Editorial

This issue of *Fishbyte* contains a paper by Arias-González et al. which differs from previous analyses of length-frequency data in *Fishbyte* in that it is based on a new analytic approach incorporated in FiSAT. FiSAT is the new FAO/ICLARM software package which will soon to be released.

FiSAT incorporates the ELEFAN I routine, but it is incorporated such that one is encouraged to estimate L_∞ independently, through a Wetherall plot, then K, through a routine which scans a wide range of K values, in very small steps. This routine is not only rapid, but produces a graph (see Figs. 2B and 4B in the paper in question) which enables one to tell whether an estimate of K is reliable or not (astute readers will note that the estimate in Fig. 2B may be reliable, while that in 4B is certainly not).

This approach closely matches that implemented in form of Shepherd's method which sometimes performs better than ELEFAN I, but usually fails to converge (i.e., it generates very high value of its score function at unrealistically high values of K; see Fig. 3B).

Users of FiSAT will appreciate the routines for scanning K values, even though they tend to show that their length-frequency data contain less information than they think. Perhaps this will encourage some to revise their sampling design, and to go get better data.

Another item: Ms. Beth Eleccion, NTFS Secretary since the beginning of this year, leaves ICLARM to work for the International Red Cross, unfortunately. The Red Cross building is next door, so we will continue to see her, fortunately. My thanks to Ms. Eleccion for her dedication, friendliness and high personal standard.

She will be succeeded by Ms. Sandra Gayosa, to whom I extend the most heartfelt welcome, and to whom you might write directly for NTFS-related matters. Ms. Gayosa has been with ICLARM for several years, and she is very familiar with NTFS activities. In Ms. Gayosa, you, NTFS members, have a very competent and helpful Network Secretary.
D. Pauly

The Small-Scale Pelagic and Demersal Fisheries off Kribi, Cameroon

C.E. GABCHE

Abstract

A description of the small-scale fisheries of the coastal pelagic and demersal resources off Kribi, Cameroon, is presented. The major fishing grounds are within the estuarine zone, an area of high productivity. Catch estimates of 19.5 t·year^{-1} and 6.5 t·year^{-1} were obtained for the pelagic motorized and nonmotorized canoes, respectively, while estimates of 11 t·year^{-1} were obtained for the demersal motorized canoes. The social benefits from these fisheries are discussed.

Introduction

The Cameroon coastline (Fig. 1) sustains large marine small-scale fisheries, with a dominant pelagic component (89% of total fish production). Target species are *Ethmalosa fibriata* and *Sardinella maderensis*, with the latter being the main component (40%) of the pelagic catch.

The target species of the demersal fisheries are: croakers (*Pseudotolithus* spp.), soles (Cynoglossidae), threadfins (*Galeoides, Pentanemus, Polydactylus*), catfish (*Arius* and *Chrysichthys* spp.), skates (Rajidae), grunts (Haemulidae), snapper (*Lutjanus* spp.), groupers (*Epinephelus*), as well as shrimps (*Palaemon hastatus* and *Penaeus notialis*). Of these, the croakers are the most important.

Assessment studies carried out so far on marine small-scale fisheries of neighboring coastlines include those of Troadec and Garcia (1979) on the resources of the Gulf of Guinea, Angola and Mauritania; Anon. (1983) on the offshore subcommunity from Togo to Cameroon and off the shelf from Equatorial Guinea to Congo; Oliver et al. (1986) in Gabon; and Oliver and Miguel (1987) who used acoustic methods. A description of the demersal

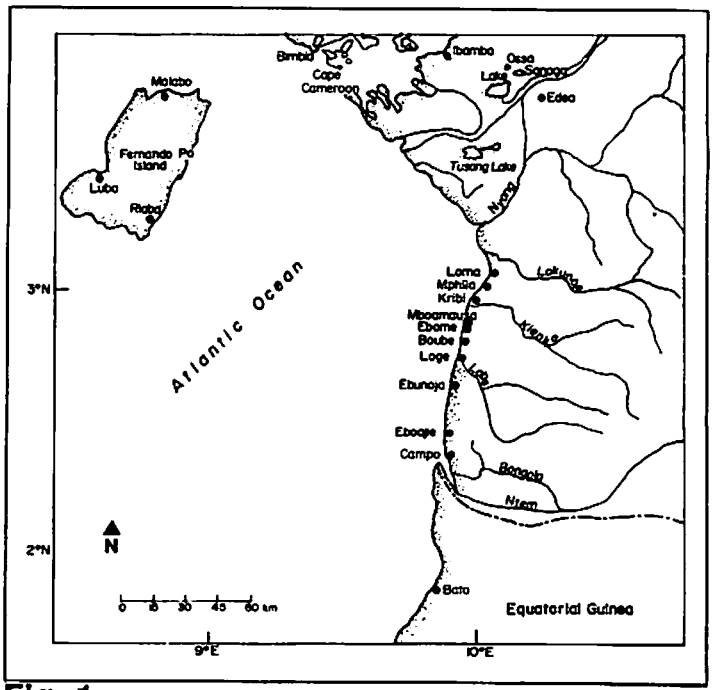

Fig. 1. *Map showing the villages cited in the Ocean fishing zone in Cameroon's coast.*

industrial fisheries of Cameroon was presented by Njock (1985) while Djama et al. (1990) dealt with the pelagic fisheries.

Continuous assessment studies in the marine small-scale fisheries should not be underestimated since these represent an important source of animal protein for the average citizen. Fisheries also acts as a rural industry, and providing employment to fishers and marketing agents. The aim of this study is to describe the current status of the fisheries off Kribi, Cameroon, based on catch statistics. This information may be useful in drawing up an analytical framework for the management and development of the fisheries.

Materials and Methods

The study was carried out at Boa-Manga landing site (Kribi), one of the fish landing stations of the Ocean fishing zone (Fig. 1).

Information on catch and others was regularly obtained from small-scale fishers early in the morning at the landing site for 12 months (June 1990-May 1991). Some other information obtained from these interviews included type of gear used; mesh size, length, height; number of active canoes; and their length; degree of motorization of canoes and their engine horsepower. The nationality of the fishers, their fishing grounds, time spent fishing and the weight of fish caught by each canoe sampled were also noted.

The fishers were classified into two groups: those fishing for pelagic fish species (mainly *Sardinella maderensis*) and those targetting demersal fish (mainly croakers). The catch per unit effort (C/f) was estimated from data with the average monthly catch being the average daily catch multiplied by the number of fishing days per month. The catches of the pelagic motorized and nonmotorized canoes were compared with the demersal motorized canoes.

Conversion into values estimates were based on 1 kg *S. maderensis*, selling for US$1 and 1 kg croaker (*Pseudotolithus*) selling for US$2. The rainfall data presented here pertain to Kribi proper.

The capital input (maintenance, fuel, food, etc.) was estimated as follows: for the pelagic motorized canoes, the amount spent each day for fuel, etc., was 2,000 francs CFA, approximately US$8. This gave US$2,448 for 306 days of effective fishing per year, with US$204 for one month. For the demersal motorized canoes, the amount spent each day for fuel, etc., was estimated at 4,000 francs CFA, approximately US$16, giving US$4,896 for 306 days of effective fishing per year, with US$408 for each month's fishing.

Results

Fishing for coastal pelagic and demersal resources is done by small-scale fishers who operate mainly in estuaries but may sail up to 200 nautical miles offshore. The gears used include beach seines, hook and line, longlines and bottom nets for fish and basket traps for shrimps. The nets used have the following ranges of parameters: stretched mesh size, 1-5 cm; lengths, 300-600 m; height, 1-2.5 m; and nets used per canoe, 1-2.

These nets are either all owned by the canoe owner or partially by the fishers. The canoes which are either dugout of planks had lengths ranging from 6 to 7.5 m and use engines of 6-15 hp. Within the period of study, 37% of the canoes were nonmotorized while 63% were motorized. They contained 1-2 paddles for 1-3 fishers; 64% of fishers were indigenous while 36% were foreigners, mainly from the Republic of Benin. Effective fishing was for two hours, during which the nets were set and removed, mostly during the night. Fishing was done every day except Sundays. However, during days for mourning and traditional rites and public holidays, no fishing was done.

The net amount obtained from fishing was divided at the end of each week into five parts with two parts going to the total number of fishers involved in fishing. The three parts remaining were subdivided as follows: canoe = 1 part; engine = 1 part; and nets = 1 part. Within the week, each of the fishers and the owner of fishing materials are entitled to 2 kg of fish per fishing day. Before subdividing, fuel cost for motorized canoes was usually subtracted. The pelagic species sold for approximately 200 francs CFA per kg while the demersal species sold for approximately 500 francs CFA per kg of fresh fish.

The monthly percentage trips to various fishing grounds during the past year is shown in Table 1. The most popular fishing ground was Londji where 30.5% of all fishing was done. Other fishing grounds, in decreasing order of importance, are Kribi (20.9%), Lokoundje (16.1%), Lobe

Table 1. Relative importance of various fishing grounds of the Cameroon Coast, Ocean Division (see also Fig. 1).

	Fishing grounds						
Month	Kribi	Bouambe	Ebome	Londji	Lobe	Mpalla	Lokoundje
June	28.60	-	4.80	42.90	9.50	14.20	-
July	-	13.30	-	13.30	40.10	28.00	13.30
August	13.0	23.10	-	32.00	23.10	8.00	-
September	-	16.70	16.60	16.70	34.00	16.00	-
October	37.50	-	6.25	31.25	18.75	6.25	-
November	42.86	7.16	-	35.70	14.28	-	-
December	25.00	25.00	-	50.00	-	-	-
January	15.00	-	-	45.00	5.00	-	35.00
February	20.00	-	-	30.00	10.00	-	40.00
March	20.00	-	-	28.00	12.00	-	40.00
April	25.00	1.00	4.00	21.00	10.00	4.00	35.00
May	24.00	4.00	4.00	20.00	13.00	5.00	30.00
Total (%)	20.95	7.52	2.97	30.50	15.82	6.12	16.12

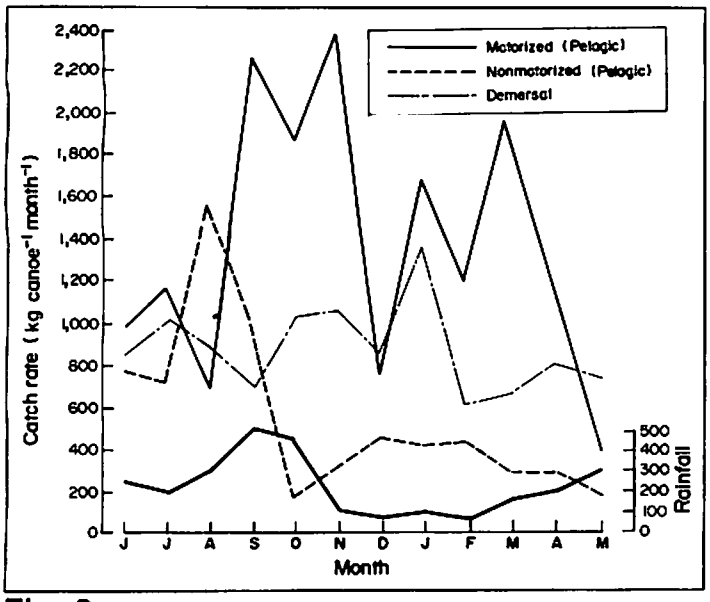

Fig. 2. *Comparisons of catch rates for pelagic motorized, nonmotorized and demersal fisheries with total monthly rainfall (mm), June 1990 - May 1991.*

of the pelagic fishing canoes should also be encouraged. The earnings of the fishers (20% of net revenue) gives values of US$284 for motorized pelagic fishing, US$108 for nonmotorized pelagic fishing and US$367 per month, respectively, for demersal motorized fishing. These figures underline the advantages of motorization.

Acknowledgements

Many thanks to the technicians of the Zootechnical Research Antenna, Kribi, Cameroon, who assisted in the data collection.

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Growth and Mortality of *Ctenochaetus striatus*, *Stegastes nigricans* and *Sargocentron microstoma* in Tiahura Reef, Moorea Island, French Polynesia

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Abstract

Growth parameters and mortality rates were estimated from length-frequency data sampled in 1982, using the FiSAT software, for three coral reef fish species, the surgeonfish (*Ctenochaetus striatus*), the damselfish (*Stegastes nigricans*) and the squirrel fish (*Sargocentron microstoma*) in Tiahura Reef, Moorea Island, French Polynesia.

Introduction

Moorea island is situated 25 km northwest of Tahiti, French Polynesia, at latitude 17°30' South and longitude 149°50' West. It belongs to the Windward islands (eastern group) of the Society archipelago (Fig. 1).

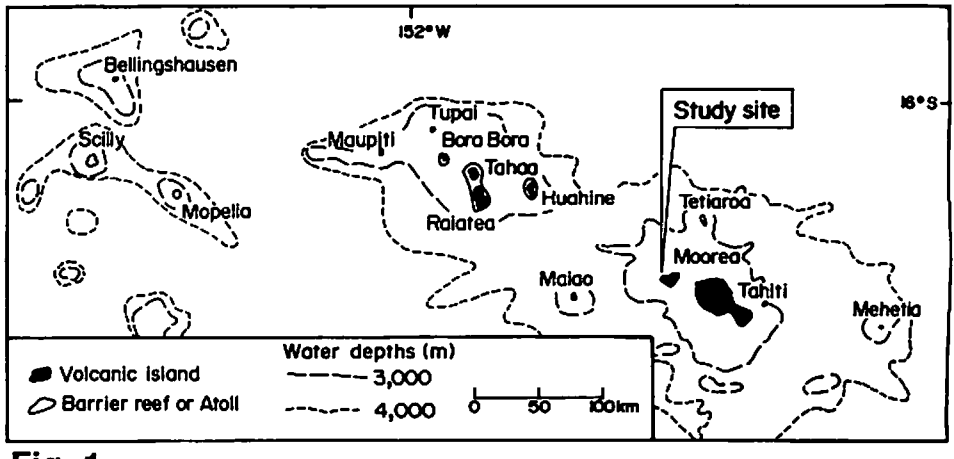

Fig. 1. *Location map of Society Archipelago, showing the location of the study site.*

Table 2. Estimated monthly catches of pelagic fish (mainly *Sardinella maderensis*) for motorized/nonmotorized canoes.

Year	Month	Weight of sample (kg) (A) (B)	Number of sampling days A/B=C	Mean daily catch month	Number of fishing days (CxD=E)	Mean monthly catches/rates
1990	June	105.0/3,000	4 / 10	37.5 / 30	26	975.0 / 780.0
	July	180.0/1,080	4 / 4	45.0 / 27	26	1,170.0 /7,020
	August	105.0/ 180	4 / 3	26.25/ 600	26	682.5 /1,560.0
	September	450.0/ 180	5 / 4	90.0 / 40	25	2,250.0 / 100.0
	October	830.0/ 30	12 / 5	69.2 / 60	27	1,868.4 / 162.0
	November	912.0/ 108	10 / 9	91.2 / 12	26	2,371.2 / 312.0
	December	450.0/ 70	3 / 4	150.0 / 17.5	25	3,750.0 / 437.5
1991	January	250.0/ 60	4 / 4	62.5 / 15	27	1,687.5 / 405.0
	February	155.0/ 70	3 / 4	51.7 / 17.5	23	1,189.1 / 402.5
	March	300.0/ 40	4 / 4	75.0 / 10	26	1,950.0 / 260.0
	April	232.0/ 55	5 / 5	46.4 / 11	25	1,160.0 /2,750
	May	260.0/ 121	15 / 15	17.3 / 8.1	24	415.2 / 194.4

Table 3. Estimated monthly catches of demersal fish species (mainly croakers (*Pseudotolithus* spp.)) for motorized canoes.

Year	Month	Weight of sample (kg) (A)	Number of sampling days (B)	Mean daily catch A/B=C	Number of fishing days/ month (D)	Mean monthly catches/rates (CxD=E)
1990	June	646.0	20	32.30	26	839.80
	July	902.0	23	39.20	26	1,019.20
	August	857.0	25	34.91	26	889.46
	September	601.2	22	27.0	25	682.80
	October	627.0	16	39.20	27	1,058.40
	November	247.0	6	41.20	26	1,071.20
	December	150.0	4	37.50	25	937.50
1991	January	970.0	18	52.9	27	1,455.30
	February	315.0	11	28.6	23	657.80
	March	330.0	12	27.5	26	715.00
	April	485.0	14	34.6	25	865.00
	May	742.0	22	33.7	24	808.80

Table 4. Gross returns per year, for canoes exploiting pelagic or demersal fish species.

Type of fishery	$/kg	Gear type	Gross value (US$) per month	per year
Pelagic	1	motorized	1,622.41	19,469
	1	nonmotorized	540.87	6,490
Demersal	2	motorized	1,233.33	22,000

(15.8%), Bouambe (7.5%), Mpalla (6.1%) and Ebome (3.0%).

The estimated monthly catches for the motorized/nonmotorized and the demersal motorized canoes are summarized in Tables 2 and 3. The mean catch rates and the total monthly rainfall (mm) are presented in Fig. 2. (The data on catch rates used for Fig. 2 stem from column E of Tables 2 and 3).

Values in Table 2 give total catch of 19.5 t and 6.5 t for the pelagic motorized and nonmotorized canoes per year, respectively. Table 3 gives a total catch of 11 t for demersal motorized canoes per year.

The peaks in catch shown in Fig. 2 for both pelagic and demersal fish species were recorded in July and April. However, pelagic motorized canoes also recorded peak catches in August and September 1990 whereas the pelagic nonmotorized canoes also recorded peak catches in December 1990, and February and March 1991. Peak catches were recorded for the demersal fish species in November 1990 and January 1991. Some periods with peak catches corresponded with months with high rainfall.

Table 4 gives the estimated gross revenues. The net revenue for both fisheries was obtained by subtracting the capital input from the gross returns; this gave US$1,418 and US$1,425 per month, respectively, for the pelagic motorized and demersal motorized canoes. The net revenue for the pelagic nonmotorized canoes was US$541.

Discussion

From previous catch estimates on the pelagic fish species (Djama et al. 1990) the minimum estimates for the Boa-Manga landing site were 5.13 t·year^{-1} for the motorized canoes and 2.7 t·year^{-1} for the nonmotorized canoes, respectively. The present values of 19.5 t·year^{-1} and 6.5 t·year^{-1} for the pelagic motorized and nonmotorized canoes fall within the limits of previous estimates for the area considered here.

The net revenue from fishing was higher for the pelagic motorized canoes than those obtained using the nonmotorized canoes, while the returns from demersal fishing are higher than for pelagic fishing. It would seem therefore, that demersal motorized fishing should be encouraged. However, considering the fact that the pelagic fish species are so important as protein source, motorization