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THE MARINE FISHERIES INFORMATION SERVICE: Technical and Extension Series envisages the rapid dissemination of information on marine and brackish water fishery resources and allied data available with the Fishery Data Centre and the Research Divisions of the Institute, results of proven researches for transfer of technology to the fish farmers and industry and of other relevant information needed for Research and Development efforts in the marine fisheries sector.

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Cover photo : Baskets with catches from mechanised vessels, ready for transport to markets.

PREFACE

Very few critical studies have been undertaken on the various inputs which have gone to strengthen the marine fisheries infrastructure in the country and assess their impact on the socio-economic structure of the fishermen communities. The rapid expansion of the fishing industry, chiefly through the introduction of mechanisation programmes resulting in a substantial increase in catch and export of marine products has brought about complex socio-economic problems in the coastal sector in many areas. The increasing pace of mechanisation in few centres has resulted in conflicts between the mechanised and traditional artisanal sectors in some of the maritime states. It has not been an easy task to find solutions to resolve such conflicts and adhoc arrangements are resorted to. In late 1978 it was felt that an impact analysis of the introduction of mechanisation through the co-operative sector and its working without impairment to the traditional artisanal sector should be investigated to assess how such a blending could take place. The working of the ARDC scheme of mechanisation programme at Puthiappa and Puthiangadi villages near Calicut in Kerala, an area of strong traditional non-mechanised fishing base offered scope for the study. The Project "Economics of marine fisheries in Calicut area" was thus taken as an inter-organisational programme by the Central Marine Fisheries Research Institute, Cochin and the Indian Agricultural Statistics Research Institute, New Delhi to be completed in two phases.

In the first phase of the project, results of which are embodied here, a survey of the socio-economic status of the fishermen of Puthiappa and Puthiangadi villages where the ARDC mechanisation programme has been in vogue is compared with the artisanal fishermen at adjacent Elathur Village where only traditional non-mechanised canoes operate. While the Project is in progress, it was felt desirable to bring out this interim report to stimulate initiation of such studies at different centres.

The scientists involved in this Project:

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Project leaders	K. Alagaraja Scientist S2	R. K. Pande Scientist S3
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I would like to express my appreciation to the collaborative effort put in by the team of Scientists from the two ICAR Institutes.

E. G. SILAS
Director

SOCIO-ECONOMIC STATUS OF FISHERMEN COMMUNITY OF CALICUT AREA*

Introduction

Marine fishery sector in India has undergone a rapid change after the introduction of mechanisation. Powering the boats for conveyance/fishing has improved the mobility and the efficiency of crafts. As during Industrial revolution the indigenous sector faced a set back with unbalanced economic change, mechanisation of marine fishing crafts has brought in both positive and adverse effects on the socio-economic conditions of rural fisherfolk; positive in the sense of increased catches and adverse in the sense that the presence of these mechanised boats deprive the legitimate claims of traditional crafts as they are not able to compete with the mechanised ones and hence catch less quantity of fish. Thus the economic viability of labour intensive traditional sector has faced a set back. This imbalance may be due to the presence of persons, other than fisherman, owning mechanised crafts, since fishermen are not able to purchase powered crafts due to their high costs.

In case the powered boats are made available to traditional fishermen they may get all the benefits of mechanisation which will improve their economy immensely. The main objective of this project is to study the impact of introduction of mechanised boats on the socio-economic conditions of traditional fishermen when they are supplied with mechanised boats. To study this impact, Calicut region is selected where Agricultural Refinance Development Corporation (ARDC) has supplied 50 mechanised boats of size 36′ so that each boat is allotted to seven fishermen families thus involving 350 fishermen families in this venture. These families belong to Puthiappa and Puthiangadi area. For comparative study another neighbouring village Elathur has also been selected where traditional fishing alone is followed.

Puthiappa and Puthiangadi are two marine fish landing centres where there are seven Fishermen Co-operative Societies. ARDC supplied 50 mechanised boats to these 7 co-operative societies. Each society is having about 50 members and each member representing a fishermen family in this region. In addition, under General Mechanisation Scheme (GMS) undertaken by the Kerala State Government there are eleven mechanised boats which also are brought under the ARDC Scheme. Apart from these 61 mechanised boats, there are 70 more mechanised boats owned by local fishermen. These 131 boats are engaged in trawl fishing in this area.

ARDC has introduced a slab system in sharing the catches as an incentive to the crew to bring better catches. The share rates introduced in 1976 are for catches worth upto Rs. 400, 401—500, 501—600 and 600 and above 30, 40, 45 and 50% respectively.

Under ARDC Scheme two nets for each mechanised boats are supplied @ Rs. 2,800 each. All ARDC boats are 36′, each costing Rs. 1.35 lakhs. Apart from these boats there are two workshops and three ice plants under this scheme to meet the local requirements. Mechanised boats operating gill nets numbering about 80 during season, owned by fishermen belonging to other areas such as Colachal are also fishing in nearby areas and landing their catches here. Also mechanised trawling boats of Elathur land their catches here because of the infrastructure facilities available here. In addition, about 275 indigenous boats are operating in this area. There are about 750 persons using boat seines, 200-300 persons using gill nets and 100 persons using hooks and lines. Each boat seine costs about Rs. 15,000, operation of which requires two boats and 15-20 men, 75% of the catches goes to the labourers and 25% to the owner. Fishermen community consists about 65% of local population. Total investment in this area is about Rs. 1 crore, ARDC investing 72 lakhs and NCDC 25 lakhs.

During October–May local fishermen operate both mechanised and indigenous boats and in the rest of the period mainly indigenous crafts. For operation of indigenous crafts at a considerable distance from the shore, mechanised boats are used for towing them 5–10 in number to the fishing grounds and back thus increasing the mobility of the indigenous crafts and improving the catches. This type of an integrated approach in the use of both mechanised and traditional crafts by the fishermen in fishing, hence, has made this area unique in all respects. Fisherfolk who do not go

* Prepared by K. K. P. Panikkar and K. Alagaraja

Table 1. *Distribution of families of fishermen and others by size.*

Puthiappa–Puthiangadi

No. of Members / Category of families	1–5	6–10	11–20	above 20	Total
Fishermen families	170	484	165	39	858
Other families	172	227	50	1	450
TOTAL	342	711	215	40	1308
Elathur					
Fishermen families	124	276	69	4	473
Other families	252	233	42	1	528
TOTAL	376	509	111	5	1001

Occupational status

In Puthiappa-Puthiangadi area there are 858 fishermen families which constitute 65.6% of the total households (Table 2). Out of this 16 (1.9%) families have got full ownership and 273 (31.8%) families partial ownership of mechanised boats. The partial ownership comprises about 200 families who are shareholders in ARDC boats. In some families there are 2 or 3 shareholders and the total number of ARDC shares comes to 350. Initially it was proposed to provide one boat to seven families on the basis of only one member from each family. However, as it was a newly introduced scheme, the society found it difficult to get 350 families to take the shares in 50 boats. So some families were provided more than one share limited to a maximum of 3 shares. Only 69 (8.0%) families operate their own country crafts for fishing. Other than this, some of the families who own mechanised boats also have got country crafts. 467 (54.5%) families live on wages they receive from either mechanised boats or country crafts. They don't have any fishing equipments. For 33 (3.8%) families main occupation is any of the allied activities such as net repairing, fish trading, transporting fish etc. In this area there are 450 (34.4%) families who are not at all connected with fishing industry.

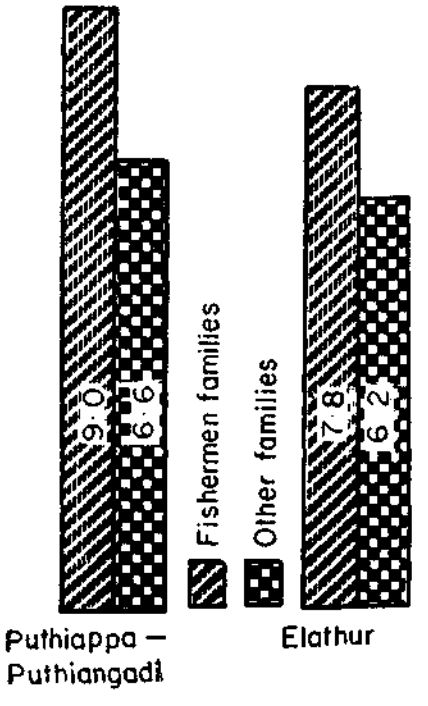

Fig. 1. Average size of the families of fishermen and others.

Those families who are share holders of ARDC boats are not actually the owners of the boats. They will get the ownership of the boats only after the complete repayment of the loan. Till that time the ownership is bestowed on the society. Each boat is allotted to 7 members on condition that they have to hand

for fishing are otherwise engaged in net making under ARDC Project, operations of ice plants, workshops, sorting the catch, transporting and fish trading. Thus throughout the year almost all the fisherfolk are profitably engaged in one or the other type of activities connected with fisheries. Mechanised and traditional fishing are not competing with each other as in other areas in our coastal waters, but have become complementary to each other thus increasing the standard of life in this area. Availability of infrastructure facilities for processing the catch and amenities for quick disposal of the same are added attraction in this area.

In contrast to this, the landing centre at Elathur which is about 8 km from Calicut township consisting of three mechanised boats, 28 dug out canoes and 80 small boats, does not show much activity. No infrastructure facilities are available. Hence these mechanised boats land their catches at Puthiappa only. There is only one co-operative society consisting of about 180 members with a single mechanised boat. In this diluted responsibility the operation of this mechanised boat became a liability and was impounded by the Government for non-payment of loans.

In order to study the impact of introduction of mechanised crafts under the integrated approach for fishing, suitable schedules numbering five have been developed. The collection of data is planned in two phases. The first phase is concerned with the complete census of all the families in Puthiappa and Puthiangadi areas covered by the ARDC Scheme and families in wards I, II & III of Elathur village where there is a concentration of fishermen families. In this phase, data have been collected on size of the family, occupation details, possession of crafts, infrastructure facilities, indebtedness and income. In the second phase a sample of households representing all types of occupations will be selected for detailed study.

This report gives an account of the first phase of the project.

Work programme

Before initiation of the census, the following items of work were taken up.

1. Meeting the important personalities of the locality, Panchayat and Co-operative society Officials for enlisting their Co-operation.
2. Preparing a list of families residing in the area and obtaining a rough sketch of the area under coverage to form a base for the same and
3. Dividing the area into two exclusive parts to be given to two enumerators selected for collecting census data.

On 9-4-'79 two enumerators have been recruited and were given training at Calicut Research Centre of CMFRI, Calicut. The programme of work for the enumerators were chalked out in such a way that daily progress of work was brought to the notice of Officer-in-Charge, Calicut Research Centre and weekly reports were prepared, once in a week by enumerators. The Scientists from Headquarters and Officer-in-Charge, Calicut Research Centre supervised their work.

Size of the Family

In the Puthiappa-Puthiangadi area regarding the size of the family, there is wide variation between fishermen and non-fishermen families. As seen from Table 1, fishermen families are of large size when compared to non-fishermen families, the average sizes being 9.0 and 6.6 respectively. Of 858 fishermen families 204 (23.7%) families have more than 10 members whereas amongst 450 non-fishermen families only 51 (11.3%) families have more than 10 members. There are 39 fishermen families with more than 20 members and only one non-fishermen family under this classification. With 6 to 10 members there are 484 fishermen families and 227 non-fishermen families. However, among fishermen families only 170 families have less than 6 members constituting 19.8% and 172 non-fishermen families constituting 38.2%. Fishermen families are larger in size because of the joint family system still prevalent among the fishermen community in this area. The joint family system is convenient for them to do fishing as a joint venture. Financial difficulties in constructing a new house and lack of enough space for further partitioning compel them to stay together under one roof and maintain collateral joint system.

In Elathur village, of 473 fishermen families 73 (15.4%) families have more than 10 members. 349 families constituting 73.8% of the total fishermen families have more than 6 members, whereas out of 528 non-fishermen families 276 families constituting 52.3% come under this group. With the size of less than 6 members there are 124 (26.2%) fishermen families and 252 (47.7%) non-fishermen families. As in the case of Puthiappa-Puthiangadi, in this village also fishermen families are comparatively of larger size. Average sizes of fishermen and other families are 7.8 and 6.2 respectively. (Fig. 1).

Table 2. *Distribution of fishermen families by occupational status.*

Occupational Status	Puthiappa-Puthiangadi	Elathur
I. Fishing and allied activities		
1. Full ownership of mechanised boats*	16	1
2. Partial ownership of mechanised boats**	273	2
3. Ownership of country crafts***	69	73
4. Wage earners	467	351
5. Allied activities	33	46
TOTAL	858	473
II. Other activities	450	528
GRAND TOTAL	1308	1001

* Those families having full ownership of mechanised boats have been accounted here irrespective of their partial ownership of mechanised boats or ownership of country crafts.

** These families are having only partial ownership of mechanised boats. However they may have country crafts also.

*** They are owning only country crafts.

over to society certain percentage of their catch and from that the society will repay the ARDC loan. When the loan amount of a boat is fully repaid it will be released to its members. This arrangement is convenient both for the society and the fishermen. Since the society is regularly collecting its dues from the fishermen, it does not have any difficulty in the repayment of the loan. The advantage for the fishermen is that they are not directly responsible for the repayment of loan. The general complaint against the fishermen by the credit institutions such as banks, co-operative societies etc. is that once they have taken loan, they are not much bothered about repayment. Such a situation is successfully avoided in the above arrangement.

At Elathur out of 1001 families, 473 (47.3%) families are those of fishermen and out of them 351 (74.2%) are wage earners. They work in others boats or engaged in mussel collection. Only 3 families in this village have ownership of mechanised boats, one is fully owned by one family and the other two are partially owned. Even these three boats are operating mostly at Puthiappa area. Only 73 (15.4%) families operate their own country cratts. 46 (9.7%) families are engaged in mussel trading, transporting etc. In this village fishermen are mostly engaged in mussel collection and this is an important centre of mussel production.

Figure 2 shows the percentage distribution of families engaged in different fisheries activities in Puthiappa-Puthiangadi area and Elathur village.

Active fishermen

In Puthiappa-Puthiangadi 825 households are pursuing fishing as their full time occupation (Table 3). Of the 1658 active fishermen, belonging to these families, as many as 485 persons (29.3%) work in their own mechanised boats and 289 (17.4%) work in their own country crafts. 884 person constituting 53.3% of the total active fishermen, work in others boats (either mechanised or non-mechanised) for wages. 59 (3.4%) persons are engaged in allied fisheries activities other than fishing such as fish trade, net repairing, curing etc.

In Elathur village out of 756 active fishermen 5 are working in their own mechanised boats and 200 (26.5%) persons in their own country crafts (Table 3). Among the active fishermen 551 (72.9%) are wage earners without having any fishing equipment. 52 (6.9%) persons are engaged in allied fisheries activities.

The percentage distribution of active fishermen by their occupational status is illustrated in Figure 3.

Family Income

In spite of difficulties, such as one year recall period, non-maintenance of household accounts, illiteracy of

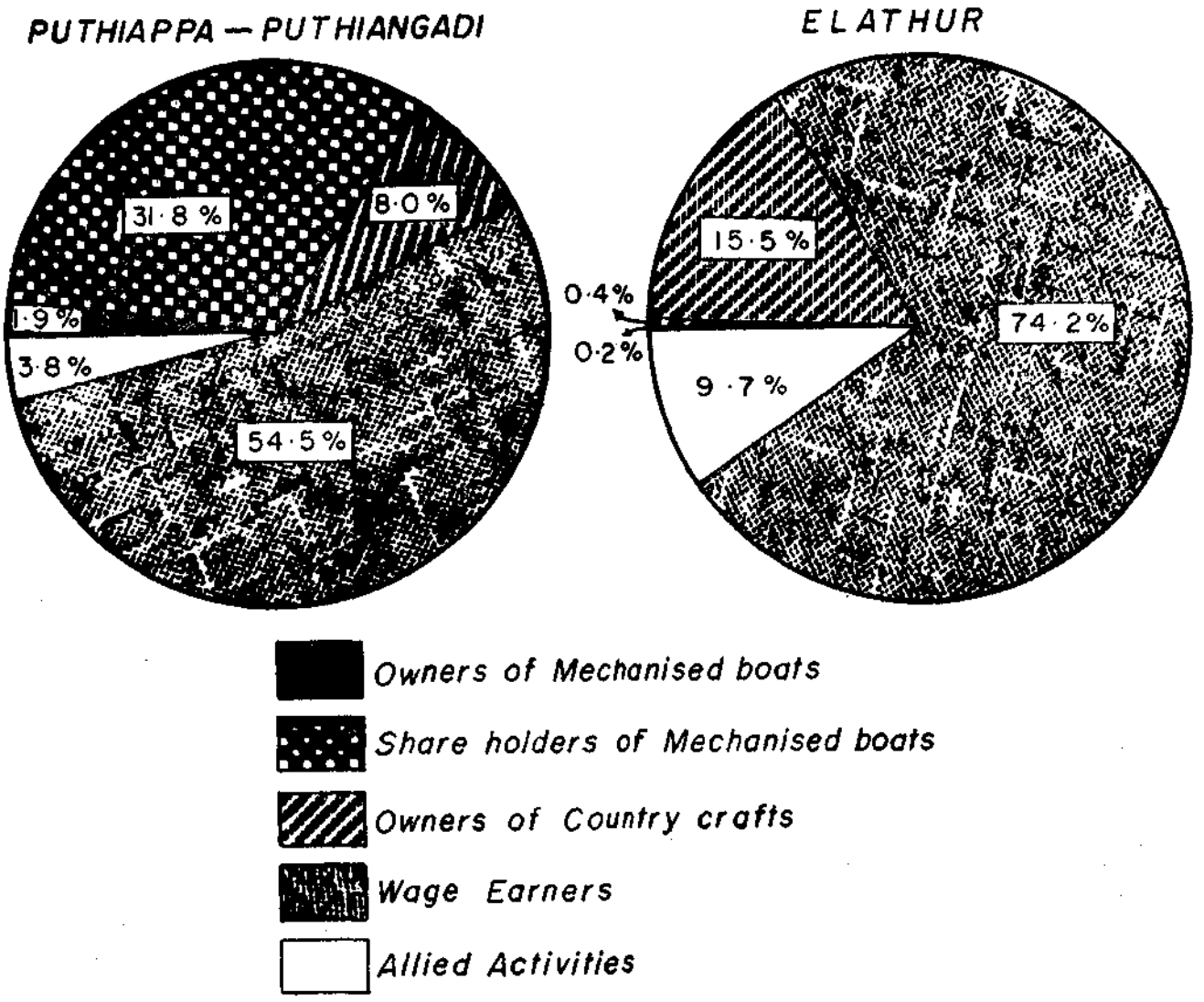

Fig. 2. Percentage distribution of families engaged in different fisheries activities.

the people and availability of free ration during off-seasons for only those whose annual income is below Rs. 1200/- etc., every effort has been made in convincing the local people about the scope and purpose of the enquiry while collecting the data.

Table 4 gives the distribution of the households in Puthiappa-Puthiangadi area by annual income groups and occupational status. The statement shows that the largest single group accounting for 44.9% of the total fishermen households have annual income between Rs. 1001 and 2000. They are followed by those in the income group of Rs. 501–1000 forming 22.1% and those in the income group of Rs. 2001–3000 constituting 19.8% of the total fishermen households. There are, however, 103 fishermen households (12% of the total fishermen households) in the annual income group of above Rs. 3000. Only 4 families have recorded an annual income in the range of Rs. 10,000–30,000. On the lower side only 10 families are found in the annual income group of Rs. 500 and below and 200 families (23.3%) in the group of less than Rs. 1001.

The analysis of the statement on the basis of the occupational status of the fishermen reveals that out of 16 families who have full ownership of the mechanised boats, 15 families have an annual income of more than Rs. 3000. Even among the 273 fishermen families who have got partial ownership of mechanised boats all have reported their annual incomes as above Rs. 1000. Among them, 133 families (constituting 48.7% of the total share holders of mechanised boats) are in the annual income group of Rs. 2001–3000 and 30 families in the income group of above Rs. 4000/-. Among

Table 3. *Distribution of active fishermen by their occupational status.*

Occupational Status	Puthiappa-Puthiangadi	Elathur
1. Number of fishermen operating:		
a) Own mechanised boats	45	2
b) Partially owned mechanised boats	440	3
c) Country crafts	289	200
d) Others boats (both mechanised & non-mechanised)	884	551
Active fishermen (a + b + c + d)	1658	756
2. Fishermen engaged in allied activities	59	52
3. Other activities	645	823
TOTAL	2362	1631

Table 4. *Distribution of households by occupational status and annual income groups* in Puthiappa–Puthiangadi

Type of activities	(Income range in Rs.) 500 & below	501–1000	1001–2000	2001–3000	3001–4000	4001–5000	5001–10000	10001–20000	20001–30000	Total
1. Owners of mechanised boats	—	—	—	1	5	5	2	2	1	16
2. Share holders of mechanised boats	—	—	62	133	48	15	14	1	—	273
3. Owners of country crafts	—	1	53	14	1	—	—	—	—	69
4. Wage earners	10	185	253	17	2	—	—	—	—	467
5. Allied activities	—	4	17	5	5	2	—	—	—	33
TOTAL	10	190	385	170	61	22	16	3	1	858
6. Other activities (excluding fishery activities).	30	63	173	71	34	17	48	13	1	450

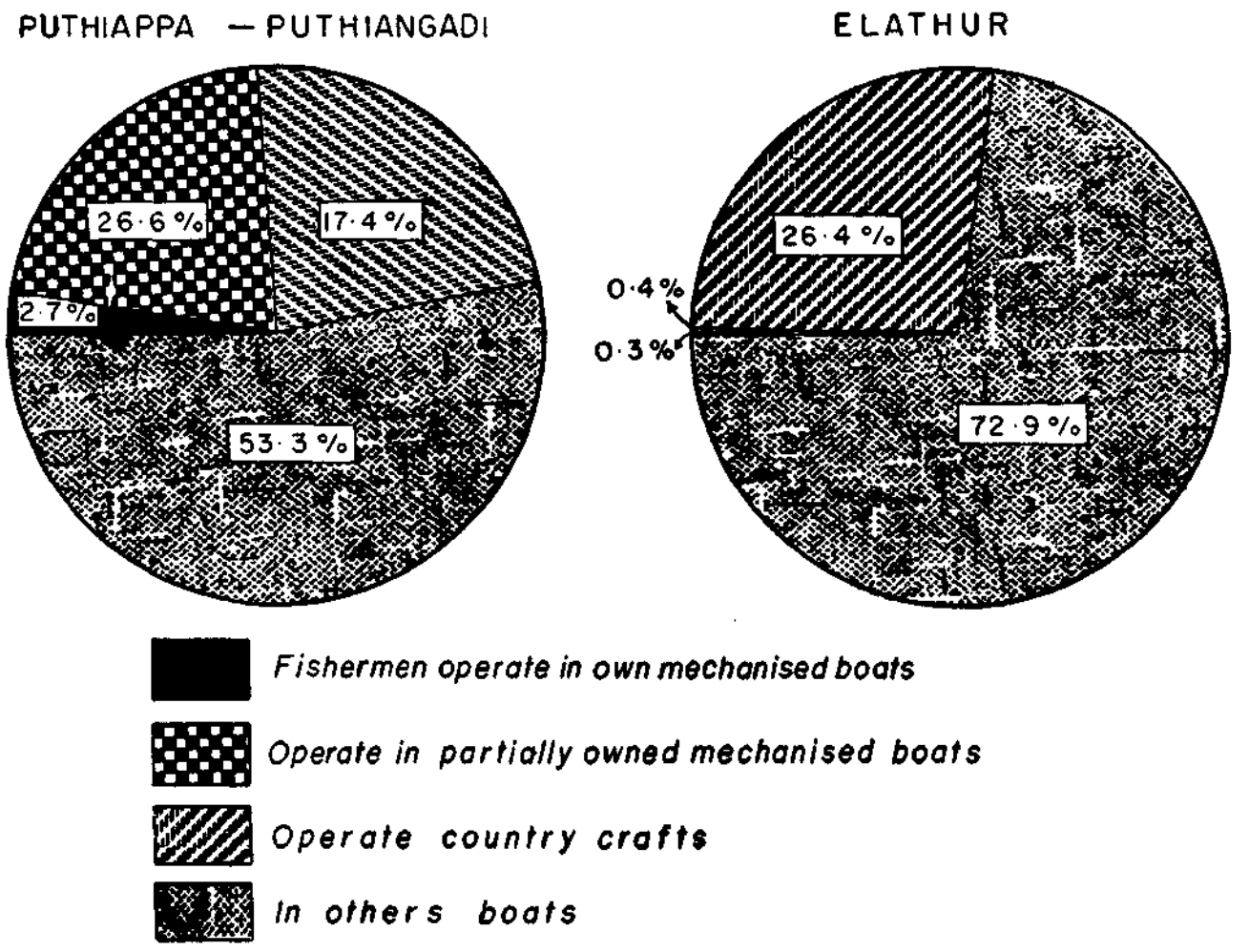

Fig. 3. Percentage distribution of active fishermen by their occupational status.

the 69 fishermen families who do fishing by only country crafts one family has an annual income of Rs. 1000/- or less. 53 families constituting 76.8 per cent of the country craft operators are in the income group of Rs. 1001–2000 and 15 families in the group of Rs. 2001–4000. Of the five different categories classified under the occupational status of the fishermen families, wage earners are found to be more in the lower income groups. Out of 467 families of wage earners 448 families (95.9%) have annual income of Rs. 2000 or less and 41.8% of them earn annually Rs. 1000/- or less. Of the 33 families engaged in allied activities such as fish trading, net making, repairing etc. 29 (87.8%) families have annual income of more than Rs. 1000, out of which 12 families are in the income range of Rs. 2001 to 5000. Only 4 families earn Rs. 1000/- or less.

The average annual income per fishermen household in this area is worked out at Rs. 2200.

From Table 5 it is seen that in Elathur village, of the 473 fishermen families 387 families (81.8%) have annual income between Rs. 501 and 2000. 169 families (35.7%) earn annually Rs. 1000/- or less 61 (12.9%) families have come under the income group of Rs. 2001–3000 and 25 (5.3%) families have reported their income between Rs. 3000 and 10,000.

As seen from the statement, in this village there is only one family which is having full ownership of a mechanised boat and this family comes under the annual income group of Rs. 2001–3000. Of the two families who are shareholders of mechanised boats one is in the annual income group of Rs. 2001–3000 and the other in Rs. 3001–4000. Out of 73 families who operate country crafts 50 (68.5%) are in the income group of Rs. 1001–3000. 14 (19.1%) families come under the income group of Rs. 3001–4000 and 9 families in the group of Rs. 4001–10,000. Of 46 families who are engaged in allied activities such as fish trading,

Table 5. *Distribution of house-holds by occupational status and annual income groups* in Elathur

Type of Activity	(Income range in Rs.) 500 & below	501–1000	1001–2000	2001–3000	3001–4000	4001–5000	5001–10000	10001–20000	20001–30000	Above 30,000	Total
1. Owners of mechanised boats	—	—	—	1	—	—	—	—	—	—	1
2. Share holders of mech. boats	—	—	—	1	1	—	—	—	—	—	2
3. Owners of country crafts	—	—	31	19	14	4	5	—	—	—	73
4. Wage earners	—	161	164	26	—	—	—	—	—	—	351
5. Allied activities	—	8	23	14	—	1	—	—	—	—	46
TOTAL	—	169	218	61	15	5	5	—	—	—	473
Other Activities	51	108	98	76	37	41	74	28	11	4	528

net making etc., half of them come under the income group of Rs. 1001–2000, 14 families are in the group of Rs. 2001–3000 and one family earns an annual income of Rs. 4001–5000. The average annual income of a fishermen household is worked out at Rs. 1125/-.

Indebtedness

Out of 858 fishermen families in Puthiappa-Puthiangadi area, 642 families (74.8%) are in debt. Table 6 gives the number of fishermen families in debt by source and annual income Since there are instances that the same family has taken loan from different sources, for the purpose of classification, the major source of loan has been taken into consideration for each family. Accordingly, the major contributor towards the loan requirement of fishermen families in this area is the co-operative society. This is because of the loan (Rs. 72 lakhs) advanced by the ARDC through the co-operative society. 223 families constituting 34.7% of the total fishermen families in debt have received loans through co-operative societies. For 196 families (30.5%) money lenders are the major contributors of their loan requirements. The rate of interest generally ranges from 24 to 75%. Out of them 63 (32.1%) families have taken loan on contract basis. Credit is advanced on contract basis only to those fishermen who own some fishing equipments. The size of the loan depends on the value of those equipments. No time will be fixed for the repayment of loan. Generally, to receive a loan the boat owner (both for mechanised and non-mechanised) has to enter into a contract with the money lender by which the borrower is bound to give the moneylender certain percentage of their daily catch. This often ranges from 15 to 30% depending upon the size of the loan till the repayment of the loan. Boat owners also advance loans to fishermen. There are 102 (15.9%) such families who have received loans from boat owners. With the receipt of this loans which generally ranges from Rs. 500 to 1500, they will become contract labourers and they should work only in that boat from the owner of which they have received loan till the loan is repaid. There is no interest in cash or kind.

Bank's contribution to the outstanding debt of the fishermen is only a meagre one. 53 families constituting 8.3% of the total fishermen families in debt, have received loans from banks. Size of the loan is also comparatively small.

In Elathur village (Table 7) out of 473 fishermen families only 43 families (9.1%) have taken loan. Of these, 19 families have received loans from banks (44.1%). 12 families are indebted to boat owners. 8 families received loan from money lenders. As compared to Puthiappa-Puthiangadi the percentage of fishermen in debt in Elathur village is far less. This is mainly because of the absence of loan facilities here. Most of the fishermen families do not possess any

Table 6. *Distribution of fishermen families in debt by source of credit and annual household income groups:* Puthiappa-Puthiangadi

Sources	(Income groups in Rs.) 500 & below	501–1000	1001–2000	2001–3000	3001–4000	4001–5000	5001–10000	10001–20000	Total
1. Government	—	2	3	8	2	—	1	2	18
2. Co-operative Society (including ARDC)	—	1	101	90	19	6	6	—	223
3. Money lenders	—	29	107	33	18	5	4	—	196
4. Boat owners	—	54	42	6	—	—	—	—	102
5. Banks	—	4	24	11	6	4	3	1	53
6. Others	1	17	22	5	3	2	—	—	50
TOTAL	1	107	299	153	48	17	14	3	642

Table 7. *Distribution of fishermen families in debt by source of credit and annual household income groups:* Elathur

Sources	(Income groups in Rs.) 500 & below	501–1000	1001–2000	2001–3000	3001–4000	4001–5000	5001–10000	10001–20000	Total
1. Government	—	—	—	2	—	—	—	—	2
2. Co-operative Society (including ARDC)	—	—	—	—	—	—	—	—	—
3. Money lenders	—	3	2	1	1	—	1	—	8
4. Boat owners	—	4	6	2	—	—	—	—	12
5. Banks	—	3	12	3	—	—	1	—	19
6. Others	—	—	1	—	1	—	—	—	2
TOTAL	—	10	21	8	2	—	2	—	43

Table 8. *Borrowings of fishermen from different agencies (in Rs.)*

Credit Agencies	Puthiappa & Puthiangadi	Elathur
Government and Co-operative Societies	3,57,000	5,000
Banks	3,14,400	18,500
Money lenders	6,52,900	17,000
Boat owners	73,350	8,400
Others	1,84,400	3,500
TOTAL	15,82,050*	52,400

* Excluding the loan advanced by ARDC.

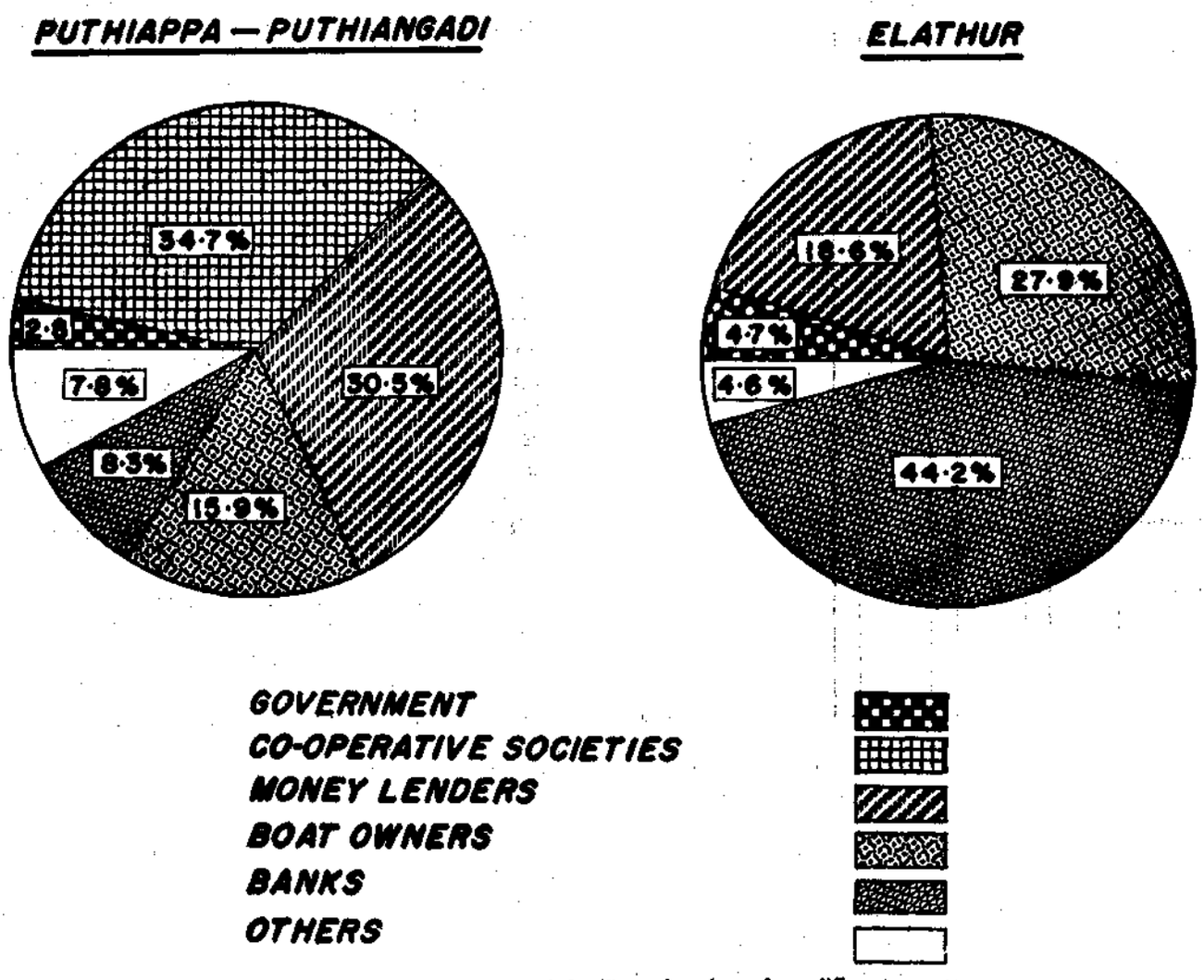

Fig. 4. Percentage distribution of families taken loan from different sources.

fishing equipment and their repaying capacity is very poor. Generally money lenders are not interested in giving loan to such families. Even the loans advanced to few families by banks and money lenders are of small amounts (Fig. 4).

The total outstanding debt of the fishermen families amounted to about Rs. 16 lakhs in Puthiappa-Puthiangadi and about Rs. 50 thousand in Elathur. This excludes the loan extended by ARDC and G.M.S. in Puthiappa-Puthiangadi, which amounted to about Rs. 1 crore.

As seen from the Table 8, even without taking into consideration the ARDC and G.M.S. loans, there are better credit facilities in Puthiappa-Puthiangadi than in Elathur. In Puthiappa-Puthiangadi the Government and Co-operative Society advanced a loan of Rs. 3.57 lakhs whereas in Elathur it was only Rs. 18.5 thousand. The contribution of money lenders amounted to Rs. 6.53 lakhs in Puthiappa-Puthiangadi and Rs. 17 thousand in Elathur (Fig. 5).

Income-effect of Mechanisation

As indicated earlier, the Agricultural Refinance Development Corporation advanced a loan of Rs. 72 lakhs to the Kozhikode Regional Fish Marketing Co-operative Society to introduce mechanised fishing in Puthiappa-Puthiangadi area.

From the records available in the Society during the period from 1971–72 to 1978–79, the total value of the entire catch by these boats worked out to Rs. 1,74,77,726. Out of this, an amount of Rs. 49,91,270 was paid to fishermen as wages. The commission paid to members amounted to Rs. 8,73,754. Oil expenditure and repairing charges came to Rs. 57,23,388

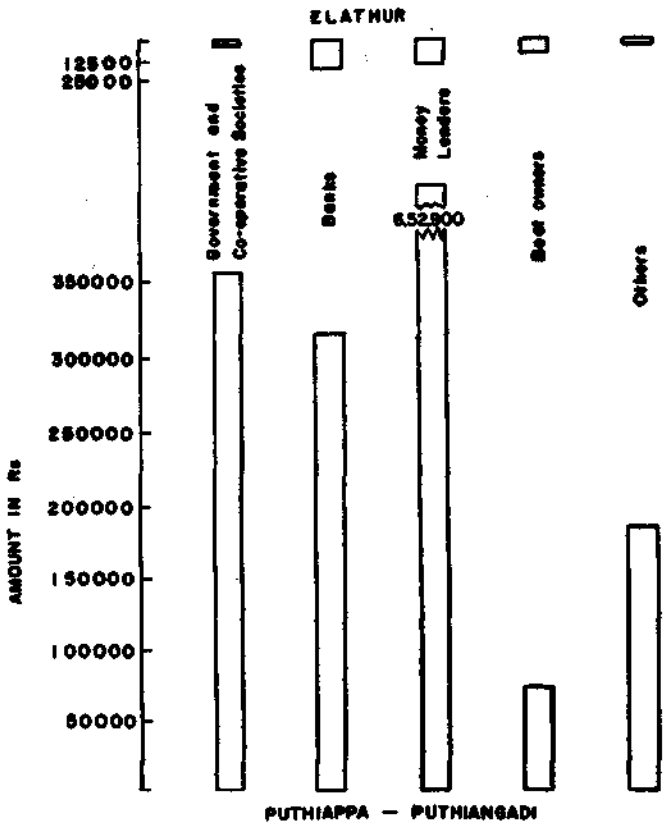

Fig. 5. Contribution of different credit agencies to the total loan amounts advanced to fishermen community.

and Rs. 38,59,762 respectively. Thus the money income created by this project has got direct impact on the economy of this area. The wages and commission (Rs. 58,65,024) received by fishermen, have increased the demand for goods and services in the village. An increase in income will increase consumption especially in a poor community whose propensity to consume is very high. More consumption means more demand which will ultimately stimulate the economic activities of the village. There will be a proliferation of allied activities such as fish trading, processing, ice factory, net repairing etc. which will create additional employment not only in the fisheries sector, but also to a certain extent in other sectors. In this way the additional income created by mechanisation in this area has obviously a positive impact on its economy.

Conclusion

The analysis of data relating to the socio economic background of the fishermen families in Puthiappa-Puthiangadi and Elathur clearly indicates the improvement of the economic condition of the fishermen families in the former region which received credit facilities from ARDC to acquire mechanised boats. Eventhough the beneficiaries of this scheme are 200 families constituting only one-fourth of the total fishermen families, the whole fishermen community in this area has received the spill over benefits of this scheme. Moreover, this project is characterised by the existence of certain externalities. The introduction of mechanisation by ARDC in this area in 1971–72 induced many other fishermen to shift from traditional to mechanised fishing which resulted in increased landings and created more employment opportunities in net making, ice plant and work shop operations, sorting, auctioning, transporting and fish trading. The absence of such economic activities in the neighbouring Elathur village is a pointer to the importance of availability of credit facilities to invest in improved fishing techniques.

Another important feature observed in Puthiappa-Puthiangadi area is the compatibility of mechanised and indigenous fishing sectors. This may be because during off-season, mechanised boats are used for towing 5 to 10 country crafts to operate at distant grounds. Moreover, most of the mechanised boats belong to local fishermen families.

ARDC advanced loan to fishermen through the co-operative society at Puthiappa-Puthiangadi. The repayment of loan is the responsibility of the society. The fishermen to whom the boats are allotted have to hand over to the society certain percentage of their daily catch and from that, the society will repay the loan. Because of this arrangement, delay in realising the loan is avoided. This can be taken as a guide line for advancing loans in other rural areas also.

Despite the higher level of average annual income per household and also higher tempo of economic activities in Puthiappa-Puthiangadi as compared to Elathur village the intensity of indebtedness is more in the former than in the latter village. This can be attributed to the absence of credit facilities in Elathur, especially the institutional credits and the reluctance of the money lenders there to advance credit to poor fishermen whose repaying capacity is very poor. Thus a lower degree of credit facilities in any fishing village may be an indicator of its lower level fishing activities.

MUSSEL CULTURE AT KARWAR, KARNATAKA STATE*

Lab-to-Land Programme

The green mussel, *Perna viridis* is an important item of food of the people of coastal Karnataka. The mussel popularly known as 'Neeli Kallu' in Kanarese and 'Kulate' in Konkani and Marathi occurs abundantly on rocks and other hard substrata in the inshore waters all along the coast. It supports a sustenance fishery of some consequence along the 144 km Uttar Kannada (North Kanara) coast from Majali in the north to Bhatkal in the south. The fishermen supplement their earnings by taking to mussel fishing not only during lean but also good seasons of mackerel, oil sardine, prawn and other fisheries. Mussel of marketable size harvested from natural beds fetch Rs. 10/- to Rs. 15/- per hundred in the locality and medium-sized ones Rs. 1/- to 3/- per hundred. But, the production from natural sources falls far short of the requirements of the people. In order to augment production of quality mussel through coastal aquaculture, the Lab-to-Land Programme for transfer of mussel culture technology to the fishermen of Binage, a fishing hamlet situated 7 km south of Karwar town, was initiated in November 1980.

The programme was channelled to ten fishermen, each representing one family of the low income group. These fishermen operate the traditional shore seines, 'Rampan' and 'Yendi' in the area. The rationale in selecting them for implementation of the programme is that once they feel that the rafts placed are their own and derive good returns from them, they would so reorient their traditional fishing activities as not to disturb the rafts in the sea which in turn ensures their total involvement in the programme and its success.

The Binage coastal village is part of the Karwar Development Block of Uttar Kannada (North Kanara District), Karnataka State. The village comprising 4 wards is densely populated. The fourth ward of the village is occupied exclusively by the fishing community comprising 134 families of 846 members.

As a first pre-requisite to the implementation of the programme, the Bench Mark Survey on the socio-economics of the fourth ward in general and the selected families in particular was taken on hand and completed on schedule. The selected ten families have 30 male and 18 female members, of whom 10 are children below the age of 14. Among the adults, 23 males are engaged in 'Yendi' operations; they also work as labourers in the 'Rampan' units. Of the 15 females, 7 eke out a living by selling fish in the local market and the rest attend to domestic chores. The ten families are categorised under the low income group.

Raft culture

The mussel culture programme could be implemented only after imparting training to the 10 involved fishermen and other members of the adopted families in all phases of culture. The fishermen were trained in the selection and preparation of material and fabrication of the rafts, floating and mooring the rafts at sea, location and collection of seed of the required size, cleaning the seed and seeding the ropes, suspending seeded ropes from the rafts and maintenance of the rafts at sea including periodical cleaning of the ropes to remove epifauna and fouling organisms. Training was imparted to the women and other members of the families in cleaning the seed and seeding the ropes.

The mussel culture rafts were located in two areas, viz., Binage Bay and Karwar Bay. Four rafts, two each at Binage and Karwar, fabricated out of casuarina and bamboo poles (tied together with coir and nylon ropes) and varying in size from 5 x 5 to 7 x 7 m were used for suspending the seeded ropes. Sealed empty oil barrels, each of 200 litres capacity, were used as floats for the rafts. Each raft was moored in the sea by means of two 100 kg iron anchors and 11 mm link diameter 20 m long iron chains at 6 to 7 m depth about 2 km from the shore. Initially, attempts were made to place the first raft near the Hulchi Rock off Binage as this area afforded protection to the raft from wave action and purse seiners. But, because of predation by fishes on transplanted mussel seed, the raft had to be moved and placed at a safer location between Hulchi Rock and Anjadiv Island. The second raft at Binage was moored near the first. These rafts of size 7 x 7 and 6 x 6 m floated on 16th December 1980 and 6th February 1981 had the full complement of 48 and 41 seeded ropes by 22nd January and 21st February respectively. In the Karwar Bay, the rafts of size 5 x 5 m floated on 23rd January and 24th February had the full complement of 33 and 32 seeded ropes by 6th February and 13th March 1981 respectively.

The seed for the programme emanated from the intertidal and submerged rocks situated in the vicinity

* Prepared by M. Vasudev Pai and P. S. Kuriakose

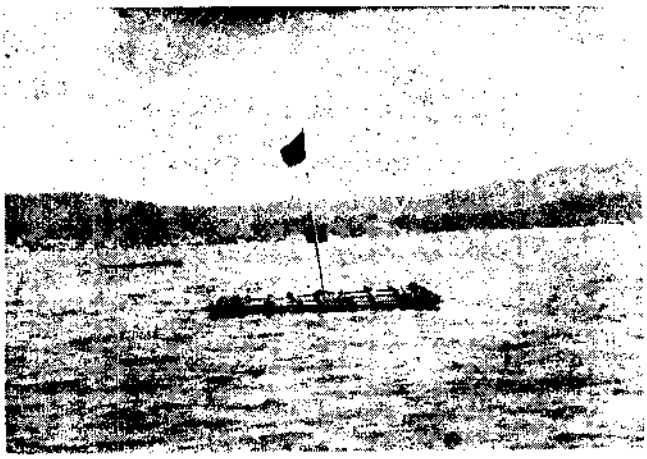

Fig. 1. Rafts in position in the Binage Bay

Fig. 3. Ropes being examined for growth of mussel

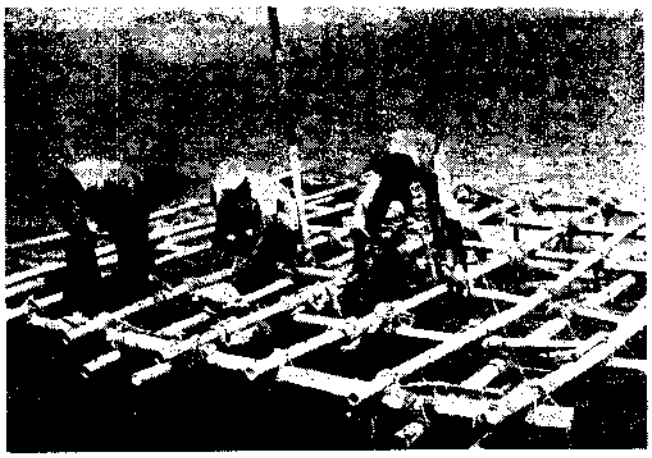

Fig. 2. Maintenance of raft at sea

Fig. 4. Lab-to-Land Programme participants with the harvest

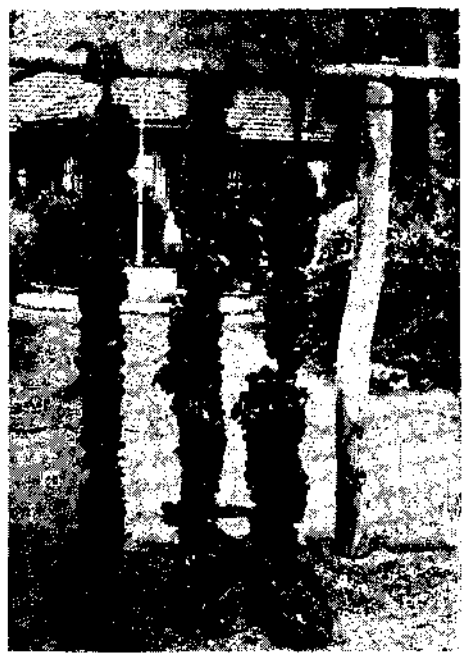

Fig. 5. Harvested mussel ropes.

of the Karwar Research Centre of CMFRI and also Chendia. Immediately after collection, the seed were cleaned thoroughly to remove adhering mud and epifauna. Four kg of cleaned seed of size 10 to 20 mm go into the seeding of 4 m length of coir ropes of 20 mm diameter. The seed mussel were secured around the rope by stitching knitted cotton cloth of 25 cm width. The ropes, each with 4 m seeded length, were suspended from the rafts with the lower free end about 2–3 m above the bottom of the sea. The seed mussel got attached to the ropes by means of freshly secreted byssus thread in a matter of days when the cloth cover disintegrated.

The growth particulars of cultured mussel are presented in Table 1. Seed mussel having an average length of 17.50 mm and weighing 0.51 g transplanted on 20th January grew to a size of 62.60 mm weighing 14.70 g within a period of 134 days registering an average monthly growth rate of 10.10 mm in length and 3.18 g in weight. The maximum meat yield was 38.10% of the total weight obtained at the time of harvest on 4th June 1981.

Though the cultured mussel had not grown to marketable size, it was decided to harvest the crop and retrieve the rafts from the sea for future use because of the turbulent sea conditions during the South West Monsoon. The mussel were harvested from 2nd through 12th June 1981. The details of production, etc., are given in Table 2. In all, 3,751 kg of mussel were harvested from 120 ropes (480 m seeded length) recovered from the four rafts. But for the 3 ropes lost at sea, the recovery of seeded ropes was near-total and 2,080 kg of mussel were harvested at Binage. The average production per metre length of rope was 7.815 kg of mussel showing 7.815 times increase in seed weight. At Karwar, 31 ropes with harvestable sized mussel were lost due to poaching and 1,671 kg of mussel were obtained from other ropes. A good part of the harvest was distributed free among the 10 Lab-to-Land participants as also local fishermen and the public of Karwar as part of the Institute's extension programme and the rest sold.

Fishermen and the public alike had visited the Karwar Research Centre to see the harvest for themselves, the first to be witnessed in the area. Kumari Sobha Nambisan, I.A.S., the then Project Director, District Rural Development Society (erstwhile SFDA), Karwar evinced keen interest in the programme. The programme has so impressed the fishermen of Karwar as to make them feel that mussel culture is a viable proposition and can be relied upon to augment their meagre income.

Table 1. *Growth of the cultured mussel, Perna viridis. (The figures of length and weight are averages of* 100 *specimens).*

Date of observation	Length (mm)	Total weight (g)	Shell weight (g)	Meat weight (g)	Mantle water weight (g)	Percentage of shell weight	Percentage of meat yield	Percentage of mantle water weight
20–1–1981 (seed)	17.50	0.51	0.11	0.12	0.28	21.57	54.90	23.53
23–2–1981	30.24	2.38	0.73	0.79	0.86	30.67	36.13	33.19
11–3–1981	35.88	3.46	1.10	0.93	1.43	31.79	41.33	26.88
1–4–1981	44.90	6.63	2.28	2.32	2.03	34.39	30.62	34.99
1–5–1981	50.00	8.20	3.06	2.98	2.16	37.32	26.34	36.34
26–5–1981	58.44	13.74	4.84	5.00	3.90	35.23	28.38	36.39
4–6–1981	62.60	14.70	5.00	5.60	4.10	34.01	27.89	38.10

Read the figures in the last two columns interchanged.

Table 2. *Details of rafts and production of mussel.*

Details of rafts	Binage Bay		Karwar Bay	
	Raft No. 1	Raft No. 2	Raft No. 1	Raft No. 2
1. Size of the raft (m)	7 x 7	6 x 6	5 x 5	5 x 5
2. No. of ropes suspended	48	41	33	32
3. Length of seeded rope (m)	4	4	4	4
4. Weight of seed used for seeding one metre length of rope (kg)	1	1	1	1
5. Date of seeding	18–1–81 to 22–1–81	6–2–81 to 21–2–81	23–1–81 to 6–2–81	24–2–81 to 13–3–81
6. Date of harvest	2–6–81	9–6–81	12–6–81	12–6–81
7. No. of ropes harvested	45	41	16	18
8. Total weight of the harvest (kg)	1275	805	786	885
9. Average yield per metre length of rope (kg)	7.1	4.9	12.3	12.2
10. No. of ropes lost due to poaching	—	—	17	14
11. No. of ropes lost in choppy seas	3	—	—	—
12. Weight of mussel distributed in the village (kg)	—	805	386	485
13. Weight of mussel sold (kg)	1275	—	400	400
14. Amount realised from the sale (Rs.)	700/-	—	144/-	85/-

Shri P. M. Tandel, Managing Director, M/s Binage Ice & Cold Storage (Private) Ltd., Binage, Karwar and Member, CMFRI Management Committee was of considerable help in motivating the fishermen to take to mussel culture under the Lab-to-Land Programme. The help rendered by the staff of the Karwar Research Centre of CMFRI at various stages of the implementation of the programme is gratefully acknowledged.

ON THE RARE OCCURRENCE OF A GIANT SIZED HAWKSBILL TURTLE OFF ELEPHANTA CAVES (NEAR BOMBAY)*

A turtle weighing 80 kg was caught in a 18.3 m long and sturdy drift net (called *"Jali"* in Maharashtra) operated off Elephanta Caves, a rocky and sandy sea resort of historical and tourist interest about 18 km south of Bombay, on 2–9–1981.

This turtle (Fig. 1) was reported to have been caught, accidentally, by a fisherman Shri Vaman Kusha Koli of Trombay, coinciding with a festival day of Ganesh Chaturthi while he was hauling his drift nets. As the turtle was struggling for its escape

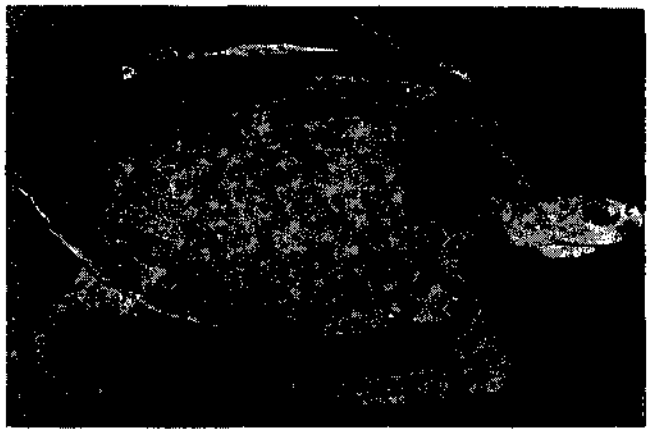

Fig. 1. The hawksbill turtle, Eretmochelys imbricata (Linnaeus) caught off Elephanta Caves (near Bombay)

from the net, the fisherman had to cast another net to control the wildly struggling creature for its inescapable watery journey from Elephanta Caves to a fishing village near Trombay where it was kept alive in captivity.

The following observations were made on the morphometry of the turtle as well as other interesting characteristics of the animal, which was identified as *Eretmochelys imbricata* (Linnaeus):

1. Total length of the turtle from snout to the tail ... 1213 mm
2. The length of carapace ... 783 mm
3. Width of the carapace along the curveture ... 613 mm
4. Width of the carapace in a straight line ... 448 mm
5. The length of plastron ... 438 mm
6. Number of barnacles and other epizootic organisms on the carapace and head ... 8 nos.
7. Number of costal scutes ... 4 pairs
8. Number of inframarginal scutes ... 4 pairs
9. Length of ear-like foreflipper ... 348 mm
10. Number of pre-frontal scales ... 2 pairs
11. Total weight of the turtle ... 80 kg
12. The scutes were very thick, measuring about 5 mm thickness.
13. Head was narrow, parallel-sided and with the jaws meeting at a highly acute angle, which facilitates extraction of food organisms from crevices in coral reefs.
14. Nuchal scute was separated from the first costal scute.
15. The colouration of the dorsal scutes was attractive with radiating streaks of brown and black in an amber substrate.
16. The plastral scutes were orange-yellow in colour.
17. Jaw surfaces were not serrated and the bill was bird-like.
18. The scales of head and forelimbs were very distinct, each being dark-brown with a light border.

It was a female specimen and she got entangled in the drift net, presumably, during her nocturnal egg-laying journey towards the rocky and sandy shore of Elephanta Caves-which serves as an ideal nesting place for hawksbill turtle.

The turtle was kept alive under captivity, for six days in the ante-room of a fairly large house of the captor of the turtle, who regarded the capture of turtle as auspicious and labelled it as "Sea God", duly worshipped by the offering of rice and vermilion.

Since the animal was registering its protest of the captivity by starvation and there was no possibility of keeping it in the local zoo because of the restrictions under the Wild Life (Protection) Act, 1972, it was released back into the sea on September 7, after six days of its capture.

Earlier records of hawksbill turtle reveal that it grows upto 724 mm in carapace length and weighing 50 kg as reported off Jabal Azig Island, in the Gulf of Aden. The present record of the hawksbill from the Arabian Sea off Bombay appears to be the highest both in carapace length and weight.

Grateful thanks are expressed to Dr. E. G. Silas and Dr. S. Ramamurthy for kindly going through the manuscript critically.

*Prepared by J. P. Karbari, Bombay Research Centre of CMFRI

OCCURRENCE OF SMALL SIZED SEER FISHES *S. GUTTATUS* AND *S. COMMERSON* AT KARWAR (KARNATAKA)*

While examining a rampan catch on 3rd December 1981, small sized *Scomberomorus guttatus* (Fig. 1) were observed along with mackerel. The sizes ranged from 52 mm to 96 mm with modal length at 72 mm. Again

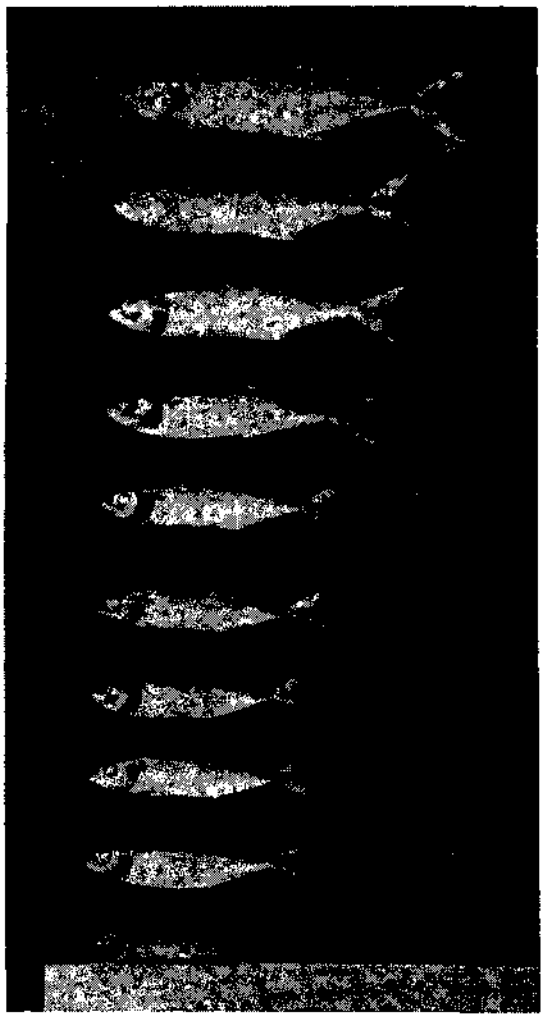

Fig. 1 *S. guttatus*

a few of these were observed in the same gear on 8th and 9th instants, the sizes ranging from 76 mm to 116 mm and modes at 97 mm.

On 8th, 9th and 17th instants, a few numbers of *S. commerson* (Fig. 2) were also picked up. The minimum and maximum size recorded for this species was 83 and 139 mm respectively.

Small sized *S. guttatus* and *S. commerson* could be identified based on some external features. The height of body in the latter species is more than in the former. The second dorsal fin in *S. commerson* is tinged as brightly yellow as its caudal fin, whereas in the other species it is lacking. The characteristic steep slope of lateral line below second dorsal fin which distinguishes the adults of the two species is also clearly discernible. Another added feature to identify these two species is based on dentition. In *S. guttatus* the teeth on the lower half of the jaw are of villiform type and are more in numbers whereas in the other there are 6–7 prominent teeth pointing backwards with fairly

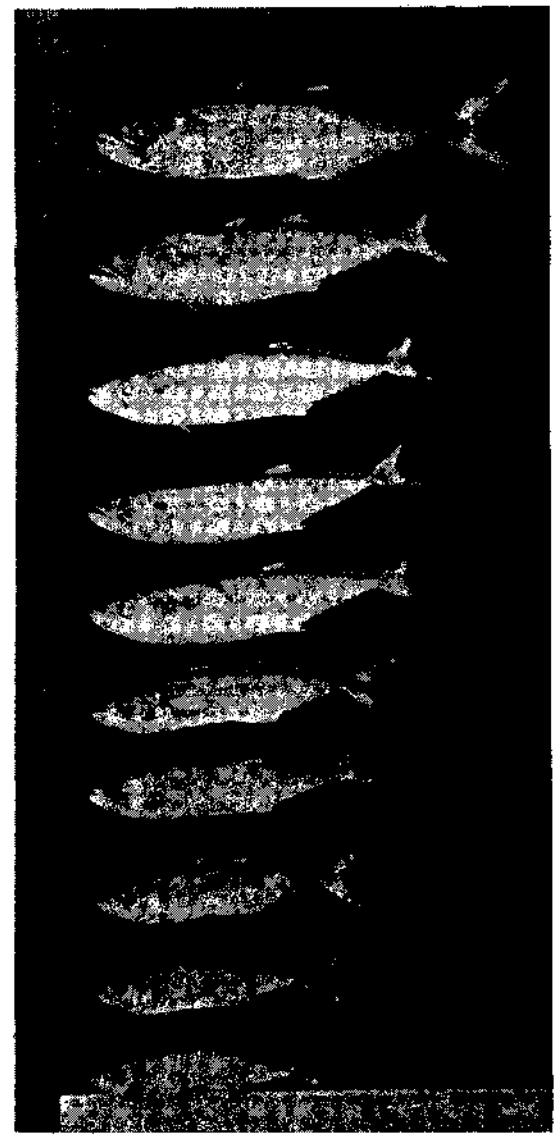

Fig. 2. *S. commerson*

*Prepared by M. H. Dhulkhe

NEWS—INDIA AND OVERSEAS

Mechanised fishing vessel disasters along Karnataka coast

Eight mechanised boats were involved in accidents in the sea between Mangalore and Honavar along Karnataka coast on 8th–9th September, 1981. A purse-seiner, a carrier boat and a trawler capsized at the mouth of Nethravathi estuary at Mangalore on 8th September. A trawler at Coondapur and a purse-seiner at Honavar met similar fate on the same day while three mechanised boats anchored at Pollippu were heavily damaged in the early hours of 9th September, 1981 lashed by waves and wind.

The three fishing boats capsized outside Nethravathi estuary due to water currents and wind at the mouth of the estuary. The purse seiner *Pancha Durgi* a 46′ vessel with 100 H.P. Leyland engine was owned by ex-rampan net owners. The boat fell to a side and the crew swam to safety. Two of them were injured and were treated in hospital. The hull and engine were very much damaged. The boat was salvaged and pulled to the sea coast at Bengre by a large number of fishermen of the area on the next day. *Noor Madani* a 32′ trawler, equipped with a 40.7 H.P. Ruston engine, while trying to enter the estuary turned turtle due to water currents and waves. One of the six crew was drowned. The carrier boat *Jaya Ganga*, a 32′ vessel fitted with 49 H.P. Ruston engine also sank at the mouth of the estuary All the four crew were rescued by other boats in the area

On the same day a 32′ trawler with H.P. Ruston engine *Syed Madani* sank opposite Coondapur estuary at 1 p.m. as it was attempting to enter the estuary. The six crew swam ashore but four trawl nets abroad the boat were lost. The trawler was salvaged and pulled ashore on the next day.

Fig. 1. *"Durga Parameshwari"* capsized on 8th Sept. 81 while negotiating the river bar at Honavar.

The purse seiner *Durga Parameswari* belonging to ex-rampan fishermen of Karwar sank on 8th September 1981 afternoon as it was trying to enter Sharavathi estuary at Honavar after fishing (Fig. 1). This vessel was launched only a week earlier on 2nd September,

Fig. 2. A view of the 32′ trawler *Maheswar Prasad* which ran aground at Polippu with the badly damaged wheel-house and hull.

1981. The boat was completely damaged and the net lost. Out of 27 crew, eighteen swam to safety and nine lost their lives.

Besides the above five boats, a 36′ purse seiner *Sagar Ratna,* a 30′ carrier boat *Jeevan Ratna* and a 32′ trawler *Maheswar Prasad* anchored off at Polippu, 48 km north of Mangalore ran aground in the early hours of 9th September under the impact of waves and wind and were damaged considerably. There were heavy damages to the hulls, engines and nets (Fig. 2).

All the boats except the carrier boat *Jeevan Ratna* were insured and the owners of the boats have submitted claims to the Insurance Companies. The tragic mishaps to these fishing boats at Mangalore, Coondapur and Honavar indicate the urgency for construction of breakwaters at the mouths of the estuaries and deepening of channels by dredging regularly. Dredging operations at the entrance of the estuaries is quite essential as a large number of mechanised fishing boats regularly use the passages to go for fishing and the safety of fishermen has to be assured. The accidents at Polippu have brought to focus the risks involved in anchoring mechanised vessels in coastal waters, however protected they may appear to be. It is quite necessary that mechanised fishing boats, which are extremely costly are berthed in fishing harbours or sheltered areas.

Reports from Mangalore and Karwar Research Centres of CMFRI.

Octopus demand in Japan

Nearly seventy per cent of the total world production of Octopus is consumed in Japan. *Octopus dofleini,* the Pacific Octopus contributes to the major part of this production The catch of Octopus in Japan totalled about 63,000 tonnes in 1978 and with 74,000 tonnes imported from outside, the total quantity amounted to 137,000 tonnes There are widely different fishing methods for octopus in use in Japan, longline fishing using baits, trap method utilising the instinctive nature of the animal and small trawl net fishing.

The Japanese use octopus for food in many different ways. It is never eaten raw, but boiled first and then processed into various products like boiled octopus, vinegered octopus, flavoured items and smoked items. Octopus is an even more favourite food than other fish in Japan, with extremely stable demand and consumption.

World Fishing 29 (11): November 1980

Typhoons improve the fishery

In the Philippines a recent study as part of a three year research programme called "Pollution, Resources, Environment and the Philippines Future" (PREPF) has shown that typhoons could help fishery industry.

According to the study, the fishery resources of the Philippines are not as rich as those in temperate areas because there is less frequent turbulance in its waters except during the southwest monsoon when typhoons occur. The violent agitation of the waters during a typhoon enables nutrients to circulate from the bottom of the sea to the near surface of the waters, thereby enriching these areas. Major part of the fish caught by Fillipino fishermen comes from the surface waters, the pelagic fishery of the Phillippines contributing to nearly 64 per cent of the total fish production.

World Fishing 30 (6): June 1981

Workshop on shrimp fishery management

A workshop on the scientific basis for the management of penaeid shrimp, jointly sponsored by the Fishery Resources and Environment Division of the Food and Agriculture Organisation (FAO) of the United Nations, Rome, U.S. National Marine Fisheries Service (NMFS), Southeast Fisheries Center, Florida and Gulf States Marine Fisheries Commission, Mississippi was conducted at Key West, Florida from November 18 to 24, 1981. Representing different countries and organisations 44 delegates participated in the workshop.

Based on country review papers presented, detailed discussions were held on topics of interest in the penaeid shrimp fisheries of the world. In addition to delineating the problems of research, discussions centred around biological aspects of importance in shrimp fisheries, multiple species problems, environmental aspects, management and future course of work. On the basis of the discussions and comments, recommendations for further follow up action concerning the main items of consideration were given. The proceedings of the workshop will be published shortly.

BOOKS

Legal control of Marine Pollution: By C. K. Chaturvedi, Deep & Deep Publication, New Delhi, pp. 240, 1981.

Half the biological productivity of the world's oceans occurs in the coastal regions of the sea. Commercial fishing in coastal waters is an important industry. It is a tourist region with significant tourist business. It has been recognised that marine environment and all the living organisms which it supports are of vital importance to humanity, and all people particularly of the coastal states have an understandable interest in assuring that this environment is so managed that its quality and resources are not impaired.

This book is primarily devoted to a critical analysis of the issue concerning legal control of marine based pollution. The appendix to the book reproduces in full four Geneva Conventions on the Law of the Sea; the Indian Territorial waters, continental shelf, EEZ and other Maritime Zones Act of 1976, the recent draft convention of the Law of the Sea (extracts) and some other conventions relevant to pollution control. This book will be useful to those engaged in shipping industry, governments and citizens of coastal states, students of law offering law of the sea at higher studies and those connected with sea industries or interested in healthy and unpolluted environment.

Chemoreception in Fishes: Edited by Tashiaki J. Hara, Elsevier Scientific Publishing Company, Amsterdam, pp 433, 1981.

This is the eighth volume in the series, Developments in Aquaculture and Fisheries Science. It is a review of chemoreception in fishes with particular emphasis on its significance in behaviour and its environmental interactions. Four aspects are discussed in the light of recent developments in electron microscopical, electrophysiological and biochemical studies while searching for the general, fundamental mechanisms of chemoreceptive transduction: (a) the morphology, development and differentiation of the peripheral chemoreceptor organs, with some discussion of the central neuronal organisation in the olfactory organ, (b) the primary sensory process in the olfactory and taste as well as lateral-line organs with special emphasis on electrophysiological and biochemical aspects of amino acid receptors; neuronal correlates of olfactory behaviour and its role in orientation, (c) the role of chemoreception in behaviour with particular reference in identification of feeding stimulants and its application to artificial baits, alarm substance fright reaction system and its adaptive significance, and olfactory imprinting to an artificial chemical in homing salmonids, and (d) interactions between aquatic pollutants chemoreceptors and resulting behaviour.

Compiled and prepared by M. J. George & G. Subbaraju.
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