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# ON THE BIOLOGY OF ROUNDSCADS (*DECAPTERUS BLEEKER*) IN PHILIPPINE WATERS\*

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## ABSTRACT

This paper presents data on the biology of the *Decapterus* spp. of Philippine waters, noting that the nominal species *D. macrosoma* and *D. lajang* are for practical purposes inseparable, whereas, *D. russelli* is readily recognizable. The two former species are accordingly treated as one. Information on age, rate of growth, fecundity, maturity, nematode infestation and food is presented.

## INTRODUCTION

Studies on Philippine roundscads form part of the researches initiated in October 1956 by the Fisheries Research Division of the Bureau of Fisheries with the assistance of the senior author while serving as FAO Marine Biologist (1956-1958) (Tiews, 1959). Biological researches on this group became most desirable as the roundscads are one of the very few fishes in Philippine waters which are caught in large quantities most of the year. A specialized bag-net fishery, basnigan (Manacop & Laron, 1953) developed after World War II in Palawan waters, Visayan Sea, Batangas Bay, Tayabas Bay and Lingayen Gulf, Camarines Norte, Ragay Gulf, and northern Zamboanga which landed about 18,880 metric tons of roundscads in 1956 (Anon. 1957), increasing to 92,000 tons in 1966 (Table I). This

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\* Presented at the 13th Session, Indo-Pacific Fisheries Council, 1968.



TABLE I  
Production of Roundscads in the Important Fishing Grounds (Metric tons)  
(Philippine Fisheries Statistics)

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Palawan Waters	14,206	15,278	17,415	18,038	21,597	21,194	33,842	46,476	68,886	77,949	61,745
Visayan Sea	1,967	1,782	2,004	2,510	1,541	2,674	1,827	3,683	5,075	11,447	17,305
Manila Bay approach	1,771	1,115	498	291	105	294	300	2,596	1,125	3,619	3,035
Lamon Bay (Pacific side)	289	242	604	443	106	318	199	355	622	1,600	1,394
Sibuguey Gulf	7	14	9	-	48	92	325	583	622	1,700	7,748
Tayabas Bay	179	60	148	-	23	-	558	1,594	362	864	1,126
Total	18,419	18,491	20,678	21,282	23,420	24,572	37,051	55,287	76,692	97,179	92,353

fish today is the most important of all commercial species. Since 1961, modern purse seine fishing uses puretic power blocks in connection with the light luring technique of the basnig fishery, this was introduced and resulted in the fast development of this fishery. In 1966, 46 purse seine boats were in operation. Expansion of the fishery is still possible, especially around Mindanao and east of Luzon.

The roundscads are small to moderate sized fishes, with a taste and texture of flesh almost similar to that of chub mackerel *Rastrelliger*. Although not "first class", the fish is popular to the poor people because it is cheap and has good flavor. This fish may prove to be the most important source of cheap protein food to the Filipino masses and should, therefore, be of special interest to both the commercial fishery and fisheries research for further development.

The research was conducted mainly thru analysis of samples taken in the fish markets, inasmuch as no research vessel was available for systematic surveys of fishing grounds and since, it was not possible to develop a sampling programme aboard commercial fishing boats due to lack of personnel. Although this study continued up to 1964, most of the data here presented were up to 1958 and a few up to 1960.

#### MATERIAL AND METHODS

With the aim to observe the composition of roundscad catches regarding species and length composition as well as to maturity condition, samples from known fishing grounds were mainly purchased in the beginning of the study at the Navotas fish landing. Since August, 1957, however, samples were taken exclusively at San Andres Market, Manila. Although a retail city market, it was found to be favorable for securing fish samples as the dealers obtain their fish from two of the important roundscad landing places, i.e. from Navotas, Rizal, where fish catches from Palawan waters are mainly landed and from Rosario, Cavite. Rosario is located on the opposite side of Navotas, in Manila Bay, and it is where nearly all catches from the Manila Bay approaches are landed.

In the beginning, samples were secured only from catches taken from Palawan waters. After April 1957, however, it was found desirable to extend the investigations to the fishing grounds in the Manila Bay approaches which consist of the area from the mouth of Manila Bay to Batangas. In addition to the materials analyzed at



the Dagat-dagatan Fisheries Research Laboratories, additional samples were measured in the San Andres city market from February 1958 without purchasing them in order to increase the data on the length composition of catches (Table II). This arrangement became possible through the close cooperation of the fish dealers at the market. Since then, the length composition of catches was checked daily.

The purchased samples normally consisted of about 300 specimens each of unsorted fishes. In the beginning of the study when samples were mainly purchased at the Navotas fish market, the size of samples could not be standardized since these could only be secured by purchasing a whole container at the wholesale fish market in Navotas. A total of 233 samples of 117, 547 specimens were examined. The total length of the fish has been used in this study.

#### IDENTIFICATION

Herre (1953) reports that 4 species of roundscads are present in Philippine waters:

1. "*Decapterus kurroides* Bleeker (1855) — a rare fish, only known from 10 specimens, 4 from the East Indies and 6 from the Philippines."
2. "*Decapterus lajang* Bleeker (1855) — East Indies and Philippines, north to Japan and in the Indian Ocean to South Africa."
3. "*Decapterus macrosoma* Bleeker (1851) — from Najal to the Philippines, north to Japan and the Bonin Islands, south through the East Indies to Australia."
4. "*Decapterus russelli* Ruppell (1828) — Red Sea and East coast of Africa to the Philippines, Japan, and Australia."

The keys given by different authors including that of Weber and de Beaufort (1931), unfortunately, do not allow a clear separation of all the species as the selected characters were not characteristically different for each species (Table III).

In the beginning of the study, it was believed that three species could be distinguished. However, as more samples were studied, evidence was gathered that for ordinary sampling purposes only two species of *Decapterus* can externally be distinguished in Philippine waters for population study, i.e. *Decapterus macrosoma/lajang* and *Decapterus russelli*. Statistical studies on variation of some meristic

TABLE II  
Roundscad (*Decapterus*) Samples Measured during the Period of Research.

Month & Year	Palawan waters			Manila Bay		
	Studied in laboratory	Measured in market		Studied in laboratory	Measured in market	
	No. of samples	No. of fish		No. of samples	No. of fish	
November 1956	1	308	-	-	-	-
December "	1	608	-	-	-	-
January 1957	3	820	-	-	-	-
February "	3	1,066	-	-	-	-
March "	4	2,725	-	-	-	-
April "	3	4,274	-	1	98	-
May "	2	2,498	-	3	1,085	-
June "	3	3,024	-	2	497	-
July "	4	2,662	-	-	-	-
August "	6	1,496	-	-	-	-
September "	6	1,784	-	3	808	-
October "	6	1,871	-	3	727	-
November "	4	1,167	-	1	201	-
December "	5	1,412	-	4	916	-
January 1958	3	898	-	8	2,022	-
February "	9	2,852	1,717	7	1,795	1,545
March "	6	1,764	2,491	6	1,415	1,424
April "	4	1,199	2,743	6	1,378	1,231
May "	6	1,855	3,183	5	1,467	1,021
June "	6	1,862	4,098	4	1,222	1,048
July "	5	1,500	3,237	5	1,514	932
August "	5	1,501	3,369	5	1,521	640
September "	5	1,496	3,018	2	589	182
October "	5	1,492	1,279	6	1,814	1,332
November "	9	1,466	2,045	2	315	72
December "	10	1,565	1,387	-	-	-
January 1959	8	1,515	2,165	4	1,199	266
February "	3	899	1,157	7	1,076	537
March "	9	1,515	1,348	5	853	2,472
Total	144	49,094	33,237	89	22,512	12,702



TABLE III  
Old Key for the Separation of *Decapterus* Species as  
Given by Various Authors.

	<i>D. russelli</i>	<i>D. macrosoma</i>	<i>D. lajang</i>
Body form	Elongate, not much compressed, dorsal and ventral profile equal.	Elongate, scarcely compressed, rather low.	Elongate, somewhat compressed, dorsal and ventral profile slightly convex, the ventral more
Height length in body	4.5 - 5.5	5.5	6
Head length in body	3.4 - 3.5	4 - head more or less pointed	4
Eye	3.6 to more than 4 in head	4 - 5 in head	3 times in head
Lateral line	Begins straight then slightly arched below soft dorsal and descends below its middle posterior part.	Descend in a straight line and scarcely arched below dorsal and about the 13th second dorsal soft rays.	Scarcely arched part longer than the posterior straight part which starts below the 15th dorsal ray.
Scales		60	
Scutes	40	27- 30	28 - 30
First dorsal	VIII	VIII	VIII
Second dorsal	I. 30 - 32	I. 32 - 25	I. 31 - 34
Anal	II 1. - 24 - 27	II 1. - 27 - 30	II 1. - 27 - 30

characters indicated that considerable variations existed in the counts and measurements which may have confused previous authors in the description of each species. The belief that only two species of *Decapterus* can be readily distinguished locally became more conclusive when three samples of 150 specimens for each of the originally identified three species *D. lajang*, *D. macrosoma* and *D. russelli* were compared in their variability of meristic characters, wherein *D. lajang* and *D. macrosoma* were distinguished by (a) the general shape of the body (the first one seemed to be more round than the other) and (b) by the structure of the lateral line (the latter seemed to possess a sharp decline of its lateral line near the end of the first dorsal). It was also shown that the length composition individually taken during the whole period of study for the three supposed species showed exactly the same pattern with regard to the dominant length groups in the case of *D. lajang* and *D. macrosoma*, so that a clear division of the samples into those two species was not possible.

The two species of roundscads found in the Palawan catches and the Manila Bay approach were separable by the characters given in Table IV.

Comparison of the two Philippine species reveals that *D. russelli* has a much longer pectoral fin, a larger body depth and head length, the larger number of scutes, and a smaller number of scales along the lateral line and of fin-rays in its second dorsal fin (Table IV). No characteristic differences were found in the number of vertebrae, of gill-rakers, of the epi- (10-14), cerato- (19-25) and hypobranchial (9-13) of fin-ray of the first dorsal, and (25-32) pectoral fins (20-23).

#### DISTRIBUTION

Roundscads are widely distributed in Philippine waters, but the fisheries at present concentrate on few areas only. Main fishing grounds are the Palawan waters and the Visayan Sea (Table V). During the Southwest monsoon (June to October), *D. macrosoma/lajang* dominates the whole catch in Palawan waters, while during the Northeast monsoon season (December to March), it is *D. russelli*. The fishery then shifts to the more sheltered side of western Palawan.

In the Manila Bay area, roundscads do not enter Manila Bay by itself. All roundscads of this area are caught West of Corregidor Island, i.e., outside the Bay. Roundscads obviously avoid zones of



TABLE IV  
Key Used for Separating the *Decapterus* spp.

	<i>D. lajang/macrosoma</i>	<i>D. russelli</i>
Scales along lateral line (Region - from head to the first scute)	74 - 93	51 - 66
Pectoral length in standard length	4.9 - 6.3	3.7 - 4.7
No. of scutes	26 - 32	32 - 39
Finrays of 2nd dorsal	34 - 38	30 - 33
Body depth in S. length	4.7 - 6.5	4.0 - 5.1
Head length in S. length	3.4 - 4.3	3.0 - 3.7

TABLE V  
Percentile share of *Decapterus russelli* on the roundscad samples from  
Palawan waters and Manila Bay approach studied at the laboratory.  
The figures in parenthesis were computed from the additional  
samples investigated from the market (compare Table II).

Month	Palawan Waters	Manila Bay Approach
November 1956	0.0	--
December	16.3	--
January 1957	38.2	--
February	37.8	--
March	19.0	--
April	0.3	28.6
May	2.5	65.7
June	1.5	65.2
July	3.2	--
August	0.0	--
September	2.3	61.8
October	4.1	73.0
November	2.0	70.2
December	21.8	97.5
January 1958	66.8	69.8
February	32.5 (21.3)	94.6 (98.7)
March	45.5 (50.4)	81.3
April	30.3 (30.6)	59.7 (77.0)
May	27.4 (38.5)	42.4 (57.7)
June	19.2	47.8
July	15.5	17.4

TABLE V (Cont'd.)

Month	Palawan Waters	Manila Bay Approach
August 1958	12.2	56.7
September	13.4	2.7
October	0.8	59.1
November	23.4	71.4
December	23.6	--
January 1959	75.1	100.0
February	100.0	92.2
March	42.0	56.3

TABLE VI  
A Comparison of the Fecundity of the Two Species of *Decapterus*.

Species	Maturity stage	n.	Av. wt. fish (gm)	Av. length fish (mm)	Av. wt. ovaries (gm)	Av. No. of eggs	Av. egg diameter (mm)
<i>D. russelli</i>	IV	3	48	170	1.8	28,766	0.35-0.40
	V	7	88	229	3.4	48,668	0.30-0.35
<i>D. macrosoma/lajang</i>	IV-V	1	79	210	2.3	76,273	0. 0.35
	IV	10	82	209	2.2	67,896	0.30-0.35
	IV-V	1	120	226	4.6	81,327	0.25-0.30
	IV-V	5	123	232	4.1	86,924	0.30-0.35
	IV	3	130	238	3.4	74,774	0.30
	V	1	199	288	4.9	106,166	0.30



lower salinities within the bay. Soemarto (1960) noted that *D. lajang* do not enter the waters around Djakarta. Even during the dry season from January to May, when salinity inside and outside the bay is the same, roundscads do not enter the bay. Perhaps the difference in the food supply found inside and outside the bay may be another possible explanation for the absence of roundscads from Manila Bay. While inside the bay, normally phytoplankton dominates the zooplankton forms, on which roundscads mainly feed. In the San Miguel Bay area located on the Pacific side of Southern Luzon, roundscads are never caught inside the Bay.

With the present knowledge, roundscads can be defined as coastal fishes avoiding salinities below 30‰ and the phytoplankton concentrations found in the bays of the Philippine Archipelago. The main catching places of the bagnet fishery are a little off-shore, characterized by water depths from 20-25 fathoms up to one hundred fathoms as occasionally found around the Palawan waters.

### BIONOMICS AND LIFE HISTORY

#### 1. Reproduction

##### a) Spawning time

To determine its breeding time, the development of gonads were examined in catch samples. Eight maturity stages were distinguished (Buckmann, 1929). It can be concluded that the breeding period of both species of roundscads extends from November to March in Palawan waters, although mature specimens were rarely found. Spawning time in the Manila Bay approaches seemed to be delayed by 1-2 months thus, extending to April and May.

##### b) Fecundity

Fecundity studies were also conducted (Table VI). A total of 31 ovaries were treated with Gilson solution and the eggs counted. There were between 67,900 and 106,200 eggs in *D. macrosoma/lajang*, and between 28,000-48,000 in *D. russelli*.

#### 2. Infestation with nematode parasites

At the start of this study numerous nematode parasites were noted in the mesenteries and omenta of roundscads. The species of parasites are still unknown to the authors. Nevertheless, the infestation of fishes was studied (Tables VII-X).

TABLE VII  
Nematode Infestation of *D. russelli* from Manila Bay

MALES	No. of sample	Month	Size Group (100-150 mm)			Size Group (151-200 mm)			Total No.	Size Group (201-250 mm)		
			Total No.	Infected No.	%	Total No.	Infected No.	%		Total No.	Infected No.	%
May 1957	2		178	8	4.5	13	1.6					
June "	2		127	7	5.5	20	3.0					
Sept. "	2		90	3	3.3	5	1.6					
Oct. "	3		15	0	0	0	0					
Nov. "	1		-	-	-	-	-					
Dec. "	3		26	19	7.3	33	1.7					
Jan. 1958	5		421	7	1.7	7	1.0					
Feb. "	4		73	1	1.4	1	1.0					
Mar. "	4		221	12	5.4	13	1.1					
Apr. "	3		188	4	2.0	6	1.5					
May "	3		65	3	4.6	5	1.7					
June "	5		22	3	13.6	3	1.0					
July "	4		54	6	11.1	10	1.7					
Aug. "	5		1491	73	4.9	116	1.6					
Oct. "	5		3567	390	10.9	653	1.7					
Total	53		1491	73	4.9	116	1.6		193	12	6.4	1.6
FEMALES	No. of sample	Month	Size Group (100-150 mm)			Size Group (151-200 mm)			Total No.	Size Group (201-250 mm)		
			Total No.	Infected No.	%	Total No.	Infected No.	%		Total No.	Infected No.	%
May 1957	2		149	3	2.0	3	1.0					
June "	2		107	10	9.3	13	1.3					
Sept. "	2		52	2	3.8	4	2.0					
Oct. "	3		20	0	0	0	0					
Nov. "	1		-	-	-	-	-					
Dec. "	3		-	-	-	-	-					
Jan. 1958	5		17	7	41.3	10	1.5					
Feb. "	7		348	3	0.9	4	1.3					
Mar. "	4		43	2	4.7	2	1.0					
Apr. "	4		118	1	1.0	1	1.0					
May "	3		102	2	3.8	3	1.5					
June "	5		53	2	3.8	3	1.5					
July "	4		17	0	0	0	0					
Aug. "	5		48	6	12.5	8	1.2					
Oct. "	5		1078	38	3.5	50	1.3					
Total	53		1078	38	3.5	50	1.3		47	3	6.4	1.3



TABLE VIII  
Nematode Infestation of *D. russelli* from Palawan Waters.

MALES Month	No. of sample	Size Group (100-150 mm)						Size Group (151-200 mm)						Size Group (201-250 mm)					
		Total No.	Infected No.	%	Total para- sites	Av.No. para- sites	Total No.	Infected No.	%	Total para- sites	Av.No. para- sites	Total No.	Infected No.	%	Total para- sites	Av.No. para- sites			
Dec. 1957	1	-	-	-	-	-	174	114	85.5	296	2.6	21	12	57.0	73	2.8			
Jan. 1958	3	-	-	-	-	-	267	163	62.0	503	3.0	54	41	76.0	275	6.3			
Feb. "	6	-	-	-	-	-	107	82	76.6	231	2.8	44	40	91.0	180	4.5			
March "	7	298	4	1.3	5	1.2	78	2	2.6	2	1.0	-	-	-	-	-			
" Apr. "	4	72	0	0	0	0	281	23	8.2	47	2.0	17	4	23.6	6	1.5			
" May "	4	55	4	7.3	6	1.5	134	21	15.7	29	1.4	-	-	-	-	-			
" June "	5	76	24	31.6	70	2.8	62	17	25.8	28	1.6	-	-	-	-	-			
" July "	3	15	3	20.0	7	2.3	53	7	13.2	12	1.7	-	-	-	-	-			
" Aug. "	3	7	0	0	0	0	54	9	16.7	14	1.5	-	-	-	-	-			
" Sept. "	3	4	2	50.0	3	1.5	79	9	11.4	15	1.7	-	-	-	-	-			
Total	39	527	37	7.0	91	2.5	1289	447	34.4	1177	2.6	136	97	71.3	534	5.5			
FEMALES																			
Dec. 1957	1	-	-	-	-	-	81	53	65.5	127	2.4	20	14	70.0	31	2.2			
Jan. 1958	3	-	-	-	-	-	90	59	65.5	204	3.4	25	21	84.0	116	5.5			
Feb. "	7	627	0	0	0	0	94	59	62.8	204	3.4	29	24	83.0	87	3.6			
Mar. "	5	91	4	4.4	5	1.2	146	3	2	3	1	-	-	-	-	-			
" Apr. "	4	2	0	0	0	0	128	14	10.9	54	3.8	6	2	33.4	3	1.5			
" May "	4	30	3	1	3	1.0	121	13	10.7	17	1.3	-	-	-	-	-			
" June "	5	48	21	43.8	39	1.1	115	11	9.6	21	1.9	-	-	-	-	-			
" July "	3	17	0	0	0	0	101	7	6.9	8	1.1	-	-	-	-	-			
" Aug. "	3	7	0	0	0	0	86	8	9.3	10	1.2	-	-	-	-	-			
" Sept. "	3	4	2	50.0	3	1.5	108	10	9.2	15	1.5	-	-	-	-	-			
Total	38	826	30	3.6	50	1.7	1070	237	22.1	663	2.8	80	61	76.3	237	3.9			

TABLE IX  
Nematode infestation of *D. macrostoma/lajang* in Manila Bay (males only).

MALES Month	No No. samp.	Size Group (101-150 mm)				Size Group (151-200 mm)				Size Group (201-250 mm)					
		Total No.	Infected No.	%	Total para- sites	Total No.	Infected No.	%	Total para- sites	Total No.	Infected No.	%	Total para- sites		
Jan. 1957	2	13	1	8.0	1	170	15	8.8	30	2.0	42	3	0.7	3	1.0
June "	1	4	4	100.0	0	9	1	1.1	1	1.0	-	-	0	-	-
Sept. "	2	-	-	-	0	234	14	6.0	30	2.1	5	0	0	0	0
Oct. "	1	-	-	-	-	87	5	5.8	6	1.2	1	0	0	0	0
Nov. "	1	-	-	-	-	10	1	1.0	1	1.0	18	0	0	0	0
Jan. 1958	4	3	3	100.0	16	86	9	11.6	10	1.1	175	32	18.3	35	1.1
Feb. "	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March "	3	-	-	-	-	9	1	1.1	1	1.0	168	4	2.7	8	2.0
Apr. "	5	27	2	0.7	4	106	5	4.7	5	1.0	76	6	7.6	10	1.5
May "	5	18	2	11.1	2	288	32	11.1	52	3.3	85	5	5.9	7	1.2
June "	3	4	4	100.0	4	281	39	13.9	61	1.6	18	3	1.7	5	1.2
July "	5	51	3	5.9	3	310	26	8.4	26	1.0	1	1	100.0	1	1.0
Aug. "	2	2	0	0	0	183	6	3.3	7	1.1	-	-	-	-	-
Sept. "	2	1	0	0	0	291	1	1.7	5	1.0	-	-	-	-	-
Oct. "	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total:	40	123	19	9.4	32	2064	159	7.7	235	1.5	589	54	9.3	69	1.3

TABLE X  
Nematode infestation of *D. macrosoma/lajung* in Palawan waters.

MALES Month	No. samp.	Size Group (100-150 mm)				Size Group (151-200 mm)				Size Group (201-250 mm)					
		Total No.	Infected No.	Total para- sites	Av.No para- sites	Total No.	Infected No.	Total para- sites	Av.No para- sites	Total No.	Infected No.	Total para- sites	Av.No para- sites		
March 1957	1	-	-	-	-	190	1	0.5	0	3	18	4	5.1	43	11.0
" "	2	103	9	8.7	10	666	63	9.5	105	1.7	-	-	-	-	-
" May	3	165	4	2.2	4	329	23	7.0	29	1.3	-	-	-	-	-
" June	3	14	3	4.0	3	610	85	13.9	120	1.4	6	3	50.0	40	13.3
" Aug.	5	42	2	4.8	2	606	56	9.2	74	1.3	2	0	0	0	0
" Sept.	6	111	5	4.5	6	759	167	22.0	307	1.8	3	2	67.0	25	12.5
" Oct.	6	12	1	8.3	1	706	114	16.2	169	1.6	16	4	25.0	9	2.2
" Nov.	4	-	-	-	-	563	81	14.4	95	1.2	-	-	-	-	-
" Dec.	4	-	-	-	-	455	266	58.5	811	3.1	76	33	43.4	206	6.3
" Jan. 1958	1	-	-	-	-	87	80	92.0	530	6.5	42	38	90.0	0	0
" Feb.	9	135	6	4.4	6	49	5	10.2	34	7.0	154	3	1.9	20	7.0
" March	5	54	4	7.4	4	208	3	1.4	3	1.0	-	-	-	-	-
" Apr.	5	6	0	0	0	336	2	0.6	5	2.5	15	1	6.7	3	3.0
" May	6	34	1	2.9	1	469	23	4.9	31	1.3	2	0	0	0	0
" June	6	47	0	0	0	481	8	1.6	9	1.1	13	0	0	0	0
" July	5	2	0	0	0	455	8	1.7	11	1.4	24	0	0	0	0
" Aug.	5	-	-	-	-	432	13	3.0	17	1.3	116	6	5.2	17	2.8
" Sept.	5	-	-	-	-	372	41	1.1	46	1.1	162	3	7.0	5	1.7
" Oct.	5	-	-	-	-	502	79	15.8	135	1.7	54	8	14.8	14	1.8
Total:	86	725	35	4.5	39	8275	1118	13.5	2531	2.3	703	105	13.8	382	3.6

TABLE X (Cont'd.)  
Nematode infestation of *D. macrostoma/tajang* in Palawan waters

FEMALES Month	No. samp.	Size Group (100-150 mm)					Size Group (151-200 mm)					Size Group (201-250 mm)							
		Total No.	Infected No.	% Infected	Total para- sites	Av.No. para sites	Total No.	Infected No.	% Infected	Total para- sites	Av.No. para- sites	Total No.	Infected No.	% Infected	Total No.	Infected No.	% Infected	Total para- sites	Av.No. para- sites
May 1957	2	-	-	-	-	-	104	2	0.9	2	1.0	-	-	-	-	-	-	-	-
June "	4	63	4	6.6	4	1.0	298	29	9.7	35	1.2	-	-	-	-	-	-	-	-
July "	3	43	1	2.3	1	1.0	644	76	11.8	138	1.8	-	-	-	-	-	-	-	-
Aug. "	5	45	1	2.2	1	1.0	522	50	8.0	61	1.2	-	-	-	-	-	-	-	-
Sept. "	6	46	2	4.4	2	1.0	653	132	20.2	258	2.0	-	-	-	-	-	-	-	-
Oct. "	6	16	0	0	0	0	925	128	13.8	176	1.3	-	-	-	-	-	-	-	-
Nov. "	4	-	-	-	-	-	572	64	11.2	76	1.2	-	-	-	-	-	-	-	-
Dec. "	4	-	-	-	-	-	449	218	48.5	1026	4.5	-	-	-	-	-	-	-	-
Jan. 1958	3	-	-	-	-	-	79	71	90.0	358	5.0	-	-	-	-	-	-	-	-
Feb. "	8	317	8	2.5	8	1.0	80	0	0	0	1.0	-	-	-	-	-	-	-	-
Mar. "	5	63	1	1.6	1	1.0	205	3	1.5	3	1.0	-	-	-	-	-	-	-	-
Apr. "	5	5	0	0	0	0	209	1	0.5	2	2.0	-	-	-	-	-	-	-	-
June "	6	57	2	3.5	2	1.0	569	7	1.2	7	1	-	-	-	-	-	-	-	-
July "	5	1	0	0	0	0	576	7	1.2	7	1	-	-	-	-	-	-	-	-
Aug. "	5	-	-	-	-	-	422	12	2.8	13	1.1	-	-	-	-	-	-	-	-
Sept. "	5	-	-	-	-	-	479	26	5.4	33	1.3	-	-	-	-	-	-	-	-
Oct. "	5	-	-	-	-	-	637	73	11.7	150	2.3	-	-	-	-	-	-	-	-
Total	81	556	19	2.8	19	1.0	7533	899	11.7	2345	2.6	-	-	-	-	-	-	-	-



It was found that the average number of parasites per fish and the infestation rate increased with the length of fish in both *Decapterus* species. Infestation was higher in fish from Palawan waters than in those from Manila Bay approach. This applies also for the number of parasites found per fish. This phenomena may indicate a certain autonomy of fish stocks in both areas. For example, females of *D. macrosoma/lajang* above 200 mm in size were infested in Palawan waters by 13.8% (3.6 parasites per fish), while those in Manila Bay approaches by 9.3% (1.3 parasites per fish). Males of *D. russelli* above 200 mm were infested in Palawan waters by 71.3% (5.5 parasites per fish) while those in Manila Bay approaches only by 6.4% (1.6 parasites per fish).

### 3. Food and feeding habits

A total of 514 analyses of stomach contents were made (Tables XI-XII). *D. macrosoma/lajang* is a typical zooplankton feeder, while *D. russelli* preys on a much larger degree on fishes. Both species had frequently eaten *Stolephorus* eggs.

### 4. Fat content

A total of 240 fat analyses were made (Table XIII) to determine if a special fat content cycle existed in this fish. As the results show, fat content is neither correlated with the length of the fish nor with the species nor with season.

The fat content in *D. macrosoma/lajang* ranged from 5.2% to 14.4% while that of *D. russelli* ranged from 6.8% to 19.3%.

The average fat content of all samples seemed to be slightly higher in *D. russelli* than in *D. macrosoma/lajang*.

## POPULATION

### 1. Sex ratio

The sex ratio differs slightly with area and species. While there is a slight preponderance of male *D. russelli* in Manila Bay approach, the sex ratio is nearly balanced in Palawan waters.

In the case of *D. macrosoma/lajang* sexes are relatively more balanced in Palawan waters, but females were found to be slightly more numerous during most of the time in the Manila Bay approaches (Table XIV).

TABLE XI

Food items found in the stomachs of 123 *Decapterus russelli* collected from Palawan waters, Mercedes, Camarines Norte, and Manila Bay approaches (34 stomachs were empty). (Date of Collection V, VI, VII, IX, X, 1957 and II, 1958).

Food Items	n	% of total (Dominance)
Animal components	(710)	(88.3)
Crustaceans		
1. Megalops	31	3.9
2. Copepods	22	2.8
3. Shrimp fry	11	1.4
4. Amphipods	9	1.1
5. Ostracods	3	0.4
6. Mysis	2	0.3
7. Crustacean remains	187	23.2
8. Copepod eggs	1	0.1
Pisces		
9. Fishes	163	20.2
10. Fish remains	188	23.3
11. <i>Stolephorus</i> eggs	89	11.1
Protozoans		
12. Radiolaria	2	0.3
Molluscs		
13. Squids	1	0.1
14. Sponge spicules	1	0.1
Plant components	(94)	(11.7)
15. <i>Navicula</i>	94	11.7
Total:	804	100.0%

Nematode parasites: 57

TABLE XII

Food items found in the stomachs of 381 *Decapterus macrosoma/lajang*, collected from Palawan waters and Manila Bay approaches (97 stomachs were empty). (Date of Collection: V, VI, VII, VIII, IX, X, 1957 and II, 1958).

Food Items	n	% of Total (Dominance)
Animal components	(1720)	(86.2)
<u>Crustaceans</u>	(1204)	(60.3)
1. Copepods	112	5.6
2. Amphipods	75	3.8
3. Ostracods	8	0.4
4. Shrimp fry	9	0.5
5. Cladoceran	7	0.4
6. Zoeae larvae	9	0.5
7. Megalops	7	0.4
8. Megalop larvae	28	1.4
9. Nauplius larvae	3	0.2
10. Crustacean remains	773	38.0
11. Copepod eggs	173	8.7
<u>Pisces</u>		
12. Fishes	19	1.0
13. Fish remains	27	1.4
14. <u>Stolephorus</u> eggs	454	22.7
<u>Protozoans</u>		
15. Noctiluca	2	0.1
16. Radiolaria	3	0.2
<u>Mollusca</u>		
17. Veliger larvae	3	0.2
18. Fragment	1	0.1
19. Pteropod	1	0.1
20. Spong spicules	1	0.1
21. Unidentified organism	5	0.3
Plant components	(276)	(13.8)
22. Conscinodiscus	110	5.5
23. Rhizosolenia	1	0.1
24. Synedra	58	2.9
25. Nitzschia	2	0.1
26. Filamentous algae	105	5.3
Total	1996	100.0%

Nematode parasites: 67

TABLE XIII

Comparison of the percentage of fat present in different size groups of *Decapterus macrosoma/lajang* and *Decapterus russelli*.

Month & Year	<i>Decapterus macrosoma/lajang</i>						<i>Decapterus russelli</i>					
	100 - 150		Size groups mm				100 - 150		Size groups mm			
	No. of fish		150 - 200		200 - 250		150 - 200		200 - 250		200 - 250	
	(n)	X%	n	X%	n	X%	n	X%	n	X%	n	X%
January 1967	2	6.7	11	6.7	7	6.8	-	-	-	-	-	-
February "	6	12.3	3	9.8	2	10.0	-	-	5	12.1	-	-
March "	19	9.3	-	-	-	-	-	-	3	23.7	2	15.0
April "	1	7.9	12	10.9	-	-	4	10.6	-	-	1	12.7
May "	-	-	10	12.2	-	-	2	14.9	2	18.4	-	-
June "	3	11.0	8	12.4	2	12.7	1	6.8	4	8.7	-	-
July "	1	9.2	9	10.7	-	-	1	7.1	4	11.3	-	-
August "	2	6.2	8	11.9	-	-	-	-	-	-	-	-
September "	-	-	17	10.5	-	-	3	13.3	3	9.3	-	-
October "	-	-	11	8.1	-	-	1	9.1	3	9.4	1	12.5
November "	-	-	9	12.6	1	5.2	-	-	4	9.3	1	10.3
December "	-	-	9	10.4	1	7.5	-	-	6	10.3	-	-
January 1958	-	-	1	8.5	1	8.3	-	-	1	19.6	1	11.3
February "	9	9.5	-	-	2	8.4	7	8.6	2	9.7	-	-
March "	1	12.3	5	14.4	4	10.7	2	19.3	7	16.7	-	-
Total	44		113		20		21		44		6	
average		9.4		10.7		8.7		11.2		13.2		12.4



TABLE XIV

Sex ratio (SR) in samples of *D. russelli* and *D. macrosoma/lajang* taken in Manila Bay approaches and Palawan waters expressed in percentage shares of males on the total number (N = number of samples, n = number of specimen).

			<i>D. russelli</i> (% of males)						<i>D. macrosoma/lajang</i> (% of males)					
			Manila Bay approach			Palawan waters			Manila Bay approach			Palawan waters		
	N	n	SR	N	n	SR	N	n	SR	N	n	SR	N	n
Nov. 1956	-	-	-	-	-	-	-	-	-	1	294	45.2	-	-
Dec. "	-	-	-	-	-	-	-	-	-	1	254	44.5	-	-
Jan. 1967	-	-	-	-	-	-	-	-	-	3	814	45.1	-	-
Feb. "	-	-	-	-	-	-	-	-	-	3	1,124	49.4	-	-
March "	-	-	-	-	-	-	-	-	-	4	1,180	60.5	-	-
Apr. "	-	-	-	-	-	-	-	-	-	3	1,347	62.9	-	-
May "	3	585	50.6	-	-	-	2	364	53.8	2	888	86.6	-	-
June "	2	308	53.9	-	-	-	1	167	39.5	3	898	55.0	-	-
July "	-	-	-	-	-	-	-	-	-	3	1,491	53.6	-	-
Aug. "	-	-	-	-	-	-	-	-	-	5	1,322	49.2	-	-
Sept. "	2	349	52.7	-	-	-	2	310	55.8	6	1,577	55.3	-	-
Oct. "	3	532	57.9	-	-	-	1	191	46.1	6	1,698	43.2	-	-
Nov. "	1	143	43.4	-	-	-	1	58	48.3	4	1,142	49.4	-	-
Dec. "	3	747	42.3	1	296	65.9	1	23	47.8	4	1,103	48.1	-	-
Jan. 1958	5	1,089	52.2	3	597	53.8	4	587	47.3	1	255	49.0	-	-
Feb. "	7	1,537	60.3	8	317	54.9	2	66	30.3	9	378	38.8	-	-
March "	4	792	50.5	5	222	45.9	3	322	59.4	5	530	49.4	-	-
Apr. "	4	540	53.1	4	267	49.1	5	389	54.0	4	466	61.2	-	-
May "	3	544	65.5	5	340	55.7	5	805	48.7	6	1,083	47.7	-	-
June "	3	400	61.5	6	305	47.6	3	619	50.3	6	1,182	45.7	-	-
July "	4	36	47.2	3	186	36.6	5	738	49.0	5	1,239	38.8	-	-
Aug. "	4	849	56.5	3	154	39.6	4	484	38.2	5	1,232	44.5	-	-
Sept. "	-	-	-	3	195	42.6	2	564	52.6	5	1,226	43.6	-	-
Oct. "	6	1,051	51.7	-	-	-	6	732	54.0	5	1,283	43.5	-	-
Nov. "	1	190	55.8	4	344	43.7	1	133	32.4	5	1,118	44.2	-	-
Dec. "	-	-	-	5	299	34.4	-	-	-	5	1,164	42.0	-	-
Jan. 1959	4	1,200	47.7	4	1,136	54.1	-	-	-	4	379	61.9	-	-
Feb. "	5	1,201	63.2	3	899	64.8	2	18	27.8	-	-	-	-	-
March "	2	330	60.0	4	358	49.2	2	75	40.0	5	837	48.9	-	-
Grand average			55.1			49.2			46.1			50.3		

## 2. Size composition and growth rate

The size composition of both roundscad species during the research period from May 1957 to May 1959 is indicated in Figs. 1 and 2. There was no distinct size difference between males and females (Tables XV and XVI). The largest fish measured 250 mm. in *D. macrosoma/lajang*, and 300 mm. in *D. russelli*. Smallest fish of both species were caught in February/March, having a size of 80 mm. when it entered the fishery.

The length composition data reveal a distinct shifting of the modes of the length frequency curves which can be excellently used for growth estimates. There were no other means to determine growth directly in these fishes.

In the case of *D. macrosoma/lajang* the mode A at 155 mm. in May 1957 shifted until January 1958 to 200 mm. thus, indicating a growth of 45 mm. within 8 months, which correspond to a monthly increase of 5.6 mm. or of an annual size increase of about 66-70 mm. A similar result can be concluded from the shifting of the other modes.

In *D. russelli* the mode A at 150 mm. in May 1957 shifted to 195 mm. in January 1958, which means a size increase of 45 mm. in 8 months, corresponding also to a monthly increase of 5.6 mm. The annual growth increase of this species is, therefore, equal to that of *D. macrosoma/lajang*.

The fish enter the fishery for the first time roughly at the beginning of their second year of life and are fully exploited during this stage. They mature and spawn for the first time at about 180-200 mm. at the beginning of their year of life, when they leave the fishery. Only a few fishes return after spawning.

## SUMMARY

1. A total of 233 samples of 117,547 specimens were collected for the research project carried out in Palawan waters and in the Manila Bay approaches, to study the size composition and determine other various criteria.
2. It was only possible to distinguish two species of *Decap-terus* i.e. *D. macrosoma/lajang* and *D. russelli*.
3. Roundscads are fished in all important fishing grounds of the Philippines, but they are not found in waters where the



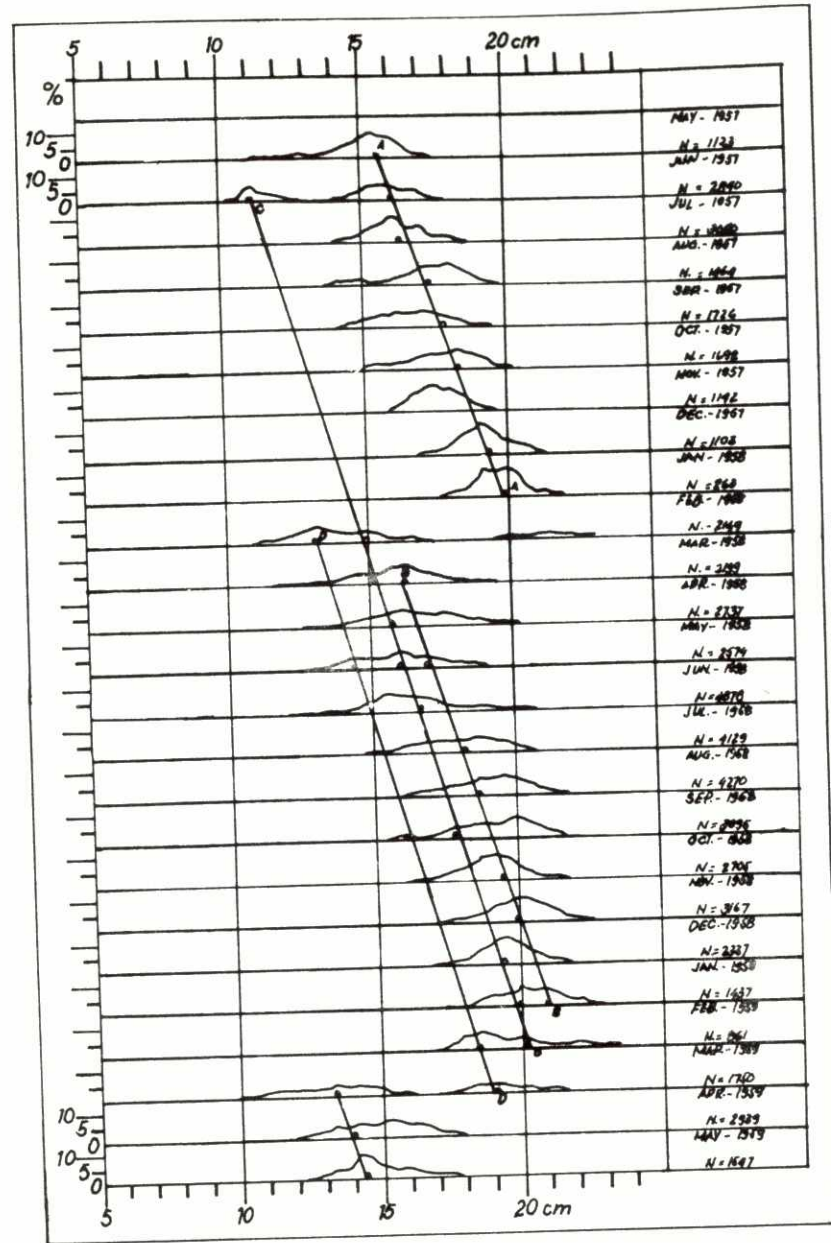


Fig. 1. Length Composition of *Decapterus macrosoma/lajang* from Palawan Waters.

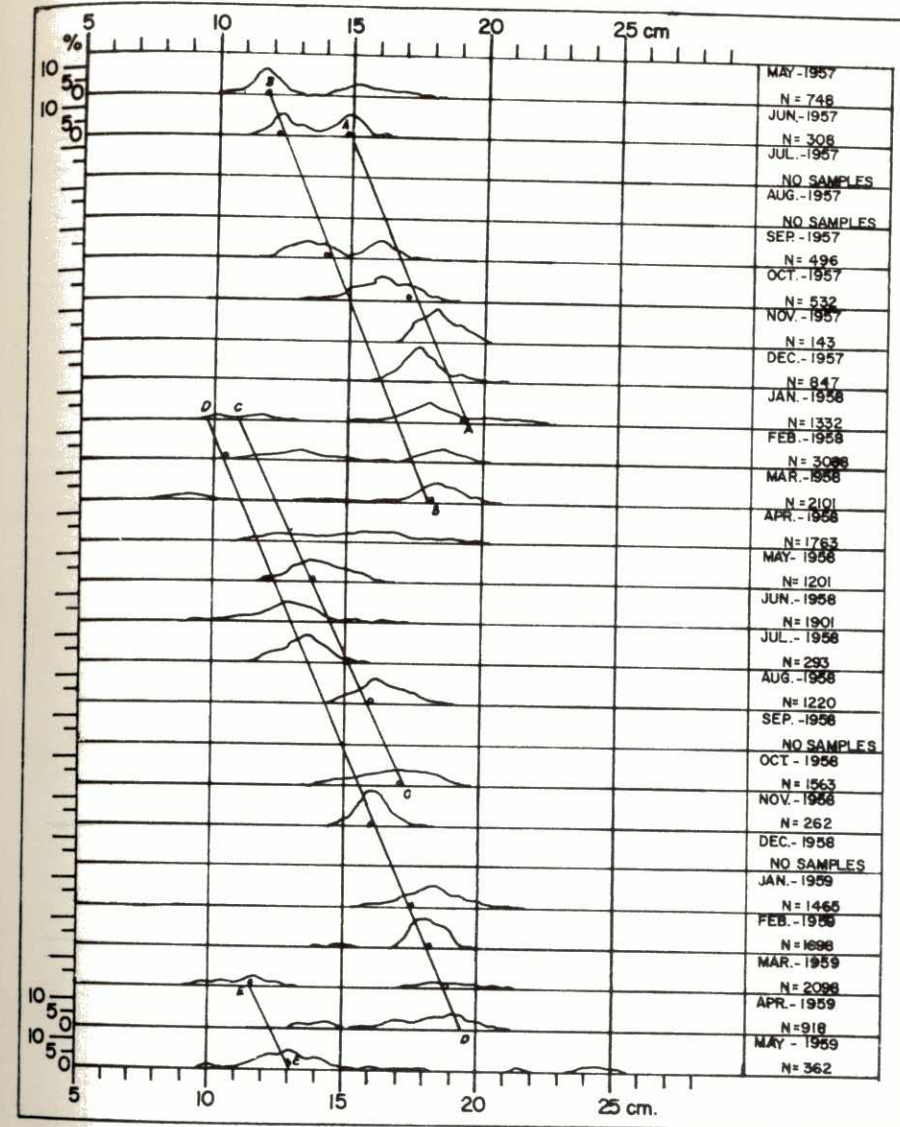


Fig. 2. Length Composition of *Decapterus russelli* from Manila Bay.



TABLE XVI  
Mean lengths of male and female *Decapterus russelli* in Manila Bay Area  
(n = number of specimen).

Month & Year	Male		Female	
	n	$\bar{X}$	n	$\bar{X}$
May - June 1957	409	139.3	484	135.9
July - August "	-	-	-	-
Sept. - Oct. "	492	158.3	389	160.1
Nov. - Dec. "	378	180.4	512	179.6
Jan. - Feb. 1958	1,612	175.7	1,080	167.5
Mar. - April "	741	173.2	592	176.3
May - June "	306	142.1	535	140.7
July - August "	386	164.4	496	161.9
Sept. - Oct. "	508	169.5	543	168.2
Nov. - Dec. "	83	163.6	106	161.1
Jan. - Feb. 1959	1,067	182.9	1,326	180.2
Mar. - April "	460	189.8	657	183.9
Total	6,442		6,720	
Average		167.2		165.0

TABLE XV  
Mean lengths of male and female of *Decapterus macrosoma/lajang* collected  
in Palawan waters (n = number of specimen).

Month & Year	Male		Female	
	n	$\bar{X}$ mm	n	$\bar{X}$ mm
May - June 1957	496	158.4	1,241	154.2
July - Aug. "	1,450	167.9	1,363	170.5
Sept. - Oct. "	1,607	170.4	1,668	174.6
Jan. - Feb. 1958	474	180.4	669	166.9
Mar. - Apr. "	547	168.0	448	167.6
May - June "	1,200	167.5	1,055	167.6
July - Aug. "	1,275	184.0	1,029	184.3
Sept. - Oct. "	1,409	191.0	1,090	190.4
Nov. - Dec. "	1,272	197.4	1,010	95.3
Jan. - Feb 1959	145	201.6	234	200.0
Mar. - Apr. "	747	166.1	753	164.5
Total	10,622		10,560	
Average		177.5		176

salinity is lower than 30%. The reason for this may be unsuitable food supply.

4. Spawning of both species extended from November to March in Palawan water and seemed to be 1-2 months delayed in Manila Bay.
5. Fecundity studies showed there were between 67,900 and 106,200 eggs in *D. macrosoma/lajang* while in *D. russelli* much less eggs were counted (28,700 to 48,700).
6. Roundscads of Palawan waters were found to be more infested with nematodes in their body cavity than those from Manila Bay, which may indicate a certain autonomy of fish stocks in both areas.
7. *D. macrosoma/lajang* is a typical zooplankton feeder, while *D. russelli* preys on larger fishes.
8. No special cycle in the fat content could be detected. The fat content amounted from 5.2 to 14.4% in *D. macrosoma/lajang* while in *D. russelli* it amounted from 6.8 to 19.3%.
9. The sex ratio differs slightly between areas and species.
10. The size composition of catches of both species is given. An annual growth of about 60 to 70 mm. could be concluded from the shifting of modes in the length composition curves for both species. According to this growth estimate, the fish enter the fishery for the first time roughly at the beginning of their second year of life and are fully exploited in that same year. They mature and spawn for the first time at the size of about 180-200 mm. at the beginning of their third year of life when they leave the fishery. Only a few fishes return after spawning.

#### REFERENCES

- Anon. (1957). Fisheries Statistics of the Philippines. *Bur. of Fisheries*, (Mimeo), 61 pp.
- Anon. (1965). Fisheries Statistics of the Philippines, prepared by *Phil. Fish Comm.* (Mimeo), 118 pp.

- BUCKMANN, (1929). Die Methodik Fischereibiologischer Untersuchungen an Meeresfischen. *Abd. Hand d. biol. Arbeitsmeth* 9(6):
- HERRE, A.W. (1953). Check List of Philippine Fishes. *Res. Rep.* 20; *Fish and Wildlife Service, US Dept. of the Interior*, 916 pp.
- MANACOP, P.R. and S.V. LARON (1953-54). Two Outstanding Commercial Fishing Gears Used in Philippine Waters. *Bull. Fish. Soc. Phil.* 3 and 4:73-84.
- SOEMARTO (1960). Fish Behaviour with Special Reference to Pelagic Shoaling Species: *Lajang (Decapterus spp.)*. *IPFC Procs.*, 8 (3): 89-95.
- TIEWS, K. (1958). Report to the Government of the Philippines on Marine Fishery Resources. *Rep. FAO/ETAP 1141*, 88 pp. and *Phil. Jour. Fish.* 6(2):107-208 (1958).