Silas, E.G. 1969 Bull. Centr. Mar. Fish. Res. Inst., 12: pp.1-86.

Plan of work:

Operation of Precesion Depth Recorder and other echo sounders and fish finders with oscilloscope (if available) at various depths at different times during the day and night for obtaining recordings of bioscattering and D.S.L. during the research cruises.

Collection and identification of the biological constituents from the D.S.L.

Study of seasonal variations in the composition and the intensity of bioscattering and D.S.L. to determine fishing grounds, fishing depths etc., in relation to food.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the reproduction, life-history and biology of Euphausiacea.

Project Code No: MBO/MB/Pl. 2.8

Division: Marine Biology and Oceanography Location: Cochin

Title of major project, if any: Planktological Investigations.

Personnel (Name and Designation)

Project Leader:

* K.J. Mathew,
Research Assistant

Objectives:

To study the reproduction, life-history and biology of euphausiids from plankton samples.

Total duration: 3 years Date of initiation: 1970

Brief resume of literature:

As euphausiids play a very important role in the economy of the world oceans by forming forage to higher animals, investigations on their reproduction, life-history and biology in relation to fisheries are very important. So far none of these aspects have been worked out in the Indian Ocean.

Reports of expedition like 'Challenger', 'Siboga', 'Valdivia', 'Dana', 'John Murray' etc. give the faunal list of euphausiids in the world oceans. Works of Brinton, Mauchline, Rudd etc. have revealed the distribution of euphausiids in space. Life history studies of a few species have been covered by Lebour, Fraser, John and others. Biological studies have been carried out by Sheard, Ponamareva, Mauchline etc.

1. Sars, G.O. 1885. "Report on the Schizopoda collected by H.M.S. Challenger during the years 1873-76", Challenger Reports, Zool., XIII, pp. 1-228
2. Illig, G. 1930. "Die Schizopoden der Deutschen-Tiefsee-Expedition", 'Valdivia', XXII, part 6, 400-625.
3. Mauchline, J and L.R. Fisher 1969. "The Biology of Euphausiids" Advances in Marine Biology, VII, pp. 1-454.
4. Fraser, F.C. 1936. "On the development and distribution of the young stages of 'Krill' (Euphausia superba)", Discovery Reports XIV, 1-192.
5. Brinton, E. 1962. "The distribution of Pacific Euphausiids", Bull. Scripps Instn. Oceanogr., VIII, 51-270.

Plan of work:

(1) Collection of euphausiid material from plankton samples
(2) Analysis of material
(3) Interpretation of data.

* Coordinator: E.G. Silas, Junior Fishery Scientist.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the biology and ecology of Chaetognaths in relation to hydrological conditions along the west coast of India.

Project Code No. MRC/MB/Pl. 2.9

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project, if any: Planktological Investigations.

Personnel (Name and designation)

Project Leader:

*M. Srinivasan, Research Assistant

Objectives:

To study the biology and ecology of Chaetognaths in relation to hydrological conditions.

Total duration: 3 years

Date of initiation: 1970

Brief resume of literature:

Chaetognaths form one of the major constituents of the marine plankton and are well known for their indicative nature of the hydrological conditions of the water masses. So far no attempt has been made in India to study the ecology and biology of Chaetognaths in relation to the movements of the water masses. Appreciable work has been done on these aspects in the Atlantic and Pacific Oceans. As far as the taxonomy of this group is concerned it has been studied well in the Atlantic, Indian and Pacific oceans.

1. Alvarino, 1967 The Chaetognaths of the NAGA expedition (1959-61) in the South China and the Gulf of Thailand Part I. NAGA Report Volume 4(2):1-197.
2. Elvezio Ghirardelli, 1968 Some aspects of the Biology of the Chaetognaths Adv. mar. Biol. Vol.6:271-375.
3. Russel, F.S. 1935 On the value of certain plankton animals as indicators of the water movements in the Plymouth area 1930-1931. J. Mar. Biol. Ass. U.K. 20(2):309-332.
4. Silas, E.G. and M. Srinivasan 1969 A new species of Eukrohnia from the Indian seas with notes on three other species of Chaetognaths. J. Mar. biol. Ass. India, 10(1):1-33.
5. George, P.C. 1952 Proc. Nat. Inst. Sci. India, 18:657-689.

Plan of work:

Collection of plankton samples during the cruises of R.V. VARUNA, sub-sort the Chaetognaths from the samples, identification of species, making sketches, processing and interpreting the data.

*Coordinator: E.G. Silas, Jr. Fishery Scientist.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the quantitative abundance, ecology and biology of Siphonophora of the west coast of India.

Project Code No. MBO/MB/Pl. 2.10

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project, if any: Planktological investigations.

Personnel (Name and designation)

Project Leader:

*K. Rengarajan, Survey Assistant

Objectives:

To study the quantitative abundance, ecology and biology of Siphonophora

Total duration: 3 years

Date of initiation: 1970

Brief resume of literature:

As Siphonophores form one of the major constituents of the plankton, play a major role in the trophic cycle and are indicators of the ocean currents, their ecological and biological studies are important.

Most of the earlier works on Siphonophora refer to the taxonomic investigations or faunastic accounts and only recently some work has been carried out on their ecology and bathymetric distribution. Upto now there are no details on quantitative seasonal abundance of species of Siphonophora in Indian seas and on the relationships of their occurrence and distribution with hydrological conditions.

1. Totton, A.K. 1932 Siphonophora. Sci. Rep. Great Barrier Reef Exped., 4(10):317-374.

2. _____ 1954 Siphonophora of the Indian Ocean. Discovery Report, 27:1-162.

3. Haeckel, E. 1888b Report on the Siphonophora . Rep. Sci. results H.M.S. Challenger (Zool), 28:1-380.

*Coordinator: E.G. Silas, Jr. Fishery Scientist

4. Lens, A.D and Riemsdijk, Th. V. 1908 The Siphonophora of the Siboga Expedition. Siboga Exped., 9(38)

5. Leloup, E. 1955 Siphonophora. Rep. Sci. results Michael Sars Deep Sea Exped., 1910.

6. Daniel, R. and Daniel, A. 1963 On the Siphonophores of the Bay of Bengal. I. Madras coast. J. Mar. biol. Ass. India, 5(2):

Plan of work:

1. To sort out Siphonophores from the plankton collections made during the cruises of R.V. Varuna from the west coast of India and Laccadives.

2. To subsort and identify Siphonophores in the plankton.

3. To estimate the seasonal abundance of the dominant species.

4. To investigate relations, if any between the distribution of Siphonophora and hydrological conditions.

5. To investigate the importance of Siphonophora in the trophic cycle in the ecosystem.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the ecology, biology and quantitative distribution of pelagic copepoda.

Project Code No. MBO/MB/Pl. 2.11

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project, if any: Planktological investigations

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Personnel (Name and designation)

Project Leader:

*
P. Parameswaran Pillai,
Research Assistant

Objectives:

Pelagic copepods with their larvae constitute the major food resource to the pelagic fish larvae and plankton eating food fishes and hence are of high economic importance. Present investigations are aimed at:

1. Elucidating the status and biology of different species of pelagic copepods, 2. understanding their spatial and temporal distribution patterns in relation to hydrology and, 3. understanding their biological importance as food of larval and adult fishes and as indicators of water masses.

Duration: 3 years

Date of initiation: 1970

Brief resume of literature:

Since R.B.S. Sewell's monograph on pelagic copepods no comprehensive work on this group has been carried out from the India Seas. Critical biological and distributional reviews carried out in other parts of the world during the last 30 years has made more intensive studies on this group from Indian Seas necessary for evaluating the status, biology and distribution patterns of different species.

No synoptic studies on the distribution and abundance of pelagic copepods have been carried out from the proximal neritic and oceanic regions of Indian Seas. Pioneer studies, in this field, carried out in the Atlantic Ocean reveal that such synoptic studies are imperative to understand the species distribution, occurrence and abundance of copepods in the light of hydrology and fisheries.

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* Coordinator: E.G. Silas, Jr. Fishery Scientist.

1. Sewell, R.B.S. 1929-1932 The Copepoda of Indian Seas. Mem. Indian Mus., 10:1-221.

2. Marshal, S.M. and A.P. Orr. 1955 The biology of a marine copepod, Calanus finmarchicus (Gun.), 1-188: Oliver and Boyd, London.

3. Bigelow, H.B. 1917 Explorations of the coast waters between Cape Cod and Halifax in 1914 and 1915, by the U.S. Fisheries schooner Grampus. Oceano. Plankton, Bull. Mus. Comp. Zool., 61:161-357.

4. Grice, G.D. and A.D. Hart 1962 The abundance, seasonal occurrence and distribution of the epizooplankton between New York and Bermuda. Ecol. Monogr., 32: 287-309.

5. Fleminger, A. 1964 Distribution atlas of calanoid copepods in the California Current region I. California Co-operative Fisheries Investigation atlas No.2, 313 pp.

Plan of work:

1. Investigations on the material of pelagic copepods from the plankton collections made during R.V. Varuna cruises will be carried out for the study of the distribution of copepods in neritic and oceanic waters.

2. Special plankton collections will be made from the estuarine and neritic areas around Cochin to study the links between neritic and estuarine systems.

3. Adults and larval stages of different species of copepods will be sorted out from the plankton collections and studied in detail.

4. Quantitative data will be collected and processed to asses the distribution pattern of different species in relation to hydrological conditions.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on distribution, abundance and ecology of planktonic gastropods.

Project Code No. MBO/MB/Pl. 2.12

Division: Marine Biology and Oceanography Location: Mandapam

Title of major project, if any: Planktological Investigations.

Personnel (Name and Designation)

Project Leader:

C.Mukundan,
Asst. Fishery Scientist

Associates:

Objectives:

To study the horizontal distribution and abundance of the planktonic gastropods with special reference to seasonal fluctuations.

Total duration: 3 years Date of initiation: 1969

Justification:

The pteropods and heteropods are often found to be indicators of particular water masses and the pattern of their distribution and movement could give an idea of the water mass movements off our shores. Such water movements are significant from the point of view of nutrients and plankton and hence of fisheries.

Very little work has been done on the pteropods and heteropods of our waters, and even these have hitherto been confined to inshore waters. The study of the offshore areas off South West coast, as planned here, could lead to significant information as regards distribution and seasonal fluctuation of this group in particular and (together with similar studies on other major groups) of zooplankton in general, of the offshore waters.

Plan of work:

Qualitative and quantitative study of the petropods and heteropods collected by R.V. VARUNA. The species concerned will be identified, their relative abundance studied from station to station and season to season, and correlation attempted between occurrence of these species and the hydrological conditions of the waters.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the taxonomy and distribution of Pelagic Tunicata of the Indian Seas.

Project Code No. MBO/MB/Pl. 2.13

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project, if any: Planktological Investigations.

Personnel (Name and Designation)

Project Leader:

P. Dhandapani,
Research Assistant (Selection Grade)

Associates:

Objectives:

To study the various species of pelagic tunicates, their taxonomy and distribution spatially and bathymetrically in relation to oceanographic conditions.

To investigate whether any common or rare species are indicative of water masses and changing oceanographic conditions which effect the course of the fishery.

Total duration: 3 years

Date of initiation: 1970.

Brief resume of literature:

The pelagic tunicates from the food constituents of fishes, both coastal and oceanic. This would help to ascertain the specific fish shoals which depend on specific pelagic tunicates for food. This study will help in understanding relationship between the distribution of pelagic tunicates and their predators (i.e. fishes) in relation to oceanographic conditions. Some relevant references on the subject are given below:

1. Bernard, M. 1958. Systematique et distribution saisonniere des tuniciers pelagiques d' Algers. Comm. Inst. Expl. Sci. Medit. Rapp. Proc. verb. Reunions. 14 (n.s.) pp. 211-231.

2. Berner, Leo. D. Unusual features in the distribution of pelagic tunicates in 1957 and '58. Rep. Calif. Coop. Ocean. Fish. Invest. 7: 133-135.

3. Ganapathy, P.N. and P.V. Bhavanarayana 1958. Pelagic tunicates as indicators of water movements off Waltair coast. Curr. Sci. 27: 57-58.

4. Hardy, A.C., G.T.D. Henderson, C.E. Lucas and J.H. Fraser 1936. The ecological relations between herring and the plankton investigated by the plankton indicator. J. Mar. Biol. Ass. U.K. 21(1): 147-291.

5. Fenaux, R. 1963. Ecologie et biologie des des appendiculaires Mediterraneens (Villefranche-sur-Mer.) vie et Milieu suppl. 16: 1-142, 58 figs.

6. Nair, R.V. 1949. The Thaliacea of Madras plankton. Bull. Mad. Govt. Mus. N.S. Sec. 6(1): 41 pp.

7. Thompson, H. 1942. Pelagic tunicates in the plankton of South eastern Australian waters, and their place in oceanographic studies. Commonwealth of Australia, C.S.I.R.O. Australia. Bull.153.

8. _____ 1948, Pelagic tunicates of Australia. C.S.I.R.O. Australia.

9. Sewell, R.B.S. 1926, The salps of the Indian Seas. Rec. Ind. Mus. 28(2), 65-126.

Plan of work:

1. The zooplankton collections made by R.V. Varuna from cruise No. 19 to 101 would be sorted out for pelagic tunicates and identified.

2. The distribution will be studied in comparison with the oceanographic conditions.

3. A weekly collection of commercially important fishes of both shallow and deep water region will be examined from the catches of the exploratory fishing vessels for their stomach contents to identify the tunicates comprising the food of these fishes.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Studies on decapod larvae of the offshore plankton.

Project Code No. MBO/MB/Pl. 2.14

Division: Marine Biology and Oceanography Location: Cochin

Title of major project, if any: Planktological Investigations.

Personnel (Name and Designation)

Project Leader:

K.H. Mohamed,
Fishery Scientist

Associated:

1. P. Vedavyasa Rao, Asst.Fishery Scientist
2. M.S. Muthu, Asst. Fishery Scientist
3. C. Suseelan, Research Assistant

Objectives:

To study the occurrence, distribution and abundance of Decapod larvae in the offshore waters. To carry out the spawning survey of important commercial species of decapod crustacean. To elucidate the larval stages and to study the larval development of commercially important species.

Total duration: Continuing Date of initiation: 1970.

Brief resume of literature:

Knowledge of Decapod larvae occurring in the offshore waters of our coast is very scanty. Indian Ocean Biological Centre have recently commenced studies on Decapod crustacean larvae and have prepared charts relating to the distribution of the larvae in the Indian Ocean.

Plan of work:

1. Decapod larvae sorted out from the plankton samples collected by R.V. KALAVA/R.V. VARUNA will be studied in detail for their various morphological characters in order to identify them to species.

2. By quantitative analysis, studies on larval distribution in space and time in the offshore waters will be made.

3. By using the abundance index spawning survey of the important commercial species will be carried out.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Zooplankton sorting Programme

Project Code: MBO/MB/Pl. 2.15

Division: Marine Biology and Oceanography Location: Cochin

Title of major project, if any: Planktological Investigations

Personnel (Name and Designation)

Coordinator:
Head of the Marine Biology and Oceanography Division.

Associates:
All scientific workers connected with this project.

Objectives:

To sort the major constituents of zooplankton collected during the research cruises of R.V. VARUNA.

Total duration: 5 years Date of initiation: 1969.

Plan of work:

To help in the collection of zooplankton samples on board the research vessel during cruises.

The proper maintenance of plankton collections made during the research cruises, including labelling, preservation and maintenance of registers on the collection.

Sorting and subsorting of zooplankton.

Maintenance of plankton collecting gear for use on board research vessel.

To help in the preservation and maintenance of any other biological collections made during the research cruises.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Taxonomy and ecology of epiphytic and Benthic diatoms.

Project Code No. MBO/MB/Ben. 3.1

Division: Marine Biology and Oceanography Location: Cochin

Title of major project, if any: Investigations on Benthos

Personnel (Name and Designation)

Project Leader:

R. Subrahmanyan,
Fishery Scientist.

Associates:

1. C.P. Gopinathan,
Research Assistant

Objectives:

A large number of species of diatoms, one of the primary producers, grow on other aquatic plants and sea weeds at the water edge. They form the food of many small benthic animals. Hence a study of them is of importance.

Total duration: 3 years. Date of initiation: 1969.

Brief resume of literature:

Very little is known of this community of diatoms; the only accounts are by Smith (1856), Hustedt (1955) and Hendey, (1964) abroad. Subrahmanyan has done some work (unpublished). Otherwise no work has been attempted on this subject in India so far.

1. Smith, W. 1853 A synopsis of the British Diatomaceae, London.

2. Hustedt, F. 1955 Marine Littoral Diatoms of Beaufort, North Carolina. Durham, N.C.

3. Hendey, I. 1964 Bacillariophyceae (Diatoms). In an introductory account of the smaller algae of British Coastal waters. H.M.S. London.

4. Subrahmanyan, R (Unpublished). Epiphytic Diatoms on Sea Weeds.

Plan of work:

Seaweeds and plants growing along water edge and intertidal zone as also brownish film on soil near water edge, will be collected and examined for the diatom flora. At the same time wherever possible environmental conditions will be noted. It is expected to make collections for at least 2 years period to study the fluctuation as well as succession of the species.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the taxonomy, biology and distribution of Polychaetes.

Project Code No. MBO/MB/Ben. 3.2

Division: Marine Biology and Oceanography Location: Mandapam Camp

Title of major project, if any: Investigations on Benthos

Personnel (Name and Designation)

Project Leader:

G.P. Kumaraswamy Achari,
Research Assistant (Selection Grade)

Associates:

Objectives:

To study the taxonomy, biology and distribution of polychaetes; to study the role of polychaetes as food of demersal fishes and crustaceans of fisheries importance.

Total duration: 1 year Date of initiation: 1970.

Brief resume of literature:

The taxonomy of polychaeta of the Indian region has been studied by several workers, but our knowledge on this group is far from complete. Ganapati et al (1969), Hartman (1966), Panikkar and Aiyar (1938); Kurian (1955) have made ecological studies on polychaetes. It has been shown that polychaetes form an important item of the food of some demersal fishes, molluscs and prawns. (Job, 1940; Hall, 1962; Seshappa, 1953 and Mohamed, 1956).

1. Achari, G.P.K. 1969 Catalogue of polychaetes in the reference collections of the Central Marine Fisheries Research Institute. Bull. Cent. mar. Fish. Res. Inst. 7: 31-40.

2. _____ 1970 Polychaetes of family saballariidae with species reference to their intertidal habits. Symposium on Marine intertidal Ecology. (National Institute of Sciences of India) Waltair. Jan. 22-24, 1970.

3. Fauvel, P.	1953	Annelida Polychaeta. Indian Press., Allahabad. 1-507.
4. Ganapati, P.N et. al.	1969	Hydrobiological and faunistic survey of Godavari estuarine systems. Final report., Dept. Zool. Andhra University, 1-54.
5. Hall, D.N.F.	1962	Observations on the taxonomy and biology of some Indo-west Pacific Penaeidae (crustacea, Decapoda). Fishery Publication No.17, London. 1-229.
6. Hartman, O.	1966	Quantitative survey of the benthos of San Pedro basin, Southern California Part II. Allan Hancock Pacific Expeditions. 19(2):
7. Job, T.J.	1940	An investigation on the nutrition of the perches of the Madras coast. Rec. Indian Mus. 42: 289-364.
8. Kurian, C.V.	1955	A preliminary survey of the bottom fauna and bottom deposits of the Travancore coast within 15 fathom line. Proc. Nat. Inst. Sci. India, 19:747-776.
9. Mohamed, K.H.	1969	Genus Penaeus Fabricius 1798. Bull Cent. Mar. Fish. Res. Inst. 14: 49-75.
10. Panikkar, N.K. and Aiyar, R.G.	1938	The brackish water fauna of Madras. Proc. Ind. Acad. Sci. 6: 284-337.
11. Seshappa, G	1953	Observations on the physical and biological features of the inshore sea bottom along the Malabar coast. Proc. Nat. Inst. Sci. India, 19: 256-79.
12. Tampi, P.R.S. and K. Rangarajan	1964	Some polychaetous annalids from the Andaman waters. J. mar. biol. Ass. India, 6 (1):98-121.
13. Willey, A.	1905	Report on the polychaeta collected by Prof. Herdman at Ceylon. Roy. Soc. Rep. on Pearl oyster Fisheries, Suppl. Rep. 30: 243-324.

Plan of work:

Taxonomy of polychaetes of the seas around India and biology, reproduction and early developments of a few selected species will be studied.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the annual growth behaviour of marine algae in the Palk Bay and Gulf of Mannar.

Project Code No. MBO/MB/Anc. 4.1

Division: Marine Biology and Oceanography Location: Mandapam

Title of major project, if any: Ancillary Marine Resources Investigations.

Personnel (Name and Designation)

Project Leader:

M. Umamaheswara Rao,
Assistant Fishery Scientist

Associates:

1. Lab-cum-Field Assistant - One

Objectives:

To study the seasonal growth rates and fruiting behaviour of some selected commercially important algae.

Total duration: 2 years. Date of initiation: 1969.

Brief resume of literature:

Knowledge on the growth cycles and reproductive periods of the algae is very essential to determine the harvesting seasons, to maintain the seaweed beds occurring in a particular areas in healthy condition and to cultivate the important species by artificial methods. Earlier ecological studies (Srinivasan, 1946, Misra, 1960 and Umamaheswara Rao & Sreeramulu, 1964) were made on the entire vegetation growing in the littoral regions and detailed attempts have not been made to study the biology and autecology of the marine algae of commercial importance, as investigated in other parts of the world (Knight & Parke, 1950; Jones, 1959 and Bony, 1965).

1. Bony, A.D. 1965. in Advances in Marine Biology, Acadamic Press, London.

2. Jones, W.E. 1959. J. Mar. biol. Ass. U.K. 38: 47.

3. Knight, M and M. Parke 1950. J. Mar. biol. Ass. U.K. 29: 439.

4. Misra, J.N. 1960. Proc. Symp. Algology, I.C.A.R, New Delhi.

5. Srinivasan, K.S 1960. Indian J. bot. Soc. M.O.P. Iyengar Commem.vol. pp. 276.

6. Umamaheswara Rao, M and T. Sreeramulu 1964. J. Ecol. 52: 595.

Plan of work:

The growth behaviour of different algae selected in two stations on the Palk Bay side and two stations on the Gulf of Mannar side will be studied.

Observations will be made on the fruiting periods and relative abundance of the different types of fruiting plants in the population of some important agarophytes and alginophytes of Mandapam area.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on density and distribution of agar and algin - yielding seaweeds.

Project Code No. MBO/MB/Anc. 4.2

Division: Marine Biology and Oceanography

Location: Mandapam

Title of major project, if any: Ancillary Marine Resources Investigations.

Personnel (Name and Designation)

Project Leader:

M. Umamaheswara Rao,
Asst. Fishery Scientist

Associates:

1. Lab-cum-Field Assistant - One

Objectives:

To study the density of Gracilaria, Sargassum and other agar and algin-yielding plants growing in the intertidal and shallow sublittoral regions around Mandapam and 2) to know the distribution of these seaweeds in relation to the nature of substratum and other environmental conditions of the area investigated.

Total duration: Two years

Date of initiation: 1969

Brief resume of literature:

This work has been taken up to know the abundance of agarophytes or alginophytes at Mandapam area and to study the habitats in which they grow laxuriantly. Information obtained in this study would give an idea of the standing crops of different species and the environmental conditions suitable for maximum growth of the economically important seaweeds. After studying the habitats it would be possible to increase the area of the substratum by artificial methods to augment the production of raw material needed for seaweed industry.

Studies of this nature have been carried out in other countries (Marshal et al., 1949; Bony, 1965). Very few attempts have been made in India to investigate the ecological distribution of the algae (Varma, 1959; Srinivasan, 1960) and due emphasis was not given to the agarophytes or alginophytes in these investigations.

1. Bony, A.D. 1965. In Advances in Marine Biology, Academic Press, London.

2. Marshall, S.M., Newton, L and A.P. Orr. 1949. A study of certain British seaweeds and their utilization in the preparation of agar. H.M.S.O., London.

3. Varma, R.P 1960. J. Mar. biol. Ass. India, 2: 221.

4. Srinivasan, K.S 1960. Proc. Symp. Algology, ICAR, New Delhi.

Plan of work:

Intertidal and shallow subtidal regions near Mandapam, Pudumadam and Rameswaram will be surveyed to estimate the density and standing crops of Sargassum and Gracilaria species growing in these areas. While sampling the vegetation observations will be made on the habitats and distribution of the agarophytes and alginophytes. Harvesting experiments will be conducted with Gracilaria corticata to study the influence of harvesting on the density of the crop.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Chemical studies on the agar - agar of Gracilaria

Project Code No. MBO/MB/Anc. 4.3

Division: Marine Biology and Oceanography Location: Mandapam Camp

Title of major project, if any: Ancillary Marine Resources Investigations.

Personnel (Name and Designation)

Project Leader:

M.Umamaheswara Rao,
Asst. Fishery Scientist

Associates:

1. Lab-cum-Field Assistant - One

Objectives:

To study the effect of alkali treatment on the gel strength of agar - agar of Gracilaria species.

Total duration: Initially for 4 years Date of initiation: 1970.

Brief resume of literature:

Funaki and Kojima(1951) and other workers (Tsuchiya and Hong, 1965; Tagawa, 1968) have shown that the gelling power of agar - agar can be increased by alkali treatment of the seaweeds used for agar manufacture. Similar studies have not been carried out on the Indian Gracilaria spp. which yield agar - agar of low gel strength. Hence it is proposed to take up this work.

1. Funaki, K and V. Kojima 1951 Studies on the preparation of agar-agar from Gracilaria confervoides (Part I) Bull. Jap. Soc. Sci. Fish. 16: 401

2. Tagawa, S 1968 Chemical studies on manufacture of agar - agar. Joun. Shim. Univ. Fish. 17: 35.

3. Tsuchiya, Y and K.C. Hong 1965 Agarose and agaropectin in Gelidium and Gracilaria agar. Tohuku. Joun. Agri. Res. 16: 141.

Plan of work:

Samples of Gracilaria lichenoides, G. corticata and other species will be treated with different concentration of alkali and at different temperatures.

Agar - agar will be extracted from the alkali treated samples and the gel strength, setting and melting temperatures of these agar samples will be determined.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on Foraminifera of Mandapam area

Project Code No. MBO/MB/Anc. 4.4

Division: Marine Biology and Oceanography

Location of work: Mandapam

Title of major project, if any: Ancillary marine resources investigations

Personnel (Name and designation)

Project Leader:

K.M.S. Ameer Hamsa,
Research Assistant

Associates:

Objectives:

To study the taxonomy and distribution of foraminifers

Total duration: Initially for two years

Date of initiation: 1970

Brief resume of literature:

An understanding of the taxonomy, abundance and distribution of foraminifers is essential since they form one of the food items of fishes, prawns and holothurians. Some references on the subject are given below:

1. Amma, J. Sethulekshmi. 1958 Foraminifera of the Travancore Coast. Bull. Res. Inst. Univ. Kerala, Ser. C. Vol.VI, No.1

2. Bhalla, S.N. 1967 Recent foraminifera from Visakhapatnam beach sands, India. IIOENL, 4(4): 5 (Abstract)

3. Carter, H.J. 1880 Report on specimens dredged up from the Gulf of Mannar and presented to the Liverpool Free Museum by Capt. W.H. Cawne Warren. Ann. & Mag. N. Hist., Ser.5, Vol.V

4. Chandra, P.R. 1967 Distribution of benthic foraminifera in sediments from continental shelf of Bay of Bengal. IIOE NL, 4(4):7 (Abstract)

5. Cushman, J.A. 1921 Foraminifera of the Philippine and adjacent Seas. U.S. Nat. Mus. Bull. 100, Vol.4

6. _____ 1959 Foraminifera : Their classification and economic use. 4th ed. Cambridge, Mass., 605 pp.

7. Gnanamuthu, C.P. 1943 The foraminifera of Krusadai Islands. Bull. Mad. Govt. Mus. No.2, pt.5

Plan of work:

a) Study of systematics and abundance of foraminifers in sand and mud samples.

b) Analysis of gut contents of various fishes, prawns and holothurians and determination of the species of foraminifers constituting the food of the above forms.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Biology and fishery of sponges

Project Code No. MBO/MB/Anc. 4.5

Division: Marine Biology and Oceanography

Location of work: Mandapam

Title of major project, if any: Ancillary Marine Resources investigations

Personnel (Name and designation)

Project Leader:

P.A. Thomas,
Senior Research Assistant

Associates:

Objectives:

To survey the commercially important sponges of the Indian waters with special reference to Mandapam area

Total duration: 2 years

Date of initiation: 1969

Brief resume of literature:

A variety of the commercially exploitable species (Spongia officinalis var. ceylonensis) is available in plenty in certain parts of Gulf of Mannar and Palk Bay. Experiments are to be conducted to study whether this can be exploited for the preparation of "Bath-Sponge" as in Mediterranean and American coasts.

Sponges which bore into corals are also to be studied and such study may help in minimising the natural calamities such as land slides, surf action etc. Boring sponges which cause destruction to the commercially important molluscs such as pearl oyster, sacred chank are also to be studied and this may help in increasing the yield of pearl and chank grounds substantially.

1. Crawshay, L.R. 1939 Studies in the market sponges I. Growth from the planted cutting. J. Mar. biol. Ass. U.K., 23(2):553-574.

2. de Laubenfels, M.W. 1936 A discussion of the sponge fauna of Dru Tortugas in particular and the West Indies in general, with Materials for a Revision of the Families and Orders of the Porifera. Pap. Tortugas Lab., 30:1-225.

3. _____ 1948 The Order Keratosa of the Phylum Porifera. A Monographic study. Occ. Pap. Allan Hancock Fdn. (3):1-217.

4. _____ 1950 The Porifera of the Bermuda Archipelago Trans. zool. Soc. Lond., 27:1-154, Pl.1.

5. _____ and J.F. Storr. 1958 The taxonomy of American commercial sponges. Bull. mar. Sci. Gulf Caribb., 8(2):99-117.

6. Dendy, A 1905 Report on the sponges collected by Prof. Herdman, at Ceylon in 1902. Rep. Govt. Ceylon Pearl Oyster Fish. Gulf Mannar. Suppl. 18:57-246.

7. Moore, H.F. 1908 A practical method of sponge culture. U.S. Bureau of Fisheries. Bull., 28 Pt. I., 545-585.

8. _____ 1951 Commercial sponges - in Marine Products of Commerce. Reinhold publishing corporation, U.S.A.:733-751.

Plan of work:

1. Systematic studies of sponges.
2. Charting the natural grounds.
3. Processing the specimens readily available.
4. Developmental studies.
5. Other ecological studies.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on the systematics, biology and fishery of holothurians

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Project Code No. MBO/MB/Anc. 4.6

Division: Marine Biology and Oceanography

Location of work: Mandapam Camp

Title of major project, if any: Ancillary Marine Resources Investigations.

Personnel (Name and designation)

Project Leader:

D.B. James,
Senior Research Assistant

Associates:

Objectives:

To study the systematics, biology and fishery of the commercially important holothurians of Palk Bay and Gulf of Mannar.

Total duration: 3 years

Date of initiation: 1969

Brief resume of literature:

Certain species of large holothurians which occur in the Gulf of Mannar and the Palk Bay are used in the preparation of a commercially important product known as beche-de-mer. In recent years about five lakh rupees worth of beche-de-mer is exported annually from India and hence the study of holothurians is important from the economy point of the industry.

Very little information is available on the systematics of the Indian holothurians. Koehler and Vaney (1908) reported the holothurians collected by R.I.M.S. Investigator from the Indian Seas. Pearson (1903) has reported about 30 species of holothurians from the Gulf of Mannar and the Palk Bay. Outside the Indian region Fisher (1908) from Hawaii, Clark (1938) from Australia, Deichmann (1948) from South Africa and Cherbonnier (1955) from the Red Sea have published detailed systematic accounts of the holothurians.

There is no information available on the biology of any holothurian from India. Recently Fish (1967) from England has given an account of the biology of Cucumaria elongata.

Regarding the beche-de-mer industry Hornell (1917) has given a detailed account of the history and revival of the Indian beche-de-mer industry. Adithiya (1967) has given a brief account of the beche-de-mer industry of Ceylon. Panning (1944) has reviewed the beche-de-mer industry on a global basis.

1. Adithiya, L. 1967 Beche-de-mer - The sea slug. Loris.11(2):87-90.

2. Cherbonnier, G. 1955 Les holothuries de la mer Rouge. Ann. Inst. Oceanogr., 30:129-183.

3. Clark, H.L. 1921 The echinoderm fauna of Torres Striat: its composition and its origin. Pap. Dep. mar. biol. Carnegie. Instn. Wash., 10:1-223.

4. _____ 1938 Echinoderms from Australia. Mem. Mus. Comp. Zool. Harv., 55:1-596.

5. Deichmann, E. 1948 The holothurian fauna of South Africa. Ann. Natal. Mus., 11:325-376.

6. Fish, J.D. 1967 The biology of Cucumaria elongata (Echinodermata: Holothuroidea). J. mar. biol. Ass. U.K. 47:129-143.

7. Fisher, W.K. 1907 The holothurians of the Hawaiian Islands. Proc. U.S. natn. Mus., 32:637-744.

8. Hornell, J. 1917 The Indian beche-de-mer industry: its history and recent revival. Madras Fish. Bull., 11(4): 119-150.

9. Koehler, R. and C. Vaney 1908 Echinoderma of the Indian Museum. Part. IV. An account of the littoral Holothurioidea, collected by the R.I.M.S. Investigator. 55 pp. Calcutta.

10. Panning, A. 1944 Die Trepangfischerei. Mitt. hamb. zool. Mus. Inst., 49:1-76.

11. Pearson, J. 1903 Report on the Holothurioidea collected by Professor Herdman at Ceylon in 1902. Rep. Govt. Ceylon Pearl Oyster Fish. Gulf Mannar. 1:181-208.

Plan of work:

1. A detailed study of the taxonomy of the various species collected from the Palk Bay and the Gulf of Mannar will be made.

2. Age and growth, breeding, fecundity, development and fishery of Holothuria scabra will be studied.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of project: Hydrographic studies.

Project Code No. MBO/OC/Oce. 1.1

Division: Marine Biology and Oceanography Location: Cochin.

Title of major head, if any: Oceanographic Investigations.

Personnel (Name and Designation)

Project Leader:

A.V.S. Murty,
Fishery Scientist

Associates:

1. C.P. Ramamirtham, Asst. Fishery Scientist
2. G. Subba Raju, Asst. Fishery Scientist
3. D. Sadananda Rao, Asst. Fishery Scientist

Objectives: To provide hydrographic information for fishery investigations.

Total duration: Continuing Date of initiation: 1969.

Brief resume of literature:

1. Ramamirtham, C.P. and R.Jayaraman 1960 Hydrographical features of the continental shelfwaters off Cochin during the years 1958 and 1959. J.Mar. biol. Ass.India, 2(2): 199-207.

2. Banse, K 1959 On upwelling and bottom trawling off the southwest coast of India. J. Mar. biol. Ass. India, 1(1): 33-49.

3. Ramamirtham, C.P. 1966 - On the relative (geostrophic) currents in the southeastern Arabian Sea. J. Mar. biol. Ass. India, 8(2):236-243.

4. Sharma, G.S. 1968 Seasonal variation of some hydrographic properties of the shelf waters off the west coast of India. Bulletin of the National Institute of Sciences of India.

Plan of work:

The area between the west coast of India and 500 m line between Cape Comorin and Karwar will strip by strip be investigated by systematic cruising. The water samples would be collected from standard depths at each hydrographic stations. The parametres to be investigated are temperature, salinity, dissolved oxygen, phosphate, nitrate, nitrite.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies on upwelling.

Project Code No. MBO/OC/Oce. 1.2

Division: Marine Biology and Oceanography Location: Cochin.

Title of major project, if any: Oceanographic Investigations.

Personnel (Name and Designation)

Project Leader:
C.P. Ramamirtham,
Asst. Fishery Scientist

Associates:
1. G. Subba Raju, Asst. Fishery Scientist
2. D. Sadananda Rao, Asst. Fishery Scientist

Objectives:

Upwelling being a phenomenon which starts with bottom (deeper) waters and ends with surface waters, the study of it serves as an interlink between the bottom waters and the surface waters. The phenomenon is virtually a carrier of nutrients and "low temperatures" from the bottom to the surface layers. The major project gives scope for coordination with the projects of primary plant production at sea and hence the pelagic fisheries.

Total duration: 3 years Date of initiation: 1969.

Brief resume of literature:

Upwelling brings up nutrients from deeper to the surface layers thus fertilizing the waters and associated with the photosynthesis by phytoplankton the area becomes more suitable for fish life.

1. Ramamirtham, C.P and R. Jayaraman 1960 Hydrographical features of the continental shelf waters off Cochin during the years 1958 and 1959. J.Mar. biol. Ass. India, 2(2): 199-207.

2. Banse, K 1959 On upwelling and bottom trawling off the southwest coast of India. J. Mar. biol. Ass. India, 1(1): 33-49.

3. Wyrtki, K 1962 The upwelling in the region between Jawa and Australia during the southeast monsoon. Aust. J. Mar. Freshw. Res.,13(3):217-225.

4. Strickland, J.D.H 1958 Solar radiation penetrating the ocean, a review of requirements, data and methods of measurement with particular reference to photosynthetic productivity. J. Fish. Res. Bd. Can.,15: 453-493.

Plan of work:

A) The areas of upwelling would be detected based on transperancy studies. The area of operation would be between west coast of India and the 500 metre line between Karwar and Cape Comorin. Transperancy observations would be conducted from each hydrographic station from fixed depths between 0 to 100 m.

B) Based on hydrographic data and nutrient collections analysis would be carried out to study the extent of upwelling in space and time.

Coordinator: A.V.S. Murty, Fishery Scientist.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.)
Mandapam Camp

Title of Project: Studies of currents.

Project Code No. MBO/OC/Oce. 1.3

Division: Marine Biology and Oceanography Location: Cochin

Title of major project, if any: Oceanographic Investigations

Personnel (Name and Designation)

Project Leader:
A.V.S. Murty,
Fishery Scientist.

Associates:
1. C.P. Ramamirtham, Asst. Fishery Scientist
2. G. Subba Raju, Assistant Fishery Scientist

Objectives:

The project aims at bringing out the detailed pattern of circulation in the area of operation. The information on currents is valuable for understanding the migrational behaviour of fishes.

Total duration: 3 years. Date of initiation: 1969.

Brief resume of literature:

A system of seasonal currents along the west coast of India obtained by indirect methods was related with the trends in commercial pelagic fishery in a systematic way. These results encourage for undertaking the studies on currents in a more detailed manner.

1. Murty, A.V.S Indian J. Fish., 12(1):(In Press.)
2. Montgomery, R.B. 1937 A suggested method for representing gradient flow in isentropic analysis. Bull. American Meteorological Soc:210-212.
3. Ramamirtham, C.P 1966 On the relative (geostrophic) currents in the south-eastern Arabian Sea. J. Mar. biol. Ass. India, 8(2): 236-243.
4. Wyrtki, K 1962 Geopotential topographies and associated circulation in the southeastern Indian Ocean. International Indian Ocean Expedition, Collected reprints Vol. I: 133-149.

Plan of work:

The area of operation would be mainly bounded by the west coast of India and the 500 metre line between Cape Comorin and Karwar. Computations of circulation would be made by the method of (a) Isentropic analysis and (b) dynamic depth analysis. Direct current observations will be made by means of current meter as the direct current observations require the research vessel to be anchored, the area of operation would be further limited depending upon the anchoring facilities of the research vessel. At each station continuous observation for more than 24 hrs. may be required in order to account for tidal influences on currents. Hence the area would be covered by part by part.

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
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Mandapam Camp

Title of Project: Observations on basic hydrological and meteorological conditions.

Project Code No. MBO/OC/Oce. 1.4

Division: Marine Biology and Oceanography

Location: Port Blair, Kozhikode, Mangalore, Karwar, Waltair, Madras.

Title of major project, if any: Oceanographic Investigations.

Personnel (Name and Designation)

Project Leader:
A.V.S. Murty,
Fishery Scientist

Associated:
1. K. Rengarajan, Asst. Fishery Scientist
2. N.S. Radhakrishnan, Asst. Fishery Scientist
3. G.G. Annigeri, Survey Assistant (S.G)
4. P. Mozumdar, Research Assistant (S.G)
5. S. Muthuswamy, Research Assistant
6. Field Investigator - One

Objectives:

To study the fluctuations in the hydrological conditions of the inshore and offshore waters along with mteorological conditions to correlate them with fishery trends.

Totoal duration: Continuing

Date of initiation: 1969.

Justification:

Studies of fluctuations on nutrients, salinity, temperature etc. are very important as they play a vital role in fish abundance and distribution.

Plan of work:

Sea water samples will be collected at regular intervals and detailed analysis will be made for estimating salinity and nutrients. Air and sea water temperatures, rainfall, wind speed etc. will be recorded wherever possible.