BAY OF BENGAL PROGRAMME

DEVELOPMENT OF SMALL-SCALE FISHERIES

ARTISANAL MARINE FISHERIES IN ORISSA: A TECHNO-DEMOGRAPHIC STUDY

BOBP/WP/29

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ARTISANAL MARINE FISHERIES IN ORISSA: A TECHNO-DEMOGRAPHIC STUDY

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with the assistance of Orissa's marine fisheries extension officers

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The fisheries census presented in this paper is part of a project for integrated development of marine fishing villages in the four coastal districts of Orissa. In the course of the project an extension service for traditional marine fisherfolk was established by the Department of Fisheries, Orissa; and training was provided to the extension officers in the areas of fishing technology, credit and finance, extension techniques and community development by the small-scale fisheries project of the Bay of Bengal Programme.

In conjunction with the training for extension officers, active extension work was also undertaken with BOBP support. This related to: (a) making institutional finance available for traditional fisherfolk; (b) establishing non-formal primary schools; (c) introducing and trying out motorized beachlanding craft and (d) introducing improved types of fishing gear.

To meet the information requirements of the extension service, a few surveys were conducted. These included a qualitative analysis of Orissa's traditional fishing technology; a socio-cultural study of the major ethnic groups and castes forming the marine fisherfolk; a study of the economics of commonly used fishing methods; and last, but not the least, a fisheries census, which is presented in this paper.

Actual data collection and compilation at the village level were carried out for these studies by the officers of the Marine Fisheries Extension Service of Orissa. In compiling and interpreting the data, valuable advice was provided by Mr. P. Mohapatra, Additional Director of Fisheries; Mr. B. B. Mohapatra and Mr. R. K. Singh, Deputy Directors; and Mr. B. C. Patnaik, Superintendent of Fisheries Statistics.

It is hoped that the census methodology developed for this paper might be useful for other extension services in the Bay of Bengal region.

The small-scale fisheries project of the Bay of Bengal Programme started 1979 from Madras. It is funded by the Swedish International Development Authority (SIDA) and executed by the Food and Agriculture Organization of the United Nations (FAO). Its main goals are to develop, demonstrate and promote appropriate technologies and methodologies to improve the conditions of small-scale fisherfolk and raise the production of fish from the small-scale sector in member countries—Bangladesh, India, Malaysia, Sri Lanka and Thailand.

This document is a working paper and has not been cleared either by the FAO or by the Government concerned.

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CONTENTS

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1. INFORMATION REQUIREMENTS OF MARINE FISHERIES EXTENSION SERVICES

In order to draw up work plans and measure or evaluate the impact of extension services, a proper data base is required. Without underestimating the value of qualitative information, it is assumed here that reliable quantitative data are indispensable. Extension work becomes more obvious and its achievements can be highlighted more convincingly when measured against quantitative data.

Before determining data requirements, the subjects/goals of an extension service have to be defined first. Without going too much into detail, the following subjects and goals of extension work are assumed:

Subjects	Goals
1. capture technology and methods brackishwater aquaculture techniques	– further disseminate and diversify traditional technology – introduce new appropriate technologies and methods
2. fishing inputs	– supply information to fisherfolk about prices, types and availability of known and new fishing inputs. – organize supply through cooperatives, individuals, fair price shops, etc.
3. handling/processing	– improve existing methods and introduce new methods and technology, such as use of ice on fishing boats, improvement of hygiene and durability of salted, dried and smoked fish products, etc.
4. marketing/distribution	– supply marketing information to fisherfolk about wholesale and retail prices, ultimate market places, etc. – strengthen the position of fisherfolk against middlemen by means of organizational and financial support for marketing through fisherwomen and cooperatives.
5. conservation of stocks	– advise and educate fisherfolk about conservation methods for fish stocks.
6. community development	– facilitate availability and use of institutional credit, education, health care, family planning, drinking water/sanitation, communication, electricity, in cooperation with other government departments.

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Subjects	Goals
	— create awareness and participation among fisherfolk concerning all the subjects and goals mentioned above, by means of individual contacts and group meetings. — strengthen the role of women by introducing earning activities such as net-making, fish marketing, finance management (in credit and saving schemes, etc.). — train link workers from fishing villages! leadership training — participate in development and conduct of non-formal education programmes for children and adults with emphasis on vocational and environmental aspects.
7. credit and finance	— facilitate direct contacts between banks and fisherfolk. — facilitate indirect institutional finance through cooperatives, credit societies, etc. — implement government schemes for the development of the poorer sections of fisherfolk. — promote institutional savings.

Attaining the extension goals listed above requires the following information inputs:

1. Technical and operational details of existing technologies with regard to catching, handling, processing.
2. Economics of commonly used craft/gear combinations.
3. Sociological and cultural profiles of the major ethnic groups and castes who constitute the marine fisherfolk.
4. Monthly information about fish prices at various stages of processing and marketing.
5. Monthly information about catch and fishing effort with regard to major species and craft/gear combinations.
6. Availability of infrastructure facilities at village level.
7. Areawise distribution of fisherfolk population.
8. Areawise distribution of fishing craft and gear.
9. Areawise distribution of assets/ownership patterns.

While the first three information requirements are to be met by qualitative and quantitative studies[1] and the fourth and fifth by sample surveys the last four requirements are the ones which are attempted to be covered by the census presented here.

The information inputs listed above can be used in the following ways:

— Infrastructure facilities such as roads, electricity, safe drinking water, educational facilities, health centres, etc., are a pre-condition if the process of catching, handling, processing and marketing of fish has to function well—particularly under the conditions prevailing in tradi-

[1] A detailed description of the traditional marine fishing technology in Orissa as well as sociological and cultural profiles of the major ethnic groups and castes among the fisherfolk are at present under print. Other relevant information about Orissa's fisheries is given in "Marine Small-Scale Fisheries of Orissa: A General Description" BOBP/INF/7, Madras, India, December 1984.

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tional fishing communities. Detailed information about the availability or absence of these facilities at the village and district levels facilitates concentration of effort to provide these facilities in cooperation with other government agencies.

- Areawise information about the distribution of assets makes it possible to assess prevailing ownership patterns, to learn how technologies operate at present, how systems work, whether they promote or hamper a desirable distribution of income. This information helps to identify target groups for credit programmes or other governmental support.

- Information about areawise distribution and concentration of fisherfolk, plus information about fishing grounds and marine resources, can be used to guide population policy. It can help promote alternative employment opportunities in cooperation with other government agencies (in case of overpopulation) or migration of fisherfolk (in case of under-population). It can also promote marine fishing for occupational groups like riverine and estuarine fisherfolk or agricultural labourers by various measures such as providing infrastructural facilities, extending assistance in the form of training, demonstrations, credit, etc.

- Information about areawise distribution of fishing technologies can be used—again, together with information about fishing grounds and marine resources—to evaluate whether the appropriate fishing methods are used along a given stretch of coastline. Or, whether because of constraints such as lack of familiarity, tradition, superstition, etc., fishing technologies which could be gainfully employed are not employed. This information can guide work to diversify fishing effort and promote an optimum allocation of fishing techniques—again, by means of training, demonstration, provision of credit facilities, etc.

- The inforniation mentioned above can also be used to assess the economic balance between craft, gear, labour and marine resources. They can help to identify inadequacies which hamper the optimum utilization of the four components mentioned above and can guide decisions like, for example, which type of new net could still be introduced, taking into account the type and degree of utilization of the present craft and labour capacity.

To utilize census data along the lines described above, data have to be analysed at the district, jurisdiction and village levels to guide practical extension work.

A proper balance of craft, gear and labour ata higher organizationallevel (e.g. district) is a necessary but not a sufficient precondition for a balance at a lower organizational (e.g. village) level, while a balance at a lower level is a sufficient precondition for a balance at a higher level.

For example, if we find a balance of craft, gear and labour in all villages of an extension jurisdiction, the jurisdiction as a whole will also necessarily be balanced. On the other hand, a well balanced jurisdiction may very well consist of totally unbalanced villages.

However, the scope of this paper makes it impossible to analyse the census results for all 236 villages—and for all jurisdictions—separately. While data concerning infrastructure facilities, distribution of fisherfolk households, craft, gear, and distribution of assets have been presented at the jurisdiction and district levels, analysis of the craft-gear-labour balance had to be limited to the district level. The analysis intends merely to demonstrate the method of assessment and to highlight major trends, rather than arrive at detailed conclusions which can guide practical extension work. It is strongly recommended, however, that further assessment at village and jurisdiction levels be carried out by all extension officers along the lines demonstrated in this paper.

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2. METHODOLOGY OF CENSUS

2.1 Population

The census has been limited to artisanal, non-harbour based small-scale marine fisherfolk because they form a homogeneous group in terms of skills, technology, developmental needs, lifestyle, etc., and because they constitute the target group of the marine fisheries extension service. Further, this group accounts for the major share of exploitation of marine resources. Excluded are riverine and estuarine fisherfolk and technologies, harbour-based mechanized trawlers and gillnetters operating from Paradeep, Chandipur, etc., mechanized gillnetters operated by cooperative societies from river mouths, as well as traditional craft owned by non-fisherfolk and rented out to marine fisherfolk.

Though estuarine and riverine fisherfolk might partly exploit the same resources as marine fisherfolk while fishing in the mouth or delta of a river, they have been excluded from this census because their skills and technology and often even their caste/social group, clearly distinguish them from their marine counterparts. They represent development requirements that are better catered to by an inland fisheries extension service.

Harbour-based' mechanized trawlers and gillnetters are omitted because their requirements are altogether different from beach-based artisanal fisheries.

Traditional fishing boats owned by non-fisherfolk (a phenomenon limited to Balasore district) have been omitted because the existence of this phenomenon was not known while planning the census.

2.2 Data collection

The data on size of household, occupation (major or minor time fishing households), number of active fishermen per household, and on ownership of craft and gear have been obtained by interviews with the head of the household. Data on craft and gear are based on physical observations. All information with regard to infrastructure facilities has also been obtained by observation. The raw data for each household and village have been recorded according to a census schedule given in Appendix 3.

Categories and classifications, as well as details of data compilation and aggregation, are found in Appendices 6 and 7.

'Harbour means landing site at the bank of a river with some shore facilities such as workshop, fuel station, packing shed, ice plant, and eventually a jetty. A table showing landing sites, as well as numbers and types of mechanized fishing boats is found in Appendix 8.

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3. MARINE RESOURCES AND PRESENT LEVEL OF EXPLOITATION

The total marine fish catch for Orissa for 1981 as given by the CMFRI (Central Marine Fisheries Research Institute) was 35,655 tonnes.

With a coastline of 480 km which constitutes 16% of the east coast, Orissa produces only 7% of the catch. Per capita production per annum was 1.3 tonne against 2.5 tonne in Andhra Pradesh and 5.4 tonne in Tamil Nadu in 1980.

The catch per hour record provided by the Exploratory Fisheries Project (EFP) of the Government of India, using 17.5 metre vessels of the same horse power and gear from different bases, gives a good indication of fish abundance in the demersal coastal areas of various zones up to a depth of 58 metres. While Andhra Pradesh records 76.6 kg/hr and Tamil Nadu 97.5 kg/hr. the catch per hour in the Orissa coast has been 153.1 kg/hr. The figures are based on average values for five years between 1976—77 and 1980—81 and the differences are significant.

The demersal fisheries potential in the continental shelf of Orissa (20160 km^2) has been estimated at 100,000 to 120,000 tonne of fish. This is a very approximate figure. However, this indicates that the demersal resources are probably largely under-exploited. Pelagic resources are not yet quantified; so also the deeper zones of the shelf. It is only in 1981 that the EFP used larger vessels to fish in depths beyond 70 m. The catch in some areas has been as high as 399654 kg/hr—indicating a high potential.

4. FISHERFOLK AND FISHING ASSETS

4.1 Marine fisherfolk households/active fishermen

The Marine Extension Service, Orissa, is divided into 15 extension jurisdictions or extension centres, each centre covering on an average a 34 km coastline with 16 villages from which marine fishing is carried out.

The following table summarizes the demographic data for the four coastal districts of Orissa.

Table 1: Demographic data by district

	Ganjam	Pun	Cuttack	Balasore
1. Number of marine fishing villages	29	16	7	184
2. Number of marine fisherfolk households—major time and minor time				
a. No. of households	4132	1808	1686	9260
Average no. of fisherfolk households per village	142.5	113	240.9	50.3
b. Average size of household	5.4	6.9	6.1	6.1
c. No. of major time fishing households	3831 (93%)	1602 (88%)	1460 (87%)	7527 (81%)
Average no. of major time fishing households per village	132.1	101.1	208.6	40.9
d. No. of minor time fishing households	177 (4%)	181 (10%)	178 (11%)	1657 (18%)
Average No. of minor time fishing households per village	6.1	11.3	25.4	9
e. No. of single old people households	124 (3%)	25 (2%)	48 (2%)	76 (1%)
Average no. per village	4.3	1.4	6.9	0.5
3. Number of active fishermen	5880	3800	3202	17168

To compare the density of fisherfolk population in the four districts, one considers how long the coastline is in each district and how many of Orissa's marine fisherfolk households and active fishermen live there.

Table 2: Density of fisherfolk population

District	% of Orissa coastline	% of Orissa's fisherfolk households living in the district	% of Orissa s fishermen living in the district
Balasore	27 (130 km)	55	57
Cuttack	28 (135 km)	10	11
Pun	32 (155 km)	11	13
Ganjam	13 (60 km)	24	20

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Table 2 shows clearly that Balasore and Ganjam districts are more densely populated than Cuttack and Purl. Occupying only 40% of Orissa's coastal length, Balasore and Ganjam house more than three-fourths of its marine fisherfolk while Cuttack and Pun (60% of the coastal length) house not even one-fourth.

If we compare the number and size of villages (Table 1), the large number of comparatively small settlements in Balasore contrasts sharply with the small number of big villages in Cuttack, while Ganjam and Pun rank in between.

Regarding the sub-division into major and minor time fisherfolk households in all coastal districts, more than four-fifths of the fisherfolk population spend the major part of their time fishing. The percentage of major time fisherfolk households is highest in Ganjam (93%) and lowest (81%) in Balasore, most probably because of greater alternative employment opportunities in agriculture.

The percentage of single old people households which could be considered as a target group for social welfare measures is very low in all coastal districts.

If we compare the number of active fishermen with the number of fisherfolk households, we arrive at the following ratios (active fishermen per household): Ganjam 1.4; Pun 2.1; Cuttack 1.9; Balasore 1.85.

While Pun, Cuttack and Balasore show similarities, the comparatively small number of active fishermen per household in Ganjam is probably due to the comparatively small family size in this district, which is 5.4 compared to 6.9, 6.1 and 6.1 in other districts.

Table 3 shows the demographic trends at jurisdiction level.

The conclusions concerning density of fisherfolk population derived at the district level can be confirmed with reference to data by jurisdiction. The number of fisherfolk households per jurisdiction ranges from 56 to 3369 households. The jurisdictions with less than 600 households are Konarak and Astarang of Purl district, and Rajnagar and Kujang of Cuttack district, besides Ganjam jurisdiction of Ganjam district.

A similar picture emerges if we take the number of fishing villages. Even though the average number of fishing villages per jurisdiction is 16, a wide variation between different jurisdictions can be observed, the number ranging from one in Konarak jurisdiction of Purl district to 49 in Balasore jurisdiction of Balasore district. The jurisdictions with less than four villages (besides Konarak in Pun district) are the three jurisdictions in Cuttack district.

As regards the size of fishing villages, the data by jurisdiction confirms the trend that has already been indicated at the district level. To answer the question whether the size of fisherfolk villages within a jurisdiction is more or less similar or whether it shows a wide variation, we have to look at the standard deviation of the average size of the villages of the various jurisdictions. The table shows that in all jurisdictions there is a wide variation, the standard deviation ranging between 50% and 100% of the average size in most of the jurisdictions. Those jurisdictions which exceed even 100% are Purl, Kujang and Rajnagar, Mahakalpara, Sonapur and Chatrapur.

The information about major and minor time fisherfolk households can be further specified at the jurisdiction level. The jurisdictions with less than 80% major time fisherfolk are the three northern jurisdictions of Balasore, Baliapal and Bhograi with 77%, 72% and 70%, respectively, as also Ganjam jurisdiction with 67%.

The conclusion that the ratio of the number of households to the number of active fishermen mainly depends on family size, is not easily confirmed at the jurisdiction level. In some cases, jurisdictions with the same average household size show quite a different ratio even though the general tendency remains the same. Therefore, it must be assumed that other regional factors such as economic status, alternative employment opportunities, craft and gear capacity, and cultural factors such as age of initiation of children into work, etc., also play an important role, besides the average household size.

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Table 3: Demographic data by jurisdiction

Item	Ganjam District			Puri District			Cuttack District			Balasore District					
	Sonapur	Chatrapur	Ganjam	Puri	Konarak	Astarang	Kujang	Mahakalpara	Rajnagar	Dhamara	Basudevpur	Gopalpur	Balasore	Baliapal	Bhograi
No. of marine fishing villages	10	12	7	7	1	8	2	3	2	41	14	28	49	27	25
No. of marine fishing households major time and minor time															
Total no. of fisherfolk households	1570	2020	542	1546	56	206	516	835	335	1083	1082	1436	3369	1160	1130
Average no. per village	157	168.3	77.4	220.9	56	25.8	258	278.3	167.5	26.4	77.3	51.3	68.8	43	45.2
SD of average number	134.1	115.4	41.4	358.0	—	18.3	330.92	163.1	229.1	14.9	72.5	47.9	62.4	22.2	22.3
Av. of size of household	4.9	4.9	6.3	5.1	6	7.9	7.00	5.3	6.8	5.5	6.85	5.6	6.95	6.43	5.81
SD of average size	0.83	0.32	0.48	1.33	—	0.8	0.70	0.89	1.1	1.09	1.55	1.02	1.34	1.24	0.93
Total no. of major time fisherfolk households	1515	1955	361	1340	56	206	468	674	318	900	1046	1353	2600	835	793
% of all fisherfolk households	96%	97.1%	67%	87%	100%	100%	91%	81%	95%	83%	97%	94%	77%	72%	70%
Average no. per village	151.5	162.7	51.6	91.4	—	26	234	224.7	159	22	74.71	48.3	53	30.93	31.7
SD of av. no. per village	129.4	22.65	29.5	129.3	—	25.8	296.99	12.95	212.1	12.59	1.76	31.55	20.88	12.27	14.52
Total no. of minor time fisherfolk households	3	3	171	181	—	—	48	116	14	177	—	79	752	312	337
% of all fisherfolk households	0.2%	0.2%	32%	12%	—	—	9%	14%	4%	16%	—	5.5%	22%	27%	30%
Average no. per village	—	—	24.4	25.9	—	—	24	38.7	7	4.3	—	2.8	15.3	11.56	13.5
SD of av. no. per village	—	—	29.7	31.5	—	—	33.94	58.3	—	7.83	—	5.23	20.0	12	14.39
Total no. of single old people's households	52	62	10	25	—	—	0	45	3	6	36	4	17	13	—
% of all fisherfolk households	3%	3%	2%	2%	—	—	—	5%	1%	1%	3%	0.002%	1%	1%	—
Average no. per village	5.2	5.2	1.4	3.6	—	—	—	15	1.5	0.15	2.57	0.14	0.35	0.48	—
SD of av. per village	3.2	2.9	2.4	1.9	—	—	—	1.25	2.12	0.53	1.79	2.12	1.32	1.34	—
No. of active fishermen	1781	3192	907	3265	112	423	783	1837	582	2040	1752	2983	6694	1894	1805

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4.2 Craft and gear

Before going into details of the distribution of craft and gear, differences between north and south Orissa regarding marine ecology are to be kept in mind.

South Orissa, which comprises Ganjam, Pun and the southern part of Cuttack district has a shallow continental shelf and open sandy beaches, while central and northern Cuttack and Balasore are characterized by an extended continental shelf, tidal areas, river mouths and river deltas. The main fisheries in the south are sardines/anchovies, mackerels and prawns, while hilsa and pomfret play a more important role in the north. These differences account for differences in craft and gear between north and south.

Another reason for the different types of craft and gear that are used is the fact that the cultural and ethnic background as well as the professional traditions and skills of the fisher-folk in south Orissa differ considerably from those of the fisherfolk of north Orissa. While the fisherfolk of north Orissa are usually Oriyas and Bengalis, those from south Orissa are usually Telugu.

All these factors are clearly reflected in the types of craft and gear operated in various areas. In the southern districts of Gnnjam and Pun, and partly in Cuttack, log rafts and bar boats are the main crafts in use. Navas from Andhra are seasonally active from October to February. In the north, displacement craft such as Salti, Dhingy/Danga, Patia/Botali, Chhoat and a few motorized gillnetters are in operation, in most cases from creeks and river mouths.

As regards displacement craft, seaworthy types such as Patia/Botali and Chhoat constitute the major portion of craft in Balasore district while less seaworthy types such as Dhingy/Danga constitute the major portion of craft in Cuttack district.

On comparing the total number of boats with the number of active fisherfolk and also with the number of gear, one is struck by the comparatively small number of boats in Balascre district. The reason is that in Balasore, as is traditionally the case also in West Bengal and Bangladesh, the boats are sometimes owned by well-to-do non-fishermen from the village. Since the census covered only fisherfolk households, these boats are not included there.

The type of fishing gear operated reflects clearly the environmental conditions. In the case of gillnets, small and medium mesh sizes aimed primarily at sardines, anchovies, mackerels and prawns are operated in the south, while medium and large mesh sizes meant mainly for hilsa and pomfret are used in the north. Besides gillnets, the typical gear of the north with its tidal areas, are set bagnet, tidal wall net and encircling gillnet while the typical gear of the south is boat seine and lift net. Common to the north and south are beach/shore seines, though of a different design.

The data by jurisdiction provide a more precise picture.

Ganjam district

In all three jurisdictions, there are more small kattumarams (usually operated with sardine nets of small mesh size) than large kattumarams (usually operated with medium mesh gillnets, sometimes also with small mesh nets). However, the number of large kattumarams is greater in Chatrapur jurisdiction than in the other two. This is because of the large number of boat seines, and the lift nets which are operated here.

Beach seines are used in all jurisdictions, with the number decreasing from south to north.

Pun district

Except for the absence of beach seines, the craft and gear pattern in Konarak and Astarang is the same as that in Pun jurisdiction. And in all three jurisdictions, the pattern is just the opposite of that in Ganjam district. First, only large kattumarams (2-section Andhra-type boat kattumarams) are used, and second, medium mesh gill nets greatly outnumber the small mesh gillnets, because prawn fishing is more important than sardine fishing in Pun district.

Table 4: Fishing craft and gear by district

	Item	DISTRICTS				
		Ganjam	Purl	Cuttack	Balasore	Total
Fishing Craft	Kattumaram–Small	1914				
	Large	814				
	Total	2728	1108	141		3977
	Barboat	231		23		296
	Nava		138	93		231
	Salti				87	87
	Dhingy/Danga			862	757	1619
	Patia/Botali				787	787
	Chhoat			5	154	159
	Motorized gillnetter			16	67	83
	Total no. of boats	2959	1288	1140	1852	7239
Fishing Gear	Small mesh gillnets (2-4 cm)					
	Katlala, Kavala, Kokuli, etc. in operational units	2168	294	74		2536
	Medium mesh gillnets (5-6 cm):					
	Jagawala, Kilumala, Nyallala, Behundi etc. in operational units	2186	1041	466	1159	4852
	Large mesh gillnets (10 cm): Phasi					
	Padasilkiwala			7	2854	2861
	Very large mesh gillnets (15-20 cm):					
	Nakuda, Bhekti			63	10	73
	Total no. of drift/bottom gillnets in operational units	4354	1335	610	4023	10322
	Wall nets: Malo, Bedha				424	424
	Set bagnets: Behundi, Dhai				705	705
	Beach seine, shore seines: Bado, sarini, etc.	235	67	39	291	632
	Encircling gillnets: Jangal, Khia badia			35	120	155
	Boat seines: Irgali	580	190	26		796
	Liftnets: Marala	102				102
	Total no. of gear in operational units	5271	1592	710	5563	13136

Note: — Craft and gear classifications are in accordance with the description found in the paper BOBP/WP/24, *Traditional Marine Fishing Craft and Gear of Orissa* by P. Mohapatra (under print).

— Longlines have not been systematically included in the census and are, therefore, not found in this table.

— In Balasore district, in the Astarang jurisdiction of Pun district and especially in the Mahakalpara and Rajnagar jurisdictions of Cuttack district, fishing boats listed in this table are also operated with riverine and estuarine fishing gear. This accounts for the disproportion between boats and gear, which is particularly obvious in the case of Mahakalpara.

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Table 5: Fishing craft and gear by jurisdiction

	ITEM	DISTRICTS															TOTAL (in opera-units)
		GANJAM			PURI			CUTTACK					BALASORE				
		Sonapur	Chatrapur	Ganiam	Puri	Konarak	Astarang	Kujang	Mahakalpara	Rajnagar	Unamara	Basudevpur	Gopalpur	Balasore	Baliapal	Bhograi	
Fishing Craft	Kattumaram—Small	804	740	370													
	Large	226	504	84	893	101	114	141									
	Total	1030	1244	454													
	Bar boat	145	68	18	42			23									296
	Nava				138			93									231
	Salti										83					4	87
	Dhingy/Danga							16	695	151	95			548	113	1	1619
	Patia/Botali										11	272	217	7	99	181	787
	Chhoat									5				18	38	98	159
	Motorized gillnetter								—	16	7			52		8	83
	Total no. of boats	1175	1312	472	1073	101	114	273	695	172	196	272	217	625	250	292	7239
Fishing Gear	Small mesh gillnets (2-4 cm): Katlala, Kavala, Kokuli, etc. (Operational units)	757	1178	233	205	32	57	74									2536
	Medium mesh gillnets (5-6 cm): Jagawala, Kilumala, Nyallala, Behundi, etc. (Operational units)	751	1185	250	844	83	114	331	74	61		384	148	627			4852
	Large mesh gillnets (10-11 cm): Phasi, Padasilkiwala							7			54	509	191	1565	141	394	2861
	Very large mesh gillnets (15-20 cm): Nakuda, Bhekti								30	33		10					73
	Total no. of drift! bottom gillnets (Operational units)	1508	2363	483	1049	115	171	412	104	94	54	903	339	2192	141	394	10322

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Table: 5: Fishing craft and gear byjurisdiction—(contd.)

DISTRICTS

Fishing Gear — ITEM	GANJAM			PURl			CUTTACK			BALASORE						TOTAL (in operational units)
	Sonapur	Chatrapur	Ganiam	Puri	Konarak	Astarang	Kujang	Mahakalpara	Rajnagar	Dhamara	Basudevpur	Gopalpur	Balasore	Baliapal	Bhograi	
Tidal wall nets:																**8495**
Malo, Bedha										214		155	158	42		569
Setbag nets:																
Behundi, Dhai										482.			40	108	25	655
Beach seines																
shore seines																
Bado, Sarini, etc.	138	93	4	67				39					140	32	24	537
Encircling gillnets:																
Jangal, Khia badia								35					69	29	22	155
Boat seines: Irgali, etc.	149	384	47	140	16	34	26									796
Liftnets: Marala		102														102
Total no. of gear	1795	2942	534	1256	131	205	438	178	94	750	903	494	2599	352	465	13136

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Cuttack district

The southernmost jurisdiction, Kujang, shows the same pattern as Pun, except for a few large mesh gillnets which are operated there. This is because the Telugu fishermen, who have settled here, brought along their traditional craft and gear. Prior to their appearance hardly any marine fishing by artisanal fisherfolk was carried on in Kujang jurisdiction.
The number of marine fishing gear is very small compared to the number of boats in the other two jurisdictions. The reason is that most of the boats are used for river and estuarine fishing too. In Mahakalpara, a wide variety of gear is operated—such as encircling gillnets, shore seines, medium and very large mesh size nets—while in Rajnagar only the last two are used.

Balasore district

Of the typical gear of the Balasore coast, encircling gilinets and beach seines are used only in the three northern jurisdictions; set bagnets in all jurisdictions except Basudevpur and Gopalpur because of the absence of river deltas, and tidal wall nets in all jurisdictions except Basudevpur.

Gilinets of large mesh size are operated in all jurisdictions, medium mesh size nets only in Basudevpur, Gopalpur and Balasore and very large mesh nets only in Basudevpur.

Scope for further diversification of fishing methods

In order to achieve a better allocation/distribution and diversification of fishing methods, the following possibilities could be considered:

Ba/asoere: Medium and very large mesh gillnets could also be operated in jurisdictions other than Gopalpur, Balasore and Basudevpur. Encircling gillnets could be operated in Dhamra, Basudevpur and Gopalpur too.

Cuttack: In general a greater quantity of marine gear could be introduced—which could be accompanied by gradual replacement of the present boats with more seaworthy ones. In Mahakalpara, small mesh and large mesh nets could be introduced; in Kujang, large mesh nets, very large mesh nets, encircling nets, or boat seines.

Puri/Gan/am: Large mesh nets could be introduced for night fishing with large kattumarams. In all districts longlines are used only occasionally and in small numbers. With some technical improvements of the existing design, longlines could be used as a regular gear.

4.3 Distribution of assets

The following table shows the ownership pattern with regard to craft and gear for the four coastal districts.

In the two southern districts, the percentage of those who do not own any boat roughly equals the percentage of those who do not own any net. This pattern suggests that on the one hand there is a group of labourers who do not own any assets while on the other hand boats as well as nets are owned by the same households.

The figures for Balasore district look completely different from those of the other three districts. Even though 81% own one or several nets or net pieces, only 17% of the households own a boat and one per cent two or more boats. This confirms the pattern which we mentioned earlier—that many boats in Balasore district are owned by non-fisherfolk. The ownership pattern with regard to nets shows a widespread ownership of small assets such as one net or net piece/share. The reason for this phenomenon is that in Balasore a crew member has to contribute a net piece in order to get a share of the catch. If he cannot provide a net piece he gets a fixed wage per fishing day which is much more unfavourable than a share. The number of owners is rapidly declining when it comes to ownership of more than one net.

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Table 6: Distribution of assets by district*

	Ganjam	Pun	Cuttack	Balasore
Distribution of assets				
a. *Ownership pattern with regard to boats*				
Percentage of households with no boat	37%	54%	49%	81%
Percentage of households with one boat/boat share	36%	26%	36%	17%
Percentage of households with two and more boats	24%	20%	15%	1%
Total	97%	100%	100%	99%
b. *Ownership pattern with regard to gear*				
Percentage of households with no gear	37%	52%	35%	18%
Percentage of households with one gear/gear share	16%	9%	43%	60%
Percentage of households with two gear/gear shares	10%	9%	4%	17%
Percentage of households with three & more gear! shares	35%	29%	18%	4%
Total	98%	99%	100%	99%

*For Cuttack and Balasore districts, the percentage figures refer also to riverine and estuarine gear which are not shown in Tables 4 and 5. In Purl and Cuttack districts, one jurisdiction each could not be considered since no reliable information could be obtained.

The system in Ganjam and Pun is completely different, because there are separate boat, net and labour shares. This is clearly reflected in the prevailing ownership pattern. While those households which do not own any net and/or boat form the biggest group, the second biggest group is formed by those who own one boat and/or several net pieces. The group of households who own two and more boats is still around a fifth of the total number of households.

This shows a certain concentration of ownership which might be closely related to operational and managerial skills available with the respective households.

The larger number of non-owning labourers in Pun district might be due to operational aspects, because larger kattumarams are operated there which require a bigger crew.

Cuttack district shows a pattern similar to that in Purl and Ganjam.

The data on distribution of assets by jurisdiction confirms the trends already observed in the districts. Chatrapur jurisdiction shows a strong concentration of ownership, most probably because the number of lift nets which require four kattumaramsfor their operation and the number of boat seines that require two kattumarams is larger than in other jurisdictions. Also perhaps because these craft and gear combinations might be owned by individual households.

In Konarak jurisdiction, which consists of only one village even though the concentration of ownership is even greater than in Chatrapur, the number of non-owners of boat as well as of

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Table 7: Distribution of assets by jurisdiction

ITEM	DISTRICTS														
	GANJAM			PURI			CUTTACK			BALASORE					
	Sonapur	Chatrapur	Ganjam	Puri	Konarak	Astarang	Kujang	Manakalpara	Rajnagar	Dhamara	Basudevpur	Gopalpur	Balasore	Baliapal	Bhograi
Distribution of assets (Craft)															
% of households which do not own a boat or boat share	32%	40%	43%	56%	5%	—	61%	21%	—	87%	75%	86%	80%	79%	79%
% of households which own 1 boat or boat share	60%	19%	42%	26%	32%	—	28%	62%	—	12%	23%	13%	18%	19%	17%
% of households who own 2 and more boats	8%	40%	15%	18%	63%	—	11%	19%	—	2%	1%	1%	12%	1%	4%
Total	100%	99%	100%	100%	100%		100%	101%		101%	98%	100%	100%	100%	100%
Distribution of assets (Gear)															
% of households which do not own a net/net share	32%	39%	43%	54%	5%	—	62%	6%	—	30%	4%	12%	26%	18%	16%
% of households which own 1 net or net share	25%	7%	25%	9%	—	—	11%	77%	—	50%	72%	57%	63%	59%	59%
% of households which own 2 nets or net shares	10%	9%	16%	8%	27%	—	9%	—	—	17%	23%	18%	11%	20%	16%
% of households which own 3 or more nets or net shares	33%	43%	15%	28%	68%		18%	17%		18%	11%	13%	—	3%	8%
Total	100%	98%	99%	99%	100%		100%	100%		100%	100%	100%	100%	100%	99%

For Cuttack and Balasore districts the percentage figures refer also to riverine and estuarine gear which are not shown in Tables 4 & 5.

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gear is almost negligible. The reason might be that the majority of the fishing population in Konarak migrate regularly between Andhra and Orissa. They are well equipped with craft and gear and hire labour locally whenever required.

In Cuttack district, Kujang follows the pattern which prevails in the southern districts though with an extraordinarily high proportion of non-owners. Mahakalapara, on the other hand, follows the pattern of Balasore only with regard to gear. But boats are owned here by the fisherfolk themselves.

What is the scope for intervention to influence the ownership pattern, so that it meets operational requirements better and facilitates a desirable distribution of income? The possibility of helping artisanal fisherfolk in Balasore to acquire their own boats should be considered, so that the benefits of fishing operations would accrue in the first place to the operators.

Another advantage from an operational point of view could be that all decision-making functions as to where and when to go fishing, with what gear, etc., would be with the person who is actually in charge of the fishing operation.

The capital cost of the boats, taking into account the revenue from fishing, would be within the reach of artisanal fisherfolk, if institutional credit would assume a role in financing.

Regarding south Orissa, it is difficult to say what degree of concentration of ownership would be desirable. Among other things, two aspects have to be considered. The first one concerns the question of how many craft and gear can be owned by a given number of households without creating excess capacity. This question will be dealt with in the next section. The second aspect is how the number should be distributed. It comes down to the basic question whether boats should be owned by both the households or by only one, while the members of the other work as labourers. This question should not be answered schematically.

One has to bear in mind that ownership should go along with operational skill and a basic managerial ability, such as being able to recruit and organize a crew, organize sale of fish, etc. On the other hand, a concentration of assets at the household level can result in under-utilization of the assets if it does not go along with operational ability or capacity. Therefore, the problem should be decided at the village level.

4.4 Balance between labour-craft-gear

4.4.1 *Method of assessment*

The assessment of the balance between labour, craft and gear consists of two separate assessments, namely, an assessment of the craft-gear balance and then an assessment of the balance between technology and labour.

By a "balanced relationship" we understand that all labour, craft and gear capacities are utilised optimally. A suboptimal (in general, non-optimal) usage results in an imbalance.

In evaluating the balance, we take into account the fact that while a boat can be operated whenever the sea is negotiable a net need not be used on those days when the catch is expected to be poor. Thus, a certain under-utilization of net capacity would appear inevitable. An excess net capacity of up to 30 per cent is generally thought of as justified and is referred to as "permissible" imbalance.

Besides this, we must also take into account the fact that the operation of some types of gear precludes the use of some other types of gear, i.e., their use is mutually exclusive in that they are not operated on the same day. These mutually exclusive combinations are listed below:

- Beach/shore seines — gillnets
- Boat seines — gillnets
- Tidal wall nets — gillnets
- Boat seines — lift nets

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Whether they are actually operated simultaneously or not depends on the location of fishing grounds, agreements among the villages, etc. Similar considerations apply also for the labour-technology balance.

Here and elsewhere it has to be established separately in each case whether an observed under-capacity or overcapacity is not justified under the particular conditions of that area—such as bottom configurations of fishing grounds, operational patterns, etc.

Assessment of craft-gear balance

The assessment proceeds in four steps.

1. *Craft-Gear Combinations (CGC):* All craft-gear combinations operated in a given area are to be listed along with their maximum period of operation. The gear has to be expressed in terms of average operational units (length/no, of pieces joined together).
2. *Craft-Gear Ratio (CGR):* For all combinations the craft-gear ratio has to be stated (e.g. how many craft are required to operate a gear) according to formula $CGR = \frac{C}{}$
3. *Actual Craft-Gear Balance (ACGB):* The ACGB has to be calculated for each CGC according to the formula:

$$ACGB = \frac{}{Nc} \times CGR \times 100 \text{ (in \%)}$$

Where NG is the number of gear
Nc is the number of craft
CGR is the craft-gear ratio

4. *Monthly Aggregated Craft-Gear Balance (MACGB).-* To calculate the Monthly Aggregated Craft-Gear Balance (MACGB), all ACGBs are entered in a timetable which is vertically divided into months and horizontally divided into craft types. The MACGB is calculated for each craft type by adding up the ACGBs for each month.

Assessment of labour-technology balance

The assessment proceeds again in steps.

1. *Labour-Technology Ratio (LTR)* is calculated for each craft-gear combination according to the formular $LTR = \frac{}{}$ where L is the number of crew to operate the craft-gear combination and T is one unit of operation of that combination.
2. *The Actual Labour Requirement (ALR):* The total number of labourers required to operate the craft-gear combinations of a given area is calculated for each CGC according to the formula NG x LTR where NG is the number of gear operated in a given area.
3. *Labour Utilization Factor (LUF):* The LUF in % is calculated according to the formula $\frac{ALR}{L} \times 100$, where L is the total number of active fishermen at a given area. It shows the portion of the total labour force which is absorbed by the craft-gear combination. LUF has to be calculated for each type of craft-gear combination.
4. *Monthly Aggregated Labour-Technology Balance (MALTB):* To calculate the MALTB all LUF are entered into a timetable which is divided in months. The MALTB for each month is calculated by adding up all LUFs.

In what follows, the balance between labour, craft and gear is assessed for the four coastal districts. This is done in order to analyse the overall trends and to demonstrate the method of assessment. As mentioned earlier, the district-level assessment is not a substitute for assess-

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ments by village and by jurisdiction. There have to be separate assessments at the three levels; over-utilization and under-utilization of capacity have to be identified as well to direct and concentrate developmental efforts in a meaningful way.

4.4.2 *Present disproportions and inadequacies*

4.4.2.1 Ganjam district

A. Craft-Gear Balance

A.1 Craft-Gear Combination (CGC)

	Craft-Gear Combination	*Period of Operation*
1.	Bar boat with beach seine	October-April (7 months)
2.	Kattumaram with small mesh gillnet	October-March (6 months)
3.	Kattumaram with medium mesh gillnet	October-August (11 months)
4.	Kattumaram with boat siene	February-August (7 months)
5.	Kattumaram with lift net	February-April (3 months)

A.2 Craft-Gear Ratio (CGR)

	CGC	*CGR*
1.	Bar boat with beach seine	1 :1 —1
2.	Kattumaram with small mesh gillnet	1 :1 1
3.	Kattumaram with medium mesh gillnet	1 :1 1
4.	Kattumaram with boat seine	2:1 **2**
5.	Kattumaram with lift net	4:1 .4

A.3 Actual Craft Gear Balance (ACGB)*

	CGC	ACGB $\frac{N_G}{N_C}$ x CGR x 100
1.	Bar boat with beach seine	$\frac{235}{231}$ **x 1 x 100** = 102%
2.	Kattuniaram with small mesh gillnet	$\frac{2168}{2728}$ **x 1 x 100** **79%**
3.	Kattumaram with medium mesh gillnet	$\frac{2186}{2728}$ **x** 1 × 100 80%
4.	Kattumaram with boat seine	$\frac{580}{2728}$ **x 2 x 100** **42%**
5.	Kattumaram with lift net	$\frac{102}{2728}$ x 4 x 100 15%

*The difference in length of operational net units between large and small kattumarams need not be taken into account because it has already been considered while calculating the number of nets.

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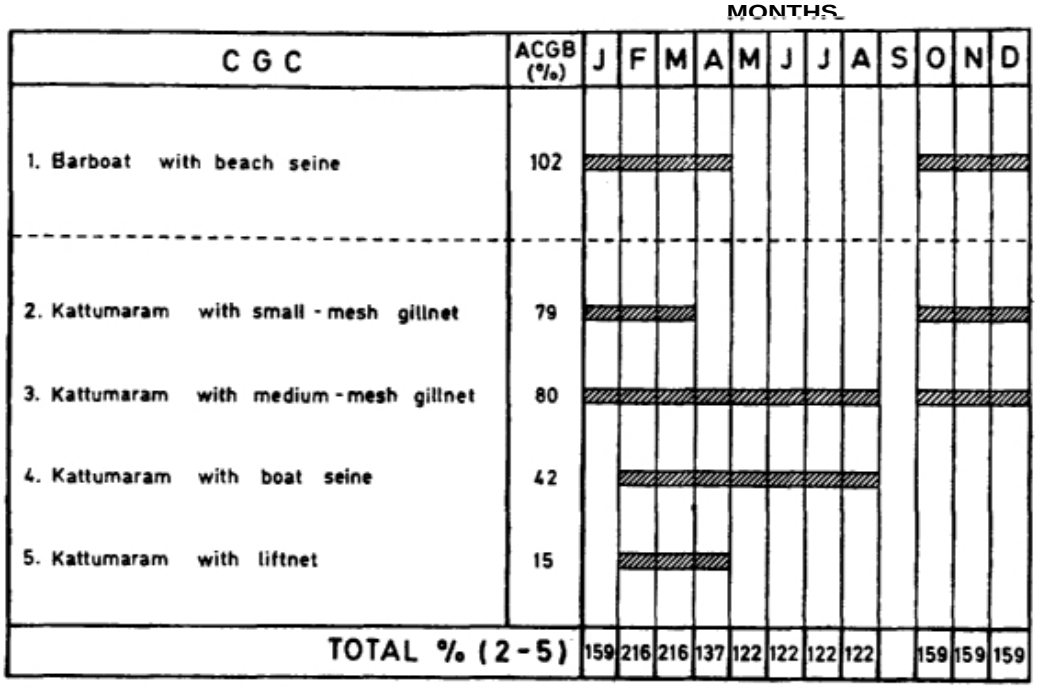
A.4 Monthly Aggregated Craft-Gear Balance (MACGB)



The table shows a well balanced relationship (102%) between beach seines and bar boats.

In the case of small and large kattumarams on the one hand, and small mesh gillnets, medium mesh gillnets, boat seines and liftnets on the other hand, a slight imbalance (159%) is shown for the months from October to January, a heavy imbalance in February and March (216%) and a rough balance from April to August; 130%isconsidered as balanced, becausesmall and large kattumarams are operated with both types of gillnets (see 4.4.1).

The two months of heavy imbalance seem to be unavoidable because during these months the end of small mesh gillnet fisheries overlaps with the beginning of boat seine and lift net operations. The slight imbalance from October to January occurs because of simultaneous operation of small and medium mesh gillnets. Taking into account the rocky bottom of many fishing grounds in Ganjam district, the excess capacity in gears might be attributed to the fact that spare nets are kept to replace damaged nets and do not reflect overcapacity.

Even though craft and gear are roughly balanced for the whole of Ganjam district, further analysis at jurisdiction and village levels using the method demonstrated here has to be carried out to guide practical developmental efforts.

If we consider the mutual exclusiveness of boat seines/liftnets and gillnets the following picture of utilisation of boat capacity emerges.

Month

	J	F	M	AM		J	J	A	S	O	N	D
CGC Considered[1]	**2,3**	**2,3**	**2,3**	**3**	**3**	**3**	**3**	**3**		**2,3**	**2,3**	**2,3**
MACGB (%)	159	159	159	80	80	80	80	80		159	159	159

[1]The most craft-intensive gear have been considered in terms of ACGB.

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Taking into account the mutual exclusiveness of gear, the period from April to August shows an underutilisation of boat capacity, which could be overcome by introduction of more boat seines, if labour force and marine resources can support the effort

B. Labour-Technology Balance

B.1 Labour-Technology Ratio' (LTR)

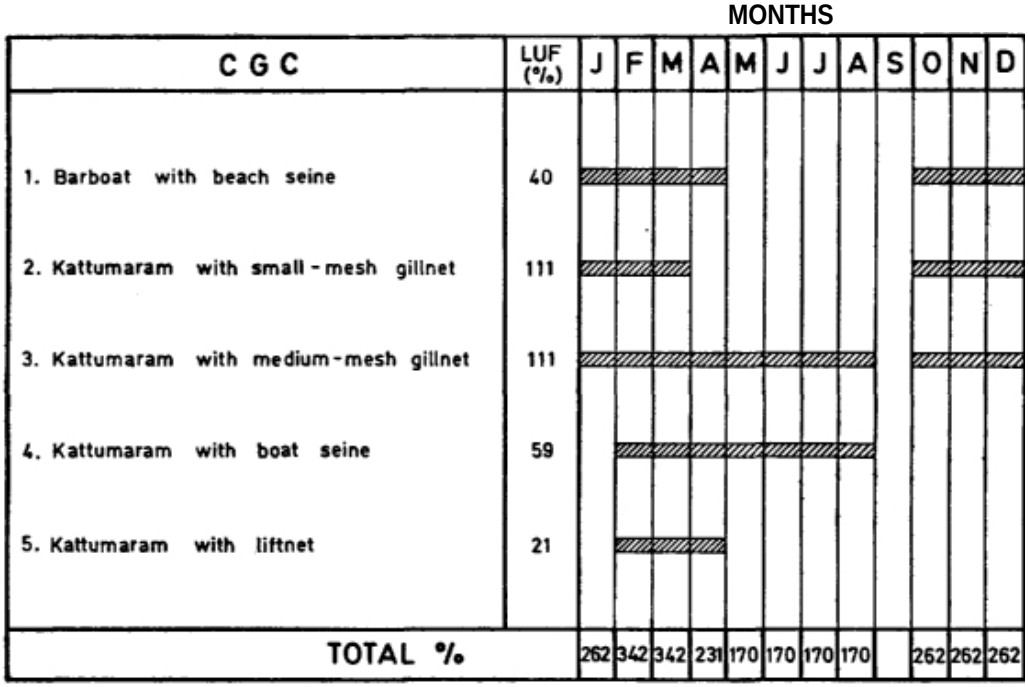
CGC	*L TA*
1. Barboat with beach seine	10 (32) :1 = 10 (32)
2. Kattumaram with small mesh gillnet	**3 :1=3**
3. Kattumaram with medium mesh gilinet	**3 :1=3**
4. Kattumarams with boat seine	6 **:1=6**
5. Kattumarams with liftnet	**12 :1 12**

B.2 Actual Labour Requirement (ALR)

B.3 Labour Utilization Factor (LUF)

CGC	NG	LTR	ALR	LUF
1	235	10(32)	2350	40%
2	**2168**	**3**	**6504**	**111%**
3	2186	3	6558	111%
4	580	6	3480	51%
5	**102**	**12**	**1224**	**21%**

B.4 Monthly Aggregated Labour-Technology Balance (MALTB)



If we consider the mutual exclusiveness of beach seines and gillnets, boat seines and liftnets, boat seine/liftnets and gillnets the following picture emerges:

[1]It is assumed that out of the 32 persons who are required for a beach seine operation only 10 are from among active fishermen. The others might be women, children and other members of the village.

<<

	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
CGC considered[1]	2,3	2,3	2,3	3	3	3	3	2	2,3	2,3	2,3	
MALTB	222	222	222	111	111	111	111	111	222	222	222	

The table shows an excess capacity in fishing technology with regard to the number of active fishermen from October until March which is caused by the large number of small mesh and medium mesh gill nets. If we take 130% as the maximum permissible MALTB, the excess-capacity amounts to 92%.

Even if we take into account the need for spare nets, the excess capacity remains obvious. One reason might be that in some households (see Table 7) craft and gear are symbols of social status. Economic and operational factors are in such cases immaterial.

4.4.2.2 Pun district

A. Craft-Gear Balance

A.1 Craft-Gear Combination (CGC)

Craft-Gear Combination	*Period of Operation*
1. Barboat with beach seine	October-April (7 months)
2. Kattumaram with small mesh gillnet	October-March (6 months)
3. Kattumaram with medium mesh gillnet	October-August (11 months)
4. Kattumaram with boat seine	February-August (7 months)
5. Nava with medium mesh gillnet	October-March (6 months)

A.2 Craft-Gear Ratio (CGR)

CGC	*CGR*
1. Barboat with beach seine	1
2. Kattumaram with small mesh gillnet	1
3. Kattumaram with medium mesh gillnet	1
4. Kattumaram with boat seine	2
5. Nava with medium mesh gillnett	4

A.3 Actual Craft-Gear Balance (ACGB)

CGC	*ACGB*
1. Barboat with beach seine	$\frac{67}{42} \times 1 \times 100 = 159\%$
2. Kattumaram with small mesh gillnet	$\frac{294}{1108} \times 1 \times 100 = 26\%$
3.* Kattumaram with medium mesh gillnet	$\frac{1041}{1108+(138)} \times 1 \times 100 = 83\%$
4. Kattumaram with boat seine	$\frac{190}{1108} \times 2 \times 100 = 35\%$

[1]While deciding which CGC has preference, the more labour-intensive one has been chosen.
*The Navas take double the amount of gear, but operate only for half the period a kattumaram operates. Therefore, the number can simply be added to the number of kattumarams.

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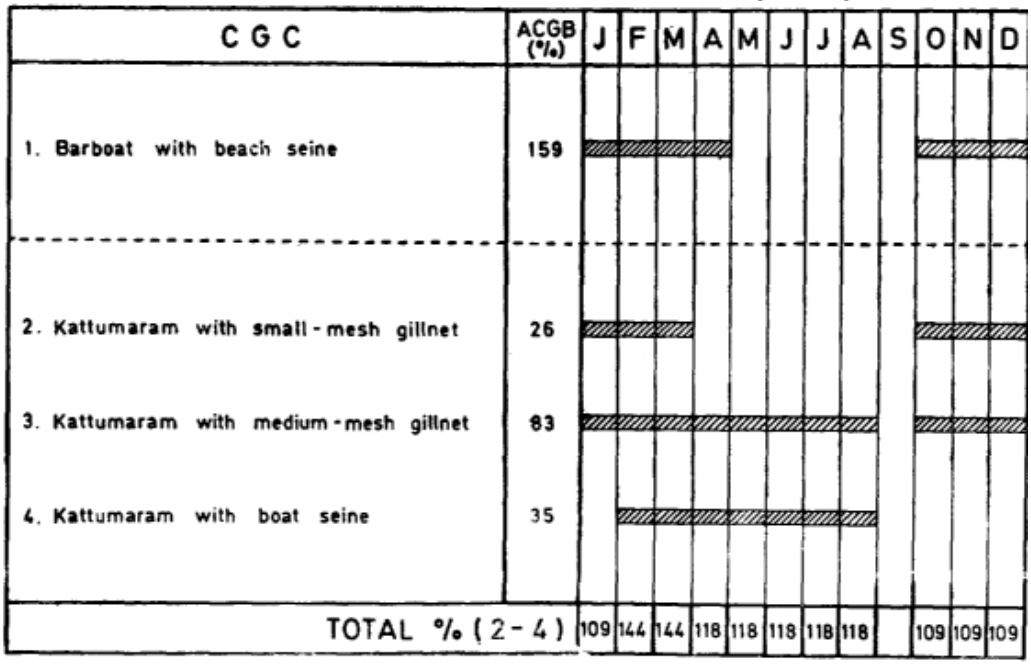
A.4 Monthly Aggregated Craft-Gear Balance (MACGB)

MONTHS



In the case of kat.tumarams, gillnets and boat seines (CGC 2-4), the craft/gear ratio is well balanced throughout the year except for February and March, because of overlapping fisheries. In the case of CGC1, there is an excess capacity of beach seines, while the number of barboats is below capacity. If we consider the mutual exclusiveness of boat seines and gillnets the following picture of utilization of boat capacity emerges.

Month	J	F	M	A	M	J	J	A	S	O	N	D
CGC considered'	2,3	2,3	2,3	3	3	3	3	3		2,3	2,3	2,3
MACGB	109%	109%	109%	83%	83%	83%	83%	83%		109%	109%	109%

The table shows a low degree of utilization of craft from October to March and a clear unutilized capacity of craft from April to August.

B.1 Labour-Technology Ratio (LTR)

	CGC	*LTR*
1.	Barboat with beach seine	10(32) : 1 = **10(32)**
2.	Kattumaram with small mesh gillnet	3:1=3
3.	Kattumaram with medium mesh gillnet	3:1=3
4.	Kattumaram with boat seine	6:1=6

8.2 Actual Labour Requirements (ALR)

B.3 Labour Utilization Factor (LUF)

CGC	NG	LTR	ALR	LUF
1	67	10	670	18%
2	294	3	882	23%
3	1041	3	3123	82%
4	190	6	1140	30%

L=3800

'The most craft intensive gear have been considered in terms of ACGB.

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B.4 Monthly Aggregated Labour-Technology Balance

MONTHS

If we consider the mutual exclusiveness of beach seines and gillnets and boat seines and gillnets, the following picture emerges:

Month	J	F	M	A	M	J	J	A	S	0	N	D
CGC considered'	2,3	2,3	2,3	3	3	3	3	3		2,3	2,3	2,3
MALTB	105%	105%	105%	82%	82%	82%	82%	82%		105%	105%	105%

'The more labour intensive CGC has been chosen.

Taking into consideration that a below-capacity figure of 30% for labour is acceptable, as discussed earlier, the table shows an excess capacity of labour from March to August.

Regarding the distribution of assets (see Table 7) we find a large proportion of fisherfolk in Pun jurisdiction who do not own a net or a boat compared to Ganjam district where such a porportion is small. Thus the 'underemployment' in Pun district could be overcome by introduction of more gillnets of medium mesh and more boat seines to households which do not as yet own any assets, provided of course, the marine resources are sufficient to sustain the increased fishing effort.

4.4.2.3 Cuttack district

A. Craft-Gear Balance

A.1 *Craft-Gear Combination1*	*Period of Operation*
1. Small mesh gillnet with....	October-April (7 months)
2. Medium mesh gillnet with....	October-August (11 months)
3. Large mesh gillnet with....	October-August (11 months)
4. Very large mesh gillnet with....	October-August (11 months)
5. Shore seines with....	October-April (7 months)
6. Boat seines with....	February-August (7 months)
7. Encircling gillnet with....	October-April (7 months)

'To simplify the calculation it is assumed that all boats are operated with all gear. In practice we find various types of combinations in Cuttack district which justify this assumption.

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A.2 Craft-Gear Ratio (CGR)

CGC	*CGR*
1. Small mesh gillnet with....	1
2. Medium mesh gillnet with....	1
3. Large mesh gillnet with....	I
4. Very large mesh gillnet with....	1
5. Shore seines with....	**2.5'**
6. Boat seines with....	**2**
7. Encircling gillnet with....	**2**

A.3 Actual Craft-Gear Balance (ACGB)

CGC	*ACGB*
1. Small mesh gillnet with....	$\frac{74}{1140} \times 1 \times 100 = 6\%$
2. Medium mesh gillnet with.	$\frac{466}{1140} \times 1 \times 100 = 41\%$
3. Large mesh gillnet with....	$\frac{7}{440} \times 1 \times 100 \times 2\%$
4. Very large mesh gillnet with.	$\frac{63}{1140} \times 1 \times 100 = 5\%$
5. Shore seines with.	$\frac{39}{1140} \times 2.5 \times 100 = 8\%$
6. Boat seines with....	$\frac{26}{1140} \times 2 \times 100 = 5\%$
7. Encircling gillnet with....	$\frac{35}{1140} \times 2 \times 100 = 6\%$

A.4 Monthly Aggregated Craft-Gear Balance (MACGB)

MONTHS

CGC	ACGB (%)	J	F	M	A	M	J	J	A	S	O	N	D
1. Small-mesh gillnet with...	6	▨	▨	▨	▨						▨	▨	▨
2. Medium-mesh gillnet with...	41	▨	▨	▨	▨	▨	▨	▨	▨		▨	▨	▨
3. Large-mesh gillnet with...	2	▨	▨	▨	▨	▨	▨	▨	▨		▨	▨	▨
4. Very large-mesh gillnet with...	5	▨	▨	▨	▨	▨	▨	▨	▨		▨	▨	▨
5. Shore seine with...	8	▨	▨	▨	▨						▨	▨	▨
6. Boat seine with...	5		▨	▨	▨	▨	▨	▨	▨				
7. Encircling gillnet with...	6	▨	▨	▨	▨						▨	▨	▨
TOTAL %		68	73	73	73	53	53	53	53		68	68	68

'The sarini shore seine requires 2 to 3 boats for its operation.

<<

Without taking into account the mutual exclusiveness of fishing methods, an excess capacity of boats can be observed throughout the year. The excess capacity is however absorbed by estuarine and riverine gear which is not shown here.

B. Labour-Technology Balance

B.1 Labour-Technology Ratio (LTR)

	CGC	*LTR*
1.	Small mesh gillnet with....	**2**
2.	**Medium mesh gillnet with....**	**4**
3.	Large mesh gillnet with.	6
4.	Very large mesh gillnet with....	6
5.	**Shore seines with....**	15
6.	Boat seines with....	6
7.	Encircling gillnet with.	**12**

B.2&

B.3 Actual Labour Requirement (ALR) and Labour Utilization Factor (LUF)

CGC	NG	LTR	ALA	LUF
1	74	2	148	5%
2	**466**	**4**	**1864**	**58%**
3	**7**	**6**	**42**	**1%**
4	63	6	378	12%
5	39	15	585	18%
6	26	6	156	5%
7	35	12	420	13%

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B.4 Monthly Aggregated Labour-Technology Balance

MONTHS

CGC	LUF (%)	J	F	M	A	M	J	J	A	S	O	N	D
1. Small-mesh gillnet with...	5												
2. Medium-mesh gillnet with...	58												
3. Large-mesh gillnet with...	1												
4. Very large-mesh gillnet with...	12												
5. Shore seine with...	18												
6. Boat seine with...	5												
7. Encircling gillnet with...	13												
TOTAL %		107	112	112	112	76	76	76	76		107	107	107

The table shows that ratio between craft gear and labour is balanced at a very low level during the major part of the year and that there is an excess of labour from May until August.

<<

If we consider the mutual exclusiveness of fishing methods the following figures are obtained

	Month											
	J	F	M	A	M	JJ		A	S	0	N	D
CGC'	**1-4,7**	**1-4,7**	**1-4,7**	**1-4,7**	**2-4**	**2-4**	**2-4**	**2-4**		**1-4,7**	**1-4,7**	**1-4,7**
MALTB	**89%**	**89%**	**89%**	**89%**	**71%**	**71%**	**71%**	**71%**		**89%**	**89%**	**89%**

[1]The most labour intensive fishing methods have been taken into account.

This table shows an even greater excess of labour, when compared to actual requirements of labour than the previous one. Introduction of more medium and large mesh gillnets, which could be operated by all boat types, should be considered. More boat seines, to improve the **utilization of labour capacity in Cuttack district, could also be considered.**

It should, however, be noted that at present excess labour from marine fishery might be absorbed by riverine and estuarine fishing.

4.4.2.4 Balasore district'

A. Craft-Gear Balance2

A.1 *Craft-Gear Combination3*	*Period of Operation*
1. Tidal wall net	**October-August (11 months)**
2. Set bagnet	**October-August (11 months)**
3. Encircling gillnet	**October-April (7 months)**
4. Shore seine	**October-April (7 months)**
5. Medium mesh gillnet	**October-August (11 months)**
6. Large mesh gillnet	**October-August (11 months)**
7. Very **large mesh gilinet**	February-April (3 months)

A.2 Craft-Gear Ratio (CGR)

CGC	*CGR*
1. Tidal wall net	**0**
2. Set bagnet	**1:1=1**
3. Encircling gillnet	**5:1=5**
4. Shore seine	**2.5 : 1 = 2.5**
5. Medium mesh gillnet	**1:1=1**
6. Large mesh gillnet	**1:1=1**
7. Very large mesh gillnet	**1:1=1**

1For Balasore district, no mutually exclusive fishing methods are considered because of the extended shallow inshore area.

2It is again assumed that all gear types are operated with all boat types.

3As the data were obtained too late, the southern part of Balasore jurisdiction (35 villages) has not been included in the calculations.

<<

A.3 Actual Craft-Gear Balance (ACGB)

	CGC	*ACGB*
1.	Tidal wall net	
2.	Set bagnet	$\frac{705}{1852} x\ 1 \times 100 = 38\%$
3.	Encircling gillnet	$\frac{120}{1852} \times 5 \times 100$ 32%
4.	Shore seine	$\frac{291}{1852} \times 2.5 \times 100 = 39\%$
5.	Medium mesh gillnet	$\frac{1159}{1852} \times 1 \times 100 = 63\%$
6.	Large mesh gillnet	$\frac{2854}{1852} \times 1 \times 100 = 154\%$
7.	Very large mesh gillnet	$\frac{10}{1852} \times 1 \times 100 = 1\%$

A.4 Monthly Aggregated Craft-Gear Balance (MACGB)

MONTHS

CGC	ACGB (%)	J	F	M	A	M	J	J	A	S	O	N	D
1. Tidal wall net	-												
2. Set bagnet	38												
3. Encircling gillnet	32												
4. Shore seine	39												
5. Medium - mesh gillnet	63												
6. Large - mesh gillnet	154												
7. Very large - mesh gillnet	1												
TOTAL % (2 - 7)		326	327	327	327	255	255	255	255		326	326	326

Throughout the year an insufficiency of boats in relation to gear can be observed, which is, however, compensated by renting boats from non-fisherfolk. These, however, have not been included in the census.

B. Labour-Technology Balance

B.1 Labour-Technology Ratio (LTR)

	CGC	*L TR*
1.	**Tidal wall net**	**10 :1 =10**
2.	Set bagnet	**2:1 =3**
3.	**Encircling gillnet**	35 : 1 **=35**
4.	**Shore seine**	30 : 1 **=30**
5.	Medium mesh gillnet	**4:1 =4**
6.	Large mesh gillnet	**4:1 =4**
7.	Very large mesh gillnet	10 : 1 = 10

<<

B.2 Actual Labour Requirement (ALR)

B.3 Labour Utilization Factor (LUF)

CGC	NG	LTR	ALR	LUF
1	424	10	4240	25%
2	705	3	2115	12%
3	120	35	4200	24%
4	291	30	8730	51%
5	1159	4	4636	27%
6	2854	4	11416	66%
7	10	10	100	1%
			L=17168	

B.4 Monthly Aggregated Labour-Technology Balance (MALTB)

MONTHS

CGC	LUF (%)	J	F	M	A	M	J	J	A	S	O	N	D
1. Tidal wall net	25												
2. Set bagnet	12												
3. Encircling gillnet	24												
4. Shore seine	51												
5. Medium - mesh gillnet	27												
6. Large - mesh gillnet	66												
7. Very large - mesh gillnet	1												
TOTAL %		205	206	206	206	130	130	130	130		205	205	205

The table shows that the labour supply is less than required from October until April, the period when all major types of gear are operated.

From May to August, the labour supply matches requirements, considering 130% as the optimum labour-technology balance.

4.5 Summary

Conclusions relating to the planning of extension work, which can be drawn from the results of the demographic and technological census can be summarized with regard to the different types of action required. The first one concerns increases in quantities of craft, gear or labour now available. The second one consists of qualitative adjustments and diversification without any quantitative change.

<<

A.3 Actual Craft-Gear Balance (ACGB)

CGC	*A CGB*
1. Tidal wall net	
2. Set bagnet	$\frac{705}{1852}$ x 1 x 100 = **38%**
3. Encircling gillnet	$\frac{120}{1852}$ X **5 x 100** = **32%**
4. Shore seine	$\frac{291}{1852}$ x 2.5 x 100 = 39%
5. Medium mesh gillnet	$\frac{1159}{1852}$ X 1 X 100 = 63%
6. Large mesh gillnet	$\frac{2854}{1852}$ x1 x100=154%
7. Very large mesh gillnet	$\frac{10}{1852}$ x1 x100=1%

A.4 Monthly Aggregated Craft-Gear Balance (MACGB)

MONTHS

CGC	ACGB (%)	J	F	M	A	M	J	J	A	S	O	N	D
1. Tidal wall net	-												
2. Set bagnet	38												
3. Encircling gillnet	32												
4. Shore seine	39												
5. Medium - mesh gillnet	63												
6. Large - mesh gillnet	154												
7. Very large - mesh gillnet	1												
TOTAL % (2 - 7)		326	327	327	327	255	255	255	255		326	326	326

Throughout the year an insufficiency of boats in relation to gear can be observed, which is, however, compensated by renting boats from non-fisherfolk. These, however, have not been included in the census.

B. Labour-Technology Balance

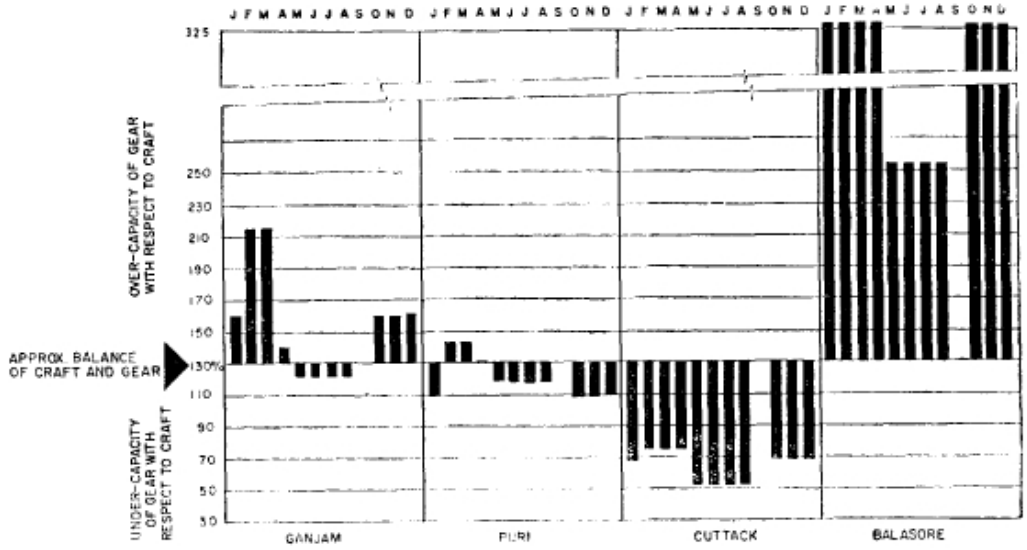
8.1 Labour-Technology Ratio (LTR)

CGC	*L TR*
1. Tidal wall net	**10 :1 =10**
2. Set bagnet	2:1 **=3**
3. Encircling gillnet	**35** : 1 **=35**
4. Shore seine	30 : 1 **=30**
5. Medium mesh gillnet	4:1 =4
6. Large mesh gillnet	4:1= 4
7. Very large mesh gillnet	10 :1 = 10

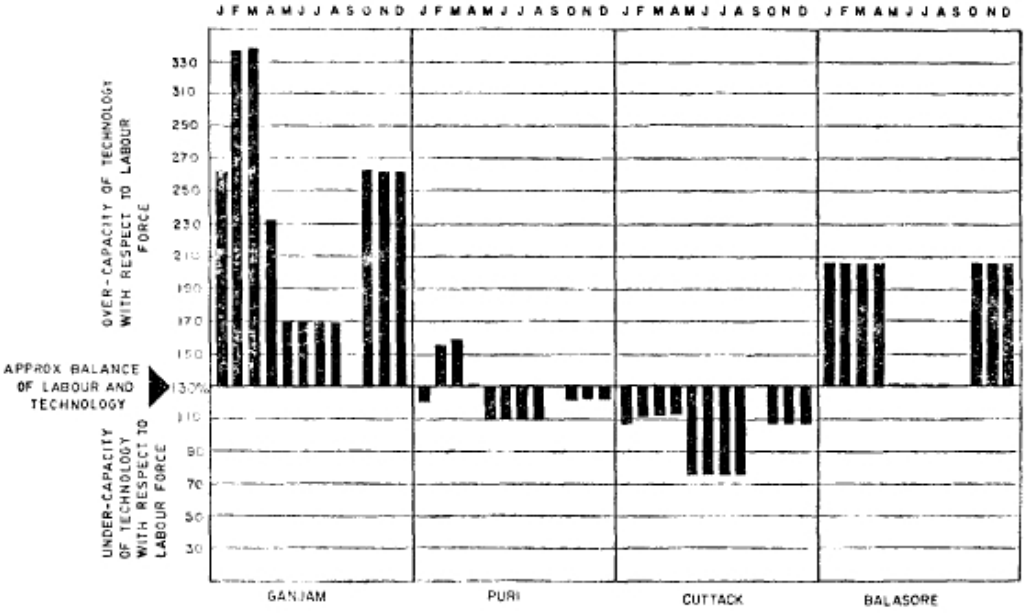
<<

The following graphs summarize the monthly aggregated craft-gear balance as well as the labour technology balance for the four districts:

Monthly Aggregated Craft-Gear Balance[1] — Comparison by district



Monthly Aggregated Labour-Technology Balance — Comparison by district



As far as the first type of conclusion is concerned the following inferences can be drawn from the data.

1. Cuttack district and Konarak and Astarang jurisdictions of Purl have reLtively low fisherfolk populations. Even then in relation to the marine craft and gear counted in the district an excess capacity of labour can be observed in Cuttack district and during certain months in Pun district. The reason is that people living along the coastline of northern Pun and Cuttack districts are traditionally agriculturists or riverine and estuarine fisherfolk, who also operate estuarine and riverine gear and work during certain months of the year as agriculturists or agricultural labourers.

'For Ganjam and Pun districts bar boats and beach seines have been excluded.

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Only recently has the situation started to change with the migration of Telugu fisherfolk from Ganjam district to the Konarak and Kujang jurisdictions. As a result, the local population has also taken up marine fishing. Initially, only fishing methods operated close to the shore, such as beach seining, are being employed.

The marine resources do not seem to pose any obstacle to the introduction of additional doses of technology or of human resources, as is shown by the recent establishment of an artisanal fishing base by Telugu fisherfolk next to Paradeep port.

However, these changes have not been supported by organized extension programmes, such as provision of infrastructural facilities, training, advice, technical support, institutional finance, allotment of land, etc. If extension services concentrate on promoting marine fishing in the northern part of Pun district and all of Cuttack district, additional employment opportunities are likely to be created and the degree of exploitation of marine resources could be increased. The major obstacle to be surmounted might be opposition from local groups which have so far managed to attract the major part of government assistance in the respective areas.

An excess of technology with respect to the number of fishermen has been observed in Ganjam and Balasore districts. It is suggested that in future, subsidy and loan schemes for acquisition of craft and gear should carefully consider whether sufficient labour is available in an area or village to operate additional fishing technology or limit the approach to replacement of worn-out equipment.

As far as the balance of craft and gear is concerned, an excess capacity of fishing gear with respect to craft has been observed in Balasore district. Future schemes for acquisition of craft and gear should take this imbalance seriously into consideration and try to rectify it.

2. Another possible way of increasing the fishing effort is to introduce traditional fishing gear in areas where it could be gainfully operated but where it has not been operated so far. The census data regarding the distribution of craft and gear by jurisdiction show that not all craft and gear which suit a certain district or area are used in all jurisdictions of the district even though resources and environment do not pose any restriction. Analysis of village-level data shows this even more clearly.

The reasons why a certain type of gear is not operated in areas where it could be operated, lie very often in the habits and traditions of the fisherfolk who live there. For Orissa, this fact is clearly demonstrated by migrations of Telugu and Bengali fisherfolk who introduced their traditional types of gear successfully to areas where these mesh sizes, types of gear, etc., had not been used before.

The census data suggest that there is scope for further dissemination of traditional fishing methods.

In Balasore district, medium and very large mesh glllnets as well as encircling gillnets could be further distributed.

In Cuttack district, more seaworthy boats, as well as all types of marine gear, could be introduced.

In Pun and Ganjam districts, the introduction of large mesh driftnets for night fishing could be considered.

However, it should first be considered, especially in Ganjam and Balasore districts, whether the new fishing method will not exploit the same resources already exploited by other methods and if so, whether the catch/effort statistics permit an increased fishing effort.

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Extension programmes which aim at further dissemination and diversification of fishing effort can do this by limiting new introductions of equipment to replacements of worn-out equipment. This is particularly necessary in Ganjam and Balasore districts where considerable shortfalls in labour capacity have been observed.

In all cases, one should carefully take into account the balance of craft, gear and human resources—by village and by jurisdiction. Even though for Ganjam and Balasore districts as a whole, a shortfall in labour capacity has been observed, this need not be the case in all jurisdictions and in all villages.

This holds true for the excess labour capacity observed in Cuttack district, as well.

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5. INFRASTRUCTURAL FACILITIES

The following chapter describes the infrastructure facilities in the areas of communication, schooling, health, water, electricity and housing available in the fishing villages of Orissa and identifies shortcomings and constraints.

5.1 Ganjam district

5.1.1 *Communication*

While communication facilities are almost satisfactory in Ganjam and Chatrapur jurisdictions, where motorable roads and bus services are available, they are inadequate in Sonapur jurisdiction.

—Sonapur (10 villages)
Only three villages are connected by motorable roads. The other seven are located at a distance of three to five km from motorable roads and are connccted by sandy footpaths. Rivers and creeks have to be crossed to reach the villages. Where there is a motorable road, a bus service is available too.

—Ganjam (7 villages)
Two villages have a motorable road without bus services, and three villages a motorable road with bus services. Only two villages are connected by non-motorable roads/footpaths.

—Chatrapur (12 villages)
With the exception of two villages all villages are connected by motorable roads. In two cases bus services are available.

5.1.2 *Schooling*

Except for four villages which have only a lower primary school, all other villages in the district have been provided with upper primary educational facilities. About 30% have a secondary or higher secondary school within accessible distance (within two to five km and in one case at a distance of 10km). However, information about the relationship between the capacity of schools and the number of school-going children and whether the Telugu-speaking fisherfolk of Ganjam district send their children at all to Oriya medium schools has not been collected.

—Sonapur (10 villages)
Four villages have only lower primary schools, and two an upper primary school but no high school or middle school, within accessible distance, while the remaining four villages are within the reach of upper primary as well as secondary schools.

—Ganjam (7 villages)
Three villages have upper primary schools but no secondary schools while the other four villages are within easy reach of both types of schools.

—Chatrapur (12 villages)
All 12 villages have upper primary schools. A secondary school however is available in only one village.

5.1.3 *Health*

Modern medical services provided by public health centres, clinics, hospitals within a distance of five km are available only for three villages out of the total 29 villages in Ganjam district. Two villages have access to a health worker's services and two others are very rarely visited by a health inspector. The worst situation prevails in Sonapur jurisdiction.

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—Sonapur (10 villages)

Three villages do not have any health facilities at all. The other seven villages have a primary health centre or a hospital in the neighbourhood, the least distance, however, being six km, and the furthest location being 20 km away. These distances have to be considered as excessive taking into account the lack of motorable roads. Only one village is visited by a health inspector and even that rarely.

—Ganjam (7 villages)

While five villages have no preventive or curative medical institutions except for a dispensary, two villages have a hospital within five and 10 km, respectively, the latter—given the poor means of transport—being most probably out of reach in times of need.

.—Chatrapur (12 villages)

One village has a hospital within a distance of three km. another a primary health centre, while the remaining 10 villages are at a distance of six to nine km from the nearest hospital or primary health centre. One of these 10 villages has a community health worker, another is occasionally visited by a health worker and a health inspector.

5.1.4 *Water*

Only five out of the 29 villages in Ganjam district have a functioning tube well. All others take their drinking water from open wells. For Sonapur and Ganjam jurisdictions, the availability of water during the dry season was stated to be sufficient, the quality of the water being good, except for one case where salinity was a problem.

In Chatrapur jurisdiction, however, there are two villages with only one well each which is too small to produce the required quantity of water. Moreover, the wells dry up in summer.

Salinity however does not seem to be a major problem in Ganjam district.

5.1 .5 *Electricity*

Of the 29 villages in Ganjam district 18 are electrified. Chatrapur and Ganjam jurisdictions have the highest number of electrified villages and Sonapur jurisdiction, the lowest.

5.1.6 *Housing*

The most usual type of housing in Ganjam and Sonapur jurisdictions is represented by medium sized houses with clay or mud walls, thatched with straw. Some of them have brick walls instead of clay walls. The land where the houses are built is allotted to the house owners by the government so that the fisherfolk are assured of their right to stay permanently. Where this right is absent, houses are smaller, as is the case in five villages in Chatrapur jurisdiction.

5.1.7 *Ganjam summary*

A general feature of the entire district is the absence of clinics, prinmry health centres, hospitals, community health workers or any other modern health facilities within a reasonable distance from the fishing village.

Another common feature is the lack of functioning tube wells, so that drinking water is usually taken from open wells, exposed to contamination. In Chatrapur block, the seasonal availability of water from the sources is a problem in some villages. Salinity, however, does not seem to be a problem in the villages of Ganjam district, except in one case.

Except for four villages, primary schools are within the reach of traditional fishing villages in Ganjam district. Whether the capacity of these schools is sufficient and whether children from fishing villages are at all attending the classes is, however, not known. Only a few secondary schools are situated within the reach of fishing villages.

About 40% of the fishing villages have no electricity.

Besides these general features, two of the three jurisdictions face special problems. For

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Sonapur jurisdiction, it is poor communications, and for Chatrapur jurisdiction, poor housing conditions and poor drinking water supply.

5.2 Pun district

5.2.1 *Communication*

In Purl district ess than half of the fishing villages are connected by motorable roads. This low percentage is caused by the almost total absence of communication in Astarang. The majority of the fishing villages depend on footpaths submerged in water during the rainy seasons as communication links with the outside world.

The situation in various jurisdictions is as follows:

— Konarak (One marine village)
The village is connected by a motorable road throughout the year.

— Astarang (8 villages)
One village has a motorable road while seven villages depend totally upon footpaths, river dykes and partially motorable reads as means of communication.

— Purl (7 villages)
Four villages, being situated within the municipal area of Pun town, are accessible by motorable roads while two other villages are linked by a footpath (up to 10 km from the nearest motorable road). One village is situated on the seaside of Chilka Lake and has to be reached by boat.

5.2.2 *Schooling*

With the exception of the municipal area of Pun, secondary and higher secondary schools are lacking within reasonable distance from the fishing villages.

Primary school facilities are not fully satisfactory either. They are insufficient in terms of the relationship between the number of schools and the number of fishing villages and even more so with regard to the relationship between the capacity of the schools and the number of children of school-going age.

The situation in various jurisdictions is as follows:

— Konarak (one village)
Educational institutions up to college level are within accessible distance.

— Astarang (8 villages)
Out of the eight villages with marine fisherfolk population, two have no primary school facilities. Secondary schools are within the reach of only two villages.

— Purl (7 villages)
All villages have primary schools run by the municipality and private organizations. In five villages there are, in addition, middle schools and high schools at a reasonable distance.

5.2.3 *Health*

With the exception of Pun town, medical care for traditional marine fishing villages in Purl district is rather underdeveloped. Half the villages have no facilities at all within a distance of less than 10 km. Most of the remaining villages have to confine themselves to primary health centres which offer only a limited number of medical services. The situation in the Astarang jurisdiction is the worst.

The situation in various jurisdictions is as follows:

— Konarak (One village)
A primary health centre is within 5 km distance.

—Astaiang (8 villages)

Except for one village, all villages are about 10 km away from a primary health centre. This distance is considerable in view of the poor communication links.

—Pun (7 villages)

While one village has no medical facilities within range of 10 km. four villages within Pun municipality are looked after by a government hospital, a clinic and primary health centres. The remaining two villages have a primary health centre at a distance of 4-10 km.

5.2.4 *Water*

With the exception of Purl town and the village in Konarak jurisdiction, water for drinking is taken from open wells, tanks and rivers. Tanks and rivers also provide water for bathing and washing. Often the water is saline, and during summer, it becomes scarce. Tube wells are found outside town boundaries only in one jurisdiction. The worst situation prevails in Astarang jurisdiction.

The situation in various jurisdictions is as follows:

—Konarak (One village)

There are two tube wells. The water is, however, slightly saline.

—Astarang (8 villages)

Only one village has a tube well and a satisfactory water supply. The others take their water from open wells and tanks, and in all cases, the situation, as far as water for drinking and bathing is concerned, is stated to be unsatisfactory, especially during the dry seasons.

—Purl (7 villages)

While the water supply to the four fishing villages within the municipal limits of Purl town is satisfactory, one viLge situated outside the municipal area of Purl town suffers from water scarcity and salinity. This village, as well as the other two, depends exclusively on open wells.

5.2.5 *Electricity*

Only a minority of villages is at present, electrified. And electricity is almost exclusively used for lighting. A large number of villages, however, is within the range of the present electricity supply system and could be connected to it without causing many technical problems.

The situation in the various jurisdiction is as follows:

In Konarak jurisdiction the only marine village has no electricity.

In Astarang, two villages are electrified, while the other six villages have electrical installations within a few kilometres distance.

In Purl, electricity is available in three out of seven villages, all of them situated within the municipal area of Pun town.

5.2.6 *Housing*

With the exception of some settlements in Pun jurisdiction, the fisherfolk of Purl district live in small, thatched, temporary, tent-like huts. The huts have a mud (clay) floor and a thatched roof constructed cut of bamboo components and palm leaves which reach down to the floor like the walls of a tent. Those fisherfolk in Pun jurisdiction who are better off regarding housing have either settled there already for a relatively long time or could avail of land which is not claimed by somebody else. The better types of houses have cement or clay floors, brick or mud walls and thatched straw or asbestos roofs.

The situation in various jurisdictions is as follows:

In Konarak the vast majority of houses are small, thatched, temporary huts. It is likewise in Astarang.

In Pun jurisdiction the housing conditions are better than in the other two jurisdictions. Houses with clay or brick walls and thatched straw roofs are common except in Pentakota, by far the largest settlement in Pun district, its temporary huts being at the lower end of the standard of housing in Orissa fishing villages.

A major obstacTe to improving the housing conditions seems to be not merely the lack of financial resources, but the fact that the land is not allotted to the fisherfolk by the government or given to them on long term lease which discourages them from putting up more durable structures.

5.2.7 *Purl summary*

With the exception of some smaller settlements within the municipal area of Pun town, infrastructural facilities such as tube wells or other supply systems to guarantee clean, non-saline drinking water supply throughout the whole year, secondary schools, primary health centres or clinics to provide basic medical care, motorable roads as well as hygienic houses and electricity are lacking in the majority of the traditional fishing villages in Pun district, the Worst jurisdiction being Astarang.

5.3 Cuttack district

5.3.1 *Communication*

Except for the two villages close to Paradeep port, coastal villages from which marine fishing is carried out are not linked by roads which are motorable throughout the year. Small boats have to be used for crossing creeks and rivers and many kilometres of sandy footpaths have to be covered in order to reach the fisherfolk. The footpaths are regularly submerged in water during the rainy seasons.

— Rajnagar (2 villages)
One village is connected by a sandy road, which submerges in water during the rainy season. To reach the other, which is actually a group of villages, two rivers have to be crossed and footpaths used.

— Mahakalpara (3 villages)
Al! the three villages are linked by sandy roads which are difficult to negotiate during the rainy season.

Kujang (2 villages)
Both villages, being close to the Paradeep port, are connected by motorable roads.

5.3.2 *Schooling*

Except for one, all marine fishing villages in Cuttack district have got a lower or upper primary school close by. More than half of the villages are within reach of secondary or higher secondary schools.

5.3.3 *Health*

Modern health care is not available for the majority of the marine fishing villages in Cuttack district.

— Rajnagar (2 villages)
In both villages modern health services are absent and not within reach of the fisherfolk.

<<

— Mahakalpara (3 villages)
Modern health facilities are not available in any of the villages.

— Kujang (2 villages)
The two villages close to Paradeep port area avail themselves of the services offered by the Paradeep pont medical centre.

5.3.4. *Water*

More than half of the villages take their drinking water from open wells and rivers. In some cases, the water is reported to be saline.

— Rajnagar (2 villages)
In one village drinking water is taken from tube wells. In the bigger village, open wells are used which are, however, not enough in number and become saline during the dry part of the year.

— Mahakalpara (3 villages)
There are no tube wells in any of the marine villages. Drinking water is taken from rivers and open wells.

— Kujang (2 villages)
One village close to the Paradeep port area has a piped water supply. The other village has tube wells.

5.3.5 *Electricity*

Two villages have electricity while five are not electrified.

5.3.6 *Housing*

The housing conditions vary from jurisdiction to jurisdiction, the lowest standard being represented by small huts with clay or mud walls and thatched roofs made out of palm leaves and the best standard by large houses with brick walls and thatched roofs constructed out of bamboo and straw.

— Rajnagar (2 villages)
All villages have medium sized houses with mud or clay walls and thatched roofs made out of straw.

— Mahakalpara (3 villages)
Except for one village, the majority of the houses are small huts, the walls being constructed of clay and mud, and the roofs out of palm leaves. In three villages medium sized houses with clay walls and thatched straw roofs are also to be found.

— Kujang (2 villages)
The two settlements in the Paradeep port area consist mainly of mud huts. The land belongs to the port authority or to the Revenue Department.

5.3.7 *Cuttack summary*

Common problems in all jurisdictions are the lack of communications the lack of health facilities, the lack of electricity and to a certain extent the lack of secondary schools. Communication is very poor in Rajnagar and Mahakalpara jurisdictions. Health facilities were also reported to be the worst in these jurisdictions.

A lack of tube wells was observed in Mahakalpara and Rajnagar jurisdictions where water for drinking purposes is taken from open wells and rivers which are exposed to contamination. *In* some cases the water is reported to be saline.

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5.4 Balasore district[1]

5.4.1 *Communication*

Regarding communication, the situation in the northern jurisdictions differs from that in the south. In the southern unisdictions of Balasore district, namely Dhamra, Basudevpur and Gopalpur, the majority of the villages, from where marine fishing is carried out are linked by motorable roads.

The best situation prevails in Basudevpur jurisdiction where twelve out of 14 villages are not connected by a motorable road while the respective proportions in Dhamra and Gopalpur jurisdiction are about 65% and 75%.

The non-motorable roads in the south of Balasore district can be divided into jeepable roads and footpaths, each category accounting for roughly 50% of all non-motorable roads.

In the three northern jurisdictions of Balasore, namely Bhograi, Baliapal and Balasore (in this case the name of a jurisdiction) less than a quarter of the 67 marine fishing villages are reached by a motorable road, half of the villages are linked byjeepable roads while the remaining quarter are accessible by footpaths.

Both in the north and in the south, rivers and creeks have to be crossed to reach the villages. Tar roads are often reported to be in a damaged condition.

— Bhograi jurisdiction (25 villages)
Three villages have a motorable road, 18 a jeepable road and four are connected by a footpath.

— Baliapal jurisdiction (27 villages)
Seven villages have a motorable road, 15 a jeepable one and five a footpath.

— Balasore jurisdiction (15 villages)
Five villages have a motorable road, five can be reached only by jeep and five by a footpath.

— Gopalpur (28 villages)
Twenty-one villages are linked by motorable roads, six by footpaths and one by a jeepable road.

— Basudevpur (14 villages)
Twelve villages are connected by motorable roads and two by jeepable roads.

— Dhamra (41 villages)
Twenty-seven villages are linked by motorable roads, nine by jeepable roads and five by footpaths.

5.4.2 *Schoollng*

Of the 1 50 marine fishing villages in Balasore district covered by the study with regard to infrastructural facilities, 24 (16%) do not have any school facilities at all. Most of the remaining 126 villages have access to only lower or upper primary schools. Secondary education is within the reach of only a minority of the fisherfolk, except in Basudevpur jurisdiction. The figures for Balasore district are as follows: 28% of the fishing villages have access to schools of lower primary standard, 28% to schools of up to upper primary standard, 11% to schools of up to middle school standard, and 17% to schools of up to high school standard. One village has educational institutions up to college level within reach.

[1] As the data were obtained too late, the southern part of Balasore jurisdiction (35 villages), which is characterized by absence of roads, health facilities, electricity and safe drinking water, could not be included.

For the various jurisdictions, the following picture emerges:

Bhograi (25 villages)
No school—one; up to lower primary standard—13; up to upper primary standard—b; up to middle school standard—one.

— Baliapal (27 villages)
No school—2; up to lower primary standard—9; up to upper primary standard—8; up to middle school standard—6; up to high school standard—2.

— Balasore (15 villages)
No school—2; up to lower primary standard-—-4; up to upper primary standard—3; up to middle school standard—one; up to high school standard—S.

— Gopalpur (28 villages)
No school—9; up to lower primary standard—6; up to upper primary standard—2; up to middle school standard—3; up to high school standard—7; up to college standard—one.

Basudevpur (14 villages)
Up to upper primary school—one; up to middle school—3; up to high school—i 0.

— Dhamra (41 villages)
No school—lO; up to lower primary standard—9; up to upper primary standard—17; up to middle school standard—3; up to high school standard—2.

5.4.3 *Health*

For the vast majority of marine fishing villages in all jurisdictions there are absolutely no clinics, health centres or hospitals within a negotiable distance which means—given the poor communication links—within six to eight km. Health visitors and community health workers are almost non-existent. While private clinics, private and government hospitals do not play any role in health care for marine fishing villages in Balasore district, primary health centres are the only relevant modern health facility. Their number is however far too small and they are generally too far away from the fishing villages to cater effecitvely to the needs of the marine fisherfolk in Balasore district. The worst situation in terms of availability of modern health facilities prevails in Dhamra, Balasore and Gopalpur jurisdictions.

— Bhograi jurisdiction (25 villages)
Three primary health centres are the only modern medical facilities available for the 25 villages in the jurisdiction. Two of them are more than eight km distant from the villages.

— Baliapal jurisdiction (27 villages)
None of the 27 villages has any modern medical facilities. There are four primary health centres which are visited now and then by marine fisherfolk. They are far too distant from the village to play an effective preventive and curative role with regard to health of the marine fisherfolk.

— Balasore jurisdiction (15 villages)
The state of health in many villages from which marine fishing is carried Out is described as extremely poor. Only one village is situated close to a primary health centre. Two villages are five to six km distant from a primary health centre. The remaining 12 villages have no modern medical facilities within less than 10 km.

— Gopalpur jurisdiction (28 villages)
While one marine fishing village has a homeopathic clinic, another a hospital at a distance of four km. two others a primary health centre at a distance of three to five km. the remaining twenty villages have no medical facilities at all within a reachable distance.

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— Basudevpur jurisdiction (14 villages)
Six villages are situated close to a hospital or a primary health centre while the other eight villages are more than six km distant from the nearest primary health centre.

— Dhamra jurisdiction (41 villages)
Thirty-two villages are without any modern medical facility within 10 km while nine villages have a private doctor or a primary health centre within reachable distance.

5.4.4 *Water*

With some exceptions in Dhamra, Basudevpur and Balasore jurisdictions, all marine fishing villages in Balasore district have tube wells. In some cases the tube wells are reported to be out of order, their number being too small and in a few cases the quality of water being poor. Where thore are no tube wells, drinking water is taken from rivers and ponds.

— Bhograi jurisdiction (25 villages)
All 25 villages have tube wells.

— Baliapal jurisdiction (27 villages)
All *29* villages have tube wells. In a few cases the water is reported to be saline.

— Balasore jurisdiction (b 5 villages)
Twelve have tube wells for drinking water, the quality of the water being in some cases not satisfactory. Three villages take their drinking water from rivers and ponds.

— Gopalpur jurisdiction (28 villages)
Except for three villages which use pond water for drinking, all villages take their drinking water from tube wells. The amount and the quality of water are reported to be acceptable.

— Basudevpur jurisdiction (14 villages)
Twelve villages have a sufficient number of tube wells, the quality of the water being good. The other two villages, however, take their drinking water from open wells and ponds, which are slightly saline.

— Dhamra jurisdiction (41 villages)
Of the 41 marine fishing villages, 21 have a sufficient number of tube wells, the quality of the water being reported to be good. Nine other villages also have have tube wells, their number, however, being too small to satisfy the demand for drinking water in the village. Eleven villages take their drinking water from ponds and rivers, which are often contaminated.

5.4.5 *Electricity*

Except for Dhamra jurisdiction where none of the villages is electrified, the majority of the marine fishing villages in Balasore jurisdiction have electricity. This is true for 13 out of 14 villages in Basudevpur jurisdiction, 20 out of 28 villages in Gopalpur jurisdiction, 10 out of 15 **villages in Balasore jurisdiction, 19 out of 27 villages in Baliapal jurisdiction and 17 out of 26** villages in Bhograi jurisdiction.

5.4.6 *Housing*

The type and size of houses are almost the same in the various jurisdictions. The walls are constructed of clay while the roof is **built of bamboo and** straw: Houses with **brick walls are rarely occupied by fisherfolk.**

5.4.7 *Balasore summary*

Regarding infrastructural facilities, the lack of modern health facilities within a reachable distance from marine fishing villages seems to be the major problem in all jurisdictions. At present, **primary health centres are the only significant institutions.**

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Their number is however far too small and their locations too far away to play an effective role with regard to preventive and curative health care in fishing villages.

Another problem, more prominent in the three northern jurisdictions, is the lack of motorable roads connecting marine fishing villages with the outside world. Very often rivers and creeks constitute obstacles to providing better communication links. Existing motorable roads, including tar roads, are often reported to be in a damaged condition.

Regarding schooling, a considerable number of marine fishing villages is still **out** of reach of primary schools. Secondary education is rarely availabte for children from marine fishing villages since only a few middle and high schools are situated within a reachable distance.

As far as drinking water is concerned, the number of tube wells should be increased in some villages and those tube wells that are out of order at present need repair. However, the drinking water supply seems on the whole satisfactory. Nevertheless, there are still a few villages which take their drinking water from ponds and rivers. Lack of electricity is mainly felt in the Dhamra jurisdiction. Housing conditions are better in Balasore district than in other districts of Orissa.

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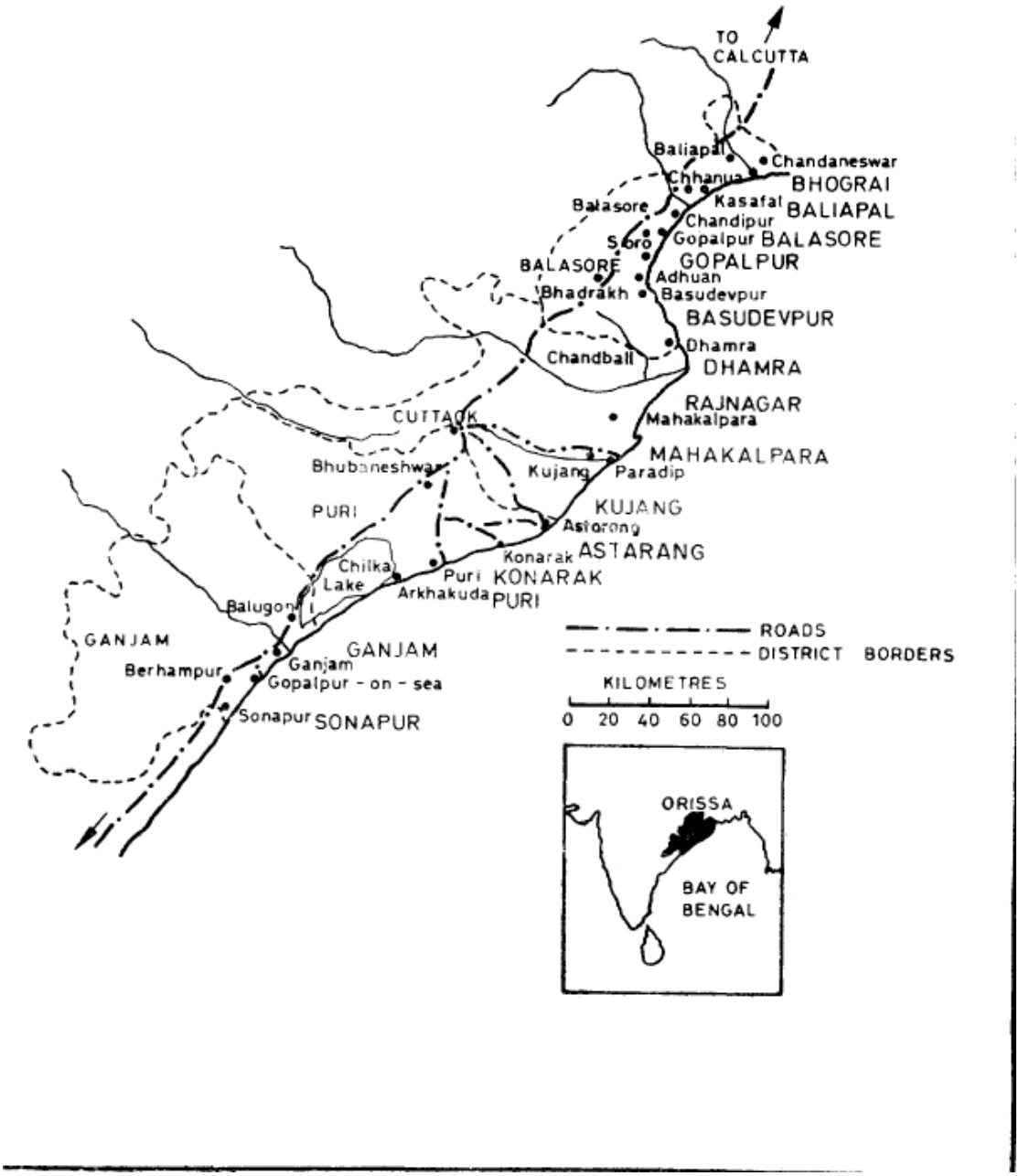
hppendix 1
LOCATION OF MARINE FISHERIES EXTENSION CENTRF5



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Appendix 1 (contd.)
List of Marine Extension Centres and Extension Officers

Marine Extension Centre	*Extension Officer/Dep. Superintendent of Fisheries*
Marine Extension Unit Rajnagar 754 225 Cuttack district	Mr. D. K. Panda
Marine Extension Centre At/PO Kujang 754 141 Cuttack district	Mr. A. Dash
Marine Extension Centre Mahakalpara Cuttack district	Mr. H. Naik
Marine Extension Centre At/PO Gopalpur-on-Sea Ganjam district	Mr. G. S. P. Mishra
Marine Extension Centre At/PO Sonapur Ganjam district	Mr. S. C. Sahoo
Marine Extension Centre **At/PO Ganjam 761 026** Ganjam district	**Mr. B. S. Durgaya**
Marine Extension Unit At Junei Bazar **P0 Junei (Konarak)** Pun district	Mr. P. C. Padhy
Marine Extension Centre Kumuti Sahi At/PO Pun Pun district	Mr. F. K. Sahoo
Marine Extension Unit At/PO Astrang **Pun district**	Mr. F. B. Roy
Marine ExtensionWCentre **At/PO Chandaneswar** Balasore district	Mr. R. K. Das
Marine Extension Centre **At/PO Gopalpur** Balasore district	**Mr. S. R. Das**
Marine Extension Dharma Fishing Harbour **P0 Narasinghpur Hat** Balasore district	Mr. P. K. Mohanty

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Marine Extension Centre Chanua Via Haldipada Balasone district	Mr. A. N. Sethy
Marine Extension Centre **At/PO Baliapal** Balasore district	Mr. Md. Zafar Akhtar
Marine Extension Centre **At/PD Adhuan** Balasore district	Mr. R. P. Nanda

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Appendix 2
LIST OF FISHING VILLAGES

District	Jurisdiction	Block	Village
Ganjam	**Sonapun**	**Chikiti**	1 **Sonapur**
			2 Kotturu
			3 Dayanithipentha
			4 Eksinghi
			5 Patisonapur
			6 Ramayyapatna
			7 Anantharaipur
		Rangaikunda	1 Golabandha
			2 Nuagolabandha
			3 **Markondi**
	Chatrapur	**Gopalpur (NAC)**	1 **Gopalpur**
		Chatrapur	1 **Raikotturu**
			2 Sonanjupalli
			3 Badarjupalli
			4 Bander
			5 Sonanolia
			6 Badonolia
			7 Kotutru
		Rangaikunda	1 Venkataraipur
			2 Digipur
			3 Boxipalli
			4 New Boxipalli
	Ganjam	**Ganjam**	1 **Gokurkuda**
			2 Kantigada
			3 Kalarabadi
			4 Prayagi
		Knishnaprasad	1 **Sonapatna**
			2 Ramalanka
			3 Arakhakuda
Pun	**Purl**	**Municipal area**	1 Chakrathirtha Road
		Pun town	2 Guudawadasahian
			3 Punibalinoliasahi
			4 Penthakota
		Brahmagiri	1 Moto
			2 Sciandi
			3 Khirisahi
	Konanak	**Kakatpur**	1 Nuliasahi
	Astarang	**GOP Astarang**	1 **Sahan**
			2 Anakana
			3 Jalaghai
			4 Gundalaba
			5 Balbadizapur
			6 Sadhikeehar
			7 Ainsinia
			8 Kota
Cuttack	Kujang	**Nuabazar**	1 Nuabazaar
		Kunja	1 **Sandhakud**

District	Jurisdiction	Block	Village
	Mahakalpara	**Mahakalpara**	1 Jamboo
			2 Kharnasi
			3 Kojalpatia
	Rajnagar	**Rajnagar**	1 Keredagada
			2 Talchua
Balasore	Dhamra	**Chandbali**	1 Rabindranagar
			2 Gobindapur
			3 Kuannikanthi
			4 Bidiyutprasia
			5 Pradyutnagar
			6 Sabidni sarai
			7 Paiksahi
			8 Biyayapatana
			9 Karanpalli
			10 Kuamana
			11 Purnaprasad
			12 Taladia
			13 Karanga
			14 Amarnagar
			15 Narendrapur
			16 Karanjamal
			17 Guansul
			18 Genapur
			19 Begunia
			20 Orasahi
			21 Sandhagada
			22 Bajarapur
			23 Charadia
			24 Baliapal
			25 Neduali
			26 Dhankuta
			27 Baincha
			28 Dosinga
			29 Gajagini
			30 Singiti
			31 Subhadia
		Tibidi	1 Hanipur
			2 Chanibruti
			3 Nandakandip
			4 Bansia
			5 Madhapur
			6 Bahalpur
			7 Kankamara
			8 Sankarpur
			9 Birabarpur
	Basudevpur	**Basudevpur**	1 **Podhuan**
			2 Kumarpur
			3 Sarvaknishnapur
			4 Kismat Knishnapur
			5 Radhanathpun
			6 Jaganathpur
			7 Eram
			8 Balinagan
			9 Suan

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District	Jurisdiction	Block		Village
			10	Adhuan
			11	Chudamani
			12	Balibindha
			13	Sudarsanpur
			14	Uhad
	Gopalpur	Bahanaga	1	Bishnapur
			2	Madnapur
		Sono	1	Tentai
			2	Solagaon
			3	Mulkaida
			4	Pakhar
			5	Balang
			6	Purushothampur
		Remuna	1	Sanatalapada
			2	**Badatalpada**
		Bahanga	1	Banipada
			2	Arunabad
			3	**Rupkhanda**
			4	**Osanga**
			5	Balrampur
			6	Khenanga
			7	Avana
			8	Barajdeuli
			9	Dehendrapur
			10	Attarpur
			11	Maharudrapur
			12	Nuapur
			13	Janhipur
			14	Kochikakoil
			15	Kanthigadia
			16	**Arada**
			17	Villa
			18	Dwanika
	Balasore	Sadar	1	Kasafal
			2	**Juan**
			3	Alumeda
			4	Kalbur
			5	Bagda
			6	Solpata
			7	Koelisahi
			8	**Silda**
			9	Dublagadi
			10	Sartha
			11	Panchpada
			12	Sandhanadi
			13	Badadhanadi
			14	Bahabalpur
			15	Chanua
			16	Sarthabendha
			17	Nankundi
			18	Kayakadala
			19	Parkhi
			20	Gopinathpur
			21	Demuria

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District	Jurisdiction	Block	Village
			22 Belda
			23 Nischimpur
			24 Pakharabad
			25 Ragunathpur
			26 Chaksindhia
			27 Tulsipada
			28 Balaramgudi
			29 Snikono
			30 Ransahi
			31 Bankeswar
			32 Gudupahi
			33 Hidigan
			34 Kuanrpur
			35 Chachina
			36 Bhimpur
			37 Jaydebkasba
			38 Jaydebkasbapahi
			39 Nidhipada
			40 Bardhaupur
			41 Sasanga
			42 Saipur
			43 Inchirdiha
			44 Padmapur
		Remuna	1 Inchudi
			2 Khadu
			3 Kantarda
			4 Balichounria
			5 Tundura
	Baliapal	Baliapal	1 Kenduadite
			2 Palpade
			3 Dentuda
			4 Jugudhha
			5 Dagara
			6 Madhupuna
			7 Sandi
			8 Badkhanpur
			9 Nayabali
			10 Kalanuan
			11 Panchuruan
			12 Chaumukh
			13 Bishnapur
			14 Kankadasal
			15 Narayanpun
			16 Balang
			17 Balital
			18 Jamatikula
			19 Badatapada
			20 Jambiral
			21 Dumachak
			22 Paljamjuda
			23 Balagadia
			24 Sunderuali
			25 Katramahal
			26 Sankanpur

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District	Jurisdiction	Block	Village
		Basta	1 Churmara
	Bhograi	Bhograi	1 Uluda
			2 Choudhury
			3 Kanadipimpal
			4 Fulbani
			5 Pathareswar
			6 Nafrai
			7 Thakunbhoury
			8 Gitkala
			9 Bichitnapur
			10 Gambhania
			11 Ranasinghpur
			12 Sahabanipur
			13 Knishnanagar
			14 Bindhapur-padmapur
			15 Udayapur
			16 Sunadhar Basan
			17 Kintania
			18 Ranakotha
			19 Nanayan Mohanty Padia
			20 Bhognai
			21 Patharaghala
			22 Baunsakhana
			23 Khalabadia
			24 Kulha
			25 Pantei

Total no. of villages in Ganjam district	29
Total no. of villages in Pun district	16
Total no. of villages in Cuttack district =	**7**
Total no. of villages in Balasone district	184
Total no. of villages	236

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Appendix 3
CENSUS SCHEDULE

A. Household Schedule

1. Name of head of family
2. Total number of family members, sex, age, occupational/educational status
3. Number and type of craft owned by households, average age
4. Number and type of gear owned, in pieces or operational units, average age of gear
5. Significance of fishing as occupation:
   Major time, minor time, single old people (retired, not living with sons or daughters family)

B. Village Schedule

1. Communication links
2. Schooling
3. Health
4. Water
5. Electricity
6. **Housing**

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Appendix 4
VILLAGEWISE COMPILATION SHEET

A. PRESENTATION SHEET FOR TECHNO-DEMOGRAPHIC DATA AT VILLAGE LEVEL

Village location

Name of village Block District:

1. (a) Total number of households:
   (b) Average size of households:
   (c) Number of major time fisherfolk households:
   (d) Number of minor time fisherfolk households:
   (e) Number of single-old-people households:
   (f) Number of active fishermen:

2. (a) Type of craft Number

   1.
   2.
   3.
   4.

   (b) Type of gear Number

   1.
   2.
   3.
   4.
   5.
   6.
   7.

2. (c) Average age of craft:
   - Type 1:
   - Type 2:
   - Type 3:
   - Type 4:

2. (d) Average age of gear:
   - Type 1:
   - Type 2:
   - Type 3:
   - Type 4:
   - Type 5:
   - Type 6:
   - Type 7:

2. (e) % of households with no boat:
   (f) % of households with one boat:
   (g) % of households with two and more boats:
   (h) % of households with no nets:
   (i) % of households with one net:
   (j) % of households with two nets:
   (k) % of households with three and more nets:

3.
   - Communication links:
   - Schooling:
   - Health:
   - Water:
   - Electricity:
   - Housing:

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Appendix 5
CATCH STATISTICS FROM 1976 TO 1981

Sl. No.		Name of Fish	1976	1977	1978	1979	1980	1981
1.		Elasmobranchs	2,974	1,658	3,386	4,331	3,772	3,210
2.		Eels	1	—	3	2	—	**24**
3.		Catfishes	1,988	1,035	1,794	1,308	2.198	6,084
4.		Chirocentrus	517	752	1,073	1,644	1,460	1,281
5.	(a)	Oil sardine	—	—	—	—	—	—
	(b)	Lesser sardines	1,657	1,227	2,514	2,687	1,891	4,535
	(c)	*H/lsa ilisha*	5,477	2,948	7,737	9,969	5,091	2,085
	(d)	Other *H/lsa*	1 29	492	848	359	46	353
	(e)	*Anchoviella*	339	486	1,169	505	270	86
	(1)	*Thrissocles*	106	197	175	295	333	322
	(g)	Other clupeoids	772	778	1,330	1,431	2,576	2,093
6.	(a)	*Harpodon nehereus*	87	86	314	449	378	73
	(b)	Saunida Er Saurus	1	5	5	50	189	108
7.		Hemirhamphus & Belone	1	—	13	28	46	2
8.		Flying fish	—	—	4	4	17	—
9.		Perches	31	55	173	151	341	122
10.		Red mullets	1	1	2	2	296	104
11.		Polynemids	244	406	1,287	1,491	1,126	566
12.		Sciaenids	333	312	5,198	5,351	2,864	2,133
13.		Ribbon fish	130	174	336	616	928	995
14.	(a)	Caranx	147	103	68	326	607	165
	(b)	Choninemus	237	386	815	716	567	196
	(c)	Trachynotus	—	—	—	—	—	
	(d)	Other carangids	—	—	—	—	—	150
	(e)	Coryphaena	2	1	—	1	—	
	(f)	Elacate	—	9	3	1	—	
15.	(a)	Leiognathus	378	233	256	1,108	704	
	(b)	Gazza	1	—	—	—	3	
16.		L,jctcrius	1	18	12	5	65	49
17.		Pomfnets	10,699	1,018	5,714	10,109	9,072	3,685
18.		Mackerel	425	195	196	306	265	823
19.		Seer fish	940	672	1,059	2,444	1,542	2,540
20.		Tunnies	84	37	609	31	34	250
21.		Sphyraena	1	3	4	5	8	9
22.		*Mug/l*	5	—	3	22	1	—
23.		Bregmaceros		—	—	—	-----	—
24.		Soles	6	72	103	125	69	47
25.	(a)	Peaeid prawns	688	802	2,599	2,983	1,074	1,328
	(b)	Non-penaeid prawns	100	17	12	34	30	55
	(c)	Lobsters	—	—	—	—	—	**3**
	(d)	Other crustaceans	23	6	4	6	359	292
26.		Cephalopods	27	—	4	14	98	57
27.		Miscellaneous	1,271	888	848	2,899	1,055	1,097
		Total	29,823	15,072	39,670	51,808	39,375	35,655

(source CMFRI)

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Appendix 6
CATEGORIES, CLASSIFICATIONS

The following classifications/definitions have been applied while collecting and compiling the census data.

Fisherfolk household : A household where at least one member is engaged in sea fishing, at least part time.

Active fishermen' : Those household members who sail out into the sea to catch fish.

Marine fishing villages : A village where at least three marine fisherfolk households live.

Major time fishing households : A household, the working members of which spend the major part of their time in fishing or a household where the major part of the income is earned by fishing.

Minor time fishing households : A household, the working members of which spend the minor part of their time in fishing or a household where the minor part of the income is eanned by fishing.

Fishing craft

The craft categories have been chosen in accordance with P. Mohapatna's paper *Traditional Marine Fishing Craft and Gear of Orissa.* However, some modifications and one addition have been made. The Botali boat has been described as Patia boat in Mohapatra's paper.

Motorized gillnetters which are not mentioned there are operated in Cuttack and Balasore district. They are 32' to 42' long with a horse power of 26 and more.

River boats which are not suitable for use in the sea such as Huh and Kathua (small dinghy) have not been included.

Large and small kattumarams have been listed separately only in the case of Ganjam district, due to a misunderstanding in the collection of data.

Fishing gear

The gear categories have been again chosen in accordance with P. Mohapatra's paper *Traditional Marine Fishing Craft and Gear of Orissa.*

The following additions have been made. Set bagnets which are actually operated in river mouths and not in the sea, have been included because of their relative importance for marine resource exploitation and their potential use in the sea.

Under tidal wall nets, a smaller type of Malo, locally called Bedha, has been included. Furthermore, it was found that the dimensions of tidal wall nets vary a lot between different areas.

1It has to be mentioned here as a major shortcoming of the census that those household members (mainly women) who are engaged in processing and marketing of fish as well as in net making and repairing have not been covered.

Under 'large mesh driftnets' a 10 cm mesh size gillnet locally called Padasihkiwala and operated by Telugu speaking fishermen in Cuttack district has been included.

Under 'very large mesh driftnets' a 15-20 cm mesh size Bhekti net, which again was not mentioned in P. Mohapatra's paper, has also been included.

The unit in which the number of fishing gear is calculated has been determined as the average operational amount of gear. As described in P. Mohapatra's paper, an operational unit or fleet of nets comprises usually several net pieces which are joined together. Only in the case of small-mesh gillnets is a single net piece equal to a minimum operational unit. In other cases, for example, in the case of encircling gillnets such as the Jangal Jab, the number of net pieces that is required to form one operational unit can be as much as 175.

The following operational units have been assumed for gillnets. In Ganjam district 1.5 pieces in the case of small mesh gillnets and 65 pieces in the case of medium mesh pieces. In Pun district the figures are 1.5 and 13 respectively. In Cuttack the same number of units as in Pun have been assumed. Furthermore, for large mesh and very large mesh nets, 1000 feet has been assumed as the average operational unit. For all gillnets in Balasore, 2000 feet has been assumed as average operational unit. Tidal wall nets, set bagnets, beach and shone seines, boat seines, encircling gillnets and lift nets have been counted as operational units as per the description given in Mohapatra's paper, even though considerable regional variations have been observed.

The following gear types have been excluded because they are meant exclusively for river and estuary fishing:

encircling gillnets	:	Masani
wall/stake nets	:	Kuntala, Nodipi, Ghananodipi
small mesh gillnets	:	Tarania, Doundi, Jaleri, Badapar jal, Sanparjal
liftnets	:	Chanra
set bagnets	:	Been, Binti
handseines/dragnets	:	Kathi, Tiki, Bhidi, Ghajal.

In order to classify gear observed during the census, to compare dimensions of pieces and operational units and for the purpose of standardization, length and depth of net pieces-given in number of meshes, have been converted into metres.

Furthermore, the total length of twine used in a panel of gillnets has been calculated for comparison.

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The following formulas have been used :

(a) Parameters

ms (m)	— mesh size, in metres
E	— hanging ratio
l (m)	— length of panel (in metres)
d (m)	— depth of panel (in metres)
l_t	— length of twine, in metres
nm_h	— number of meshes, horizontally
nm_v	— number of meshes, vertically

(b) length of net

$$l\ (m) \quad ms\ (m) \times nm_h \times E$$

(c) depth of net

$$d\ (m) \quad ms\ (m) \times nm_v \times \sqrt{1 - E^2}$$

(d) length of twine in panel

$$l_t \quad \frac{2 \times l(m) \times d\ (m)}{ms\ (m) \times E \times \sqrt{1 - E^2}} + 5\% - 15\% \text{ for knots}$$

Infrastructural facilities

Communication

Type of communication : motorable road (tar road), jeepable road, footpath, river, etc. ; distance in km

Period of use : Rainy seasons, dry seasons

Availability of public transport : bus, train

Schooling

Type of school and distance : lower primary, upper primary, secondary, high school and college.

Health

Type of facility and distance : dispensary, clinic, primary health centre, hospital.

Water

Type of facility : piped water, tube well, open well, river, pond.
Purpose : Washing, cleaning, drinking

Seasonal water shortage, salinity, contamination.

Electricity

Availability, distance, purpose of utilization

Housing

Size of compound, house, type of floor, type of wall and roof, ownership of land.

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Appendix 7
DATA COMPILATION AND AGGREGATION

Villagewise compilation:

The villagewise compilation of data has been done according to a format which is shown in Appendix 4. Besides totals and averages (arithmetic means), percentages have been calculated and in the case of infrastructure, qualitative descriptions have been prepared.

Formulas used:

Arithmetic mean

$$x = \frac{\sum_{i=1}^{n} x_i}{n}$$

where n is the total number of observations (for example: number of fisherfolk households) and x is the respective variable or single observation (for example: size of household).

Percentage/ratio

$$F = \frac{a}{n} \times 100$$

where n is the total number of observations (for example: all fisherfolk households) and a is the subgroup (for example, those who do not own a net).
Total

$$T = \sum_{i=1}^{n} x_i$$

where x is a single observation.

Data aggregation at jurisdiction level:

For aggregation of craft and gear by jurisdiction, the villagewise figures have been totalled.

In the case of demographic data, the following indicators have been compiled in addition to totalling the villagewise figures and aggregating the percentages in case of distribution of assets.

- Averages/arithmetic means: Average number of fisherfolk households pen village, average size of household in jurisdiction, average number of major time fisherfolk households per village, average number of minor time fisherfolk households per village, and average number of single old people households in the village.
- Standard deviation: for all arithmetic means.
- Average and deviation mentioned above have been compiled to compare 'average villages' of different jurisdictions as well as the intenvillage variations.

The following formulas have been used:

Aggregation of percentages:

$$P_A = \sum_{i=1}^{n} \frac{n_i}{n} x_i$$

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where P_A is the aggregated percentage at jurisdiction level, x_i is the percentage in village i, n_i the number of fisherfolk households in village i, and n the total number of fisherfolk households in jurisdiction.

Aggregated arithmetic means (weighted arithmetic mean)

$$\bar{X}_A = \sum_{i=1}^{n} \frac{n_i}{n} \bar{x}_i$$

where $\bar{X}_A$ is arithmetic mean (average) at jurisdiction level (aggregated arithmetic mean), $\bar{x}_i$ is the arithmetic mean in village i (for example, the average size of households), n_i the number of fisherfolk households in village i, and n the total number of fisherfolk households in the jurisdiction.

Standard deviation

$$SD = \sqrt{\frac{(x_i - \bar{x})^2}{n - 1}}$$

Where SD is the standard deviation, $\bar{x}$ is the arithmetic mean at jurisdiction level (for example =average number of major time fishing households), x_i is the single observation on village level (for example: number of major time fisherfolk households in village i) and n is the total number of villages in the jurisdiction.

Data aggregation at district level:

As district level totals, averages and percentages have been further aggregated using the formulas described above. The standard variation has not been aggregated further because it was felt that the district level is too abstract for meaningful interpretation of inter-village variations. Furthermore interjurisdiction and intra-jurisdiction variation might have a greater impact than interdistrict variation, a possibility which can be examined only with the help of variance analysis which again is considered too sophisticated to be operated by a marine extension service.

Appendix 8
LANDING SITES, NUMBER AND TYPES OF MECHANIZED BOATS

No.	Name/location of landing site	Number and type of vessels	Ownership	Availability of shore facilities such as jetty, slipway
1.	Talasari, Kirtania Balasore district	61 trawlers 2 gillnetters	Cooperative: 23 trawlers Er 2 gillnetters Private: 38 trawlers	No
2.	Chudamani, Balasone district	42 gillnetters	All private	No
3.	Kasafal, Balasore district	100 gillnetters	All private	No
4.	Bidaipur, Balasore district	2 gillnettens	All private	No
5.	Chandinipal, Balasone district	7 gillnetters	All private	No
6.	Chandipur, Balasore district	125 gillnetters 40 trawlers	Fish. Dept.: 5 gillnetters Coop.: 40 gillnetters Private: 80 gillnetters 40 trawlers	Jetty
7.	Dhamara, Balasore district	19 trawlers	Coop.: 16 Fisheries Dept.: 3	Jetty Shipway
8.	Talchua, Cuttack district	18 trawlers	All private	No
9.	Paradeep, Cuttack district	185 trawlers	Private: 181 Fish. Dept.: 4	No
10.	Astarang, Pun district	70 trawlers	Private: 50 Cooperative: 20	No
11.	Rushikuliya, Ganjam district	2 trawlers	Fisheries Dept.	No

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