RESEARCH PROJECTS 1971

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
COCHIN - 11

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

C O N T E N T S

TITLES OF RESEARCH PROJECTS FOR 1970 WITH CHANGES EFFECTED FOR 1971

(List of Research Projects for 1971 are given on pages viii to xi)

1970 S.No.	1970 Code No.	Title of Project	1971 S.No.	1971 Code No.
		Division: Fishery Survey and Statistics		
		ASSESSMENT OF MARINE FISHERY RESOURCES.		
1.	FSS/FS/1.1	Sample survey for estimating all India marine fish production and effort put in. (Title revised in Projects for 1971)	1.	FS/FRA/FS. 1
2.	FSS/FS/1.2	Sample survey for estimating size composition of the catches of some of the commercially important fishes.	2.	FS/FRA/FS. 2
3.	FSS/FS/1.3	Inventory of fishing potential. (Title revised)	3.	FS/FRA/FS. 3
4.	FSS/FS/1.4	Estimation of prawn catches from the backwaters of Kerala. (Project terminated)		---
5.	FSS/ST/1.1	Stock assessment and estimation of potential yield of commercially important fishes.	4.	FS/FRA/ST. 1
		Division: Fishery Biology		
		I. SARDINE INVESTIGATIONS.		
6.	FB/PE/Sa 1.1	Studies on catch and effort trends of the oil sardine fishery.		Combined into one project. Title revised. 6. FB/MF/1
7.	FB/PE/Sa 1.2	Regional, seasonal and annual fluctuations in the age composition and growth rate trends in oil sardine, Sardinella longiceps.		
8.	FB/PE/Sa 1.3	Studies on the variability in sex-ratio, maturation and fecundity of oil sardine, Sardinella longiceps.		
9.	FB/PE/Sa 1.4	Migration studies on the oil sardine, Sardinella longiceps.		
10.	FB/PE/Sa 1.5	Biology and Fishery of the lesser sardines. (Title revised)	10.	FB/OF/2

1970 S.No.	Code No.	Title of Project	1971 S.No.	Code No.
III. MACKEREL INVESTIGATIONS.				
11.	FB/PE/Ma 2.1	Study of catch and effort trends in the mackerel, Rastrelliger kanagurta		
12.	FB/PE/Ma 2.2	Regional, seasonal and annual fluctuations in the age composition and growth rate trends in the mackerel, Rastrelliger kanagurta		
13.	FB/PE/Ma 2.3	Qualitative and quantitative variation in the food composition and feeding habits of the mackerel, Rastrelliger kanagurta.	Combined into a single project.	
14.	FB/PE/Ma 2.4	Studies on the variability in sex-ratio, maturation and fecundity in the mackerel, Rastrelliger kanagurta	Title revised. 7.	FB/MF/2.
15.	FB/PE/Ma 2.5	Migration studies in the mackerel Rastrelliger kanagurta.		
IV. ANCHOVY INVESTIGATIONS.				
16.	FB/PE/An 3.1	Fishery and Biology of commercially important anchovies.	11.	FB/OF/3
V. BOMBAY DUCK INVESTIGATIONS.				
17.	FB/BDO/Bd 1.1	Biology and fishery of the Bombay duck, Harpodon nehereus.	9.	FB/OF/1
VI. RIBBON FISH INVESTIGATIONS.				
18.	FB/BDO/Rf 2.1	Study of catch trends in ribbon fish fishery		
19.	FB/BDO/Rf 2.2	Biology of commercially important ribbon fishes	Combined into a single project. Title revised. 12.	FB/OF/4
VII. CARANGID INVESTIGATIONS.				
20.	FB/BDO/Ca 3.1	Study of catch trends in Carangid fishes.	Combined as one project. Title revised.	
21.	FB/BDO/Ca 3.2	Fishery biology of the commercially important Carangid species	16.	FB/OF/8
VIII. SEER, TUNA AND BILLFISH INVESTIGATIONS.				
22.	FB/BDO/Stb 4.1	Fishery and biology of the tunas	Title revised. 13.	FB/OF/5

1970 S.No. Code No.	Title of Project	1971 S.No. Code No.
IX. FLATFISH INVESTIGATIONS		
23. FB/BDO/Ff 5.1	Systematics and biology of the common Cynoglossids.	Combined into one project. Title revised.
24. FB/BDO/Ff 5.2	Fishery and biology of Cynoglossus semifasciatus.	17. FB/OF/9
X. GROUNDFISH FISHERY INVESTIGATIONS		
25. FB/BDO/Gf 6.1	Quantitative and qualitative assessment of fishery resources of the offshore and deep sea fishing grounds.(Title revised)	33. FB/OF/25
26. FB/BDO/Gf 6.2	Determination of the relative fishing powers of the exploratory vessels. (Project terminated)	---
27. FB/BDO/Gf 6.3	Estimation of the total demersal fishery resources and potential sustainable yields of the continental shelf bordering the east and west coasts. (Terminated)	---
XI. EEL INVESTIGATIONS		
28. FB/BDO/Ee 7.1	Studies on the fishery and biology of Muraenosox talabonoides. (Title revised)	24. FB/OF/16
XII. SCIAENID FISHERY INVESTIGATIONS		
29. FB/BDO/Sc 8.1	Studies on the fishery and biology of commercially important sciaenids. (Title revised)	18. FB/OF/10
XIII. SILVER-BELLY INVESTIGATIONS		
30. FB/BDO/Sb 9.1	Catch trends and species composition of silver-bellies and silver-biddies.	Combined into one project. Title revised.
31. FB/BDO/Sb 9.2	Studies on the fishery biology of common silver-bellies and silver-biddies.	19. FB/OF/11
DIV. PERCOID FISHERY INVESTIGATIONS		
32. FB/BDO/Pe 10.1	Studies on the fishery and biology of the commercially important perches (Title revised)	20. FB/OF/12
XV. CAT-FISHES INVESTIGATIONS		
33. FB/BDO/Cf 11.1	Fishery trends and species composition of cat-fishes	Combined into one project. (Title revised)
34. FB/BDO/Cf 11.2	Studies on the fishery biology of the common cat-fishes	15. FB/OF/7

1970 S.No. Code No.	Title of Project	1971 S.No. Code No.
XVI. POLYNEMID INVESTIGATIONS		
35. FB/BDO/Pol 12.1	Biology and fishery of the chief Polynemids. (Title revised)	22. FB/OF/14
XVII. POMFRET INVESTIGATIONS		
36. FB/BDO/Pom 13.1	Studies on the fishery and biology of white pomfret Pampus argenteus (Title revised)	23. FB/OF/15
XVIII. FISH DISTRIBUTION IN RELATION TO OCEANOGRAPHIC CONDITIONS		
37. FB/BDO$Dis 14.1	Investigations on pelagic and bath-pelagic fishes with special reference to their taxonomy, distribution and spawning behaviour.	54. MBO/MB/Misc/4 under MBO division
XIX. PRAWN AND SHRIMP INVESTIGATION		
38. FB/CF/Pr 1.1	Stock assessment of prawn and shrimps	Combined into a single project (title revised) 8. FB/MF/3
39. FB/CF/Pr 1.2	Biology and life history of the prawns af genus Penaeus	
40. FB/CF/Pr 1.3	Biology and life history of the prawns of the genus Metapenaeus.	
41. FB/CF/Pr 1.4	Biology and life history of the prawns of the genus Parapenaeopsis	
42. FB/CF/Pr 1.5	Biology and life history of Solenocera indica.	
43. FB/CF/Pr 1.6	Studies on the fishery, biology and life history of the various species of genus Acetes.	
44. FB/CF/Pr 1.7	Biology and life history of non-penaeid prawns.	
45. FB/CF/Pr 1.8	Biology and life history of the species of the genus Macrobrachium	
46. FB/CF/Pr 1.9	Studies on distribution pattern of commercial prawns of the West coast of India - Charting of prawns fishing grounds	
47. FB/CF/Pr 1.10	Studies on deep-water prawns - fishery, biology and distribution.	
48. FB/CF/Pr 1.11	Biology of the prawn grounds.	
49. FB/CF/Pr 1.12	Larval history of penaeid prawns.	
50. FB/CF/Pr 1.13	Mark-recovery experiments on prawns	
51. FB/CF/Pr 1.14	Quantitative assessment of the rate of immigration and emigration of larval and juvenile penaeid prawns in estuaries and backwaters	

1970 S.No.	Code No.	Title of project	1971 S.No.	Code No.
52.	FB/CF/Pr 1.15	Studies on paddy field prawn culture practices. (Title revised)	28.	FB/OF/20
53.	FB/CF/Pr 1.16	Environmental studies in relation to prawn fishery of Vembanad Lake.	55.	MBO/MB/Misc 5
XX. LOBSTER INVESTIGATIONS				
54.	FB/CF/Lob/2.1	Fishery and biology of the lobsters of the shallow waters	25.	FB/OF/17
55.	FB/CF/Lob/2.2	Fishery and biology of the deep sea lobsters	26.	FB/OF/18
XXI. CRAB INVESTIGATIONS				
56.	FB/CF/Cra 3.1	Fishery and biology of the commercially important crabs.	27.	FB/OF/19
XXII. MOLLUSCAN FISHERIES INVESTIGATIONS				
57.	FB/MF/Mf. 1.1	Studies on chanks and pearl oysters with reference to ecology of sea bottom	Combined into one project. Title revised	
58.	FB/MF/Mf. 1.2	Studies on the ecology of the sea bottom with particular reference to the polychaete fauna of the chank grounds and other areas	29.	FB/OF/21
59.	FB/MF/Mf. 1.3	Studies on some aspects of the biology of the edible oyster, Crassostrea madrasensis (Preston). (Title revised)	30.	FB/OF/22
60.	FB/MF/Mf. 1.4	Studies on the molluscan fauna with special reference to bivalves. (Terminated)	-	
61.	FB/MF/Mf. 1.5	Studies on Turbo intercostalis and other intertidal and sub-tidal gastropods (Terminated)	-	
62.	FB/MF/Mf. 1.6	Studies on taxonomy, biology and fishery of cephalopods.	32.	FB/OF/24
XXIII. PHYSIOLOGICAL INVESTIGATIONS				
63.	FB/PH/Phy 1.1	Factors controlling the movements of prawns. (Terminated)	---	
64.	FB/PH/Phy 1.2	Studies on some aspects of the physiology of the prawn, Penaeus semisulcatus.	36.	FB/Misc/3
65.	FB/PH/Phy 1.3	Investigations on endocrine control of osmoregulation in teleosts.	35.	FB/Misc/2
		Division: Marine Biology and Oceanography		
XXIV. PRIMARY PRODUCTION STUDIES				
66.	MBO/MB/Pp 1.1	Determination of primary production at different stations along the west coast of India (Title revised)	41.	MBO/MB/Pp 1

1970 S.No.	Code No.	Title of project	1971 S.No.	Code No.
67.	MBO/MB/Pp 1.2	The use of phytoplankton pigments as an index of productivity (Title revised)	42.	MBO/MB/Pp 2
68.	MBO/MB/Pp 1.3	Culturing of phytoplankton organisms including nannoplankton.	Combined into one project. Title revised.	
69.	MBO/MB/Pp 1.4	Studies on the Photosynthetic characteristics and magnitude of respiration using cultures of phytoplankton.	43.	MBO/MB/Pp 3
XXV. PLANKTOLOGICAL INVESTIGATIONS				
70.	MBO/MB/Pl 2.1	Qualitative and quantitative studies on phytoplankton of offshore and oceanic waters.	46.	MBO/MB/Pl 1
71.	MBO/MB/Pl 2.2	Studies on the phytoplankton of the inshore waters	Merged with proj 41.	MBO/MB/Pp 1
72.	MBO/MB/Pl 2.3	Qualitative and quantitative studies on the phytoplankton of the brackish waters off Cochin.	Merged with proj 44.	MBO/MB/Pp 4
73.	MBO/MB/Pl 2.4	Studies on plankton of the inshore waters(General)	Combined into one project. Title revised.	
74.	MBO/MB/Pl 2.5	Investigations on the standing crop of zooplankton off the west coast of India and the Laccadive sea.	47.	MBO/MB/Pl 2
75.	MBO/MB/Pl 2.6	Studies on the fish eggs and larvae from the plankton of the south west coast of India and the Laccadive sea.	50.	MBO/MB/Pl 5 (Title revised)
76.	MBO/MB/Pl 2.7	Bioscattering and identification of the biological constituents of the Deep Scattering Layer (D.S.L.)	48.	MBO/MB/Pl 3
77.	MBO/MB/Pl 2.8	Studies on the reproduction, life history and biology of Euphausiacea.		
78.	MBO/MB/Pl 2.9	Studies on the biology and ecology of Chaetognaths in relation to hydrological conditions along the west coast of India.		
79.	MBO/MB/Pl 2.10	Studies on the quantitative abundance, ecology and biology of Siphonophora of the west coast of India.	Combined into one project. Title revised.	
80.	MBO/MB/Pl 2.11	Studies on the ecology, biology and quantitative distribution of pelagic Copepoda.	47.	MBO/MB/Pl 2
81.	MBO/MB/Pl 2.12	Studies on distribution, abundance and ecology of planktonic gastropods.		
82.	MBO/MB/Pl 2.13	Studies on the taxonomy and distribution of pelagic Tunicata of the Indian seas.		

1970 S.No.	Code No.	Title of project	1971 S.No.	Code No.
83.	MBO/MB/Pl 2.14	Studies on decapod larvae of the offshore plankton	49.	MBO/MB/Pl 4
84.	MBO/MB/Pl 2.15	Zooplankton sorting programme	Combined with 47.	MBO/MB/Pl 2
XXVI. INVESTIGATIONS ON BENTHOS				
85.	MBO/MB/Ben3:1	Taxonomy and ecology of epiphytic and benthic diatoms(Title revised)	44.	MBO/MB/Pp 4
86.	MBO/MB/Ben 3.2	Studies on the taxonomy, biology and distribution of polychaetes(Terminated)	--	
XXVII. ANCILLARY MARINE RESOURCES INVESTIGATIONS				
87.	MBO/MB/Anc 4.1	Studies on the annual growth behaviour of marine algae in the Palk Bay and Gulf of Mannar. (Project terminated)	--	
88.	MBO/MB/Anc 4.2	Studies on density and distribution of agar and algin yielding seaweeds.(Terminated)	---	
89.	MBO/MB/Anc 4.3	Chemical studies on the agar-agar of Gracilaria . (Terminated)	---	
90.	MBO/MB/Anc 4.4	Studies on Foraminifera of Mandapam area. (Terminated)	---	
91.	MBO/MB/Anc 4.5	Biology and fishery of sponges (Title revised)	53.	MBO/MB/Misc.3
92.	MBO/MB/Anc 4.6	Studies on the systematics, biology and fishery of holothurians.(Terminated)	---	
XXVIII. OCEANOGRAPHIC INVESTIGATIONS				
93.	MBO/OC/Oce 1.1	Hydrographic studies.(Title revised)	58.	MBO/OC/Oce 1
94.	MBO/OC/Oce 1.2	Studies on upwelling.	62.	MBO/OC/Oce 5
95.	MBO/OC/Oce 1.3	Studies on currents (Title revised)	61.	MBO/OC/Oce 4
96.	MBO/OC/Oce 1.4	Observations on basic hydrological and meteorological conditions.	63.	MBO/OC/Oce 6

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LIST OF RESEARCH PROJECTS FOR 1971

Division: Marine Biology and Oceanography

V. PRIMARY PRODUCTION STUDIES

VI. PLANKTOLOGICAL INVESTIGATIONS

VII. MISCELLANEOUS INVESTIGATIONS

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ABBREVIATIONS USED

SFS - Senior Fishery Scientist
FS - Fishery Scientist
JFS - Junior Fishery Scientist
AFS - Assistant Fishery Scientist
SRA - Senior Research Assistant
RA - Research Assistant
JSA - Junior Scientific Assistant

Title of Project: SAMPLE SURVEY FOR ESTIMATING MARINE FISH PRODUCTION AND EFFORT EXPENDED TO GET THE PRODUCTION.

Project Code No. FSS/FRA/FS-1

Division: Fishery Survey and Statistics

Location: The coverage of the survey will be the entire coast line of India. It will be planned, controlled and executed from Cochin.

Title of major project: ASSESSMENT OF MARINE FISHERY RESOURCES

Personnel:

Project Leader:

* D. Chakraborty, JFS

Associates:

Fishery Scientist (Vacant)
S.K. Dharmaraja, AFS
A.K. Kesavan Nair, RA
G. Balakrishnan, RA
Varghese Philipose, RA
K. Narayana Kurup, RA

Objectives:

Estimation of marine fish production and effort in terms of number of operations of unit gear of different types. The detailed break up of yield according to variety, region and type of gear.

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

In a country where fishing is done by a large number of 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 for collection of data on catch and effort which are basic requirements for the assessment of exploited stock.

For evolving suitable sampling scheme, pilot surveys had been conducted by Indian Council of Agricultural Research and Central Marine Fisheries Research Institute in early fifties. The important references are indicated below :-

1. Bal, D.V. and Banerji, S.K. 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, Jounral of the Indian Society of Agricultural Statistics, Vol. 20, No. 2, December.

3. Bazigos, G.P. 1970. Sampling Techniques in Inland Fisheries with special reference to Volta Lake. UNDP Volta Lake Research Project. FIO : SF/GHA/10. 6 May 1970 St. S/1 & 2.

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

5. Nair, R.V. and Banerji, S.K. 1968. A survey of the Statistics of marine fish catch in India from 1950 to 1962. Indian Journal of Fisheries, Vol. 12, Bo. 1

6. Panse, V.G. and Sastry, K.V.R. 1960. Sample Survey for Fishery Statistics. ETAP Report No. 1247.

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

8. Yamamoto, T. 1953. Sampling Survey of Fisheries catch Statistics in Japan. Statistics and Surveys Division. Ministry of Agriculture and Forestry, Tokyo, Japan.

Plan of work:

The design of Sapmle Survey involves space-time stratification. A number of geographically contiguous landing centres form the stratum in space. A ten day period of a month is the time stratum. The primary sampling unit is a centre-day/centre-group of two days. Sampling is alsoadopted over hours of the selected day and the enumerating units, which are landing boats, are selected on systematic way. The night catches are obtained by enquiry.

On the basis of estimates made for the primary sampling units, stratum estimates and their percentage error are arrived at. The period of estimation is a month.

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* Coordinator S.K. Banerji, SFS

Title of Project: SAMPLE SURVEY FOR ESTIMATING SIZE COMPOSITION OF THE CATCHES OF SOME OF THE COMMERCIALLY IMPORTANT FISHES.

Project Code No. FSS/FRA/FS.2

Division: Fishery Survey and Statistics

Location: The coverage of the survey will embrace the entire coastline of India but it will be planned, controlled and executed from Cochin.

Title of major Project: ASSESSMENT OF MARINE FISHERY RESOURCES.

Personnel:

Project Leader:

* D. Chakraborty, JFS

Associates:

Fishery Scientist (Vacant)
S.K. Dharmaraja, AFS
A.K. Kesavan Nair, RA
G. Balakrishnan, RA
Varghese Philipose, RA
K. Narayana Kurup, RA

Objectives:

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 to determine the mortality rate and proper appraisal of 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 landings of yellowfin tuna. Bull. Inter. Amer. Trop. Tuna Comm.2(5):174-243

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

Plan of work:

The work will be carried out in conjunction with project No. FSS/FRA/FS.1 . From a sub-sample of fishing units examined, a sample of specimen of the species under study will be taken and its weight measured. From the size composition of the sample and its weight the size composition of landings of the species under study will be arrived at.

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* Coordinator : S.K. Banerji, SFS

Title of Project: FRAME SURVEY

Project Code No.	FSS/FRA/FS.3
Division:	Fishery Survey and Statistics
Location:	Coverage all marine fishing villages and landing centres in India. Controlled and supervised from Cochin.
Title of major project:	ASSESSMENT OF MARINE FISHERY RESOURCES
Personnel:	**Project Leader:**
	* S.K. Dharma Raja, ASFS
	Associates:
	G. Balakrishnan, RA
	Varghese Philipose, RA

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 will also bring out the nature of changing pattern of fishing industry and its consequent impact on fishermen.

Total duration:	~~one year~~ Continuing
Date of initiation:	1971 - ~~4th Survey~~.

Brief resume of literature:

The first Session of the IPFC/IOFC Joint Working Party on Fishery Statistics recommended certain minimum requirements of a National Fishery Statistica system. This included statistics on fishing establishments, fishing man-power, fishing craft, fishing units, catch and fishing effort and value of catch. The aim of the present project is to collect statistics on the first 4 items.

In this connection the following literature published by FAO may be referred to :-

FAO 1970, IPFC/IOFC Joint Working Party of experts on Indian Ocean & Western Pacific Statistics, Bangkok, December, 1960.

Plan of work:

Investigators will collect data by visiting different houses and fishing establishments in all the marine fishing villages in India. The data will include number of marine fishing villages, fishing establishments, marine fishermen population, number of active marine fishermen and number of fishing crafts etc. It is proposed to collect such data on complete census basis every 10 years and obtain projected estimates for interim years based on sample survey data collected during these years. The implementation of the frame surve will depend upon the availability of travelling funds and field personnel.

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* Coordinator : S.K. Banerji, SFS

Title of Project: STOCK ASSESSMENT AND ESTIMATION OF POTENTIAL YIELD OF COMMERCIALLY IMPORTANT FISHES.

Project Code No. FSS/FRA/ST.1

Division: Fishery Survey and Statistics

Location: Cochin

Title of major project: ASSESSMENT OF MARINE FISHERY RESOURCES

Personnel:

Project Leader:

S.K. Banerji, SFS

Associates:

D. Chakraborty, JFS
A.K. Kesavan Nair, RA
T.S. Krishnan, RA

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 asspciated level of exploitation. The model has since been used widely to make 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 of oil sardine, mackerel, prawns and Bombay duck in the first instance.

1. 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, December 7-10, 1968.

2. Banerji, S.K. and Krishnan, T.S. Preliminary assessment of oil sardine population along the West Coast of India (MS).

3. Baranov 1918. On the question of biological basis of fisheries. Nanohnuyii issledovaleskii iktislogisheskii Institut Investiia. 1(1): 81-128.

4. Beverton, R.J.H. and S.J. Holt. 1957. On the dynamics of exploited fish populations. Fish. Invest. Lond. Ser.II:19.

5. Schaefer, M.B. 1953. Fisheries dynamics and the concept of maximum equilibrium catch - Proc. Calif. Caribb. Fish. Inst. 6th Annual Session, 63-54.

6. _____ 1954. Some aspects of the dynamics of populations important in the management of commerical marine fisheries. Bull. Inter. Amer. Trop. Tuna Comm. 1(2).

Plan of 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 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 natural mortality rates.

5. Building up suitable mathematical models linking yield with the other vital parameters (recruitment, growth and morality rates) and estimating the maximum potential yield from each fishery along with the associated levels of exploitation.

6. Utilization of suitable biological informations collected by other scientific workers for stock measurement and estimating the potential yield.

Title of Project: FISHERY DATA CENTRE

Project Code No.	FSS/FRA/ST.2
Division:	Fishery Survey and Statistics
Location:	Cochin
Title of major project:	ASSESSMENT OF MARINE FISHERY RESOURCES
Personnel:	**Project Leader:** S.K. Banerji, SFS
	Associates: Senior Scientific/Programme Officer (Vacant)
	Programme Officer (Vacant)
	Programme Assistant - 2 (Vacant)

Objectives:

The Fishery Data Centre will be the store-house of all data on exploratory and commercial fishing operations along with environmental data. To start with the relevant data from all exploratory vessels will be accumulated and their analysis will enable to draw up contour maps of various fisheries in relation to abundance and other related attributes which will ultimately be of great value in the exploitation of untapped fishery resources.

Total duration:	Being a store-house of all aspects of exploratory fishing data, the building up of a Fishery Data Centre is envisaged as a long-term and permanent scheme. However, the scheme will be developed gradually as the programme of exploratory survey gathers momentum.
Date of initiation:	1971
Brief resume of literature:	No specific literature is available on this line.

Plan of work:

1. Preparation and distribution of standard forms for the collection of relevant data.
2. Codifying and storing the data
3. Processing of the data and preparation of charts showing abundance of fish of different types.

Title of Project: FISHERY AND BIOLOGY OF THE OIL SARDINE, SARDINELLA LONGICEPS

Project Code No. FB/MF/1

Division: Fishery Biology

Location: Karwar, Mangalore, Calicut and Cochin

Title of major project: INVESTIGATIONS ON MAJOR FISHERIES

Personnel:

Project Leader:

B.T. Antony Raja, JFS

Associates:

V. Balan, JFS
N. Radhakrishnan, AFS
M.H. Dhulhed, AFS
G.G. Annigeri, SRA
V.S. Rangaswamy, RA

Objectives:

i) to study the variations in the relative abundance of oil sardine in space and time off the west coast,

ii) to assess the variations in the catch of juveniles in relation to rainfall,

iii) to study the biological aspects such as age, growth, sex ratio, spawning and migration, and,

iv) to conduct racial studies for determining whether the exploited stock consists of a homogenous population.

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

The undermentioned publication reviews up to date all the work hitherto carried out on the oil sardine.

Antony Raja, B.T. 1969. The Indian Oil sardine Bull. cent. mar. Fish. Res. Inst. No. 16

Plan of work:

1. A regular record of catch and effort data on oil sardine landed by different gears will be maintained at the centres selected for biological studies.
2. Correlation between catch data and the amounts of rainfall during the monsoon season will be made.
3. Based on routine sampling for biological studies, age composition, growth rate, sex ratio, maturity, fecundity and spawning behavior will be investigated.
4. By a regular programme of tagging, the nature of movement of oil sardine shoals and other connected problems will be studied.

Title of Project: FISHERY AND BIOLOGY OF THE INDIAN MACKEREL, RASTRELLIGER KANAGURTA

Project Code No. FB/MF/2

Division: Fishery Biology

Location: Karwar, Mangalore, Calicut, Cochin, Vizhinjam, Mandapam & Port Blair.

Title of major project: INVESTIGATIONS ON MAJOR FISHERIES

Personnel:

Project Leader:

G. Seshappa, FS

Associates:

K.V. Narayana Rao, JFS
V. Balakrishnan, JFS, P. Vijayaraghavan, AFS
K. Rangarajan, AFS
A. Noble, AFS
T.M. Yohannan, RA
P. Livingstone, RA

Objectives:

i) To study the relative abundance of mackerel in space and time, and,

ii) to investigate the aspects of biology such as age, growth, sex composition, maturation, fecundity, feeding habits, migration and spawning behaviour.

Total duration: Continuing

Date of Initiation: Already in progress

Brief resume of literature:

The existing knowledge on the fluctuations in the catch of mackerel, on the different biological aspects such as age, growth, maturity, spawning and feeding habits is embodied in the works of Banerji (1962, 1963, 1967), Pradhan (1956), Sekharan (1958, 1962) and Jones and Rosa (1967).

Plan of work:

1. Catch and effort data on mackerel will be collected at different centres mentioned above based on random sampling.

2. Biological data will be collected to study size composition, age, growth, maturity, spawning, feeding habits etc. at all the centres.

3. Tagging of mackerel will be carried out to study the movement of mackerel and other connected problems.

Title of Project: STOCK ASSESSMENT OF PRAWNS AND SHRIMPS

Project Code No.	FB/MF/3
Division	Fishery Biology
Location	Veraval, Bombay, Karwar, Mangalore, Calicut, Cochin, Colachel, Mandapam, Madras, Kakinada.
Title of major project:	INVESTIGATIONS ON MAJOR FISHERIES
Personnel	**Project Leader:** K.H. Mohamed, FS **Associates:** S. Ramamurthy, JFS M.S. Muthu, AFS M.Mydeen Kunju, AFS P.Vedavyasa Rao, AFS V.M. Deshmukh, AFS M.M. Thomas, SRA N.Neelakanta Pillai, SRA M.Aravindakshan, SRA K.Y. Telang, SRA G.Sudhakara Rao, RA Kuber Vidyasagar, SRA N. Surendranatha Kurup, RA K.N. Rajan, RA C. Suseelan, RA D. Sivalingam, RA P.E. Sampson Manickam, RA K. Devarajan, RA K.K.Sukumaran, RA K.V. George, RA K.Rajasekharan Nair, RA M. Kathirvel, RA and others

Objectives:

1. 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.

2. 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.

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

4. 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.

5. 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.

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

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

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

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 1970 although minor fluctuations are seen the data depict a general rising trend and the fluctuations are found to be random in nature.

The trend of prawn landings and their fluctuations at different centres of the coasts, percentage contribution, seasonal occurrence and distribution and 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 inthe 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 have been made. Data are, however, incomplete in the case of other commercially important species.

Of the several species of prawns recorded from Indian Seas only about a dozen species contribute to the commercial fisheries. Life history and biology of most of these species are still imperfectly understood. Divergent views have been expressed regarding the age and growth, maturity and breeding seasons, migratory pattern and recruitment to the fishery, etc. Spawning grounds of most of the species have not been demarcated although they are known to breed in deeper waters.

1. CMFRI, 1969 Prawn Fisheries of India, Bull. cent. mar. Fish. Res. Inst. No.14: 1-303.

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. _____ 1963 Post-larval abundance as a possible index of fishing success in the prawn Metapenaeus dobsoni (Mier) Indian J. Fish. 10(1): 135-39.

4. 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.

5. George, M.J., S.K. Banerji, and K.H. Mohamed 1968 Size distribution and movement of the commercial prawns of the southwest coast of India. FAO Fish. Rep., 57(2): 265-284.

6. George, M.J., K. Raman and P. Karunakaran Nair 1963 Observations on the offshore prawn fishery of Cochin. Indian J. Fish. 10A(2): 460-499.

7. 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(2): 427-442.

8. Gopalakrishnan, V. 1952 Food and feeding habits of Penaeus indicus M. Ed. J. Madras Univ. (B), 22(1): 69-75.

9. Menon, M.K., and K. Raman 1961 Observations on the prawn fishery of the Cochin backwaters with special reference to the stake-net catches. Indian J. Fish.,, 8(1): 1-23.

10. Mohamed, K.H. 1967 The prawn Fisheries. 20th Aniv. Souvenir, Central Marine Fisheries Research Institute, Mandapam Camp. 75-81.

11. Mohamed, K.H., and C. Suseelan 1968 The deep-sea prawn resources off the south-west coast of India. Symp. Living resources of the seas around India, Cochin.

12. Panikkar, N.K. and M.K. Menon 1955 Prawn fisheries of India. Proc. Indo-Pacif. Fish. Counc., 6(3): 328-344.

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

14. Subrahmanyan, M. 1965 Lunar diurnal tidal periodicity in relation to the prawn abundance and migration in Godavari estuarine system. Fish. Tech., 2(1): 26-41.

Plan of work

1. Regular random samples of prawns landed by different gears will be obtained separately from three different environments viz., estuaries, inshore and offshore areas. 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.

6. Faunistic and resources survey particularly of the deep water prawns will be undertaken.

7. Detailed analysis of the data will be made by different working groups to study the biological factors such as age and growth, food and feeding, spawning behaviour, migratory patterns etc. concerning each of the commercial species.

8. Special collections as and when required in addition to the basic data will be made from time to time.

9. Experiments will be conducted to induce spawning of prawns under laboratory conditions.

10. Rearing of larvae and adults of important species will be undertaken in the laboratory with a view to develop culture techniques.

11. Environmental data of the prawn grounds will be collected and attempts will be made to correlate the same with prawn abundance.

12. Regular collections required to study the rate of immigration and emigration of larval and juvenile prawns in the estuaries and backwaters will be undertaken.

Title of Project: BIOLOGY AND FISHERY OF THE BOMBAY DUCK, HARPODON NEHEREUS

Project Code No.	FB/OF/1
Division:	Fishery Biology
Location:	Bombay, Veraval (Jaffrabad)
Title of major project:	INVESTIGATIONS ON OTHER FISHERIES
Personnel:	Project Leader: S.V. Bapat, JFS
	Associates: A.S. Kaikini, AFS A. Kurian, RA

Objectives:

To study the fishery and biology of the Bombay duck and investigate the effect of fishing on exploited stocks.

Total duration:	Continuing
Date of initiation:	1970

Brief resume of literature:

The Bombay duck contributed 2-3% of the marine fish landings in the forties of this century. With mechanisation of craft the landings have substantially increased and have stabilized around 90,000 tonnes a year in the sixties. The fishery is lucrative on the west coast and contributes 10-13% of the marine fish landings of India and has thus gained the position of a major fishery. The undermentioned publication reviews up to date all the work hitherto carried out on the Bombay duck.

Bapat, S.V. 1970. The Bombay duck, Harpodon nehereus. Bull. Cent. Mar. Fish. Res. Inst., 21, 66 pp.

Plan of work:

Data on catch, size composition and other aspects relating to Harpodon nehereus will be collected from Dabhol, Janfira, Versova, Dahanu and Nawabunder for:

1. Observations on seasonal and regional Bombay duck landings at selected centres.
2. Biological studies on age and rate of 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.

Title of Project: SYSTEMATICS, BIOLOGY AND FISHERY OF THE LESSER SARDINES

Project Code No. FB/OF/2

Division: Fishery Biology

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

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

B.T. Antony Raja, JFS

Associates:

Syed Basheeruddin, AFS
P. Sam Bennet, AFS
D.B. James, SRA
R. Marichamy, RA
S. Lazarus, RA and others

Objectives:

The group of lesser sardines which at present yields an average catch of about 35,000 tonnes forming nearly 5% of annual marine fish production in India may well develop as one of the productive pelagic fishery resources of the Indian waters especially around the peninsular tip. Hence, for a proper understanding of the fishery and biology of the lesser sardines, a review of the taxonomy of this group and detailed studies on the biology of the different species is essential. The project is aimed at elucidating these.

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

Some of the important published accounts on the lesser sardines are that of Nair (1960), Dharmamba (1960), Bennet (1962), Gnanamekala (1962) and Radhakrishnan (1967).

Plan of work:

1. Systematic review of the various species of lesser sardines will be undertaken.

2. Studies on the species-wise catch trends on biological aspects of the different species will be carried out at the respective centres.

Title of Project: FISHERY AND BIOLOGY OF ANCHOVIES

Project Code No.	FB/OF/3
Division:	Fishery Biology
Location:	Vizhinjam, Waltair and Port Blair
Title of major project:	INVESTIGATIONS ON OTHER FISHERIES
Personnel:	Project Leader: G. Luther, AFS
	Associates: V. Ramamohana Rao, AFS; R. Marichamy, RA

Objectives:

To study the catch trends and species composition of the fishery and biology of some of the commercially important species of anchovies.

Total duration:	Continuing
Date of initiation:	1969

Brief resume of literature:

Anchovies of the Indian seas are mainly comprised of the genera Stolephorus, Thryssa, and Thryssina. Stolephorus spp. are commercially the most important anchovy in India forming nearly 80% of the total anchovy catches. About 90% of the Stolephorus catches of the country are fished by the three states; Tamil Nadu, Kerala and Andhra Pradesh. Stolephorus are pelagic and shoaling fish which exhibit wide seasonal and annual variations in catches.

Current investigations have revealed that among the anchovies the commercially important species are Stolephorus heterolobus and S. bataviensis on Waltair Coast, S. sp A (Whitehead, 1968), a species closely related to S. heterolobus and S. bataviensis at Vizhinjam and Thrissina baelama at Port Blair (Andamans). The maturation and spawning habits of S. commersonii and the food of a few species of Stolephorus spp. have been studied.

Plan of work:

Study of catch trends and species composition, and aspects of biology such as age and growth, food and feeding habits, maturity, sex ratio and spawning habits of important species of the genus Stolephorus, Thryssa and Thryssina in the commercial catches.

Title of Project: FISHERY AND BIOLOGY OF RIBBON FISHES

Project Code No.	FB/OF/4
Division:	Fishery Biology
Location:	Madras, Kakinada, Tuticorin and Kozhikode
Title of major project:	INVESTIGATIONS ON OTHER FISHERIES
Personnel:	Project Leader:
	P.T. Meenakshisundaram, AFS
	Associates:
	K.A. Narasimham, AFS
	[illegible], AFS
	J.C. Gnanamuthu, SRA
	Research Assistant - Vacant

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 the resources; to study the biology of the commercially important ribbon fishes which will help in determining the optimum catches that could be obtained without adverse effect on their stocks.

Total duration:	Continuing
Date of initiation:	1969

Brief resume of literature:

Prabhu (1955) was one of the first to study the biology of the ribbon fishes of Indian coasts. Since this publication, our knowledge on the subject has advanced very much. The monograph by James (1967) deals with many aspects of the ribbon fishes such as systematics, comparative morphology, food and feeding, reproduction and fisheries. Rosa (1957) has published an exhaustive synopsis of biological data of ribbon fishes.

1. James, P.S.B.R. 1967. The Ribbon fishes of the family Trichiuridae of India. Memoir 1. Mar. Biol. Ass. India, 226 pp.
2. Prabhu, M.S. 1955. Some aspects of the biology of the ribbon-fish, Trichiurus haumela (Forskal). India J. Fish., 2(2) : 132-163.
3. Rosa, H. Jr. 1957. A synopsis of biological data on the species of Trichiuridae, FB/57/T/FAO Fish.Div. Biol. Br., 81 pp.

Plan of work:

1. Collection of species-wise catch data.
2. Biological studies on species of ribbon fishes, (Trichiurus lepturus, Lepturacanthus savala and Eupleurogramus intermedius) with special reference to age determination, food and feeding habits, maturity, spawning and life-history.

Title of Project: FISHERY AND BIOLOGY OF THE TUNAS, SEERFISHES AND BILLFISHES

Project Code No. FB/OF/5

Division: Fishery Biology

Location: Cochin, Vizhinjam, Minicoy and Mandapam

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

M.D.K. Kuthalingam, AFS

Associates:

M.S. Rajagopalan, AFS
M.M. Meiyyappan, RA
M. Devaraj, RA

Objectives:

To study the biology and fishery of commercially important species of tunas, seerfishes and billfishes.

Total duration: Five years

Date of initiation: 1970

Brief resume of literature:

In the Indian Ocean and adjacent seas, there is a great potential for exploiting the pelagic oceanic species of fishes comprising the tunas, seerfishes and billfishes. Detailed investigations on the biology and fisheries of this group is essential for the proper exploitation and management of the resources.

The undermentioned publications have reviewed in detail the existing knowledge on the systematics and biology of the various species under this group

1. Jones, S. and E.G. Silas. 1963. Tuna and tuna-like fishes from the Indian seas. Proc. FAO World Sci. Meet. Biol. Tunas related sp., 3: 1775-1796.

2. Jones, S. and E.G. Silas, 1964. A systematic review of the Scombro fishes of India. Proc. Symp. Scombroid Fishes, Mar. Biol. Ass. India, Pt. I: 1-106.

3. Nakamura, I., T. Iwai and K. Matsubara, 1968. A review of the sailfish, spearfish and swordfish of the world. Misaki. Mar. Biol. Inst. Kyoto Univ. Spec. Rep. No.4: 1-95.

4. Nair, R.V., K. Veerabhadra Rao and K. Dorairaj, 1970. The Tuna and Tuna-like fishes of India. Bull. Cent.mar.Fish Res. Inst. No. 23: 93 pp.

Plan of work:

1. To study species-wise catch trends of tunas at selected centres of observation.
2. The biology and fishery of the coastal species of tunas will be studied at the different centres.
3. Biology and fishery of the skipjack will be studied in the Laccadives
4. Study the abundance and fluctuations in the baitfishes resources in the Laccadives.

Title of Project: FISHERY AND BIOLOGY OF COMMERCIALLY IMPORTANT ELASMOBRANCHS

Project Code No. FB/OF/6

Division: Fishery biology

Location: Bombay, Tuticorin, Mandapam, Chidambaram and Madras

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

R.V. Nair, Deputy Director

Associates:

P. Devadas, RA
R. Sarvesan, RA
K.S. Sundaram, RA
S. Shanumugham, RA
K.K. Appukuttan, RA
K. Prabhakaran Nair, RA
R. Sounderarajan, RA

Objectives:

1. To find out the regional and species-wise abundance of sharks, rays and skates and their seasonal fluctuations, and,

2. to elucidate the various biological aspects such as food and feeding habits, age and growth, reproductive and embryonic development of commercially important species of sharks, rays and skates.

Total duration: Continuing

Date of initiation: 1971

Brief resume of literature:

In the ten year period 1959-1968, the average annual landings of elasmobranchs in India was 33,223 tonnes forming 3.68% of the total marine fish production. The sharks represented by genera, Scoliodon, Carcharias, Hypoprion and Galeocerdo and the rays and skates belonging to the genera, Gymnura, Trygon, Himantura, Aetobatis and Rhynchobatus are commercially very important as they provide a rich source of food, liveroil, vitamins, fish manure, tanning oil etc.

In order to exploit the potential elasmobranchs resources, an adequate knowledge about the identity, distribution, biology and fisheries of the various species is very essential.

Some important references on the subject are :

1. Chidambaram, K and Menon, M.D., 1946. Investigation on the shark fishery of Madras Presidency. Govt. of Madras publication.

2. C.M.F.R.Institute, 1969 Marine Fisheries Production in India Bull. cent. mar. Fish. Res. Inst. No. 6, 144 pp.

3. Day, F. 1878 Fishes of India. Vols I and II, Bernard Quaritch, London.

4. Misra, K.S. 1955 On the distribution of elasmobranchs and chimaera of the Indian region in relation to the mean annual isotherms. Rec. Ind. Mus., 53: 73-86

5. Prasad, R.R. 1945 The structure, phylogenetic signi ficance and function of the nidamental glands of a few elasmobranchs of the Madras coast. Proc. nat. Inst. Sci. India. 11: 282-302

6. Prasad, R.R. 1945 Further observations on the structure and functio of nidamental glands of a few elasmobranchs of Madras coast. Proc. Indian. Acad. Sci., 22B: 368-373.

7. Sarangadhar, P.N. 1943 Tiger shark, Galeocerdo tigrinus. Feeding and breeding habits. J. Bom. nat. Hist. Soc., 44: 102-110.

8. Setna, S.B. and P.N. Sarangadhar 1948 Observations on the development of Chiloscyllium griseum, Pristis cuspidatus, Rhynchobatus djeddensis. Rec. Indian. Mus., 46: 25-29.

9. Setna, S.B. and P.N. Sarangdhar 1946 Selachian fauna of Bombay waters. Proc. nat. Inst. Sci. India., 12: 243-259.

10. Setna, S.B. and P.N. Sarangadhar, 1948. Studies on the development of some Bombay elasmobranchs. Rec. Ind. Mus., 47: 203-216.

11. Setna, S.B. and P.N. Sarangadhar, 1950. Breeding habits of some Bombay elasmobranchs. Ibid. 48: 25-54.

Plan of work:

1. Estimation of species-wise catch trends with reference to different types of gears at selected centres.

2. Determination of age and growth.

3. Study of length-weight relationship.

4. Analysis of gut contents.

5. Observations on stages of development of gonads.

6. Investigations on fecundity, variation in the numbers of intrauterine embryos, duration and periodicity of pregnancy, and other relevant aspects of study to determine the reproductive potentiality of the various species will be undertaken.

Title of Project: FISHERY AND BIOLOGY OF CAT-FISHES

Project Code No. FB/OF/7

Division: Fishery Biology

Location: Waltair

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

B. Krishnamoorthi, JFS

Associates:

P. Mojumder, AFS

Objectives:

1. To study variations in species-wise catch trends in space and time of cat-fishes constituting the commercial catches.

2. To study the various aspects of the fishery biology of commercially important species of cat-fishes.

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

Cat-fishes are important fishery resources which are abundant in some regions. The existing knowledge on this group is meagre. Detailed investigations on their biology are necessary,

1. Chidambaram, K. 1941. Observations on the development of Arius jella. Proc. Indian Acad. Sci. 14(B) : 502-508.
2. Devanesan, D.W. & Chidambaram, K. 1953. The common food fishes of the Madras State. Govt. Press, Madras - 79.
3. Mojumder, P. 1969. Food of Tachysurus thalassinus (Ruppell) (under consideration).
4. Raj, B.S. 1916. Notes on fresh-water fish of Madras. Rec. Indian Mus., 12(6): 249-294.
5. Singh, V.D. & M.S. Rege, 1968. Observations on age and growth of Tachysurus sona (Ham) J. Bombay nat. Hist. Soc.,65(1):75-87.

Plan of work:

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

2. Determination of age, growth, maturity, fecundity, spawning and feeding habits.

Title of Project: FISHERY AND BIOLOGY OF THE COMMERCIALLY IMPORTANT CARANGIDS

Project Code No. FB/OF/8

Division: Fishery Biology

Location: Waltair, Vizhinjam

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

S. Reuben, SRA

Associates:

P.V. Sreenivasan, RA

Objectives:

To study the species-wise catch trends and biology of commercially important carangids.

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

Only few reports are available on the fishery and biology of carangids. Among the Indian papers mention may be made of Tandon (1959, 1960, 1961, 1962).

Valuable information is available from other countries in the works of William (1956, 1958); Berry (1958, 1962).

Plan of work:

1. Investigations on the biology of Carangoides malabaricus, Megalaspis cordyla, and Decapterus russelli and other commercially important species of Carangids.

2. Study the species-wise catch trends of commercially important carangi

Title of Project: FISHERY, BIOLOGY AND SYSTEMATICS OF THE COMMON TONGUE-SOLES OF THE WEST COAST WITH SPECIAL REFERENCE TO THE MALABAR SOLE, CYNOGLOSSUS MACROSTOMUS.

Project Code No. FB/OF/9

Division: Fishery Biology

Location: Mangalore and Kozhikode

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

G. Seshappa, FS

Associates:

A.C.C. Victor, RA
One RA (at Calicut - Vacant)

Objectives:

Evaluation of fishery / fluctuations; study of year-class strengths and of variations in sex composition, maturity, fecundity and food components of the common species in relation to environmental factors. Systematics and variation in the family Cynoglossidae will also be studied.

Total duration: Continuing

Date of initiation: 1969

Justification:

This is an important and interesting group of fishes and a detailed knowledge about them will be of fishery biological value; the various aspects of study are essential for the understanding of the nature of the stocks in the fishing grounds and the variations or periodical fluctuations in the same.

1. Seshappa, G. and B.S. Bhimachar 1954. Studies on the age and growth of the Malabar sole, Cynoglossus semifasciatus, Day. Indian J. Fish., 1: 145-162.
2. Seshappa, G. and B.S. Bhimachar 1955. Studies on the fishery and biology of the Malabar sole, Cynoglossus semifasciatus Day. Ibid., 2: 180-230.
3. Seshappa, G. 1968. Flatfish resources of the West Coast of India. Abstr. Pap. Symp. Liv. Res. of the Seas around India, Cochin 1968, 20-21.

Plan of work:

1. Estimation of species-wise catch trends according to gear and place.
2. Estimation of size and age trends in the catches by taking measurements of random samples and examination of scales.
3. Analysis of samples for sex ratios and maturity.
4. Examination of stomach contents.
5. Study of morphometric and meristic characters for interspecific and intraspecific comparison and assessment of systematic value of the different characters.

Title of Project: FISHERY AND BIOLOGY OF COMMERCIALLY IMPORTANT SCIAENIDS

Project Code No. FB/OF/10

Division: Fishery Biology

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

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

T. Tholasilingam, FS

Associates:

V. Sadasivan, JFS
S.J. Rajan, AFS
T. Appa Rao, SRA
R.S. Lal Mohan, SRA
K.V. Somasekharan Nair, RA
K. Prabhakaran Nair, RA
A.A. Jayaprakash, RA and others

Objectives:

To study the species-wise catch trends, biology and fishery of commercia 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 Otolithoi brunneus are high quality fishes growing to a very large size. The latter speci is showing some declining trends in the past ten years. The lesser group of smaller sciaenids like Otolithus ruber, O. orgenteus, Johnius dussumieri, J. carruta, Pseudosciaena sina, P. aneus, P. axillaries, P. vogleri, etc. form a good 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 tropcial waters where these groups abound. Some of the papers published on sciaenids are given below :-

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

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

3. Narayanan Kutty, M. 1961. Scales and otoliths of the 'Koth' Otolithoides brunneus (Day) as age indicators. Indian J. Fish., 8(1) : 145-151.

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

5. 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.

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

Plan of work:

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

2. Study of food and feeding habit, age, growth and spawning behaviour of commercially important sciaenids.

3. ~~To carryout~~ Systematic studies on sciaenids as and when necessary.

Title of project: FISHERY AND BIOLOGY OF SILVER BELLIES AND SILVER BIDDIES

Project Code No. FB/OF/11

Division: Fishery Biology

Location: Mandapam, Madras and Waltair

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

G. Venkataraman, JFS

Associates:

K. Venkatasubba Rao, AFS
J.C. Gnanamuthu, SRA

Objectives:

To study the species-wise catch trends of silver bellies and silver biddies and to study their fishery and biology.

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

Silver bellies and silver biddies constitute important fisheries along both the east and west coasts of India. They form sizeable proportion in the offshore trawler catches also. The annual production of silver bellies and silver biddies was as high as 36,480 tonnes in 1968.

1. Arora, H.L., 1951. A contribution to the biology of silver belly, Leiognathus splendens (Cuv.). II Proc. Indo-Pacific Fish. Counc., (3rd Meeting), 1-6.
2. Balan, V. 1963. Biology of silver belly, Leiognathus bindus (Val.) of the Calicut coast. Indian. J. Fish. 10(1): 118-134.
3. James, P.S.B.R. 1971. A systematic revision of the fishes of the family Leiognathidae. Abstracts, Symposium on the Indian Ocean and Adjacent Seas, / Mar. Biol. Ass. India, Cochin, Jan.1971. Sec. 17, No. 184:112.
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): 303-33
6. Venkataraman, G. 1960. Studies on 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. Collection of catch and effort data on each species.
2. Determination of age, growth and studies on food and feeding habits, maturity, fecundity and spawning.

Title of Project: FISHERY AND BIOLOGY OF COMMERCIALLY IMPORTANT PERCHES

Project Code No. FB/OF/12

Division: Fishery Biology

Location: Bombay, Cochin, Mandapam, Madras and Waltair

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

B. Krishnamoorthi, JFS

Associates:

P.T. Meenakshisundaram, AFS
C.R. Shanmughavelu, AFS
M.G. Dayanandan, AFS
P. Nammalwar, RA

Objectives:

To study the fishery and biology of commercially important perches such as Nemipterus japonicus, Lactarius lactarius and Pomadasys hasta.

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

Perches as a group are commercially important and occur both in inshore and offshore waters all along the west and east coasts of India. Some information on the abundance and distribution of the group is available. But very little is known about the biology of most of the species.

1. Basheeruddin, S and K.N. Nayar. 1961. A preliminary study of the coastal waters off Madras city. Indian J. Fish. 8(1):169-188.
2. Eggleston, D. 1971. Patterns of biology in Nemipteridae. Proc. Symp. Indian Ocean and Adjacent Seas, their Origin, Science and Recources (Abstracts)
3. Gopinath, K. 1942. Distribution and feeding of the postlarval fishes of the Trivandrum coast. Curr. Sci., 11(8): 337-350.
4. Krishnamoorthi, B. 1968. An assessment of Nemipterus fishing off Andhra-Orissa coasts based on exploratory trawl fishing. Proc. Symp. Living Resources of the seas around India (in press)
5. Krishnamoorthi, B. 1970. Studies on the trawl-caught thred-fin bream, N. japonicus.I. Food and feeding habits. (MS)
6. Mio Shi-Ichi. 1965. The determination of the age and growth of Nemipterus virgatus (Houff.) Bull.Jap.reg.Fish.Res.Lab.No.15:70

Plan of work:

1. Estimation of species-wise catch abundance in inshore and offshore landings.
2. Investigate biological aspects such as age, growth rate, food and feeding habits, maturity and spawning behaviour of commercially important species.

Title of Project: STOCK ASSESSMENT AND ESTIMATION OF POTENTIAL YIELD OF THREADFIN BREAMS (NEMIPTERIDAE) AND LIZARD FISHES (SYNODUS AND SAURIDA).

Project Code No. FB/OF/13

Division: Fishery Biology

Location: Cochin

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

K. Alagarswami, JFS

Associates:

Nil

Objectives:

Threadfin breams and lizard fishes are among a few of the important fishes occurring in the offshore waters. Although, there is no large scale exploitation of them at present there are visible signs that the industry would soon put in a sizeable effort on these stocks as the deep-sea fishing programme is gaining momentum. The aim of this project is to investigate the spatial, bathymetric and temporal distribution of these species along the west coast of India and to assess the potential yield from these resources. The effect of fishing effort on these stocks will also be studied

Total duration: Continuing

Date of initiation: 1971

Brief resume of literature:

Information is available on the distribution and relative abundance of Nemipterus japonicus off Orissa and Andhra coasts (Krishnamurthy (1968). Tholasilingam et al. (1968) have made a study on the fishery and relative abundance of ground fishes off Cochin. Silas (1969) has made a general estimation of the standing crop for the shelf edge and the upper continental slope off the west coast of India. Assessment of exploited fish stocks and fishery potential is important. Such assessment with respect to important pelagic fisheries has been undertaken (Banerji, 1968).

1. Banerji, S.K. 1968. An assessment of the exploited pelagic fisheries of the Indian seas. Symposium on living resources of the Seas around India, Cochin, Dec. 1968.

2. Krishnamurty, B. 1968. An assessment of the Nemipterus fishery off Andhra-Orissa coasts based on exploratory trawl fishing. Ibid.

3. Schaefer, M.B. 1954. Some aspects of dynamics of populations important in the management of commercial marine fisheries. Bull. Inter. Amer. Trop. Tuna Comm., 1(2).

4. Silas, E.G. 1969. Exploratory fishing by R.V. Varuna. Bull. cent. mar. Fish. Res. Inst., 12.

5. Tholasilingam, T., G. Venkataraman and K.N. K. Kartha 1968. A study of the fishery and estimation of relative abundance of ground fish off Cochin. Indian J. Fish., 11 A (2)(1964): 709-734.

Plan of work:

1. Collection and analysis of catch data from exploratory, training and commercial vessels from landings at shore and also by personal participation in the voyages of the vessels.

2. Study of age and growth of the concerned species.

3. Estimation of age- and size-composition of stocks for every fishing season.

4. Estimation of fishing and mortality rates.

5. Study on (a) fecundity, maturation and spawning, and (b) feeding habits, food components and availability of food to the extent necessary to understand the biological factors that may cause the movement of stocks and their relative abundance.

6. Estimation of potential yield for each fishery using suitable mathematical models.

Title of Project: FISHERY AND BIOLOGY OF COMMERCIALLY IMPORTANT POLYNEMIDS

Project Code No.	FB/OF/14
Division:	Fishery Biology
Location:	Bombay and Mandapam
Title of major project:	INVESTIGATIONS ON OTHER FISHERIES
Personnel:	Project Leader: P.V. Kagwade, AFS
	Associates: K. Dorairaj, SRA

Objectives:

To study the fishery and biology of commercially important polynemids with a view to understanding the causes behind fluctuations in catch abundance.

Total duration:	3 years
Date of initiation:	1969

Brief resume of literature:

The undermentioned publications review up to date all the work hitherto carried out on the commercially important polynemids from Indian Seas.

1. Kagwade, P.V. 1968. Polynemid fishery resources of India. Symposium on the Living Resources of the Seas around India. Adv. Abstr. Contri. Fish. Aquat. Sci. India. 2(4): 70-71.

2. Kagwade, P.V. 1970. The polynemid fishes of India. Bull. cent. mar. Fish. Res. Inst., 18. 69 pp.

Plan of work:

1. Study the species-wise catch trends of Polynemids in the inshore and offshore fisheries.

2. Investigate biological aspects such as age, growth-rate, food and feeding habits, maturity and spawning behaviour of commercially important polynemids such as P. indicus, P. heptadactylus, P. sextarius, P. microstoma and E. tetradactylum.

Title of Project: FISHERY AND BIOLOGY OF POMFRETS

Project Code No. FB/OF/15

Division: Fishery Biology

Location: Veraval

Title of mjaor project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:
Kuber Vidyasagar, SRA

Associates:
Nil

Objectives:

To study the fishery and biology of pomfrets

Total duration: 3 years

Date of initiation: 1970

Brief resume of literature:

At Veraval, gill nets are mostly used and the pomfrets Pampus argenteus and Parastromateus niger account for the major portion of catches with these nets. Pampus argenteus is caught in good quantities during the season. Very limited information is available regarding the fishery and biology of pomfrets.

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. Sivaprakasam, T.E. 1963. Observations on the food and feeding habits of Parastromateus niger, of the Saurashtra coast. Indian J. Fish., 10(1): 140-147.

3. Kuthalingam, M.DK. 1963. Observations on the fishery and bilogy of the silver pomfret Pampus argenteus (Euphrasen) from the Bay of Bengal. Ibid.. 10: 59-74.

Plan of work:

1. Estimation of species-wise catch trends.
2. Study of biological aspects such as age, growth-rate, food and feeding habits, maturity and spawning behaviour of Pampus argenteus and other species.

Title of Project: FISHERY AND BIOLOGY OF MURAENOSOX TALABONOIDES

Project Code No. FB/OF/16

Division: Fishery Biology

Location: Bombay

Title of major Project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

M.K. George, RA

Associates:

Nil

Objectives:

To study the biology and fishery of the eel. Muraenesox talabonoides

Total duration: 3 years

Date of initiation: 1969

Brief resume of literature:

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. Ind. Acad. Sci., 52 B: 147-168.

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

Plan of work:

Studies on the fishery and biological aspects such as age and growth rate, food and feeding habits, maturity and spawning behaviour of the species based on catches from mechanised vessels.

Title of Project: FISHERY AND BIOLOGY OF THE LOBSTERS OF THE SHALLOW WATERS.

Project Code No. FB/OF/17

Division: Fishery Biology

Location: Cochin, Colachel/Muttom

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

K.H. Mohamed, FS

Associates:

P. Vedavyasa Rao, AFS

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 bilogy and fishery of P.homarus of the southwest coast of India have been under investigation by CMFRI. Growth and movement of the lobster have been studied by length frequency method and tagging. Some data on the spawning behaviour and food and feeding habits are available. The complete life history of the species is yet to be elucidated. The first phyllosoma larval stage has been described.

1. George, M.J. 1967. Observations on the biology and fishery of the spiny loster Panulirus homarus (Linn.). Proc. Symp. Crustacea, Mar. Biol. Ass. India., Pt. IV, 1308-1316.

2. Mohamed, K.H. and M.J. George. 1967. Results of the tagging experiments on the Indian spiny lobster Panulirus homarus (Linnaeus)-movement and growth. Pap. pres. at Australian /New Zealand Meet. on Decapoda Crustacea, CSIRO, Australia, 24-28, October 1967.

Plan of work:

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

2. Biological aspects such as age, growth rate, food and feeding habits, maturity and spawning behaviour will be investigated.

3. 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.

Title of Project: FISHERY AND BIOLOGY OF THE DEEP-SEA LOBSTERS.

Project Code No. FB/OF/18

Division: Fishery Biology

Location: Cochin

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

P. Vedavyasa Rao, AFS

Associates:

C. Suseelan, RA

Objectives:

To determine the seasonal, geographic and bathymetric distribution of the deep-sea spiny lobsters of India and to prepare maps 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 coasts 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 on the south-east coast off Mandapam and Tuticorin. Lesser quantities occur throughout the area explored. Being a newly discovered 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:260-278.
3. Rao, P. Vedavyasa and M.J. George 1968. The deep-sea spiny lobster, Puerulus sewelli Ramdan : Its commercial potentialities. Abstr. Symp. Liv. Res. Seas around India, Cent. mar. Fish. Res. Inst., 27.

Plan of work:

1. Planned collections of samples during exploratory surveys.
2. Study the aspects of the biology of the species.
3. Density of the populations of the species will be determined and commercial prospects evaluated.

Title of Project: FISHERY AND BIOLOGY OF THE COMMERCIALLY IMPORTANT CRABS

Project Code No. FB/OF/19

Division: Fishery Biology

Location: Cochin, Mandapam and Kakinada.

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

G. Sudhakara Rao, SRA

Associates:

K.M.S. Ameer Hamsa, RA
M. Kathirvel, RA

Objectives:

1. To collect catch data of the common species of edible crabs to find out the extent of production.

2. To elucidate the salient features of the biology such as age and grwoth, food, reproduction, migration and habits of the commercially important species Portunus pelagicus and Scylla serrata.

Total duration: 4 years

Date of initiation: 1970

Brief resume of literature:

General accounts of the crabs and crab fisheries of Bombay, Mangalore, Malabar, Mandapam, West Bengal and Chilka Lake are available. These studies deal with bionomics, life-history stages, species composition, fishing season, methods of fishing and gear employed. Detailed studies of catches and biological aspects of species of commercially importanne will be helpful in the development of the crab industry.

1. George, P.C. and K. Ramesh Nayak 1961. Observations on the crab fishery of Mangalore coast. Indian J. Fish., 8(1):44-53.
2. Prasad, R.R. and P.R.S. Tampi 1951. An account of the fishery and fishing methods for Neptunus pelagicus (Linnaeus) near Mandapam. J. Zool. Soc. India, 3(2): 335-339.
3. Prasad, R.R. and P.R.S. Tampi 1953. A contribution to the biology of the blue swimming crab Neptunus pelagicus (Linnaeus) with a note on the Zoea of Thalamita crenata Latrella. J. Bombay Nat. Hist. Soc., 51(3) : 674-689.
4. Menon, M.K. 1952. A note on the bionomics and fishery of the swimming crab Neptunus sebae[illegible]us (Herbst) on the Malabar coast. J. Zool. Soc. India., 4(2) : 177-184.

Plan of work:

1. Regular observations species-wise abundance.
2. Studies on the biological aspects such as age and growth rate, maturity, breeding periodicity, migration of the commercially important species Portunus pelagicus and Scylla serrata.

Title of Project: STUDIES ON PADDY FIELD PRAWN CULTURE PRACTICES.

Project Code No.	FB/OF/ 20
Division:	Fishery Biology
Location:	Cochin and Karwar
Title of major project:	INVESTIGATIONS ON OTHER FISHERIES
Personnel:	Project Leader: K.Y. Jelang, SRA
	Associates: K.V. George, RA

Objectives:

1. To investigate the species-wise abundance and biology of prawns in paddy fields also used for prawn culture.
2. To collect data on prawn resources of paddy fields used for/and to compare the suitability of different types of fields. /prawn culture

Total duration:	4 years
Date of initiation:	1969

Biref 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 carrie 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 prawnculture 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(2): 427-442.
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., 5th Sect : 131-135
5. Panikkar, N.K. and M.K. Menon 1955 Prawn fisheries of India. Proc. Indo-Pac. Fish.Coun.,Symp.Prawn Fish.,Sec.III,328-344.
6. Borja, P.C. and S.E. Pasalan 1968 A review of the culture of SUGPO, Penaeus monodon Fabricius, in the Philippines, FAO Fisheries Reports No. 57, Vol.2.. III-124.

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. Collections of relevant environmental catches from paddy fields to assess productivity of these fields.

Title of Project: ECOLOGY AND BIOLOGY OF THE CHANK AND PEARL OYSTER

Project Code No. FB/OF/21

Division: Fishery Biology

Location: Tuticorin

Title of major Project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

K. Nagappan Nayar, JFS

Associates:

S. Mahadevan, AFS
K. Ramadoss

Objectives:

To study the ecology and biology of chank and pearl oyster, their population dynamics; and charting of pearl banks and chank beds using also SCUBA.

Total duration: 5 yesrs

Date of initiation: 1969

Brief resume of literature:

It is of practical importance in the management of the commercial shell-fisheries of the Gulf of Mannar to get an idea of the conditions of existence of chanks and pearl oysters in the sea bottom of the Gulf so that effective management of these fisheries can be planned. Therefore, the present studies of the populations of chanks and pearl oysters have been taken up. The ecology of the grounds are to be investigated in detail.

So far no work of this kind using SCUBA has been done in India with the exception of studies by Mahadevan and Nagappan Nayar (1966, 1968).

1. 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: 473-482.

2. Hartman, Olga. 1955. Allan Hancock Pacific Expedition. Qualitative survey of the benthos of San Pedro Basin South California. Pt. I Vol.19 (1 & 2).

3. Kurian, C.V. 1955. Studies on the benthos of the west coast of India (Travancore coast within 15 fathom line). Proc. nat. Inst. Sci. India, 19: 746-776.

4. Mahadevan, S. and K. Nagappan Nayar. 1966. Underwater ecological observations in the Gulf of Mannar off Tuticorin VI. On the habitat, movements and breeding habits of the chank, Xancus pyrum (Linneus). J. Mar. Biol. Ass. India, 8(1); 213-218.

5. Mahadevan, S. and K. Nagappan Nayar, 1968. Underwater ecological observations in the Gulf of Mannar off Tuticorin VII. General topography and ecology of the rocky bottom. Ibid., 2(1):147-163.

6. Sanders, H.L. 1954. The biology of the marine bottom communities. Bull. Bingham Oceanogr. Collns., Vol.V.

7. Seshappa, G. 1953. Observations on the physical and biological features of the inshore sea bottom along Malabar Coast. Proc. nat. Inst. Sci. India, 19 (2); 257-279.

Plan of work:

1. Survey of the extent of the pearl banks and chank beds using also SCUBA.
2. Ecology of the pearl banks and chank beds.
3. Study the epiflora on epifauna of oysters and chanks.
4. Investigate the factors responsible for the great fluctuations in pearl oysters and the role played by natural enemies of the pearl oyster and chank in determining abundance.
5. Quantitative estimation of chank population in selected beds and studies on chank movements.

Title of Project: BIOLOGY AND ECOLOGY OF THE EDIBLE OYSTER CRASSOSTREA MADRASENSIS (PRESTON).

Project Code No. FB/OF/2 2

Division: Fishery Biology

Location: Mandapam

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

K. Satyanarayana Rao, AFS

Associates:

Nil

Objectives:

To ~~study reproductive cycles, early development, growth, factors in~~fluencing reproduction and growth, height-weight relationship, seasonal changes in meat weight and biochemical changes of Cr. madrasenis of Athankarai estuary near Mandapam and also the ecological aspects of the oysters.

Total duration: 3 years

Date of initiation: 1970

Brief resume of literature:

India has valuable edible oyster resources on its coasts and in bays, backwaters and estuaries. The edible oyster Crassostrea madrasensis is an important species occurring on the east and south-west coasts. The growth and reproductive periodicity of Crassostrea spp. of Madras, Ennore and Kelwa have been studied previously (Rao 1951, 1956, Rao and Nayar 1956, Durve 1965). As growth rate and ~~reproductive~~ reproductive periodicity of oysters of the same species vary in different areas these aspects need study in other areas. The information will be useful for oyster culture and management. The development of Cr. madrasensis has not been studied completely. Little information is available on the ecology of the edible oyster.

1. Rao, K.V. 1951. Observations on the probable effects of salinity on spawning, development and setting of the Indian backwater oyster Ostrea madrasensis Preston. Proc. Ind. Acad. Sci., 33 B : 253-256.

2. Rao, K.V. 1956. Seasonal gonadal changes in the adult backwater oyster, Ostrea (Crassostrea) madrasensis Preston from Ennur near Madras. Proc. Ind. Acad. Sci., 44 B: 332-356.

3. Rao, K.V. and K.N. Nayar 1956. Rate of growth in spat and yearlings of the Indian backwater oyster Ostrea madrasensis Preston. Indian J. Fish., 3: 231-256.

4. Durve, V.S. 1965. On the seasonal gonadal changes and spawning in the adult oyster Crassostrea gryphoides (Schlotheim). J. Mar. biol. Ass. India, 9(2) : 328-344.

5. Durve, V.S. and D.V. Bal 1961. Studies on the chemical composition of the oyster Crassostrea gryphoides (Schlotheim). J. Zool. Soc. India, 13: 70-77.

6. Corringa, P. Recent advances in oyster biology. Quart. Rer. Biol., 27: 266-308 and 339-365.

7. Venkataraman, R. and S.T. Chari 1951. Studies on oysters and clams: Biological variations. Ind. J. Med. Res., 39: 533-541.

Plan of work:

The reproductive cycles of the oysters will be studied by microscopic examination of gonads of random samples of oysters, growth by size-frequency method and development by fertilization of eggs and rearing the developmental stages in the laboratory. The variations in salinity and temperature of water over the oyster beds 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 density of epifauna and epiflora of the oysters in different periods of the year will be studied.

Title of Project: FISHERY AND BIOLOGY OF GREEN AND BROWN MUSSELS

Project Code No. FB/OF/23

Division: Fishery Biology

Location: Vizhinjam

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

G.P. Kumaraswamy Achari, SRA

Associates:

Nil

Objectives:

Survey of the existing fishery of green and brown mussels and investigate their biology and possibilities of culturing.

Total duration: 2 years

Date of initiation: 1971

Brief resume of literature:

The Green mussel Mytilus viridis and Brown mussel form a potential fishery resource which is not exploited properly on the west and east coasts of India. Their high protein content, the very short food-chain (only one link in the tropic cycle), are advantageous for mussel farming. According to Davies (1968) the annual yield of flesh per acre may be a hundred times greater in mussel culture than in beef cattle raising on good farmland and mussel farms in Holland yield 40 tonnes per acre from seed in 2-2½ years. The prospects of culturing mussels and export potentials of canned mussels have to be investigated.

1. Davies, G. 1968. Mussel as a world food source. Ibid., 873-884.
2. Jones, S. 1950. Observations on the bionomics and fishery of the brown mussel (Mytilus sp.) of the Cape region of peninsular India. J. Bombay nat. Hist. Soc., 49(3): 519-528.
3. Jones, S. 1968. The mussel fishery of the west coast of India Sea Food Exporter, 3(1) : 21-28.
4. Korringa, P. 1968. The basic principles of shell fish farming on the continental coast of Europe. Proc. Symp. Mollusca Mar. Biol. Ass. India, Part III: 818-823.

Plan of work:

1. Observations on landings to study the magnitude of the fishery.
2. Studies on rate of growth and breeding.
3. Study of the effect of substratum and associated fauna on mussel beds.
4. Comparison of artificial substratum with natural beds for settlement of spat.
5. Collection of information on the economics of this fishery.
6. Survey of the potential resources of mussel fishery in other centres having rich mussel beds.

Title of Project: STUDIES ON TAXONOMY, BIOLOGY AND FISHERY OF CEPHALOPODS

Project Code No. FB/ OF/ 24

Division: Fishery Biology

Location: Cochin

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

E.G. Silas, SFS

Associates:

R.Sarvesan, RA

Objectives:

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

To study the systematics and aspects of fishery biology of commercially important cephalopods (cuttlefishes and squids) of inshore waters.

Total duration: 3 years

Date of initiation: 1969

Brief resume of literature:

The cephalopod resource 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 references are given below:-

1. Adam, W. 1939 Rec. Indian Mus., 41 : 61-110.
2. Hoyle, W.E. 1886. Rep. Sci. Res. Voy. 'Challenger', Zool., 16:1-1246.
3. Massy, A.D. 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. 1: 37-66.
6. Silas, E.G. 1968. Proc. Symp. on Mollusca, Mar. biol. Ass. India, 1: 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~~ seasonal 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 Laccadive Sea; study the distribution and abundance of larval cephalopods in relation to hydrographic factors.

Collection and identification of cephalopods from commercial landings and study their fishery biology.

Title of Project: GROUND FISH FISHERY INVESTIGATIONS

Project Code No. FB/OF/ 25

Division: Fishery Biology

Location: Bombay, Karwar, Mangalore, Cochin, Vizhinjam, Tuticorin, Mandapam, Madras and Waltair.

Title of major project: INVESTIGATIONS ON OTHER FISHERIES

Personnel:

Project Leader:

T. Tholasilingam, FS

Associates:

S.V. Bapat, JFS
B. Krishnamoorthy, JFS
M.V. Pai, JFS
M.D.K. Kuthalingam, AFS
S.J. Rajan, AFS, D.M. Punwani, AFS.
Syed Basheeruddin, AFS
K. Venkatasubba Rao, AFS
M.G. Dayanandan, AFS
V. Ramamohana Rao, AFS
P. Mozumdar, AFS
T. Appa Rao, SRA
K. Dorairaj, SRA
S. Reuben, SRA
K.S. Sundaram, RA
R. Sarvesan, RA
P. Livingston, RA
P. Karunakaran Nair, RA and others

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:

Significant results of exploratory surveys carried out in Indian Seas are embodied in the following publications:-

1. Jayaraman, R., G. Seshappa, K.H. Mohamed and S.V. Bapat. 1969. 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 1969. Distribution pattern of the major exploited marine fishery resources of India. Bull. cent. mar. Res. Inst., 6: 69 pp.

3. 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/Symp 26: 43 pp.

4. 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.

5. 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/Symp. 26: 24 pp.

6. Tholasilingam, T., G. Venkataraman, K.N.R. 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)

7. 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.

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

Plan of work:

1. Drawing up exploratory programmes for fishing vessels.

2. 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.

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

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

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

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

Title of Project: REPRODUCTIVE PHYSIOLOGY OF FISHES

Project Code No. FB/MISC/1

Division: Fishery Biology

Location: Cochin

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader:

M. Dharmamba, AFS

Associates:

Nil

Objectives:

1. To obtain information on the maturation and breeding habits of cultivable species of fishes.
2. To study the relationship between environmental factors and reproduction.
3. To study the pituitary control of reproduction.

Total duration: 5 years

Date of initiation: 1971

Brief resume of literature:

There are several works on the reproductive physiology of fishes which have been extensively reviewed by Pickford and Atz (1957) and Hoar (1965a, 1965b and 1969). A review of the anatomy and histophysiology of pituitary has recently been made by Ball and Baker (1969). Although the pattern of regulation is general, the details vary considerably even in closely related species. Also many of the details of regulation at the cellular levels remain to be unraveled. The nature of the fish gonadotropin is not resolved. Biochemical evidence for a single protein is on increase (Burzawa-Gerard and Fontaine 1966), but studies on pituitary histophysiology seem to indicate two types of gonadotrops associated with the two hormones FSH and LH. Investigations of some of the more primitive groups of fish should be rewarding with reference to the study of specificity of the hormone. Finally the role of prolactin in reproduction of fishes still needs assessment.

1. Ball, J.N. and Baker, B.I. 1969. The Pituitary Gland: Anatomy and Histophysiology. In "Fish Physiology" (W.S. Hoar and D.J. Randall, eds.) Vol. II, Acad. Press, N.Y. and London.

2. Burzawa-Gerard, E. and Fontaine, Y.A. 1966. Sur le probleme de 1' unicite ou de le dualite de 1' hormone gonadotrope hypophysaire d'un teleosteen, la Carpe. Etude du poids moleculaire de la ou des substances actives. Ann. Endocrinon. (Paris), 27: 305-309.

3. Hoar, W.S. 1965 a. Comparative physiology : Hormones and reproduction in Fishes. Ann. Rev. Physiol. 27: 51-70.

4. ———— 1965 b. The endocrine system as a chemical link between the organism and its environment. Trans. Roy. Soc. Can., Sec. III, Ser. IV. 3: 175-200.

5. ———— 1969. Reproduction in "Fish Physiology" (W.S. Hoar and D.J. Randall, eds.,) Vol. III, pp. 1-72, Acad. Press, N.Y. and London.

6. Pickford, G.E. and Atz, J.W. 1957. "The Physiology of Pituitary Gland" N.Y. Zool. Soc., New York.

Plan of work:

1. ~~Routine collection of fishes such as~~ Chanos chanos or Etroplus spp. from Narakkal farm, once or twice a fortnight, for length, weight and maturation studies, and histological studies of gonads and pituitary.
2. Collection of data on environmental factors such as temperature and salinity at the time of collection of fish samples.
3. Study the effects of salinity, temperature, light, feeding and crowding on maturation of the fish (experimental work).
4. To study the effect of hypophysectomy (surgical or pharmacological) on the development and maturation of gonads.
5. Role of gonadotropins in reproduction - role on matruration, ovulation, etc.
6. Role of prolactin in reproduction.

Title of Project: INVESTIGATIONS ON ENDOCRINE CONTROL OF OSMOREGULATION IN TELEOSTS.

Project Code No. FB/MISC/2

Division: Fishery Biology

Location: Cochin

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader:

M. Dharmamba, AFS

Associates:

Nil

Objectives:

To study the salinity tolerance and mineral balance of some cultivable species such as Chanos chanos at various stages in life-history.

To study the hormonal control of osmoregulation.

Total Duration: 5 years

Date of initiation: 1970

Brief resume of literature:

Certain fishes such as Chanos chanos are known to breed in costal sea waters (Tampi, 1957) and the young move into the backwaters or brackish water pools. It is not known whether these fishes could attain maturity and breed in the enclosed waters. In this connection, it is of interest to study the survival pattern and osmotic behaviour of the fish from juvenile to adult stage, and the endocrine control over this function.

Studies on endocrine control of osmoregulation are based on a few groups or families of teleosts viz. Cyprinodontinae, Anguillidae, Cyprinidae, Salmonidae and Cichlidae. Maetz (1968) has extensively reviewed the work done on this aspect. Little information is known about mineral balance in clupeoid fishes.

The observations from these studies might be utilized in acclimatization of certain important food-fishes to available habitats which are not natural to them.

Maetz, J. 1968. Salt and Water Metabolism. In Perspectives in Endocrinology - Hormones in the Lives of Lower Vertebrates (E.J.W. Barrington and C. Barker Jorgensen, eds.) Acad. Press, London and New York.

Plan of work:

I . (a) Collection of data on temperature, salinity and rainfall from the area of study.

(b) ~~Seasonal collection of fish for the study of~~ the electrolyte composition of their body fluid and tissues - Determine Na, K, Ca and Cl content and osmolarity.

II. (a) Time study of acclimatization to fresh water and from fresh water to sea water of normal fish (different size groups) ~~and hypophysectomized fish (Technique~~ of hypophysectomy of the fish under study has to be developed first).

(b) Effect of prolactin, ACTH or Cortisol on the Parameters mentioned in (a). Effect to be tested on normal and hypophysectomized fish in fresh water and sea water.

(c) Effect of temperature on the plasma electrolytes in normal and hypophysectomized fish.

III. Sites of action of hormones ~~Histophysiological and biochemical~~ studies.

(a) Effect of hypophysectomy on gills (structure and Na-K activated ATP ase activity), Kidney and scales of fish adapted to fresh water and sea water.

(b) Effect of prolactin, ACTH or Cortisol on gill and scale mucous cells, Kidney structure and Na-K activated ANT ase activity of gills.

IV. (a) Cellular source of "prolactin"
(b) Source of ACTH } histophysiological studies

(c) Study of pituitary eta cells (prolactin-secreting) of fish from different salinity environments in nature and comparisons with results from experimental work.

Title of Project: STUDIES ON SOME ASPECTS OF THE PHYSIOLOGY OF THE PRAWN PENAEUS SEMISULCATUS.

Project Code No. FB/MISC/3

Division: Fishery Biology

Location: Mandapam

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader:

K. Satyanarayana Rao, AFS

Associates:

Nil

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: 1971

Brief resume of literature:

The relevant information known hitherto on this subject is available in the following references:

1. Narayanan Kutty, M. 1969. Oxygen consumption of the prawns Penaeus indicus H. Milne Edwards and Penaeus semisulcatus de Haan. Proc. World Scient. Conf. on the Biology and Culture of Shrimps and Prawns. FAO Fish. Reports, 57(3): 957-969.

2. Pampapathi Rao, K. 1958. Oxygen consumption as a function of size and salinity in Metapenaeus monoceros Fabr. from the marine and brackishwater environments. J. Exp. Biol., 35: 307-313.

3. Panikkar, N.K. 1949. Physiological aspects of adaptation to estuarine conditions. Proc. Indo-Pacific Fish. Counc., 2nd Meet., Sec, B: 168-175.

4. Panikkar, N.K. and R. Viswanathan 1948. Active regulation of chloride in Metapenaeus monoceros Fabricius. Nature, 161: 137-138.

5. Subrahmanyam, C.B. 1962. Oxygen consumption in relation to body weight and oxygen tension in the prawn Penaeus indicus (Milne-Edwards) of Madras Coast. Proc. Ind. Acad. Sci., 55B: 152-161.

Plan of work:

The oxygen consumption of the prawns 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 cloride and sodium con-

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Title of Project: STUDIES ON THE TAXONOMY AND DISTRIBUTION OF FISHES OF THE ANDAMAN AND NICOBAR ISLANDS.

Project Code No. FB/MISC/4

Division: Fishery Biology

Location: Mandapam

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader:

E.G. Silas, SFS

Associates:

M. Kumaran, Curator

Objectives:

To make a comprehensive study of fishes of the Andaman and Nicobar Islands and to prepare a descriptive catalogue of the fishes occurring in the region.

Total duration: 3 years

Date of initiation: 1971

Brief resume of literature:

Very little published information is available about the fish and fisheri of Andaman and Nicobar Islands. Surprisingly the importance of Andaman Sea as a potential fishing ground remained practically unknown and un-recognised. Therefore, with a view to highlight the fisheries resources of this area, it is necessary to make a comprehensive study of the fishes occurring in this region. Some references on the subject are given below:-

1. Day, F. 1878. Fishes of India, Bernard Quaritch, London.
2. Herre, A.W.C.T. 1939. On a collection of littoral and freshwater fishes from the Andaman Islands. Rec. Ind. Mus., 41: 327-372.
3. Herre, A.W.C.T. 1940. On a collection of littoral and freshwater fishes from the Andaman Islands : Supplement. Rec.Ind. Mus., 42: 1-8.
4. Herre, A.W.C.T. 1941. A list of fishes known from Andaman Islands. Mem. Ind. Mus., 13: 331-403.
5. Koumans, F.P. 1940. On a collection of Gobioid fishes from the Andamans. Rec. Ind. Mus., 42: 15-18.
6. Weber M. and Beaufort, L.F. 1913-1962. Fishes of the Indo-Australian Archipelago. Vols. 2-11. E.J. Brill, Leiden.

Plan of work:

The taxonomy and distribution of fishes occurring in Andaman and Nicobar Islands will be studied.

Title of Project: STUDIES ON THE SYSTEMATICS OF FISHES OF THE FAMILY CARANGIDAE

Project Code No. FB/MISC/5

Division: Fishery Biology

Location: Mándapam

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader:

E.G. Silas, SFS

Associates:

M. Kumaran, Curator

Objectives:

To identify the various species of carangid fishes which occur in different parts of the Indian region and prepare a detailed systematic account.

Total duration: 3 years

Date of initiation: 1971

Brief resume of literature:

The systematics of the carangid fishes of the Indian region have been dealt with in a few works like those of Day (1878), Weber and Beaufort 1931 and Munro (1955). A thorough study of the systematics of the carangid fishes which inhabit the seas around India some of which are fished in large quantities, has not been made. Species not reported earlier may occur. In order to enable identification of species belonging to this group easily it is necessary to describe the distinguishing characters of individual species and prepare a useful key to identify the fishes.

1.Day, F. 1878 Fishes of India. Bernard Quaritch, London.

2.Karuna, M. 1959 Fishes of the Family Carangidae Gunther of Waltair Coast. M.Sc. Thesis, Andhra University.

3.Munro, I.S.R. 1955 The Marine and Freshwater fishes of Ceylon. Dept. External Affairs, Canberra, 351 pp.

4.Weber, M. and de Beaufort, L.F. 1931 Fishes of the Indo-Australian Archipelago. Vol. VI E.J. Brill, Leiden, 448 pp.

Plan of work:

Detailed study of the systematics of carangid fishes collected from various parts of the Indian region will be made.

Title of Project: MARINE AND ESTUARINE FISH FARMING

Project Code No.	FB/MISC/6
Division:	Fishery Biology
Location:	Cochin
Title of major project:	MISCELLANEOUS INVESTIGATIONS
Personnel:	Project Leader: K.C. George, AFS
	Associates: One RA/JSA - Vacant

Objectives:

To investigate the posibilities of mariculture.

Total duration:	2 years
Date of initiation:	1971

Justification:

Except for one or two seasonal collections and stocking generally of juveniles of the species in the farms, no systematic study of 'fish seed', availability of the concerned species has been conducted in the area. For reasons mentioned in the objectives above, the study is justified.

Plan of work:

Qualitative and quantitative assessment of availability of fry, fingerlings and juveniles of fishes suitable for salt water fish culture at Narakkal, Cochin.

Title of Project: NATURAL HISTORY OF THE DUGONG (DUGONG DUGON)

Project Code No.	FB/MISC/7
Division:	Fishery Biology
Location:	Mandapam
Title of major project:	MISCELLANEOUS INVESTIGATIONS
Personnel:	Project Leader:
	R.V. Nair, Deputy Director
	Associates:
	R.S. Lal Mohan, SRA

Objectives:

To study food, age and growth with special reference to its embryology and breeding habits. Population density, seasons of fishing and fishing grounds will be studied. The problem of over-fishing and depletion of the stock will be given importance. To make observations on the animals in captivity. Study of the parasites of dugong.

Total duration:	3 years
Date of initiation:	1971

Brief resume of literature:

Dugong or the sea-cow is relished as food in the coastal areas of Gulf of Mannar. All workers in the field are unanimous that the dugongs are becoming rare. To protect the species from depletion conservation methods are required. Information about its food, anatomy and osteology is available. Nothing is known about growth, age, breeding habits and embryology of the dugong. Some data on two captive dugongs are available.

1. Bertram, G.C.L. and C.K.R. Bertram 1966 The Dugong. Nature, London, 209 (5026): 938-39.
2. Gohar, H.A.P. 1957 The Red Sea dugong. Publs.mar.biol.stn.Al Chardaqua, no. 9: 3-50.
3. Jones, S. 1966 Problems of research and conservation of the dugong Dugong dugon (Muller) in the Indo-pacific. Indo-Pacific Sci. Congr. 11, 7: 16.
4. Prater, S.H. 1928 The dugong or sea-cow (Halicore dugong). J. Bombay nat. Hist. Soc., 33(1): 84-99.

Plan of work:

1. A proforma will be supplied to the survey staff who take regular survey data from the places where dugongs occur for collection of general biological data.
2. Efforts will be made to determine the breeding season and to collect foetus.
3. The data on the above aspects will be supplemented by observations on captive dugongs.

Title of Project: **STUDIES ON ORGANIC PRODUCTION ALONG THE WEST AND EAST COASTS OF INDIA**

Proejct Code No. MBO/MB/Pp. 1.

Division: Marine Biology and Oceanography

Location: Bombay, Karwar, Calicut, Cochin, Tuticorin, Madras and Waltair

Title of major proejct: PRIMARY PRODUCTION STUDIES

Personnel:

Project Leader:

P.V. Ramachandran Nair, JFS

Associates:

K. Radhakrishna, AFS
V.S. Krishna Murthy Chennubhotla, AFS
K.J. Joseph, RA
D.C.V. Easterson, RA

Objectives:

To assess the potential productivity of the shelf waters along the west and east coasts of India.

Total duration: 3 years

Date of initiation: 1969

Brief resume of literature:

Radioactive carbon ^{14}C is now applied as a tool for estimating organic productivity in the sea. The magnitude of annual production and the seasonal variations help estimate the potential yield.

1. Steemann Nielsen, E. and E.A. Jensen. Primary production. Galathea Repts. I (1967).
2. Prasad, R.R. and P.V.R. Nair. Studies on Primary production - 1. Gulf of Mannar. J. mar. biol. Ass. India., 1963.
3. Prasad, R.R., S.K. Banerji and P.V.R. Nair. A quantitative assessment of the potential fishery resources of the Indian Ocean and adjoining seas. Indian J. Anim. Sci. 40(1): 73-98, 1970.

Plan of work:

Measure light penetration and determine the depth of the euphotic zone (secchi disc reading 3). Collect water samples from three standard depths - surface, middle and bottom. Incubate them either in situ or in simulated in situ conditions, for half day and determine the unit volume production. By integrating these values production per unit is determined.

Title of Project: ESTIMATION OF STANDING CROP OF PHYTOPLANKTON BY PIGMENT ANALYSIS AND BY TOTAL CELL COUNTS

Project Code No. MBO/MB/Pp. 2

Division: Marine Biology and Oceanography

Location: Bombay, Karwar, Calicut, Cochin, Tuticorin, Madras and Waltair

Title of major proejct: PRIMARY PRODUCTION STUDIES

Personnel:

Project Leader:

P.V. Ramachandran Nair, JFS

Associates:

K. Radhakrishna, AFS
V.S. Krishna Murthy Chennubhotla, AFS
C.P. Gopinathan, RA
K.J. Joseph, RA
D.C.V. Easterson, RA

Objectives:

To estimate the standing crop of phytoplankton organisms and to determine the relationship between phytoplankton productivity and zooplankton biomass.

Total duration: 3 years

Date of initiation: 1970

Brief resume of literature:

Chlorphyll estimations and phytoplankton cell counts made along with primary production measurements give an idea of the standing stock and thereby the productive potential in the respective water masses.

1. Richards, F.A. and Thompson, T.G., 1952. The estimation and characterisation of plankton populations by pigment analysis - II. A spectrophotmetric method for the estimation of plankton pigments. J. Mar. Res. II: 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., 10; 221-231.

Plan of work:

1. Collection of two litres of water samples from the same depths where primary production measurements are made (Project MBO/MB/Pp. 1).
2. Subsampling the samples into two equal halves after thorough mixing.
3. An aliquot of the subsamples to be taken for phytoplankton counts and the remaining part of subsample to be centrifuged and preserved in lugol iodine or neutralised formalin and sent to Cochin.
4. The second subsample of the original sample to be filtered (using GFC filters) and the filters dried and stored in darkened tubes for further analysis to be carried out at Cochin.

Title of Project: THE INFLUENCE OF ISOLATED ENVIRONMENTAL FACTORS ON UNIALGAL CULTURES OF PHYTOPLANKTON

Project Code No. MBO/MB/Pp. 3

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: PRIMARY PRODUCTION STUDIES

Personnel: Project Leader:

P.V. Ramachandran Nair, JFS

Associate:

K.J. Joseph, RA

Objectives:

To develop and maintain healthy unialgal cultures of phytoplankton organisms for in vitro experiments. These experiments would be aimed at understanding the physiological problems that are encountered in field studies.

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. 1965. Ecological studies and matter production of phytoplankton. I. Seasonal changes in photosynthesis of natural phytoplankton. Bot. Mag. Tokyo., 78: 280-288.

2. _____ 1965. Ecological studies and matter production of phytoplankton. II. Photosynthesis of algae in relation to light intensity and temperature. Ibid., 78: 360-365

3. Pravasoli, L., J.J.A. McLaughlin and M.R. Droop. 1957. The development of artificial media for marine algae. Archiv. fur Microbiologie, Bd. 25, S. 392-428.

Plan of work:

Fresh phytoplankton to be inoculated in enriched sea water. The surviving species to be isolated and recultured till pure strains are obtained, which would be maintained. Experiments will be planned and carried out to assess the inflence of each environmental factor on unialgal cultures of phytoplankton.

Title of Project: PRODUCTIVITY OF MICROBENTHOS OF THE INSHORE FISHING GROUNDS

Project Code No. MBO/MB/Pp. 4

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: PRIMARY PRODUCTION STUDIES

Personnel:

Project Leader:

P.V. Ramachandran Nair, JFS

Associates:

C.P. Gopinathan, RA
K.J. Joseph, RA

Objectives:

The benthic microflora form an important link in the food cycle of the bottom community. The density of this microvegetation manifests itself in the photosynthetic experiments. The study of primary production of the microbenthos using ^{14}C helps in a proper evaluation of the potential benthic productivity of the fishing grounds.

Total duration: 2 years

Date of initiation: 1971

Brief resume of literature:

1. Vollenweider, R.A. 1969. A manual on methods for measuring primary production in aquatic environments. IBP Handbook No. 12. Blackwell Sc. Publ. Oxford, 213 pp.
2. Grontved, J. 1960. On the productivity of microbenthos and phytoplankton in some Danish Fjords. Medd. Danmarks. Fisk Havund., 3(3): 55-92.
3. ———— 1962. Preliminary report on the productivity of microbenthos and phytoplankton in the Danish Wadden Sea. Ibid., 3(12): 347-378.

Plan of work:

1. Collection of core samples from the fishing grounds
2. Quantitative and qualitative analysis of benthic diatoms in the samples.
3. Measurement of potential primary production using ^{14}C technique.

Title of Project: ENERGY FLOW IN SOME SELECTED ECOSYSTEMS

Project Code No.	MBO/MB/Pp. 5
Division:	Marine Biology and Oceanography
Location:	Cochin
Title of major project:	PRIMARY PRODUCTION STUDIES
Personnel:	Project Leader:
	S.Z. Qasim, Director
	Associates:
	P.V. Ramachandran Nair, JFS D.Sadananda Rao, AFS N. Neelakanta Pillai, SRA P. Parameswaran Pillai, RA

Objectives:

To study the primary and secondary production rates in a controlled environment for determining the ecological efficiency and transfer of energy at different trophic levels. For the cultivation and intensive harvesting of resources, it is essential to have an understanding of the food chains and a detailed knowledge of their energetics. Hence a study will be undertaken in selected environments.

Total duration:	2 years
Date of initiation:	1971

Brief resume of lieterature:

Marine food chains play a vital role in Man's search for proteinous food. Recently much emphasis has been laid on researchs connected with the various aspects of the trophic relations in the sea with a view to determine the efficiency of food conversion.

Marine Food Chain (Ed. John Steele) Oliver and Boyd (1970)

Plan of work:

Select a farm in which the conditions of production can be regulated. Study the seasonal variability and magnitude of organic production, phytoplankton standing crop and also simultaneously measure the biomass of zooplankton and fish.

Title of Project: QUALITATIVE AND QUANTITAIVE STUDIES ON PHYTOPLANKTON OF OFFSHORE AND OCEANIC WATERS.

Project Code No. MBO/MB/Pl. 1

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: PLANKTOLOGICAL INVESTIGATIONS

Personnel:

Project Leader:

R. Subrahmanyan, FS

Associates:

C.P. Gopinathan, RA

Objectives:

To study horizontal distribution of quantity of phytoplankton and the species, and their seasonal fluctuations to get 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

Date of initiation: 1969

Brief resume of literature:

The only detailed work on these aspects has been done for inshore area on the west coast of India. There are no accounts for the oceanic waters; none on ecological aspects and as regards systematics only a 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.Mar. Biol. Ass. U.K. 2 : 409-442.

2. Subrahmanyan, R. 1946. A systematic account of the marine plankton diatoms of the Madras Coast. Proc. Ind. Acad. Sci. xxiv.

3. _____ 1959-1965. Studies on the phytoplankton of the west coast of India. Part I, II, III and IV.

4. _____ 1963-1965. Studies on the phytoplankton of the east coast of India. Part I and II.

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 of abundance, seasonal variation and distribution of species investigate relationship to physico-chemical factors and with fisheries.

Title of Project: INVESTIGATIONS ON ZOOPLANKTON, ITS STANDING CROP AND THE ROLE OF MAJOR CONSTITUENTS IN THE MARINE FOOD CHAIN.

Project Code No. MBO/MB/Pl. 2

Division: Marine Biology and Oceanography

Location: Bombay, Karwar, Mangalore, Calicut, Cochin, Tuticorin, Mandapam, Madras, Waltair and Port Blair.

Title of major project:- PLANKTOLOGICAL INVESTIGATIONS

Personnel:

Project Leader:

E.G. Silas, SFS

Associates:

C. Mukundan, AFS
K.N.Krishna Kartha, AFS
K. Rangarajan, AFS
N.S. Radhakrishnan, AFS
P.C. Girijavallabhan, SRA
P. Dhandapani, SRA
P. Parameswaran Pillai,RA
K.J. Mathew, RA
M. Srinivasan, RA
R. Marichamy, RA
M.M. Meiyyappan, RA
D.C.V. Fasterson, RA
K. Rengarajan, RA
C.M. James, Research Scholar
P.K. Martin Thompson, Research Scholar
and others.

Objectives:

In any fishery oriented investigation, the proper understanding of the relationships between the fishes that constitute the fishery and the environment is an essential prerequisite.

By far the most important factor that influence the fishery of a region is the nature and extent of its plankton production. The relationship between species abundance in the zooplankton and the fish species depending on them forms an important study in fishery investigations.

Apart from primary production which is the first important link in the complex food chain of the sea, it is essential to follow the cycle of events and transformation of material at different trophic levels in order to give valid predictions regarding the natural fluctuations in the abundance of fish stoc

This project is aimed at elucidating the above mentioned ecological aspects with particular reference to fisheries and also to highlight the role of zooplankton in the complex marine food chain.

Total duration: Continuing

Date of initiation: 1969

Brief resume of Literature:

The undermentioned publications give important and useful information relevant to the project:

1. Steele, J.H. (Ed) 1970 The Marine Food Chain , Oliver and Boyd, Edinburgh.
2. Subrahmanyan, R. 1959-1965. Studies on the phytoplankton of the west coast of India. Part I to IV.
3. Prasad, R.R. 1968 IIOE Plankton Atlases, 1 (1 & 2)
4. Fleminger, A. 1964 CALCOFI Atlas, No.2.
5. Sewell, R.B.S. 1929-1942 Mem. Indian. Mus. 10: 1-221
6. George, P.C. 1963 J. Zool. Soc. India, 5 (1): 76-107
7. Mauchline, J and L.R. Fisher. 1969 Advances in Marine Biology, VII.
8. Fraser, F.C. 1936 Discovery Rep. XIV, 1-192.
9. Russel, F.S. 1935 J. Mar. biol. Ass. U.K., 20(2):309-332.
10. Totton, A.K. 1954 Discovery Rep., 27: 1-162.

Plan of work:

1. Collection of zooplankton samples using standard methods.
2. Estimation of zooplankton biomass.
3. Taxonomy and biology of important zooplankton groups such as Copepoda, Chaetognatha, pelagic Tunicata, Euphausiacea, pelagic Gastropoda, larval Cephalopoda, Ostracoda, Siphonophora to be studied.
4. Study of the importance of zooplankton as indicators of water masses.
5. Study the disbribution and abundance of these groups with special reference to hydrographic conditions.
6. To assess the role of zooplankton in the marine food chain .

Title of Project: BIOSCATTERING AND IDENTIFICATION OF THE BIOLOGICAL CONSTITUENTS OF THE DEEP SCATTERING LAYERS (D.S.L.).

Project Code No. MBO/MB/Pl.3

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: PLANKTOLOGICAL INVESTIGATIONS

Personnel:

Project Leader:

E.G. Silas, SFS

Associates:

Nil

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:

1. Andreeva, B and Yu G. Chindonova. 1964. Okeanologia, 1:112-124.
2. Boden, B.P. 1950. U.S. Navy Electronic Lab. Rep., 186:1-29.
3. Clarke, G.L. and R.H. Backus, 1964. Bull. Inst. Oceanogr. Monaco, 64(1318): 1-36).
4. Barham, E.C. 1963. Science, 140 (3568) : 826-828.
5. Silas, E.G. 1969. Bull. Centr. Mar. Fish. Res. Inst., 12: 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 constitu-ents 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.

Title of Project: STUDIES ON DECAPOD LARVAE OF THE OFFSHORE PLANKTON

Project Code No. MBO/MB/Pl. 4

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: PLANKTOLOGICAL INVESTIGATIONS

Personnel:

Project Leader:

K.H. Mohamed, FS

Associates:

C. Suseelan, RA

Objectives:

To study the occurrence, distribution and abundance of decapod larvae in the offshore waters. To carry out the spawning survey of the important commercial species of decapod crustaceans. 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 commended studies on decapod crustacean larvae and have prepared charts relating to the distribution of the larvae in the Indian Ocean.

In 1970, preliminary examination of the plankton collected during the deep-sea prawn and lobster survey cruises off Alleppey by VARUNA was made for the larvae of pandalid prawns and the phyllosoma of the lobster, Puerulus sewelli.

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 the various morphological characters in order to identify them upto 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.

Title of Project: STUDIES ON FISH EGGS AND LARVAE FROM THE PLANKTON

Project Code No. MBO/MB/Pl. 5

Division: Marine Biology and Oceanography

Location: Bombay, Karwar, Mangalore, Calicut, Cochin, Vizhinjam, Minicoy, Tuticorin, Mandapam, Waltair and Port Blair.

Title of major project: PLANKTOLOGICAL INVESTIGATIONS

Personnel:

Project Leader:

E.G. Silas, SFS

Associates:

M.S. Rajagopalan, AFS
V. Kunjukrishna Pillai, SRA
K.G. Girijavallabhan, SRA
G.S.D. Selvaraj, RA
M. Mieyyappan, RA
A. Regunathan, RA
M. Rajagopalan, RA
and others

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.

To make detailed life-history studies on important species.

To prepare 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

Contd ...

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) : 83-140.
2. ———— 1959. Ibid., 161:107-146; 165:185-213.
3. Jones, S. and P. Bensam. 1968. Bull. Cent. mar. Fish. Res. Inst. No. 3 : 1-154.
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.
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 periods and locate spawning grounds.
9. To conduct eggs surveys to study the recruitment to the stock of various commercial fisheries.

Title of Project: LABORATORY CULTURES OF ECONOMICALLY IMPORTANT SEAWEEDS OF MANDAPAM AREA

Project Code No. MBO/MB/Misc. 1

Division: Marine Biology and Oceanography

Location: Mandapam

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader:

M. Umamaheswara Rao, AFS

Associates:

Nil

Objectives:

1. To estimate the spore output from the fruiting thalli of the species of Gracilaria, Gelidiella, Sargassum and Turbinaria.
2. To study the development of spores and the effect of light intensity on the growth and spore formation of the algae maintained in the laboratory cultures.

Total duration: Continuing

Date of initiation: 1971

Brief resume of literature:

Culture experiments under laboratory conditions on the commercially important seaweeds are indispensable to investigate the life-histories of the plants and to develop suitable techniques for seaweed farming on artificial substrata. Very few attempts have been made in India to study the growth and reproductive cycles of the marine algae in laboratory cultures and some important references on this subject are given below:-

1. Colinvaux, L.H., M. Wilbur and N. Watanabe. 1965. Tropical marine algae : growth in laboratory culture. J. Phyco. 1:69-78.
2. Sato, S. 1968. Methods for increasing the production of edible seaweeds in The series on the production of the marine products. vol. 9. pp. 2-36.
3. Edward, P. 1969. Field and cultural studies on the seasonal periodicity of growth and reproduction of selected Texas benthic marine algae. Contr. Mar. Sci. 14 : 59-119.
4. Chauhan, V.D. and V. Krishnamurthy, 1967. Observations on the output of oospores, their liberation, viability and germination in Sargassum swartzi (Turn). C. Ag. Proc. Semi. Sea Salt and Plants, CSMCRI, Bhavanagar, pp. 197-201.
5. Kale, S.R. and V. Krishnamurthy, 1967. The growth of excise pieces of thallus of Ulva lactuca var. regida in laboratory culture. Ibid., pp. 235-239.

Plan of work:

Most common and important seaweeds growing around Mandapam will be collected during the fruiting seasons; spore output per plant or gram weight of the tissue will be estimated through laboratory experiments; early development of the spores will be studied; effect of light intensity on the growth and reproduction of the selected algae will be studied; germlings will be transplanted in the inshore areas to follow the growth in the natural environment.

Title of Project: SURVEY OF SEAWEED RESOURCES OF TAMIL NADU COAST

Project Code No. MBO/MB/ Misc. 2

Division: Marine Biology and Oceanography

Location: Mandapam

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader :

M. Umamaheswara Rao, AFS

Associates:

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Objectives:

To survey the seaweed resources of Tamil Nadu coast from Mandapam to Colachel for estimating the standing crop of agarophytes, alginophytes and other kinds of seaweeds and for mapping the productive areas in the different localities.

Total duration: 3 years

Date of initiation: 1971

Brief resume of literature:

Informations on the quantities of seaweeds available for commercial exploitation along the maritime states of India is very limited.

1. Mitra, G.N. 1946 Development of Chilka Lake, Cuttak
2. Koshi, T.K. and C.C. John 1948 Survey of Gracilaria resources of Travancore. Dept. Res. Univ. Travancore, Rep.for Septen.,pp 53-55
3. Sreenivasa Rao, P., E.R.R. Iyengar and F. Thivy 1964. Survey of Algin bearing seaweeds of Adatra reef, Okha. Curr. Sci. 33: 464
4. Chauhan, V.D and V. Krishnamurthy, 1968 An estimate of algin bearing seaweeds in Gulf of Kutch. Curr. Sci. 37: 648
5. Thivy, F. 1960 Seaweed utilisation in India. Proc. Symp. Algology ICAR, New Delhi, pp 345-365.
6. Umamaheswara Rao, M. 1968. The seaweed potential of the seas around India. Symp. Living resources of the seas around India, Cochin
7. Varma, R.P and K. Krishna Rao, 1964 Algal resources of Pamban area. Indian J. Fish. 9: 205-211.

Plan of work:

1. The coast line from Mandapam to Colachel to be divided into five sections of about 60 km distance, and the coral islands and rocky areas present in each section to be surveyed.
2. Seaweed samples to be collected on transects at different stations using one metre square quadrat, and in different periods of the year to estimate the rate of growth as well as the standing crop.
3. Hydrographical data to be collected from the stations
4. This survey will be conducted as a co-ordinated project with the staff of the State Fisheries Department, Tamil Nadu and the Central Salt and Marine Chemical Research Institute, Field Station, Mandapam.

Title of Project: INVESTIGATIONS ON SPONGES DESTROYING COMMERCIALLY IMPORTANT CHANKS AND OYSTERS

Project Code No. MBO/MB/Misc. 3

Division: Marine Biology and Oceanography

Location: Mandapam

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader:

P.A. Thomas, SRA

Associates:

Nil

Objectives:

To conduct survey of the sponges which are destructive to the pearl oyster and chanks and study their ecology.

Total duration: 1 year

Date of initiation: 1971

Brief resume of literature:

1. Annandale, N. 1915. Indian boring sponges of the family Clionidae. Rec. Indian Mus., 11 : 1-24.
2. Goreau, T.F. and W.D. Hartman. 1963. Boring sponges as controlling factors in the formation and maintenance of coral reefs. American Ass. for advancement of Sci. Publ. No. 75, 25-54
3. Hopkins, S.H. 1956. The boring sponges which attack south California oysters, with notes on some associated organisms. Contr. Bears. Bluff. Labs., No. 23 : 3-30.
4. Thomas, P.A. 1968. Studies on sponges. Ph.D., Thesis, University of Kerala (unpublished).
5. Warburton, F.E. 1958. The effects of boring sponges on oysters. Prog. Rep. Atl. coast station. No. 68 : 3-5.

Plan of work:

1. Collection of bored shells from different beds for systematic studies.
2. Experimental studies relating to the vegetative spreading of the different species.
3. Developmental studies, and studies on new infestation by sexually produced larvae.
4. Synecological studies of boring sponges in relation to the different species of shells.

Title of Project: INVESTIGATIONS ON PELAGIC AND BATHYPELAGIC FISHES WITH SPECIAL REFERENCE TO THEIR TAXONOMY, DISTRIBUTION AND SPAWNING BEHAVIOUR

Project Code No. MBO/MB/Misc. 4

Division: Fishery Biology

Location: Cochin

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader:

E.G. Silas, SFS

Associates:

M.S. Rajagopalan, AFS
V. Kunjukrishna Pillai, SRA
G.S.D. Selvaraj, RA
M. Rajagopalan, RA
A. Regunathan, RA
I. David Raj, RA and others

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 apsects 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 the maturity and spawning behaviour of pelagic and deep water fishes caught in exploratory surveys.

To assess the potentital 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 the 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 deep waters especially the continental shelf edge and the upper continental slope off the south west coast of India, was undertaken (75 to 450 m) by R.V. Varuna and other vessels of the INP for assessing the demersal fish resources. 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: 1-69
2. Silas, E.G. 1969 Ibid., No. 12: 1-86
3. Silas, E.G., G.S.D. Selvaraj and A. Regunathan 1969 Curr. Sci. 38(5): 105-106.
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. Symp. Crustacea. I:327-336.

Plan of work:

Since several species of fishes 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 dominant species for investigations on their feeding habits and spawning behaviour.

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

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

Title of Project: ENVIRONMENTAL STUDIES OF THE VEMBANAD LAKE AND CONNECTED BACKWATERS

Project Code No. MBO/MB/Misc.5

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader:

G. Subba Raju, APS

Associates:

V. Kunjukrishna Pillai, SRA
K.V. George, RA
K.J. Joseph, RA
Pon Sirairneetan, JSA

Objectives:

To study the environmental factors - physical, chemical and biological- of the Vembanad Lake and the connected backwaters with a view to understand their influence on the fisheries.

Total duration: Continuing

Date of initiation: 1969

Justification:

The Vembanad Lake and the connected backwaters act as nursery for Penaeid prawns and fishes and hence is of vital interest for fisheries of the adjacent Kerala coast. Dynamic seasonal changes associated with monsoon and post-monsoonal conditions takeplace causing considerable physical and biological changes. Besides with increasing human interference in the Lake are the threat of large scale pollution by pesticides and other pollutants has been a reality in recent years. The project is aimed at studying the changing enviornmental conditions, investigating its fishery potential and monitoring the effects of pollution on life in the Lake and the connected backwaters.

Plan of work:

1. Collection of data on temperature, salinity, dissolved oxygen, nitrite, phosphate, pH, alakalinity, conductivity, turbidity, red-ox potential plankton and primary productivity from stations at appropriate places from Azhikode in the north to Alleppey in the south.
2. Collection of benthos from selected stations and use of a trial net for sampling prawns and fish.
3. Study the effects of pollutants such as pesticides on the biota of the Lake.
4. Identification of species groups which are easily affected by pollutants and to study the utilisation of selected species as indicator species for monitering pollution.

Title of Project: INVESTIGATIONS ON THE MUD BANKS OF KERALA COAST AND THEIR INFLUENCE ON THE FISHERIES

Project Code No. MBO/MB/C Misc. 6

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader:

A.V.S. Murty, FS

Associates:

D. Sadananda Rao, AFS
K.J. Mathew, RA
C.P. Gopinathan, RA
A. Regunathan, RA

Objectives:

The occurrence of mud banks being a peculiar phenomena and having a bearing on the fishery in some parts of Kerala coast needs investigations on their formation, existence, dissipation and their influence on fishery.

Brief resume of literature:

1. Sadananda Rao, D. 1967. The mud banks of the west coast of India. C.M.F.R.I. 20th Anniv. Souvenir., pp. 99-102

2. Damodaran, R. and C. Hridayanathan. 1966, Studies of the mud banks of the Kerala coast. IIOE Symp. 1966.

3. 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(2) : 257-279.

4. ———— 1953. Phosphate content of mud banks along the Malabar coast. Nature, Lond., 171, p. 526.

Plan of work:

1. Collections at regular intervals of data on physical, chemical and biological aspects.

2. Investigate the influence of mud banks on fishery.

Title of Project: STUDIES ON MARINE POLLUTION

Project Code No. MBO/MB/Misc. 7

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: MISCELLANEOUS INVESTIGATIONS

Personnel:

Project Leader:

S.Z. Qasim, Director

Associates:

P.V. Ramachandran Nair, JFS
C.P. Ramamirtham, AFS
M.S. Rajagopalan, AFS
and others

Objectives:

In recent years, there has been a world-wide awareness to the problem of marine pollution because of the immense growth of human population and industries, large scale application of pesticides and other forms of human interference with the natural environments. Apart from these, certain biological phenomena like phytoplankton blooms create condition which lead to pollution and ultimately deoxygenation of water and mortality of fish and other marine life. Hence, studies on pollution of marine environments become an obvious necessity.

Total duration: 3 years

Date of initiation: 1971

Brief resume of literature:

1. Moore, N.W. 1971 Marine pollution by pesticides and polychlorinated Biphenyles. Abs. 188, P. 114. Symp. Indian Ocean. Cochin, Jan. 1971.

2. ———— 1970 Implications of the pesticide age. Ceres. FAO Review., 3(3) : 27-30.

3. Needler, A.W.H. 1970 'Pollution prevention is costly'. Ibid., 3(3) : 34-37.

4. Simpson, A.C. 1968 The Torry Canyon disaster and fisheries. Lab. Leaflet. Fish. Lab. Burnham-on-Crough Essex.No. 18.

5. Meshal, Amin.H. 1970, Water pollution in Suez Bay. Bull. Inst. Oceanogr. Fish., No.1, pp. 463-73.

Plan of work:

The main sources of marine pollution are : domestic sewage discharge into the sea; direct effluents from industrial plants; pesticides like DDT; oil spills from tankers and oil refineries and biological phenomena like blooming of phytoplankton.

To begin with, investigations will be taken up on the deleterious effects of blooming of phytoplankton on the marine fauna.

In the areas where other forms of pollution occur, suitable surveys will be conducted to identity the problems of pollution and to suggest remedial measures.

Studies on selected natural organisms in the environment to measure the effects of pollution.

Title of Project: PROCESSING AND ANALYSIS OF OCEANOGRAPHIC DATA COLLECTED DURING PREVIOUS YEARS

Project Code No. MBO/OC/Oce. 1

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: OCEANOGRAPHIC INVESTIGATIONS

Personnel:

Project Leader:

C.P. Ramamirtham, AFS

Associates:

D. Sadananda Rao, AFS

Objectives:

To provide information on the hydrographic properties (temperature, salinity, dissolved oxygen and computed parameters) which are required for fishery investigations.

Total duration: 2 years

Date of initiation: 1970

Plan of work:

The hydrographic data collected by the C.M.F.R.Institute will be processed and analysed. The vertical and horizontal distribution patterns for temperature, salinity, dissolved oxygen and computed parameters will be charted out and the seasonal and year-wise changes in the above patterns will be analysed and made available for use in fishery investigations.

Title of Project: STUDIES ON THE INFLUENCE OF OCEANOGRAPHIC PARAMETERS ON THE FISHERIES OF THE WEST COAST OF INDIA

Project Code No. MBO/OC/Oce. 2

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: OCEANOGRAPHIC INVESTIGATIONS

Personnel:

Project Leader:

D. Sadananda Rao, AFS

Associates:

C.P. Ramamirtham, AFS

Objectives:

To study the changes occurring in the oceanic properties (temperature, salinity, dissolved oxygen content and density) along the west coast of India, month-wise, season-wise and region-wise and to prepare anomaly charts of these properties and see whether any correlation exists between these hydrographic conditions and fluctuations in the major fisheries.

Total duration: 2 years

Date of initiation: 1971

Brief resume of literature:

1. Joseph, L. Reid, Jr. 1960. Oceanography of the north-east Pacific ocean during the last ten years. California Co-operative oceanic Fish. Invest. Progress Rep. 1. 1958-1959. pp. 11-20.

2. Uda, M. 1952. On the relation between the variation of the important fisheries conditions and the oceanographical conditions in the adjacent waters of Japan. J. Tokyo Univ. Fish., 38(3) : 363-389.

Plan of work:

1. To calculate the average and anomaly values of temperature, salinity, dissolved oxygen and density, month-wise, year-wise and depth-wise in areas of 1° square along the west coast of India using C.M.F.R. Institute oceanographic data available from 1957-1970.
2. To calculate the average and anomaly values of the fishery data of the commercially important species month-wise, year-wise in areas of 1° square along the west coast of India.
3. To evaluate the data in relation to fisheries.

Title of Project: STUDIES ON THE NUTRIENTS CONCENTRATIONS ALONG THE WEST COAST OF INDIA

Project Code No. MBO/OC/Oce 3

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: OCEANOGRAPHIC INVESTIGATIONS

Personnel:

Project Leader:

D. Sadananda Rao, AFS

Associates

Nil

Objectives:

To study the role of nutrients in primary organic production.

Total duration: 2 years

Date of initiation: 1971

Brief resume of literature:

1. Atkins, W.R.G. 1923. The phosphate content of fresh and salt waters in its relationship to the growth of algal plankton. J. Mar. biol. Ass. U.K., 13: 119-150.

2. Rozanov, A.G. and Bykova, V.S. 1964. Distribution of phosphates and silicates in the water of the w stern part of Indian Ocean. IIOE coll. repr. Vol. 1: 422-434.

3. - ---------- 1964. Distribution of nitrates and nitrites in the waters of the northern part of the Indian Ocean. Ibid., Vol.1:414-421.

4. Strickland, J.D.H. and Parsons, T.R. 1968. A practical handbook of seawater analysis. Bull. Fish. Res. Bd. Canada. No. 167.

Plan of work:

The data on nutrient contents along the west coast of India will be collected, analysed and processed for their seasonal distribution pattern and relation to the rate of primary organic production.

Title of Project: STUDIES ON WATER CIRCULATION

Project Code No. MBO/OC/Oce. 4

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: OCEANOGRAPHIC INVESTIGATIONS

Personnel:

Project Leader:

A.V.S. Murty, FS

Associates:

G.S. Sharma, JFS
C.P. Ramamirtham, AFS
G. Subba Raju, AFS

Objectives:

To study the patterns of seasonal variations of circulation off the west coast of India and the North Indian Ocean based on available data at the Institute and also obtainable from International agencies so that its influence on fishery could be examined.

Total duration: Continuing

Date of initiation: 1969

Brief resume of literature:

1. Montgomery, R.B. 1923. Circulation in upper layers of southern North Atlantic deduced with use of isentropic analysis. Papers in Physical Oceanography and Meteorology, 6(2) : 55.

2. Sverdrup, H.U. 1952. Oceanography for meteorologists. George Allen & Unwin Ltd., London. pp. 117.

3. Taft, B.A. 1963. Distribution of salinity and dissolved oxygen on surfaces of uniform potential specific volume in the south Atlar South Pacific and Indian Oceans. J. Mar. Res. 21 : 129-146.

4. Tsuchiya, M. 1968. Upper layers of the intertropical Pacific Ocean. Johns Hopkins Oceanogr. Stud., 4 : 50.

5. Wyrtki, K. 1962. Geopotential topographics and associated circulati in the south eastern Indian Ocean. IIOE. coll. Repr., 1:133-14

Plan of work:

The data already available from the cruises of R.V. Varuna and other ves the data obtained during IIOE period, and the relevant data from the Indian Me orological Department will be examined to study the following:-

1. The circulation off the west coast of India based on isentropic analy
2. The dynamical anomaly studies.
3. To prepare charts of the distribution pattern of salinity, oxyty, dep and acceleration at different isenosteric surfaces.

Title of Project: STUDIES ON UPWELLING

Project Code No. MBO/OC/Oce. 5

Division: Marine Biology and Oceanography

Location: Cochin

Title of major project: OCEANOGRAPHIC INVESTIGATIONS

Personnel:

Project Leader:

G.S. Sharma, JFS

Associates:

Nil

Objectives:

To map the areas and investigate the intensity and duration of upwelling and sinking off the west coast of India.

Total duration: 18 months

Date of initiation: 1971

Brief resume of literature:

1. Banse, K. 1959. On upwelling and bottom trawling off the south-west coast of India. J. Mar. biol. Ass. India. 1(1) : 33-49

2. Sharma, G.S. 1966. Thermocline as an indicator of upwelling. J. Mar. biol. Ass. India., 8(1) : 8-19.

3. _____ 1968. Seasonal variation of some hydrographic properties of the shelf waters off the west coast of India. Proc. Symp. Indian Ocean March 1967, N.I.S.I. No. 38 : 263-276.

Plan of work:

Considerable amount of Oceanographic data are available at the Central Marine Fisheries Research Institute that have been collected since 1957. Based on these data, monthly temperature anomaly maps will be prepared by a graphical technique for the area off the west coast of India, for infering the intensity and duration of upwelling.

Title of Project: HYDROLOGY OF THE INSHORE WATERS

Project Code No. MBO/OC/Oce. 6

Division: Marine Biology and Oceanography

Location: Bombay, Karwar, Mangalore, Calicut, Cochin, Vizhinjam, Minicoy, Tuticorin, Mandapam, Madras, Waltair and Port Blair.

Title of major project: OCEANOGRAPHIC INVESTIGATIONS

Personnel:

Project Leader:

A.V.S. Murty, FS

Associates:

K. Radhakrishna, AFS
K. Rengarajan, AFS
N.S. Radhakrishnan, AFS
P. Mozumdar, AFS
G.G. Annigeri, SRA
M. Meiyappan, RA and 4 other RAs

Objectives:

To study the fluctuations of the hydrological conditions of the coastal waters for providing informations for fishery investigations.

Total duration: Continuing

Date of initiation: 1969

Brief resume of work:

1. Carruthers, J.N. 1938. Fluctuations in the herrings of the East Anglian Autumn Fishery, the yield of the spent herring fishery and the Haddock of the North Sea in the light of relevant wind conditions. Rapports et. Proces. Verbans Des Reunious., 106:10-1
2. Marr, J.C. 1959. The cause of major variations in catch of the Pacific Sardine. Proc. world Sci. meeting on the Biol, Sardines and related species., 13 : 66-79.
3. Uda, M. 1952. On the relation between the variation of the important fisheries conditions and the oceanographic conditions in the adjacent waters of Japan. J. Tokyo. Univ. Fish., 38(3): 363-389.
4. Walford, L.A. 1946. Correlation between fluctuations in abundance of the Pacific sardine and the salinity of Sea water. J. Mar. Res., 6(1) : 48-53.

Plan of work:

Water samples to be collected at regular intervals from fixed stations and from fishing grounds for analysing temperature, salinity, dissolved oxygen and nutrients.