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RELATIVE ABUNDANCE OF FISHES CAUGHT BY BAGNET AROUND CALAGUA ISLAND (LAMON BAY) WITH NOTES ON THEIR BIOLOGY

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ABSTRACT

This paper provides information on the abundance, catch and size compositions, CPUE, and sex and maturity stages of fishes caught by bagnet around Calagua Island, Lamon Bay, at different monsoon seasons based on data gathered from 1978 to 1980.

The bagnet catch, during the southwest monsoon, is composed mostly of small and immature fishes, such as anchovies, *Stolephorus* spp.; red-sea harder, *Emmelichthys* sp.; roundscads, *Decapterus* spp.; big-eyed scad, *Caranx crumenophthalmus*; yellow-striped crevalle, *Selaroides leptolepis*; mackerels, *Rastrelliger* spp.; sardines, *Sardinella* spp., and round herring, *Dussumieria* sp. During the northeast monsoon and tradewinds, the catch consists of the same species but of bigger size and most are sexually mature.

The CPUE values recorded during the study period were 540 kg per boat (in August), 971 kg per boat (in July), 529 kg per boat (in October), and 362 kg and 358 kg per boat (in April). The peak fishing season, therefore, for bagnet in the area is during the southwest monsoon, from July to September.

INTRODUCTION

Lamon Bay, which is part of the eastern Luzon waters, is a known traditional fishing ground for pelagic and demersal fishes. It has an extensive trawling area which is also suitable for pelagic fishing.

The total production of Lamon Bay for 1978-1985 fluctuated from 61,000 mt to 88,000 mt, with the highest production attained in 1982. Of these figures, 13.3%, or an average of 9,831 mt, was landed by bagnets. The production of bagnets in Lamon Bay contributed an average of 7% to the country's total bagnet production (Table 1).

Studies of the bagnet fisheries in the past were mostly on the development and efficiency of the gear. Among these are the works of Ferrer (1951), Rasalan and Datingaling (1952-1953), Manacop and Laron (1953), and Rasalan and Villadolid (1955). An effort to evaluate the catch efficiency of bagnet based on the national data was initiated by Ronquillo in 1973. This was followed by a series of BFAR/SCSP (South China Sea Programme) resource evaluations of the different major sections of the Philippine waters (1976-1979), including Lamon Bay. Catch efficiency of the

bagnet (CPUE) in areas other than Lamon Bay has also been recorded in southern Philippines (Ganaden *et al.*, 1982).

Table 1. The relationship of the bagnet production in Lamon Bay to the total production and to the national bagnet production.

Date	National Data	Lamon Bay		Bagnet catch share (%)	
	Bagnet catch (mt)	All gears catch (mt)	Bagnet catch (mt)	National	Lamon Bay
1978	160,637	61,234.0	10,327	6.43	17.0
1979	142,025	81,872.0	07,390	5.20	9.0
1980	136,890	83,434.0	08,439	6.16	10.0
1981	128,443	77,755.0	08,700	6.77	11.2
1982	146,755	88,468.0	13,260	9.04	15.0
1983	123,145	66,511.0	09,679	7.86	14.6
1984	134,173	62,111.0	09,408	7.01	15.1
1985	135,727	77,915.0	11,445	8.43	14.7
$\bar{x}$	138,474	74,912.5	09,831	7.11%	13.33%

Source: Fisheries Statistics of the Philippines, BFAR.

Studies on the catch composition, length measurements and other biological information on Lamon Bay and other areas were mostly on the trawl fisheries. These were the works of Ordoñez *et al.* (1975), Schroeder (1977), Aprieto and Villoso (1979), Gonzales *et al.* (1981), Villoso and Hermosa (1982), Mines *et al.* (1984), and Arce (1986).

This study, dealing with biological and catch-related information on the bagnet, one of the pelagic gears, was carried out under the resources assessment project of the Fisheries Resources Research Division.

MATERIALS AND METHODS

Fish landing surveys were conducted for two to three days at the Mercedes Fish Landing, Mercedes, Camarines Norte. The surveys were conducted twice during the southwest monsoon or "habagat" (August 1978 and July 1979), once during the northeast monsoon or "amihan" (October 1979), and twice during the transition period or summer months (April 1979 and April 1980).

The number of bagnet boats arriving during the sampling days, volume of the landed catch, and the catch composition per boat were recorded.

The relative abundance of each species group was obtained by taking the percentage share in relation to the total catch of the boats sampled per sampling day. The catch per unit of effort (CPUE), i.e., catch per boat, was derived by dividing the total catch landed by the number of boats observed per sampling day.

Data on the monthly average production of bagnets in Lamon Bay from 1971 to 1977 and from 1980 to 1986 were taken from the Fisheries Statistics of the Philippines, BFAR.

Fish samples from the dominant catches were collected and brought to the BFAR District Fishery Office Laboratory in Mercedes for biological analysis. The total lengths (cm) of the individual samples were taken and their sexual maturity determined. The Heicke-Naier's sexual maturity determination was used to classify the gonadal stages of the fish.

Fishes that grow to more than 30 cm were measured in centimeters. These species were *Decapterus macrosoma, D. maruadsi, Caranx crumenophthalmus, Selaroides leptolepis, Rastrelliger kanagurta, Sardinella longiceps* and *Dussumieria* sp. Fishes that attain a maximum total length of less than 30 cm were measured in millimeters. These were *Stolephorus heterolobus, Leiognathus bindus, L. insidiator, L. fasciatus* and *Emmelichthys* sp.

The Fishing Gear

Bagnet is an indigenous gear, a fine-meshed net similar to an inverted mosquito net (Fig. 1). Its size depends on the range of the outrigger or boom of the boat of 5-10 GT, the usual size of boats used in the area. The mesh size (stretched) of the bagnet varies, depending on the kind of fish the fishermen want to catch. For small-sized fish like anchovies, fishermen use a mesh size of about 1.3 cm. For bigger fishes like sardine, mackerel and roundscad, the mesh size used ranges from 2.4 cm to 3.8 cm (Sanchez, pers. comm.).

The Study Area

Calagua Island is located in Lamon Bay, off Mercedes, Camarines Norte. It lies approximately at Lat. 14°28'00" N and Long. 122°57'00" E (Fig. 2). It is exposed to the northeast monsoon from October to February, the lean period of fishing activities in the area. The peak of the fishing season occurs during the southwest monsoon, between July and September each year.

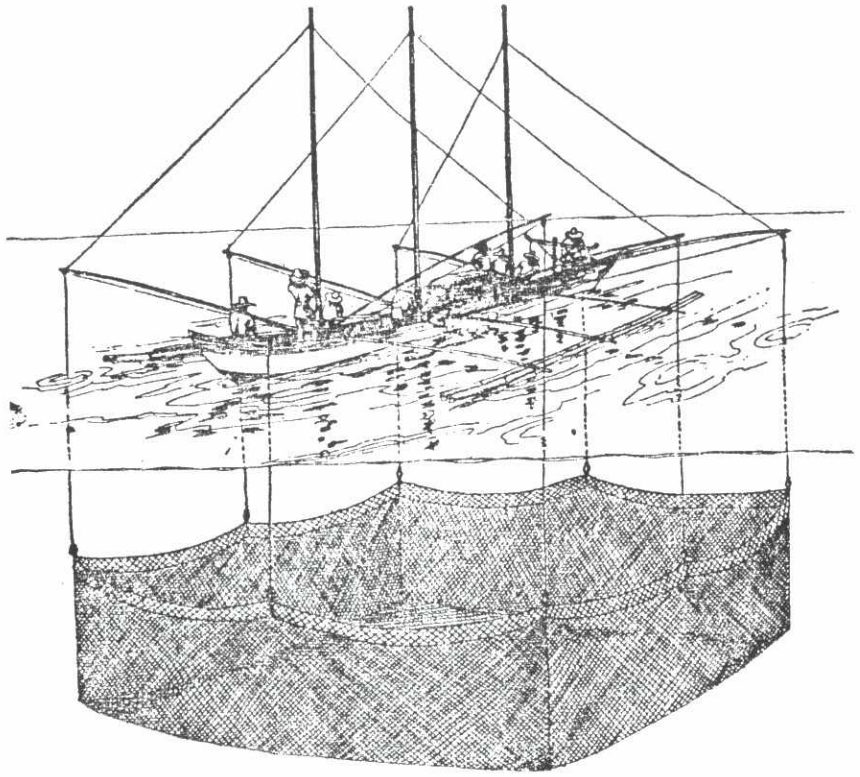

Fig. 1. Basnig (Pilipino), a typical bagnet. (After Umali, 1950.)

Aside from the trawl, the commercial bagnet is the most common fishing gear used in the waters around the Calagua Island. In fact, some of the bagnets operated in other areas (e.g., Manila Bay and Tayabas Bay) migrate to this fishing ground in Lamon Bay during the peak fishing season. Bagnet catches are landed in Mercedes, Camarines Norte, where they are auctioned and disposed.

RESULTS AND DISCUSSION

Relative Abundance and CPUE

Table 2 shows the relative abundance of the different species groups in the catch of basnigan from Calagua Island, off Mercedes waters, during the different monsoon seasons. Observations showed that more boats land with more catch during the southwest monsoon until the onset of the northeast monsoon.

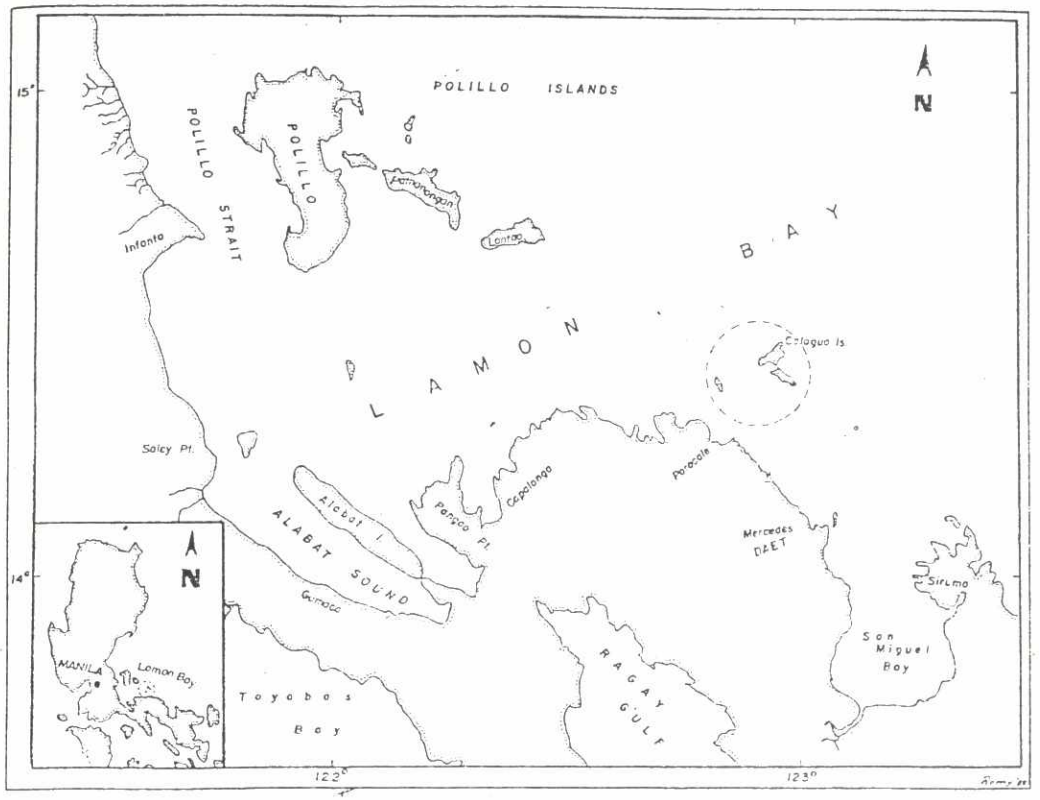

Fig. 2. The sampling area at Calagua Island in Lamon Bay.

In both seasons, the pelagic finfish group predominated the catches which accounted for more than 95% of the total catch landed during the survey periods. This group was dominated by anchovies, representing almost 80% (121,624 kg) of the total catch of 154,017 kg (Table 2). Other important pelagic fish species, in the order of dominance, were roundscad, sardine, red sea harder, round herring, and mackerel. The rest of the pelagic groups shared less than 1% of the total volume observed.

Just as the pelagic fishes are caught substantially by trawl, the demersal fishes are also caught by bagnet, but in a comparatively very minimal quantity. In the order of dominance, the demersal group was represented by slipmouth, lizard fish, croaker and barracuda which, altogether, shared less than 1%. The squids, the only invertebrates observed, also shared less than 1%.

Table 2. Relative abundance of the different species in the catch of bagnet during different monsoon periods.

Species Composition	August 5 to 6, 1978 kg	%	Nov. 29 to Dec. 1, 1979 kg	%	April 3 to 5, 1979 kg	%	July 28 to 30, 1979 kg	%	October 20 to 22, 1979 kg	%	April 17 to 18, 1980 kg	%	Grand Total kg	%
A. Pelagic Fishes														
Anchovies	440.0	3.55	-	-	520.0	11.05	106,594.0	87.84	13,680.0	99.42	390.0	21.79	121,624.0	78.97
Roundscad	5,240.0*	13.70	-	-	1,840.0	39.11	2,750.0*	2.27	-	-	420.0	23.46	10.250.0	6.66
Sardines	1,700.0	13.70	-	-	480.0	10.20	2,249.0	1.85	-	-	120.0	6.70	4,549.0	2.95
Red sea harder	1,140.0	9.19	-	-	200.0	4.25	1,640.0	1.35	-	-	-	-	2,980.0	1.93
Round herring	140.0	9.19	-	-	200.0	4.25	515.0	0.42	30.0	0.22	-	-	1,865.0	1.21
Mackerel	280.0*	2.26	-	-	-	-	1,300.0*	1.07	20.0	0.15	-	-	1,600.0	1.04
Big-eyed scad	200.0	1.61	-	-	-	-	720.0	0.59	-	-	-	-	920.0	0.60
Spanish mackerel	10.0	0.08	-	-	-	-	590.0	0.49	10.0	0.07	-	-	610.0	0.40
Cavalla	-	-	-	-	-	-	600.0	0.49	-	-	-	-	600.0	0.39
Frigate tuna	520.0	4.19	-	-	-	-	-	-	-	-	-	-	520.0	0.34
Yellow-striped crevalle	220.0	1.77	-	-	-	-	230.0	0.19	-	-	-	-	450.0	0.29
Small tuna	-	-	-	-	-	-	200.0	0.16	20.0	0.15	-	-	220.0	0.14
Barracuda	-	-	no landing	-	5.0	0.11	-	-	-	-	-	-	5.0	0.00
B. Demersal Fishes														
Slipmouth	-	-	-	-	120.0	2.55	1,144.0	0.94	-	-	90.0	5.03	1,354.0	0.88
Lizard fish	-	-	-	-	-	-	200.0	0.18	-	-	-	-	220.0	0.14
Shark	-	-	-	-	200.0	4.25	-	-	-	-	-	-	200.0	0.13
Hardtail	-	-	-	-	-	-	140.0	0.12	-	-	-	-	140.0	0.09
Croaker		-	-	-	-	-	20.0	0.02	-	-	-	-	20.0	0.01
C. Assorted Pelagic and Demersal Fshes	2,500.0	20.15	-	-	-	-	2,350.0	1.94	-	-	770.0	43.02	5,620.0	3.65
D. Invertebrates Squid	20.0	0.16	-	-	160.0	3.40	90.0	0.07	-	-	-	-	270.0	0.18
Total Catch	12,410.0	100..00	-	-	4,705.0	100.00	121,352.0	100.00	13,760.0	100.00	1,790.0	100.00	154,017.0	100.00
No. of days sampling		2 days		3 days		3 days		3 days		3 days		2 days		
No. of boats sampled		13 units				13 units		125 units		26 units		5 units		
Catch per boat (CPUE)		539.6 kg				362.0 kg		970.8 kg		529.2 kg		358.0 kg		

*With fry

The computed catch values per boat (CPUE) by monsoon season are 539.6 kg for August 1978 and 970.8 kg for July 1979 (southwest monsoon season), 529.2 kg for October 1979 (northeast monsoon), and 362 kg for April 1979 and 358 kg in April 1980 (transition period or summer months). The catch per boat was slightly lower during the northeast monsoon and much lower during the summer months, with fewer fish species represented.

The result of the analysis of the average monthly production by bagnet in the area (BFAR Statistics) suggested that it conforms with the observation of this study; that is, the peak of the fishing season is during the southwest monsoon, as higher production was recorded from June to September (Table 3 and Fig. 3).

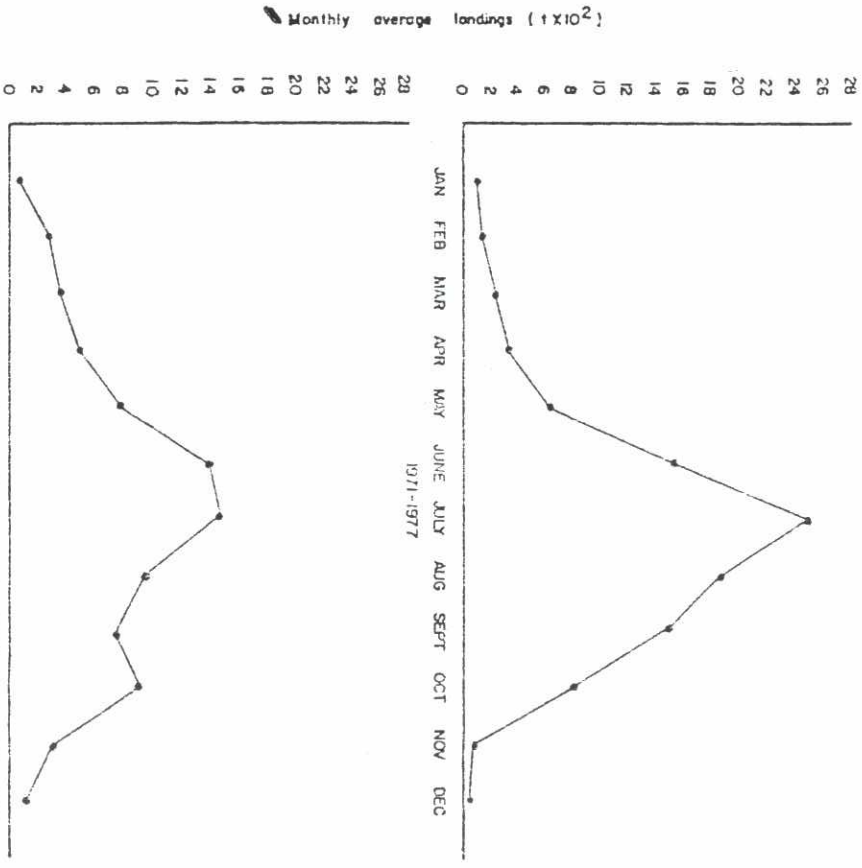

Fig. 3. Monthly average landings of bagnet catches in Mercedes, Camarines Norte.

Table 3. Monthly volume (mt) of bagnet catch from Lamon Bay landed at Mercedes and Camarines Norte from 1971 to 1977 and from 1980 to 1986.

Date	January	February	March	April	May	June	July	August	September	October	November	December
1971	-	-	-	-	-	62	-	-	10	-	-	-
1972	22	60	116	323	1,815	2,622	2,360	1,246	698	396	61	57
1973	174	286	382	341	340	1,709	1,777	1,059	630	68	62	108
1974	49	80	73	110	100	335	779	1,098	833	-	29	-
1975	159	156	310	284	371	3,821	4,409	1,714	3,079	863	112	7
1976	38	64	238	178	-	102	3,118	2,465	3,436	425	218	117
1977	126	89	204	221	469	2,080	-	2,639	1,819	2,384	-	50
x	94.8	139.2	220.5	242.8	619.0	1,533.0	2,541.0	1,870.0	1,500.0	827.0	94.4	67.8
1980	164	279	556	185	910	1,182	2,214	137	774	393	407	492
1981	307	282	382	680	237	1,292	2,164	917	819	1,172	212	40
1982	118	164	154	578	271	2,499	1,122	1,196	945	610	299	192
1983	359	287	358	430	932	289	1,076	1,147	645	932	143	72
1984	264	301	376	451	978	1,204	1,130	828	677	978	220	121
1985	299	342	426	511	1,109	1,365	1,281	939	768	1,109	250	137
1986	312	357	444	533	1,157	1,423	1,336	979	801	1,156	261	143
x̄	260.4	287.4	385.1	481.1	799.1	1,393.4	1,461.8	877.6	775.6	907.1	256	171

Source: Fisheries Statistics of the Philippines, BFAR.

Length Frequency Distribution and Gonadal Maturity Stages of the Dominant Catch

The dominant pelagic catch and demersal fish groups were studied for length-frequency distribution and gonadal stages. A total of 2,237 individuals belonging to 13 species of fish sampled from the bagnet catch were measured; 1,899 of which were analyzed for gonadal maturity. The gonadal maturity stages of the different species are shown in Figures 4a and 4b and their size composition is reflected in Figures 5a to 5c.

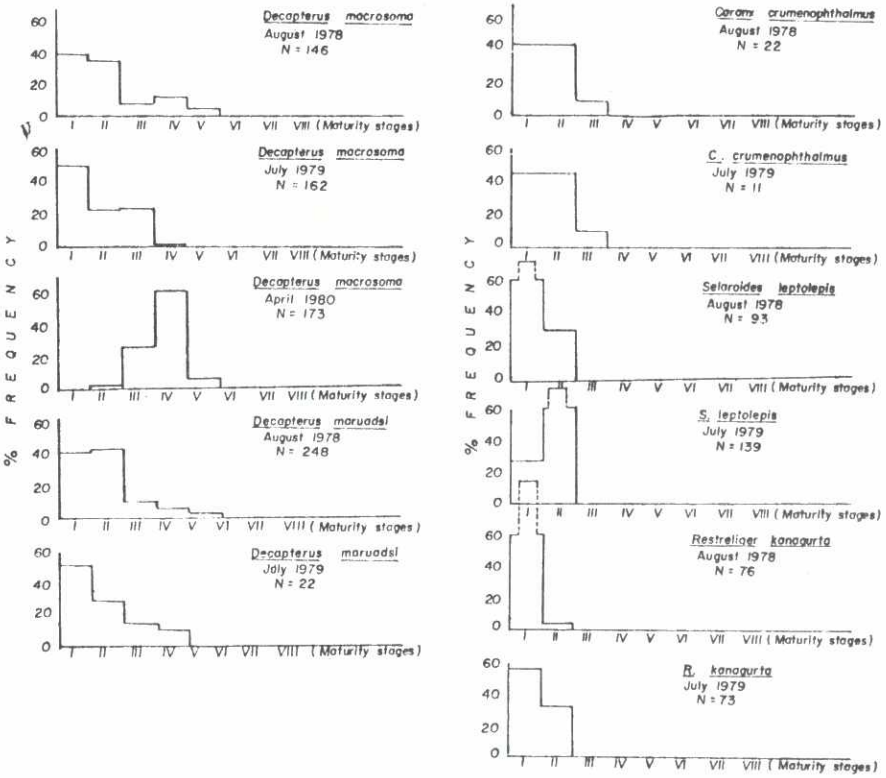

Fig. 4a. Distribution of maturity stages of the different species caught by bagnet around Calagua Island, Lamon Bay, at different monsoon seasons.

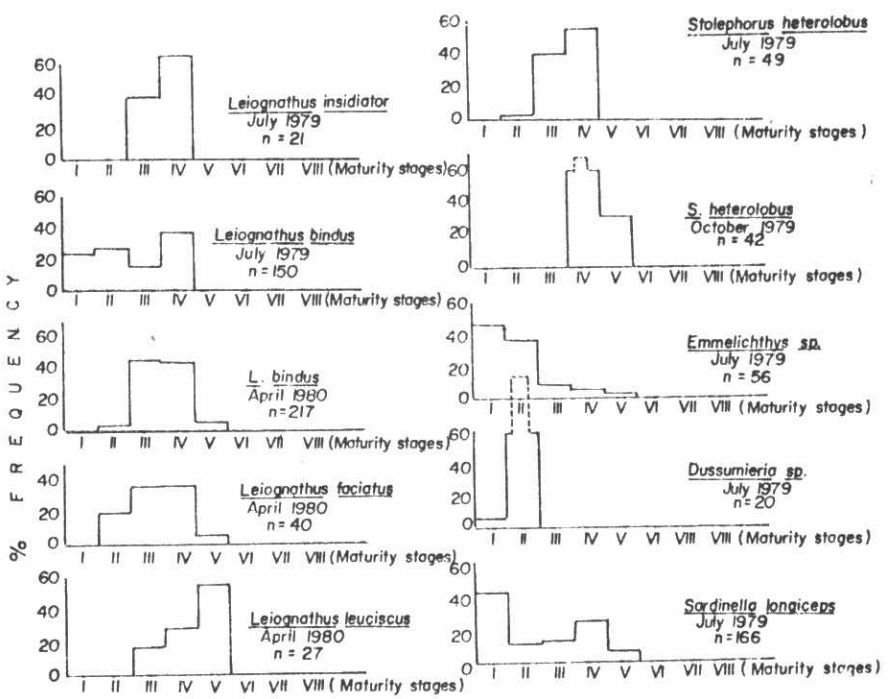

Fig. 4b. Distribution of maturity stages of the different species caught by bagnet around Calagua Island, Lamon Bay, at different monsoon seasons.

Decapterus macrosoma (Bleeker)

Analysis of 481 samples taken during the different monsoon periods showed that small sizes and young stages (fry and juvenile) occurred in August 1978 and July 1979, during the southwest monsoon period. The small sizes and immature gonads were both more than 50%. It is noteworthy that during the tradewinds in April 1979 and April 1980, all samples were of bigger sizes: 14.5-20.5 cm and 16.0-22.5 cm, respectively.

Decapterus maruadsi (Temminck and Schlegel)

The small sizes were present considerably during the southwest monsoon period (August 1978 and July 1979). Very few mature specimens were found.

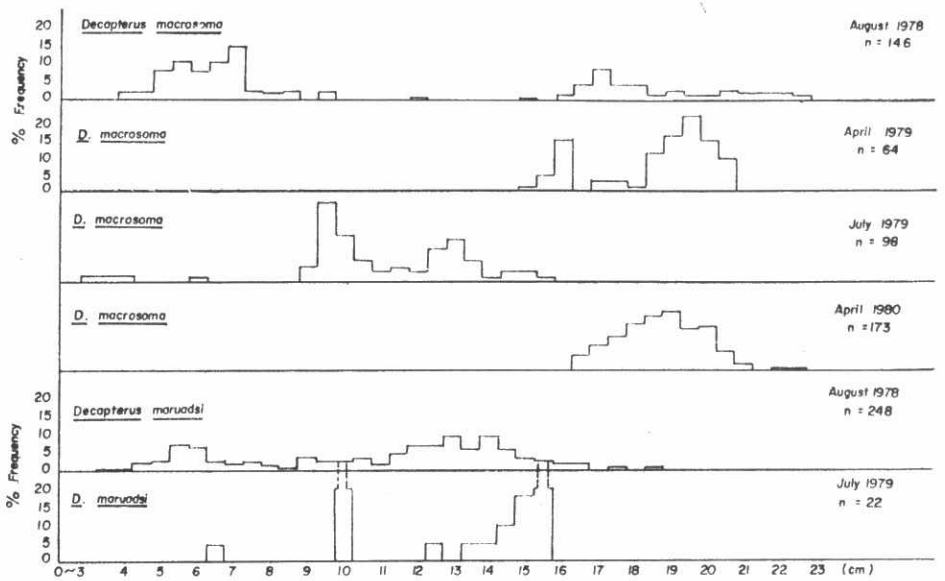

Fig. 5a. Size distribution of roundscad species caught by bagnet at different monsoon seasons around Calagua Island, Lamon Bay.

The gonadal maturity of *D. maruadsi* is similar to that of *D. macrosoma*, i.e., more of the immature ones. There were only four mature fishes out of the 248 taken in August 1978. The 22 fishes taken in July 1979 were in the immature and maturing stages. The length distribution ranged from 3.5 cm to 16.5 cm in August 1978 and from 6.5 cm to 15.5 cm in July 1979. The fry stage was significantly represented by about 60%.

Caranx crumenophthalmus (Bloch)

Samples for August 1978 (22 pc) and July 1979 (11 pc) exhibited almost 100% immature stages (Stages I and II) of gonads. Their sizes ranged from 11.5 cm to 16.5 cm (TL) in August 1978 and from 15.5 cm to 18.0 cm in July 1979.

Selaroides leptolepis (Cuvier and Valenciennes)

Immature stages (I and II) of gonads were found in the 93 samples obtained in August 1978 and in 139 samples in July 1979. The fish samples had almost the same size distribution. It ranged from 8.0 cm to 17.0 cm in August 1978 and 7.5 cm to 17.5 cm in July 1979.

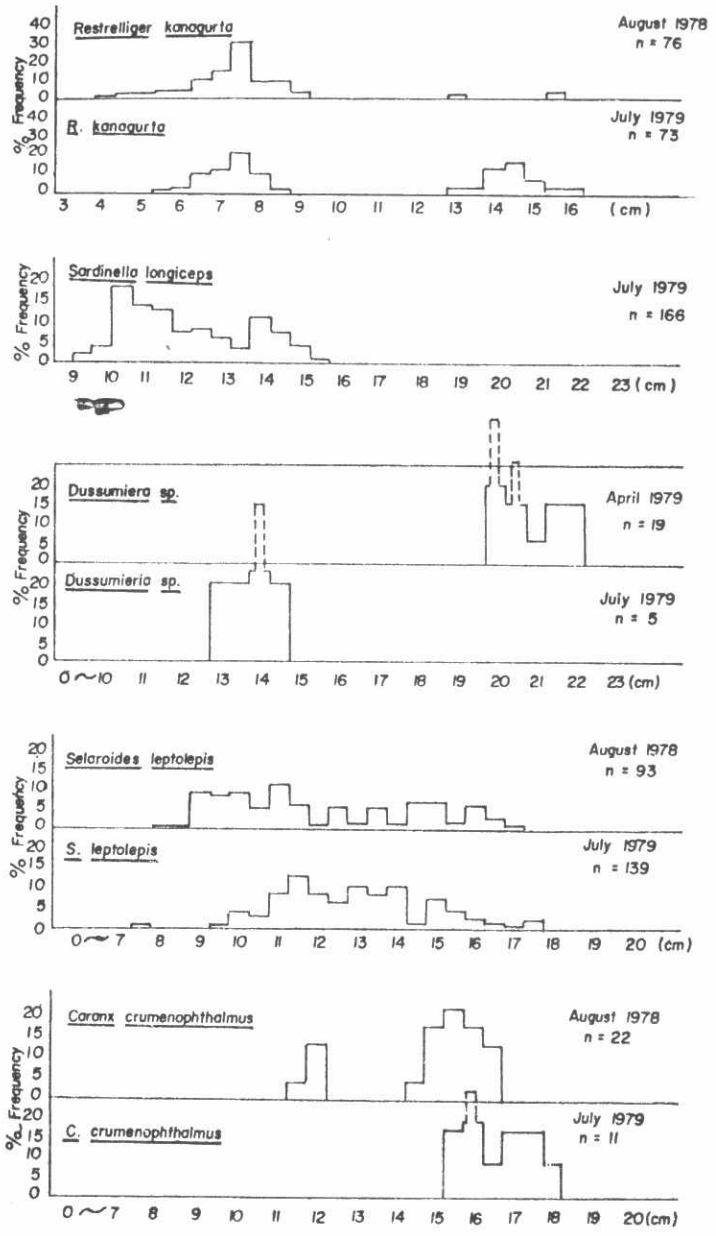

Fig. 5b. Size distribution of other species caught by bagnet at different monsoon seasons around Calagua Island, Lamon Bay.

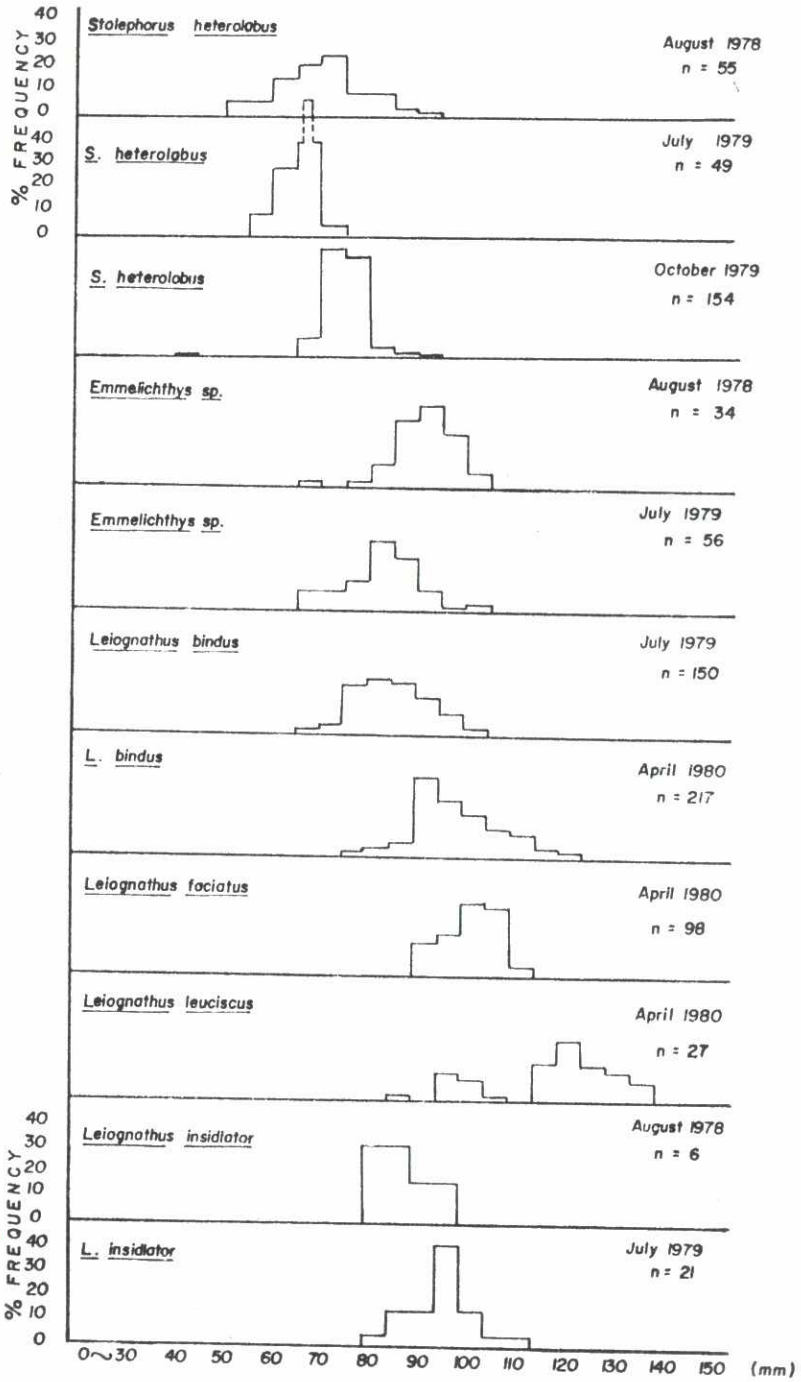

Fig. 5c. Size distribution of other species caught by bagnet around Calagua Island, Lamon Bay, during a particular monsoon season.

Rastrelliger kanagurta (Cuvier)

The samples in August 1978 and in July 1978 were 100% immature (Stages I and II). They were composed of fry, juvenile and medium sizes. The total lengths ranged from 4 cm to 15 cm in August 1978 and from 5 cm to 16 cm in July 1979.

Stolephorus heterolobus (Ruppell)

Almost all of the 245 specimens sampled in August 1978, July and October 1979 exhibited maturing and mature stages (III and IV) of gonads. The fishes had total lengths ranging from 40 mm to 90 mm.

Sardinella longiceps (Cuv. and Val.)

More than 50% of the total 166 samples belonged to immature stages (I and II), a lesser percentage for maturing stages (III and IV), and 6% were in the mature stage (V). The total lengths ranged from 9.5 cm to 15.5 cm. Mature fishes were observed to have lengths from 13.5 cm and longer.

Leiognathus bindus (Cuv. and Val.)

A total of 150 samples were almost equally distributed to immature (I and II) and maturing (III and IV) stages of gonads. The sizes ranged from 65 cm to 105 cm in total length.

Leiognathus insidiator (Bloch)

A total of 31 pieces taken in August 1978 and in July 1979 exhibited maturing (III and IV) gonad stages with total lengths ranging from 80 mm to 100 mm.

Leiognathus fasciatus (Gunther) and *L. leuciscus* (Lacepede)

The slipmouth specimens examined in April 1980 were more in the maturing and mature stages. Their lengths ranged from 80.5 mm to 120 mm for *L. fasciatus* (98 samples) and from 80.5 mm to 130 mm for *L. leuciscus* (27 samples).

Emmelichthys sp.

Most of the specimens (90 pc) taken during the southwest monsoon period (August 1978 and July 1979) were immature (Stages I and II). The rest had maturing (III and IV) and mature (V) gonads. The total lengths ranged from 65.0 mm to 100.0 mm.

Dussumieria sp.

The specimens taken in July 1979 (southwest monsoon) were immature (Stages I and II). The total lengths ranged from 12.5 cm to 14.5 cm. Samples taken during the transition period in April 1979 were bigger (19.5 cm to 22 cm).

For reference and comparison purposes, the maximum lengths of similar species from the South China Sea region and estimates of the length infinity of similar species from some traditional fishing areas of the country, particularly Manila Bay and Palawan, are shown in Tables 4 and 5.

Table 4. Maximum length of important fishes caught by bagnet around Calagua Island (Lamon Bay) in comparison with those recorded in the South China Sea region.

Family	Species	Fishing	Lmax (cm)	Date	Number analyzed	SCSP Lmax*
Carangidae	*Decapterus macrosoma*	Calagua Island (Lamon Bay)	22.5	Aug. 1978	146	20.0
			15.5	July 1979	98	-
			22.5	Apr. 1980	173	-
	Decapterus maruadsi	"	18.5	Aug. 1978	248	-
	Decapterus maruadsi	"	15.5	July 1975	22	-
	Selar crumenophthalmus	"	16.5	Aug. 1978	22	30.0
	Selar crumenophthalmus	"	18.0	July 1979	11	-
	Selaroides leptolepis	"	17.0	Aug. 1978	93	20.0
	Selaroides leptolepis	"	17.5	July	139	-
Clupeidae	*Sardinella longiceps*	"	15.5	July 1979	166	20.0
Dussumiendae	*Dussumieria* sp.	"	22.0	July 1979	19	-
	Dussumieria acuta	"	-	-	-	20.0
Engraulidae	*Stolephorus heterolobus*	Calagua Island	9.0	Aug. 1978	55	-
	Stolephorus heterolobus	"	7.0	July 1979	49	-
Inermiidae	*Emmelichthys* spp.	"	10.0	Aug. 1978	34	-
	Emmelichthys spp.	"	10.0	July 1979	56	-
Leiognathidae	*Leiognathus bindus*	"	10.5	July 1979	150	11.0
	Leiognathus bindus	"	12.0	Apr. 1980	219	-
	Secutor insidiator	"	9.5	Aug. 1978	6	10.0
	Secutor insidiator	"	10.0	July 1979	21	-
Scombridae	*Rastrelliger kanagurta*	"	15.0	Aug. 1978	76	-
	Rastrelliger kanagurta	"	16.0	July 1979	930	-

*FAO Identification Sheet.

Table 5. Estimates of infinite length (L ∞) of important fishes in the Philippine waters. (After Ingles and Pauly, 1984.)

Family	Species	Fishing Ground	L ∞ (cm)	Year	No. of specimens analyzed
Carangidae	*Decapterus macrosoma*	Manila Bay	31.5	1957-1958	3,349
	D. macrosoma	Manila Bay	31.5	1958	9,781
	D. macrosoma	Palawan	27.0	1957	4,705
	D. macrosoma	Palawan	26.8	1957-1958	25,021
	D. macrosoma	Palawan	26.8	1958	13,528
	D. macrosoma	Palawan	27.8	1958-1959	34,836
	D. macrosoma	Palawan	33.0	1959	8,108
	D. macrosoma	Palawan	27.5	1960	625
	D. macrosoma	Palawan	25.0	1965	1,949
	D. macrosoma	Palawan	25.5	1965-1966	3,079
	D. macrosoma	Palawan	25.5	1966	339
	D. macrosoma	Palawan (A)	33.0	1968	16,919
	D. macrosoma	Palawan (B)	30.0	1968	11,985
	D. russelli	Manila Bay	27.0	1958-1959	13,462
	D. russelli	Palawan	26.0	1959	7,092
	D. russelli	Palawan	33.0	1968	9,116
	Selar crumenophthalmus	Manila Bay	36.5	1978-1979	2,287
	Selaroides leptolepis	Manila Bay	29.0	1978-1979	4,440
	S. leptolepis	Visayan Sea	23.0	1976-1977	1,389
Clupeidae	*Sardinella longiceps*	Manila Bay	21.0	1978-1979	1,870
	S. longiceps	Palawan	23.0	1965	6,191
Engraulidae	*Stolephorus heterolobus*	Manila Bay	12.1	1958	2,087
	S. heterolobus	Manila Bay	11.4	1961	2,345
Leiognathidae	*Leiognathus bindus*	Manila Bay	10.3	1958	6,286
	L. bindus	Manila Bay	8.2	1959	2,074
	L. bindus	Manila Bay	8.2	1960	1,002
	Secutor insidiator	Manila Bay	10.2	1957	3,835
	S. insidiator	Manila Bay	11.0	1959	1,253
	S. insidiator	Manila Bay	9.1	1960	181
Scombridae	*Rastrelliger kanagurta*	Palawan	28.0	1965	431

The bagnet catch in Lamon Bay is composed of small and immature fishes, particularly those that grow to a maximum size of more than 30 cm, and mature individuals of the small-sized fishes, such as anchovies and slipmouths.

The presence of immature and mature individuals in a given fishing ground, as in Lamon Bay, is a characteristic of a multi-species tropical fisheries. Biological analysis of a number of species in the Philippine waters showed that there are two recruitment patterns in a year with one more pronounced than the other (Ingles and Pauly, 1984; Corpuz, *et al.*, 1985). This is a condition described as protracted spawning or spawning throughout the year. This explains the availability of mixed sizes and the presence of all maturity stages in a given catch at any given time.

Fishing Season

The peak season of most pelagic fishes in Lamon Bay is from June to September, except for roundscad which is caught almost throughout the year. It can be noted that the peak season corresponds to the period favorable for fishing in the area, i.e., during the southwest monsoon season.

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