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ZOOPLANKTON DISTRIBUTION OFF MINDORO ISLAND AND BALAYAN BAY, LUZON ISLAND, PHILIPPINES — SOUTH CHINA SEA

By

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I. INTRODUCTION

The purpose of the survey cruise made on board the RESEARCHER of the Bureau of Fisheries was to undertake experimental otter trawl fishing in Balayan Bay and longline fishing at CSK stations which are known paths of tuna. In addition, it aims to conduct oceanographic and biological observations.

During this survey cruise, 15 CSK stations and two Master stations (A & B) were occupied in a period of seven days from 31 March 1971 to 7 April 1971. During this period, 34 plankton samples using the Norpac net, 17 samples using the stramine larvae net and 12 samples using the nylon net were collected, thus giving a total of 63 plankton samples.

II. MATERIALS & METHODS

Three plankton nets were used in the collection of zooplankton samples in almost all the stations covered by the survey cruise. These are the Norpac net, the stramine larval net and the oblique tow net (fish eggs and fish larvae net). The Norpac net is the standard quantitative net adopted by the conference on Pacific Oceanography (Feb. 1956) and used principally for collecting zooplankton. Its length is 180 cm with a mouth diameter of 45 cm. The stramine net is used in collecting fish eggs and fish larvae and floating organisms.

It is towed just below the surface of the water. It is also considered an effective and efficient gear for inventory purposes of the total fish larvae concentration in the area. Eight to 90% of fish larvae was gathered by this net.

For the Norpac net, vertical plankton hauls were made from a depth of 150 m from the surface. The stramine net was lowered at the surface of the water just enough to collect some surrounding and floating organisms. An oblique tow was made with the nylon net (fish eggs and larval net) at a depth of 10-20 fathoms. A 30-minute towing time was used for both stramine and nylon nets at the speed of three knots.

A flow meter used to calibrate the volume of water that was filtered was mounted at the opening of the net. All the plankton samples collected were properly labelled and preserved in 4% formalin. With the aid of a graduated cylinder, the net displacement method was used for measuring plankton volume. The "short-cut method" was used to get the quantitative amount of zooplankton by percentage composition of the entire plankton volume.

DISCUSSION OF RESULTS

After the plankton volume was determined, the sorting of fish eggs and larvae followed. Then the identification of the fish larvae was done. The percentage of fish larvae by families is shown in Figure 1.

After removing the fish eggs and larvae, the quantitative analysis of the zooplankton was performed from the remaining plankton samples. A total of 200 organisms was counted and identified from each station. The identification was limited to family but some organisms were identified according to species. The zooplankton components were divided into eight major groups. The percentage composition of zooplankton distribution in each station is shown in Table 1. The percentage composition of the major groups of zooplankton for the whole area was computed and shown in Figure 2. The percentage distribution of the plankton samples for copepods and crustaceans is shown in Figure 3 while that for chaetognaths and mollusks is shown in Figure 4.

Table 1. The percentage composition of zooplankton distribution in each station.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Copepod	49.12	59.25	64.50	40.75	70.00	63.75	68.00	58.25	50.00	58.75	66.75	54.25	45.00	65.50	39.25
Crustacean	9.25	4.00	11.50	24.50	10.75	8.00	3.75	13.00	14.50	14.25	8.75	16.75	13.50	10.00	12.25
Chaetognaths	31.63	31.25	17.00	29.00	11.50	25.25	22.75	20.25	28.75	19.25	15.50	18.75	32.25	17.25	41.00
Coelenterates	2.25	.75	2.00	.75	2.00	1.00	1.75	1.75	2.25	2.75	2.75	1.00	1.00	1.25	1.25
Annelid	2.25	2.50	1.00	.50	.50	1.00	.50	.50	2.00	.75	1.00	1.00	2.25	1.25	1.25
Echinoderm	.25	0	0	.25	.75	0	.00	.25	.25	.25	.75	.75	.75	.0	.0
Mollusks	3.38	1.00	4.00	3.50	3.00	.75	1.50	3.75	1.25	1.75	1.50	5.50	2.25	1.25	1.50
Tunicate	1.75	1.25	0	.75	1.50	.25	1.50	2.25	1.00	2.25	2.50	2.00	3.00	3.50	2.25
Others	.12	0	0	.25	0	0	.25	0	0	0	.50	0	0	0	0
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

The zooplankton samples were composed mainly of the following: copepods (*Calanus*, *Eucalanus*, *Rbincalanus*, *Euchaeta*, *Candacia*, *Labidocera*, *Oncea*, *Corycaeus*, *Temora*, *Sapherina* and *Copilla*); crustacean larvae (phylloipoda, *Evadne*, *Pseudoconchacia*, *Mysis*, amphipod, Isopoda, *Penaeus* nauplius, *Lucifer*, euphasiids and megalop); coelenterates (medusae, *Diphyes*, *Lerioppe*, *Aglaura*, *Abylopsis*); annelid; chaetognaths (*Sagitta*); echinoderm larvae; mollusks (*Creseis*, pelycepod, *Limacina*); tunicates (*Salpa*, *Doliolum*, *Oikopleura*); and fish eggs and larvae.

Among the groups mentioned, the Chaetognaths, copepods and crustaceans predominated.

The highest plankton volume (620 ml) was recorded at Station 9 (nine miles off Maricaban Island just at the entrance to Balayan Bay). This was followed by Stations 2 and 3 shown in Figures 5 and 6 of the cruise tract with values of 57 ml and 46 ml respectively.

The minimal plankton volume was found in Station 6.

Figure 6 shows the cruise tract of the trip & Table II shows the station number & their coordinates.

FISH LARVAE AND COMPOSITION

Fish larvae were observed to be present in great number in almost all the stations occupied, showing that the area itself abounds in fishes, mostly of the commercial species, as found by the identification and classification of the larvae and young fish that were collected.

The larval samples were identified, sorted and recorded as to family and some, according to species. The following families were represented: Engraulidae, Clupeidae, Mullidae, Triglidae, Serranidae, Monacanthidae, Ophidiidae, Mugilidae, Bothidae, Sphyraenidae, Gobiidae, Leignathidae, Apogonidae, Exocoetidae, Myctophidae, Trichiuridae, Scorpionidae, Istiophoridae, Gonostomidae, Atherinidae, Belonidae, Gadidae, Stromatidae, Eleotridae, Thunnidae and Syngnathidae.

The highest concentrations of fish larvae listed in order were found located at the following stations: R71-5/3 (745 fish larvae) 8.5 miles off Ilin Is., west coast of Mindoro; R71-5/12 (654 fish larvae) inside the Balayan Bay; R71-5/4 (592 fish larvae) northeast of Busuanga Is. near northern Palawan.

Table 2. Station number and the coordinates.

Station	Latitude	Longitude
1	12° 39.3'	120° 00'
3	12° 10'	120° 55'
4	12° 11'	120° 11.5'
5	12° 07.5'	119° 11.5'
6	13° 50'	119° 54.8'
7	14° 145'	119° 29.0'
8	12° 07.5'	119° 11.5'
9	13° 34.5'	120° 25'
10	13° 46.3'	120° 46.3'
11	13° 42.5'	120° 51'
12	13° 46.5'	120° 54.3'
13	13° 53'	120° 52.3'
15	13° 50'	120° 50.3'
Master A	14° 28.7'	120° 41.8'
Master B	14° 50'	120° 26.0'

Minimal counts of fish larvae were observed at the following stations; R71-5/A (55 fish larvae) in central Manila Bay; R71-5/B (11 fish larvae) North of Lubang Is., R71-5/6 (8 fish larvae) West of Lubang Is.; and lastly, R71-5/4 & 5/15 inside Balayan Bay.

As regards the commercial fishes, tuna larvae dominated with 378 fish larvae mostly of *Auxis* spp. (359 larvae): *Thunnus albacares* (13 larvae); and *Katsuwonus pelamis* (6 larvae). Those larvae were taken at station R71-5/3 near Ilin Island, west of Mindoro. The Carangidae (349 larvae) was the next family represented. The larvae were collected from stations R71-5/4, 5/3, and 5/1 within the vicinity of Busuanga Island. This group was followed by Serranidae (302 larvae), which was represented in all stations occupied. The anchovies were abundant in station R71-5/12 near the coastal area in Balayan Bay. The family Gobiidae with 200 larvae occupies the fifth position which was slightly ahead of that unidentified family with a total count of 107 larvae from all of the stations occupied.

Of the non-commercial fishes, the lantern fishes (Myctophidae) got the highest number of larvae. It was followed by the genus *Bregmaceros*.

All in all, 3,248 fish larvae and fish were collected from the 17 stations occupied (80% larvae were being identified) while 20% remained unidentified.

FISH EGGS DENSITY

A very low concentration of fish eggs was observed at almost all stations occupied, thus giving only a total of 69 fish eggs which were taken from stations R71-5/9, R71-5/10 and R71-5/15 compared to that of the fish larvae which were present at all stations occupied.

CONCLUSION

The area off Mindoro and Balayan Bay, Luzon, Philippines has a high concentration of zooplankton. The majority of plankton animals were copepods, chaetognaths and crustaceans which are the primary food of most pelagic fishes.

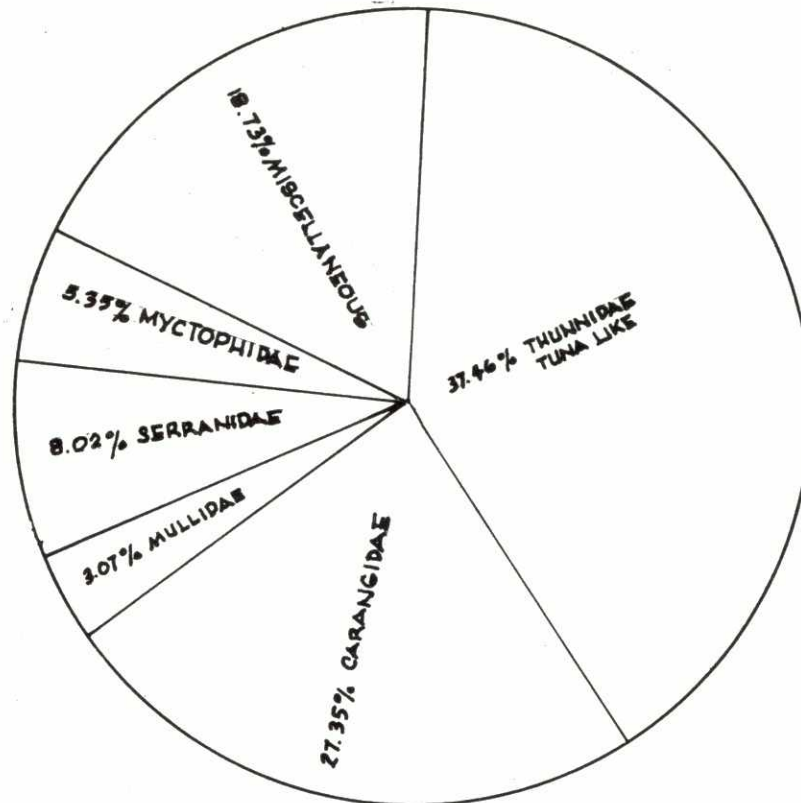
The presence of a high concentration of fish eggs, larvae and juvenile fishes in the plankton samples led us to recognize that the

same area or the adjacent region is the spawning ground of fish such as Thunnidae, Carangidae, Serranidae, Mullidae, etc. The hydrographic conditions are being analyzed to determine the specific spawning area of the region.

REFERENCES

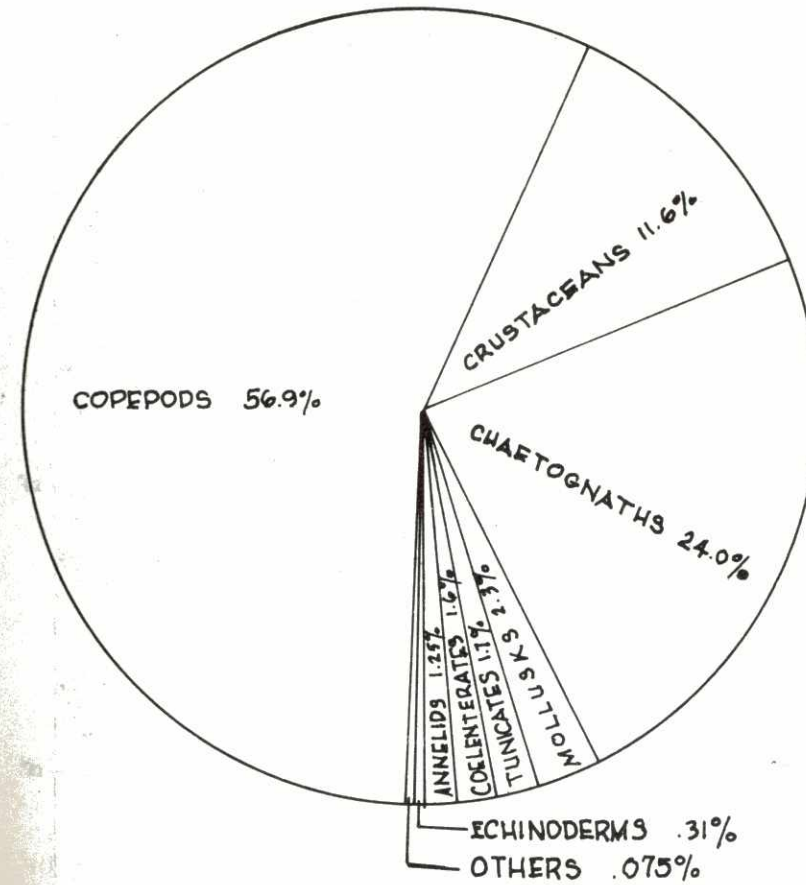
- HALLGRIMSSON, INGVAR 1958: A Short-cut Method of Estimating Zooplankton Composition at Sea, RIT Fishkideildar 2 (b), 6 pp.

FIGURE 1



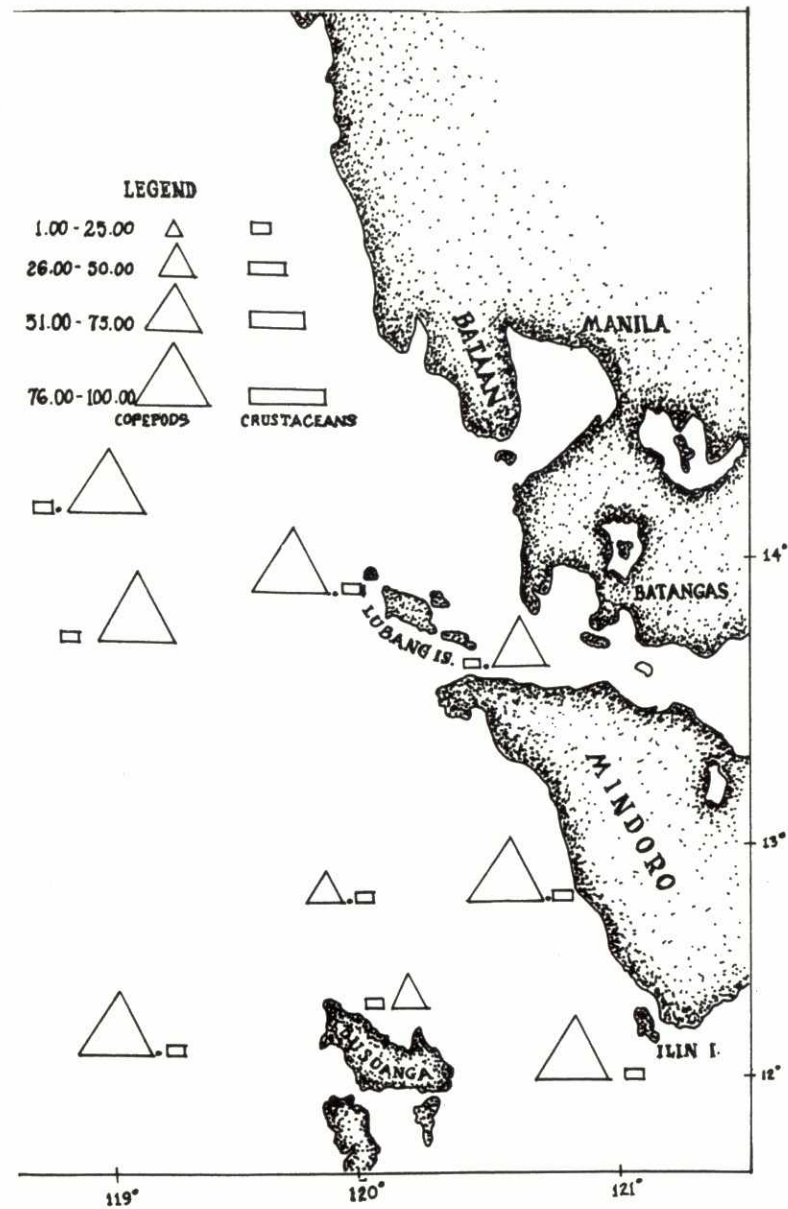
PERCENTAGE COMPOSITION OF FISH LARVAE AND JUVENILE OF SOUTH CHINA SEA (STRAMINE SURFACE TOW).

FIGURE 2



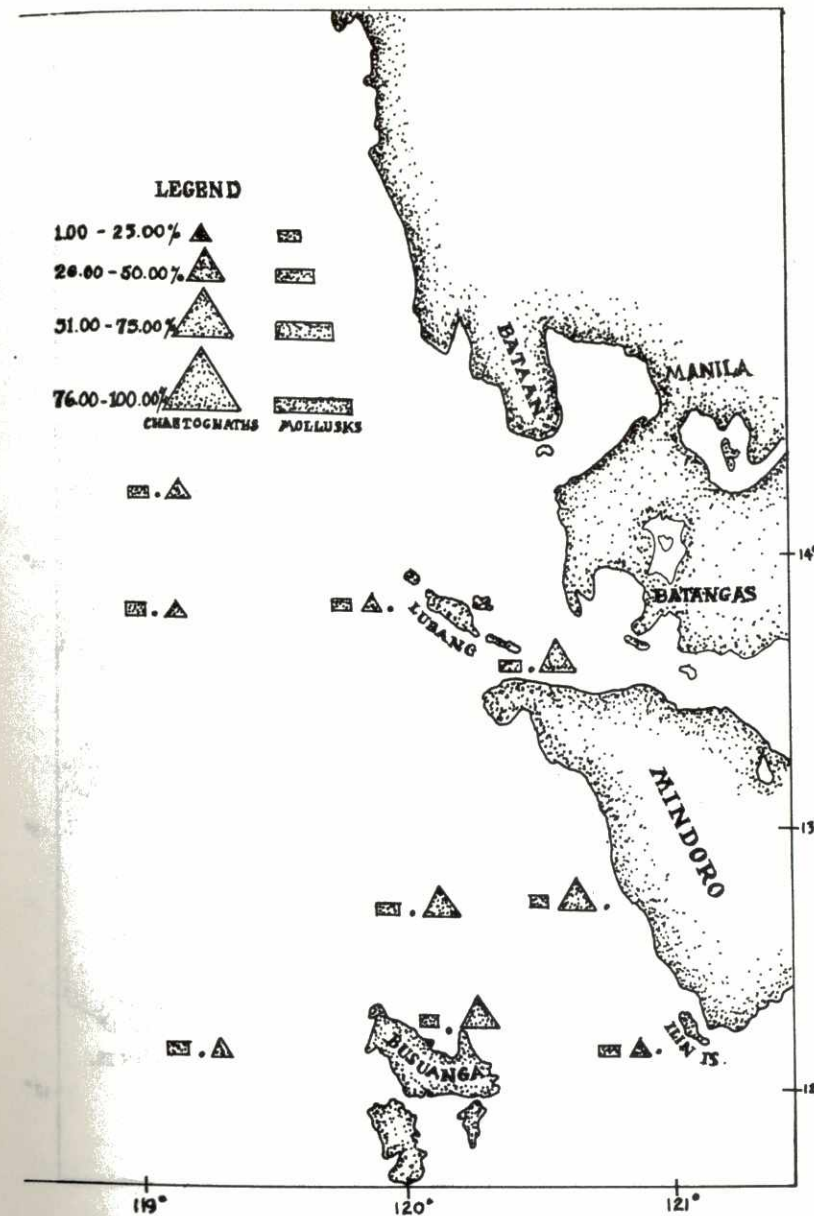
PERCENTAGE COMPOSITION OF ZOOPLANKTON IN THE CSK SOUTH CHINA SEA CRUISE

FIGURE 3



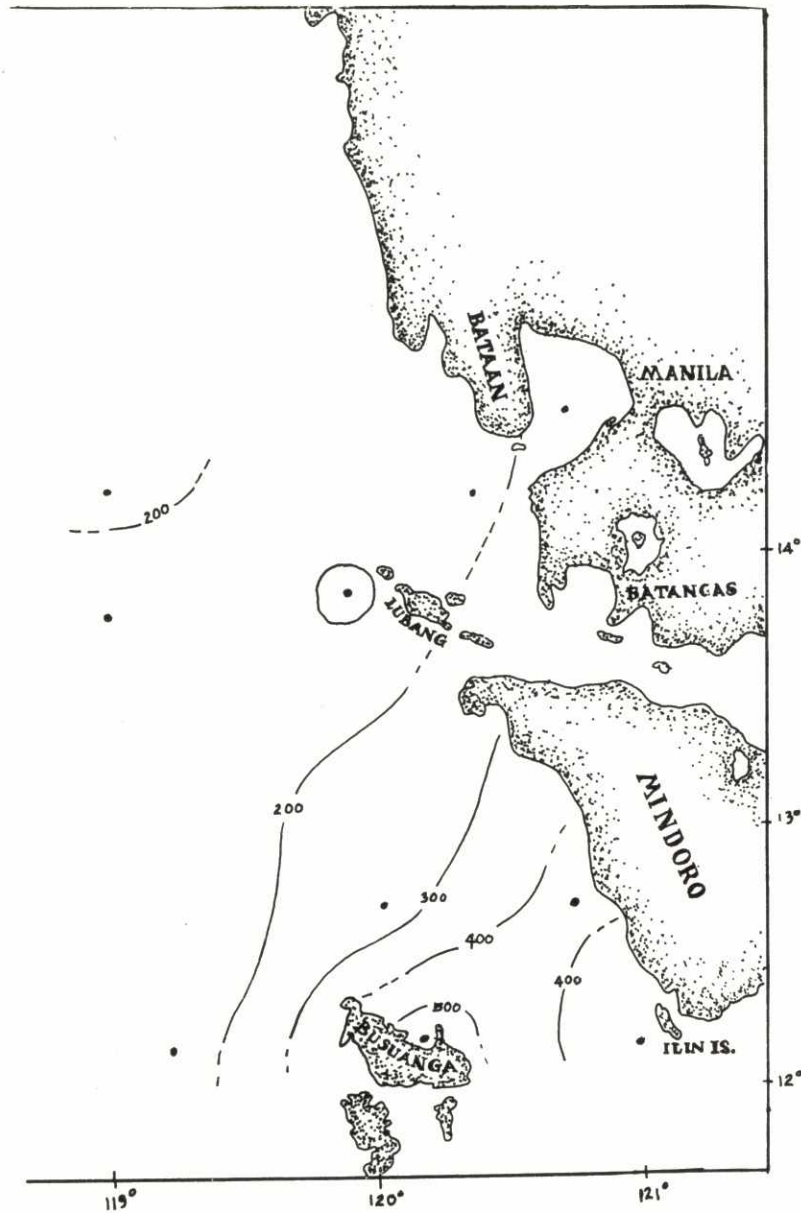
PERCENTAGE DISTRIBUTION OF COPEPODS AND AND CRUSTACEANS IN CSK STATIONS OF R-71-5

FIGURE 4



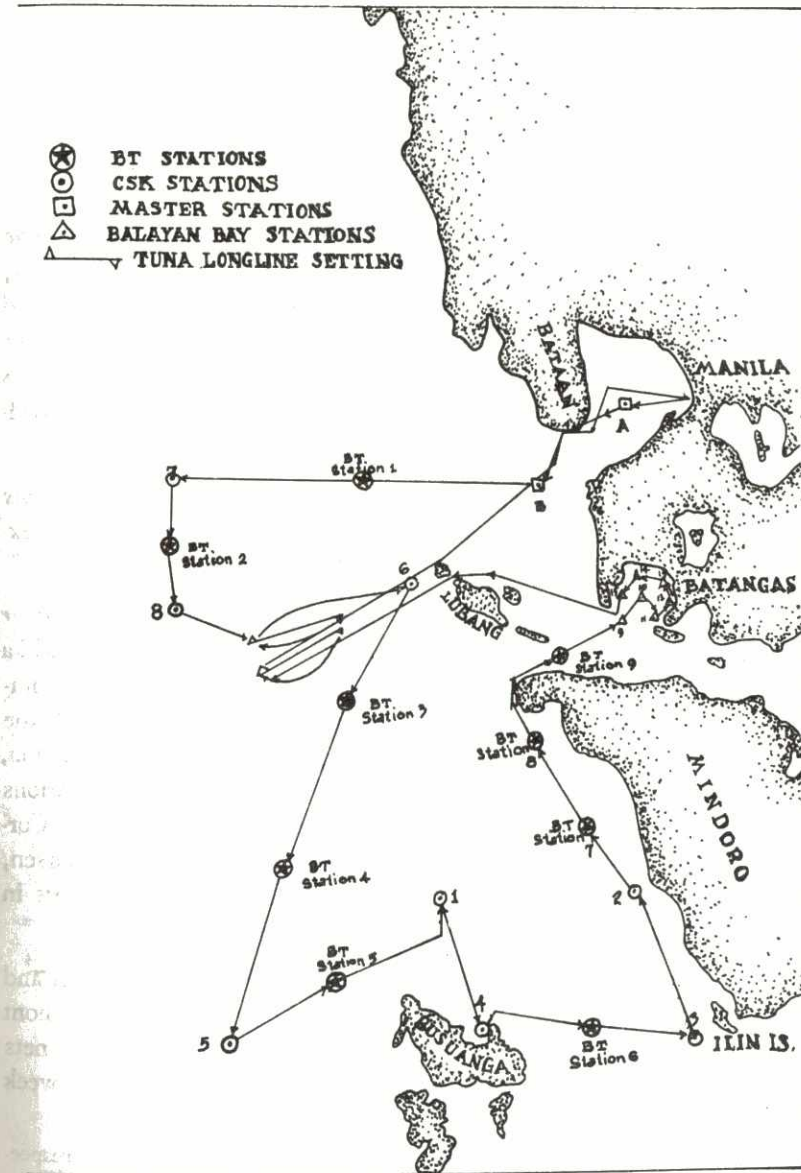
PERCENTAGE DISTRIBUTION OF CHAETOGNATHS AND MOLLUSKS OF CSK STATIONS OF R-71-5

FIGURE 5



ZOOPLANKTON VOLUME IN ml. 1000 CUBIC METER USING THE NORPAC NET AT 150-METER STANDARD DEPTH HAUL. (CRUISE R-71-5).

FIGURE 6



CRUISE TRACT TAKEN BY R/V RESEARCHER FROM MARCH 31 TO APRIL 7, 1971 (CRUISE R-71-5)