Round Scad Exploration by Purse Seine in the South China Sea, Area III: Western Philippines

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ABSTRACT

Round scad exploration by purse seine in the waters of western Philippines was conducted from April 22 to May 7, 1998 for a period of five (5) fishing days with a total catch of 7.3 tons and an average of 1.5 tons per setting. Dominant species caught were *Decapterus spp.* having 70.09% of the total catch, followed by *Selar spp.* at 12.66% and *Rastrelliger spp.* 10.70%. Among the *Decapterus spp.* caught*, D. macrosoma* attained the highest total catch composition by species having 68.81% followed by *D. kurroides* and *D.russelli* with 0.31% and 1.14% respectively. The round scad fishery stock was composed mainly of juvenile fish (less than 13 cm) and Age group II (13 cm to 14 cm). Few large round scad at Age group IV and V (20 cm to 28 cm) stayed at the fishery.

Other fishes caught were: *Auxis rochei* (0.85%), *A. thazard* (0.12%), *Caranx spp.* (0.45%), *Emmilichthys nitidus* (0.58%), *Euthynnus affinis* (0.42%), *Leiognathus ruconius* (0.58%), *Loligo sp.* (0.31%), *Megalaspis cordyla* (0.09%), *Rastrelliger spp.* (10.70%), *Sardinella longiceps* (0.03%), *Scomberoides lysan* (0.24%), *Selar spp.* (12.66%), *Sphyraena spp.* (0.90%), *Thunnus albacares* (0.96%) and others (1.02%).

Tuna and tuna like fishes such as yellowfin tuna, eastern little tuna, bullet tuna, frigate tuna and oceanic squid are distributed in the upper latitudes of the survey area. On the other hand, round scads, big-eyed scads and Indian mackerels are dominantly present in the lower latitudes of the survey area.

Keywords : round scad, tuna and tuna like fishes, purse seine, Waters of Western Philippines, South China Sea

Introduction

Round scad fishing has been developed in the Philippines before World War II with the use of bagnet or "basnigan". Bouki-ami was also introduced however, its use did not gain success. Until in 1962, a US West Coast type purse seiner was introduced (Ronquillo, 1970). Aside from these two fishing gears, several fishing nets and gears have been developed and used such as ringnet, gillnet, baby trawl as well as multiple handlines for catching round scads. *Decapterus spp.* (Round scad) locally known as "galunggong" of the family Carangidae is one of the most important small pelagic fishes caught in huge quantities in the Philippine waters most of the year. It ranked second among the major species of fish produced for over the span of twelve years from 1979 up to 1990 sharing an average of about 10.67 percent to total fish supply

(Fisheries Statistics, 1991). However, this species obtained the highest commercial landings with an average of about 132,224 MT from 1975 to 1985 (Calvello 1987) and 202,163 MT from 1986 to 1993 (Fish. Statistics 1986-1993). Most of the round scad catches are contributed mainly by the commercial sector. The price of the said fish is cheaper compared to other fishes due to the large volume of landings in the market.

There were six species of round scad caught in the Philippine waters namely *Decapterus macrosoma* (Long bodied scad); often been misapplied *to D. Layang*; *D. russelli* (Russel's mackerel scad); *D. kurroides* (Red-tailed scad), *D. maruadsi* (Yellow-tailed round scad); and *D. macarellus* (Mackerel scad).

Traditional fishing grounds of round scad in the Philippines both commercial and municipal sectors are: Sulu Sea, Visayan Sea, Moro Gulf, Lamon Bay, Cuyo Pass, Rangay Gulf, Batangas Coast, Tayabas Bay, Samar Sea, Camotes Sea, Sibuyan Sea, Bohol Sea, Davao Gulf and Babuyan Channel. Further, municipal fishing grounds includes areas of Northern and Southern Mindanao and Casiguran Sound. On the other hand, base on the findings of Tiews et. al. (1975), *Decapterus spp.* avoids salinities below $30\%^0$ as well as the phytoplankton concentrations found in the bays of Philippine archepelago such as Manila Bay and San Miguel Bay area located on the Pacific side of Southern Luzon.

According to Ronquillo (1970) *D. macrosoma and D. russelli* dominated the fishery consisting mainly of one year class, Age Group II (13cm to 14 cm length). It matures while it is available in the fishery and leaves at stage of Age Group III (21 cm length) and breed after 10 to 12 months to which breeding period of both species extend from November to March in Palawan waters and 1 to 2 months delayed in Manila Bay. He also stated those large fishes of about 23 cm to 27cm (Age Group IV and V) representing returning fishes may be found at times in coral reefs. On the otherhand, according to Bhatiyasevi (1997), in waters of Thailand round scad breeding period has to peak, which are from February to March and June to August. Furthermore, asides from these two species of round scad *D. layang* similar to *D. macrosoma, D. kurroides* (Tiews et. al. 1975) and *D. maruadsi* (Cavello, 1987) are caught in the Philippine Waters.

Base from the Fishery Statistics of 1991 covering the round scad concentration of unloading in the Philippines from 1979 to 1990 indicated the following data: the National Capital Region (NCR) contributed 50 percent of the total fish catch through commercial fishing operations with an annual average of 70,862 metric tons and a growth rate of about 5.85 percent; Western Visayas with 16 percent share equivalent to about 22,827 metric tons having a yearly increase of 7.88 percent; western Mindanao of 10 percent share ith an increase at a marginal rate of 0.79 percnt. While Southern Tagalog and Northern Central Mindnao both have declining rates of unloadings. Municipal landings was concentrated at Southern tagalog with 23 percent share to the total fish catch and a yearly increase of 5.68 percent; Bicol and Western Mindanao with 19 percent each both having negative growth rates; Ilocos and Cagayan Valley contributed the lowest catch with 0.11 and 0.06 percent share respectively. Negative growth rate in the areas of Bicol and Western Mondanao indicates overexploitation of fishery resources. Same is true according to Calvello (1987), the annual catches of roundscad from 1978 and 1985 of commercial purse seiners, basnigs and ring netters indicates some evidence that catch per vessel declines with increasing number of boat. Further, decline in catch per vessel was also recorded in 1986 with a total catch of 89,826 metric ton of round scad to 1987 with a total catch of 77,844 metric tons having 296 and 280 numbers of commercial fishing vessel respectively (Fish. Statistics 1986-1987).

On the fishery Statistics of 1993 the data presented here refers to Purse seine fishing in 1992 of *Decapterus spp.* increased with a total of 209,311 metric tons while it decreased in 1993 by 15.51 percent having only a total of 176,843 compared to 1993 catch. Further, the volume of round scad exportations continue to decline by 39.37 and 38.13 percent from 1992-

1993 wherein the major export markets are Japan, USA and HongKong. Due to this continuous decline in catch it is recommended that management intervention of fishery stocks is timely to determine the feasibility of recovering and restoring natural productivity of the Philippine round scad resources.

This paper represents survey and sampling activities of Round scad exploration by Purse Seine to determine the occurrences, distributions and abundance of the said fish within South China Sea, Area III of Western Philippine Waters.

Materials and Methods

Fishing Vessels

The study was conducted onboard M/V MAYA-MAYA the training and research vessel of the Bureau of Fisheries and Aquatic Resources (BFAR). The steel marine vessel has a 56.74 net tonnage and 165 gross tonnage. It was built in 1967 at Niigata Shipyard Japan. It is rigged and equipped for purse seine and longline operations having an overall length of 29.35 meters breadth of 7.10 meters and depth of 3.20 meters. The vessel was equipped with nautical instruments such as Radar, GPS navigational system, Fish Finder, General Observation System, Color Scanning Sonar, Facsimile Receiver, Gyro Compass and Auto Pilot. Its radio equipments consist of Marine SSB Radio telephone, Marine VHF Radiotelephone, and Transceiver. The deck machineries of the said vessel was equipped with Windlass Hydraulic Driven, Steering Gear Electrohydraulic Type with Magnetic Compass Pilot and Engine Telegraph. It has a standard speed of 9.5 knots. Other fishing accessories and equipment were: one (1) unit Steel Skiff Boat (6.04 m x 3.02 m x 31.8 m), a rubber and a fiber glass boat.

Purse Seine

A typical sardine and mackerel purse seine was used measuring 672 meters long and 139 meters deep made of nylon knotless nettings. The main webbing were 210/18 twine size x 11 knot or 30 mm mesh size. Its floatline was made up of 26 mm diameter nylon rope with 2,909 pieces of SHE 30 floats having a buoyancy of 3,000 grams each. The sinkerline was made of Galvanized steel short link chain having 95 mm diameter with a total number of 77 pieces 19 mm snap rings thick by 110 mm long. (Figure 1). A Marco Type Hydraulic power block hauls the net.

Fishing Stations

The purse seine exploration lasted for 16 days covering the areas of Candon, Ilocos Sur; off Dasol, Pangasinan; off Subic Bay Zambales and off Paluan, Mindoro. Four out of eleven (11) stations were surveyed (See Figure 2). Stations 7,8 and 10 were aborted due to rough sea and heavy rains. Further the direction of wind and water currents in the said areas were opposite creating huge waves and causing the vessel to almost tilt. The sea anchor was damaged while maneuvering from station 8 to 7 limiting the fishing depth to less than 180 meters. The following day, the fishing operation was pursued in the shallower area located off Candon Ilocos Sur set near coral areas (within station 9). It was not possible for the vessel to continue surveying the perimeter within the stations 10 and 15 for the shallowest depth of the said area was more than 200 meters which is more than the anchorage capability of the vessel.

A seamount found in station 15 located off Dasol, Pangasinan enabled the vessel to anchor in a depth of 152.5 meters and set the purse seine net in deeper water. During the operation the sea was calm and the weather remained fair. On the other hand, slight rain showers were

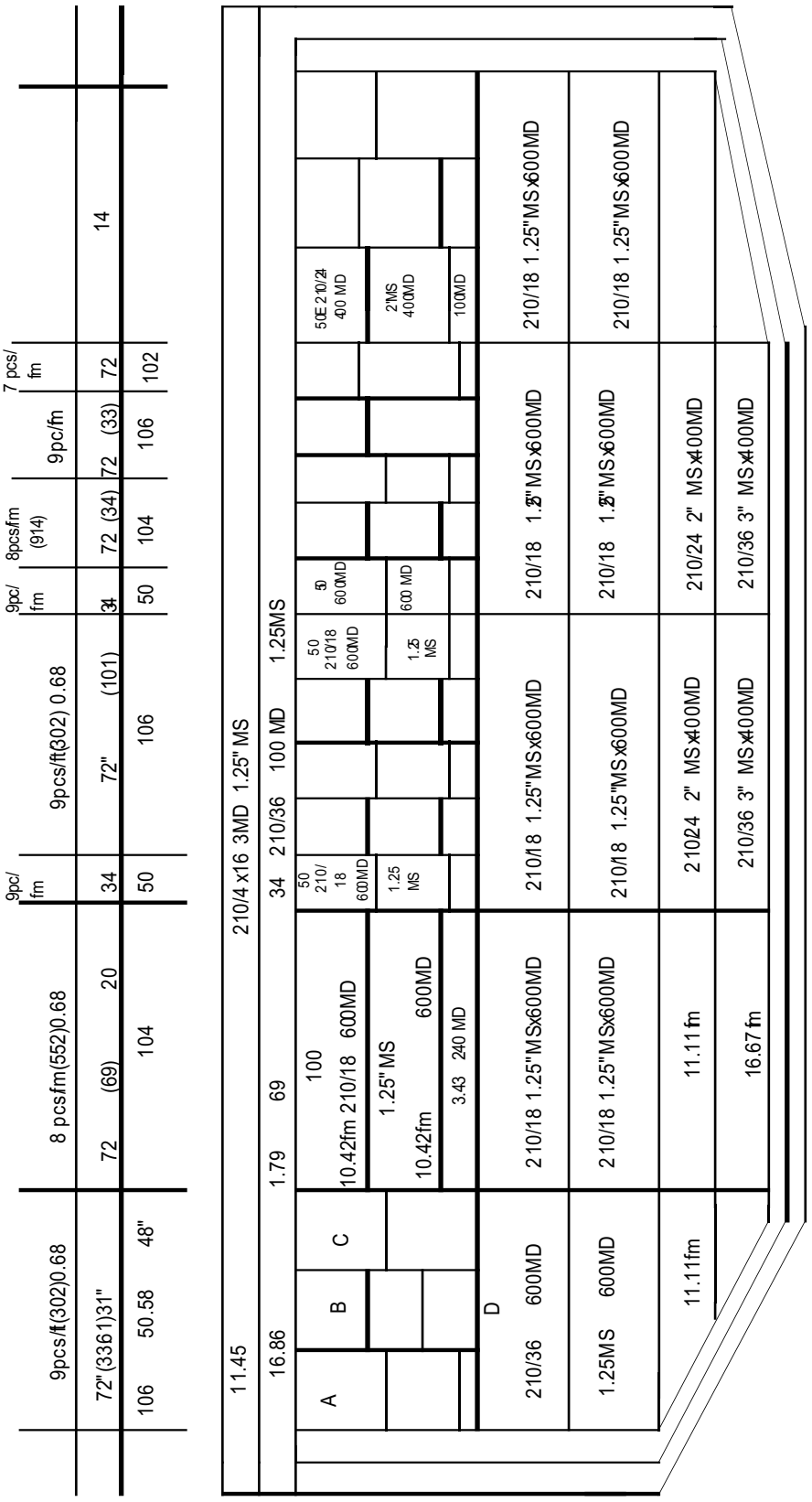

Fig. 1. Pruse seine net measuring 675m long by 135m deep.

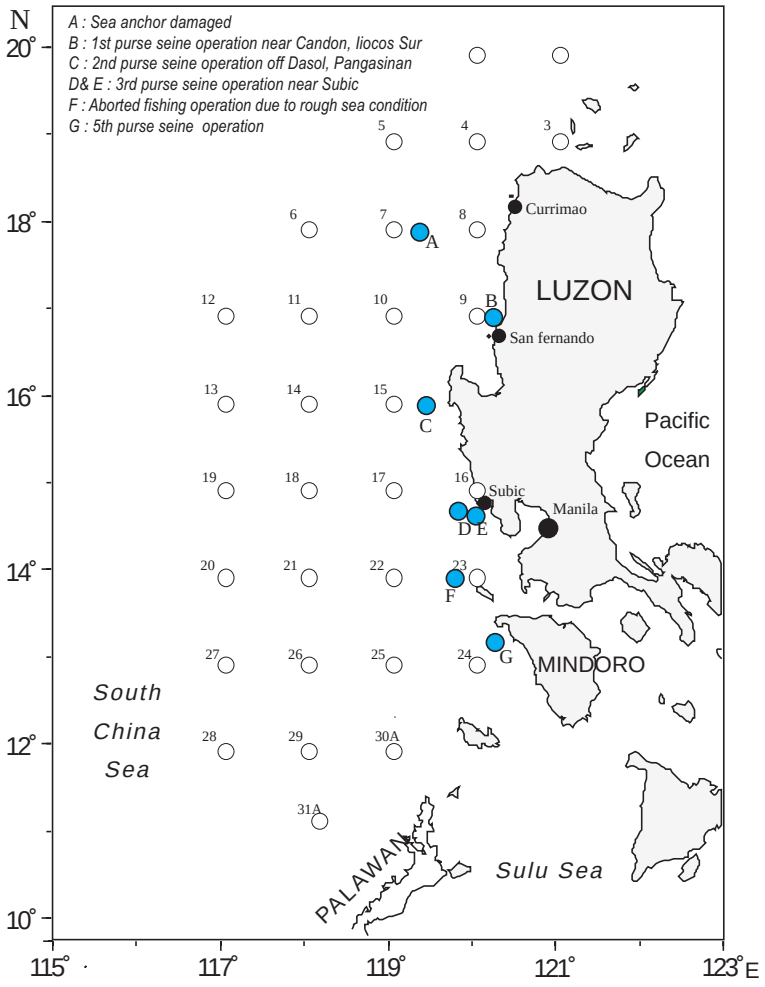

Fig. 2. Sardine purse seine sampling stations.

experienced at station 16 located near off Subic Bay, Zambales. The depth of the area was shallower compared to other stations enabling the vessel to operate twice off Subic Bay. Areas within the perimeter of stations 17 and 22 were no longer surveyed due to big waves encountered while cruising to the said stations.

There was an attempt to operate in station 23. However, strong water currents flowing in two directions unable the vessel to continue the operation within the perimeter of stations 22, 23, 24 and 25. For this reason, setting was moved outside the perimeter of the assigned areas to off Paluan, Mindoro waters, which was assumed as station 24. The area has shallower water depth but the presence of turbulent currents still affected the fishing operation.

According to the geographical data stated by Gonzales et. al. (1991) the western side of the Philippine Island has a cyclonic pattern surface water movement. This water movement is developed in the interior of South China Sea with the southerly flow along the western coast of Palawan and Luzon during the northeast monsoon. He also stated that during the southwest monsoon, water movement in the South China Sea is generally northeasternly flowing out through the Strait of Taiwan and the Luzon Strait.

Fishing Operation

Purse seine fishing operation was all done by one mother vessel (M/V MAYA-MAYA), a skiff and one light boat. Usually the mother boat arrives in the evening. With the use of fish

finder and color search light sonar, fish school were located and the bottom of the sea was checked. The vessel was anchored in the place where fishes were expected to be in abundance. Luring of fishes commence during the late evening. The process of luring fishes involved the use of four halogen bulbs (3 kilowatts each) located on top of the mothership. All lights were turned-on at the mother ship and were-turned off after the light boat gained its position and had put on its light concentrating the fish in one area. Shooting of purse seine net took place at dawn and usually lasted for 4 to 5 minutes. Pursing the cable usually took 15 minutes and hauling the net by puretic power block usually took 1 to 2 hours. Entangling was prevented by keeping the purse seine net away from the mother boat with the use of skiff. Approximately three (3) tubs of fish at 105 kgs per tubs were taken from the bunt at random and were sorted according to species whenever possible. Sample of each species were measured to the nearest centimeter using a measuring board to determine the size composition. Weight and sex determination of fish samples was difficult due to rough sea condition.

Results

Round scad purse seine fishing in the waters of western Philippines resulted to a total catch of 7.3 tons with an average of 1.5 tons per setting. The catch composition was dominated by *Decapterus spp.* at 70.09% followed by *Selar spp.* at 12.66% and *Rastrelliger spp.* at 10.70%. Among the species of round scad, *Decapterus macrosoma* obtained the highest catch by species contributing a total percentage of 68.81% followed by *D. russelli* and *D. kurroides* at 1.142% and 0.31% respectively. It was observed that *D. macrosoma* was present throughout the station at all times and it has outnumbered other species. On otherhand, *D. kurroides* and *D. russelli* were in lesser quantity within the surveyed area. (Table 1)

Most of the *Decapterus spp.* caught were juvenile to which size ranges from 8.0 cm to 12.5 cm having a peak catch in 12 cm length followed by Age group II from 9.5 cm to 13 cm. Few were found at mature stage from 22 cm to 28 cm. Size of the caught round scad by species ranges as follows*: D. kurroides* 9 cm to 15 cm*; D. macrosoma* 10 cm to 28 cm; and *D. russelli* 10 cm to 17 cm. (Figure 3). It was said that *D. maruadsi* and *D macarellus* do occur in the Philippine waters (Calvello 1987).

Tuna and tuna like fishes which includes *Auxis rochei* (Bullet tuna), *Thunnus albacares* (Yellowfin tuna) and *Euthynnus affinis* (Eastern little tuna) were caught in the upper latitude such as in latitude 16^{o} and 18^{o} having the depths of 144 and 152.5 meters respectively. With the presence of the said fishes in the area, occurrence of *Loligo sp*. was observed extending to latitude 15^{o} (off Subic Bay). Further at latitude 15^{o}, tuna and tuna like fishes were not found since the depth of the ocean floor was only 74.34 meters. At lower latitude 13^{o} of the surveyed area, occurrences of shortfin roundscad *(Decapterus macrosoma)*, big-eyed scads *(Selar crumenopthalmus)* and Indian mackerels *(Rastrelliger kanagurta)* were dominantly present. The depth of the area was 81 meters. (Table 1)

As per station the following results were taken based on the samples gathered during the purse seine fishing operation:

Station 9

Out of the 137kgs samples in station 9, *D. macrosoma* contributed 41kgs at 30% having a two year class from 7 cm to 12 cm (Age Group I) and 19 cm to 24 cm (Age group III and IV). The peak catch at Age Group I was at 8 cm length contributing 19.27% of the species samples

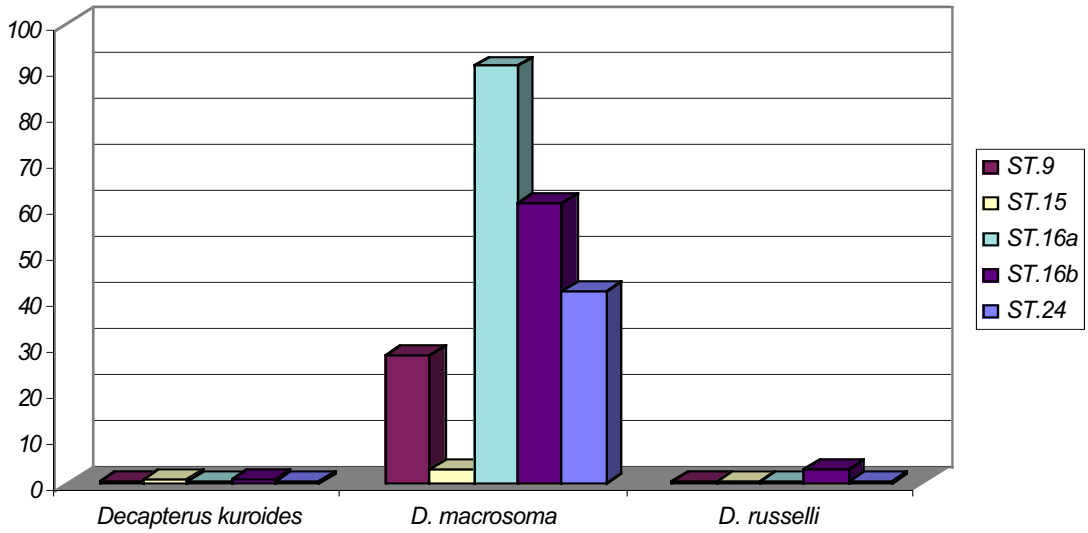

Fig. 3. Catch composition of *Decapterus* sp. in Stations 9, 15, 16a, 16b, and 24.

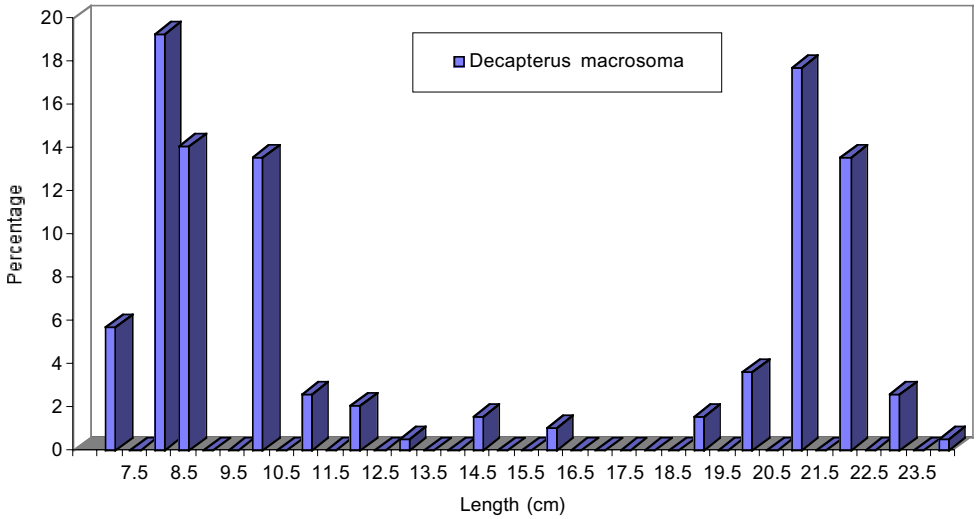

Fig. 4. Length composition of *Decapterus macrosoma* in Stations 9.

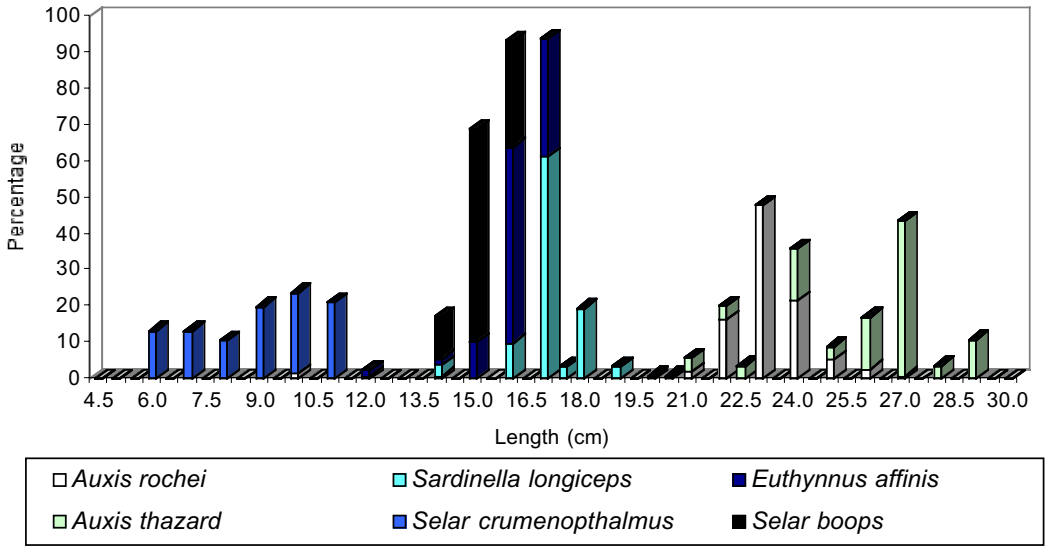

Fig. 5. Length composition of other species in Stations 9.

while the highest catch of Age Group III and IV was at 21 cm and 22 cm length with 17.71% and 13.54%. A total of 181 pieces *D. macrosoma* were sampled to which the sizes ranges from 7 cm to 24 cm length. (Figure 4)

The presence of Tuna and tuna like species during the brailing was observed with the following species *Auxis thazard* at 6.6%, *Auxis rochei* at 36.5% and *Euthynnus affinis* at 17.3% of the stations total catch. Samples of *Auxis thazard* ranges from 11cm to 29 cm with 28 pieces (9 kls) samples. Peak catch was at 27 cm length contributing of about 42.86*%. Auxis rochei* on the other hand, has a peak catch at 23 cm equivalent to 47.71% of the sample. Its size ranges from 10 cm to 27 cm length with a total of 153 (50 kls) pieces samples fish. Further, based on the length samples of *Euthynnus affinis*, its size ranges from 12 cm to 17 cm and a peak at 16 cm length equal to 54.27% with a total of 129 pieces samples. Length of *Selar crumenopthalmus* ranges from 5 cm to 11 cm with a dominant catch at 22.37%. *Selar boops* on the other hand, has 17 pieces samples with size ranges from 14 cm to 16 cm length with the highest at 15 cm equivalent to 58.82%.

Three (3) kilograms of *Loligo spp.* which represents 2.1 %; *Selar crumenopthalmus* at 14.6%; *Sardinella longiceps* at 1.46% of the total samples by station 9. Length of sampled *Selar crumenopthalmus* ranges from 5 cm to 11 cm having a peak at 10 cm equivalent to 22.37%. While samples of *S. longiceps* ranges from 4 to 9 cm with a peak at 7 cm length equivalent to 61.29%. Presence of snappers, surgeonfish, mackerel, *Caesio sp*. and squirel fish were recorded. (Figure 5)

Station 15

Samples of *Decapterus macrosoma* in station 15 showed that out of 281.45 kgs sample it obtain a 4.3 kgs equivalent to 1.76%. Sizes of the said species ranges from 7 cm to 25 cm length with a peak at 10.5 cm having 18.39% of the sampled species. The samples were composed primarily of Age Group I. A total of 223 pieces were measured. On the other hand, *D. kurroides* obtained 0.29% of the total samples with a 361 pieces at 700 gram. Size of the said fish ranges from 8 cm to 13 cm with a peak catch at 11 cm length equivalent to 22.22% of the samples. (Figure 6)

Auxis rochei of the tuna like species obtained 4.80% of the station's sample. A total of 223 pieces samples were measured with a dominant size at 13.5 cm which is 15.92% of the sample. Size of the said fish ranges from 11.5 cm to 22.5 cm length. Other species caught were *Euthynnus affinis, Selar spp.* and *Rastrelliger spp.* (Figure 7).

Station 16a

A total of 1,080 kgs of *Decapterus macrosoma* was caught in the first operation with a percentage of 94.69% of total catch. The length of *D. macrosoma* samples ranges from 8.5 cm to 16.5 cm with the highest catch recorded at 13 cm equivalent to 23.83% of the 256 pieces of sampled species. Samples were composed of Age Group I and II. (Figure 8)

Other important species such as *R. faughni* with size ranges from 11 cm to 19.5 cm and a peak at 13 cm equivalent to 13.70%; *R. kanagurta* at 1.23 cm with a peak of 16 cm equivalent to 15.49%; and *S. crumenopthalmus* at 15.3 cm to 22 cm with a peak at 17.5 cm at 16%. (Figure 9)

Station 16b

Three species of Decapterus were caught at the second operation namely; *D. macrosoma*, *D. kurroides* and *D. russelli*. *D. macrosoma* obtained the highest catch with 234 samples belonging to Age Group I. Size ranges from 8.5 cm to 17 cm and a peak catch at 17 cm equal to 19.65%. While *D. russelli* has 832 kgs total catch with 167 sampled fishes having a size that ranges from

Table 1: Percentage Distribution of Catch Per Station by Depth

Species	STATION NUMBER											
	9	%	15	%	16a*	%	16b*	%	24	%	kg	%
Auxis rochei	50.00	36.49635	11.70	4.800985	0.00	0	0.00	0	0.00	0	61.70	0.847232
Auxis thazard	9.00	6.569343	0.00	0	0.00	0	0.00	0	0.00	0	9.00	0.123583
Caranx spp.	0.00	0	33.00	13.54124	0.00	0	0.00	0	0.00	0	33.00	0.453139
Decapterus kurroides	0.00	0	0.70	0.287238	0.00	0	9.20	0.210346	0.00	0	9.90	0.135942
Decapterus macrosoma	41.00	29.92701	4.30	1.764465	2080.00	94.68533	2730.00	62.41798	156.00	46.98795	5011.30	68.81253
Decapterus russelli	0.00	0	0.00	0	0.00	0	83.20	1.902262	0.00	0	83.20	1.142.459
Emmilichthys nitidus	0.00	0	0.00	0	0.00	0	42.12	0.96302	0.00	0	42.12	0.57837
Euthynnus affinis	10.00	7.29927	3.50	1.436192	0.00	0	6.70	0.153187	10.00	3.012048	30.20	0.41469
Leignathus ruconius	0.00	0	0.00	0	0.00	0	42.12	0.96302	0.00	0	42.12	0.57837
Loligo spp.	3.00	2.189781	15.00	6.155109	4.50	0.204848	0.00	0	0.00	0	22.50	0.308958
Megalaspis cordyla	0.00	0	0.00	0	0.00	0	6.70	0.153187	0.00	0	6.70	0.092001
Rastrelliger faughni	0.00	0	0.00	0	28.83	1.312393	676.00	15.45588	0.00	0	28.23	0.387639
Rastrelliger kanagurta	0.00	0	0.00	0	23.17	1.05474	0.00	0	52.00	15.66265	751.17	10.31467
Sardinella longiceps	2.00	1.459854	0.00	0	0.00	0	0.00	0	0.00	0	2.00	0.027463
Scomberoides lysan	0.00	0	17.50	7.18096	0.00	0	0.00	0	0.00	0	17.50	0.240301
Selar crumenopthalmus	20.00	14.59854	8.30	3.405827	52.00	2.367133	676.00	15.45588	104.00	31.3253	860.30	11.81319
Selar boops	0.00	0	61.70	25.31801	0.00	0	0.00	0	0.00	0	61.70	0.847232
Sphyraena sp.	0.00	0	0.00	0	8.25	0.375555	57.20	1.307805	0.00	0	65.45	0.898725
Thunnus albacares	0.00	0	70.00	28.72384	0.00	0	0.00	0	0.00	0	70.00	0.961203
Others	2.00	1.459854	18.00	7.38613	0.00	0	44.50	1.017436	10.00	3.012048	74.45	1.022308
Total	137.00	100	243.70	100	2196.75	100	4373.74	100	332.00	100	7282.54	100
Fishing Depth (meters)	**144**		**152.5**		**74.34**		**74.7**		**81**			
Mean catch (kg/set)											1456.51	

** Two Setting at Station 16*

8.5 cm to 14.5 cm. The peak of the sample is at 9.5 cm contributing of about 30.54%. Samples were mainly juvenile having Age Group I and II. Among the two *D. kurroides* has the lowest catch with a total of 9.2 kgs and a 15 pieces sampled fish. Size of the said species ranges from 8 cm to 11 cm with a peak at 8.5 cm equal to 46.6% of its sample. (Figure10)

Other important species were *R. kanagurta* at 11.5 cm to 19.5 cm with a highest number sampled size at 12.5 cm equal to 39.05%: *S. crumenopthalmus* at 11.5 cm to 22 cm with peak 17.5 equal to 18.22%: and *E. affinis* at 20.6 cm to 25 cm peak equal to 36% of its samples. (Figure 11)

Station 24

Size of *D. macrosoma* ranges from 9.5 cm to 12.5 cm with a dominant sampled species at 10.5 cm equal to 29.78%. Most of the sampled fish composed mainly of Age Group I having 46.99% from the total catch composition of 156 kgs. (Figure 12)

Other important species include *R. kanagurta* and *S. crumenopthalnus* with size ranges from 10.5 cm to 19.5 cm and 15 cm to 21 cm respectively. (Figure 13)

Base on ICTD data, Physical oceanographic properties such as temperature, salinity, dissolved oxygen and pH of purse seine exploration covered by M/V Maya-Maya is shown in Table 2. It indicates that the temperature profile of the surveyed areas varies from 23°C to 28°C while the salinity and dissolved oxygen slightly varies from 34.1 ppt to 34.5 ppt and 4.1 ml/ to 4.5 ml/l respectively. Sea water pH remains constant to 8.25 throughout the four areas. The fishing operation's shallowest depth was 41.3 meters and deepest at 84.7 meters. Inspite of the variation in depth the temperature, salinity, dissolved oxygen and pH remains relatively similar. Gonzales et. al. (1987) stated that there is no great variation on the horizontal distribution of temperature of the surface water which ranges from 26 to 29°C. He also stated that salinity distribution is highly variable owing to the effect of river run-off, variation in precipitation rate, and mixing processes in coastal waters. (Table 2).

Table 2. Physical Oceanographic Data.

Physical Oceanographic Data

Purse Seine Operations
Fishing Station Profile from M/V SEAFDEC
South China Sea: Western Philippines
April-May 1998

Stations	Temperature	Salinity	Dissolve Oxygen	pH
9	23.5 °C	34.5 ppt	4.3 ml/l	8.25
15	26.0 °C	34.1 ppt	4.2ml/l	8.25
16	27.0 °C	34.5 ppt	4.2ml/l	8.25
24	28.0°C	34.5 ppt	4.5ml/l	8.25

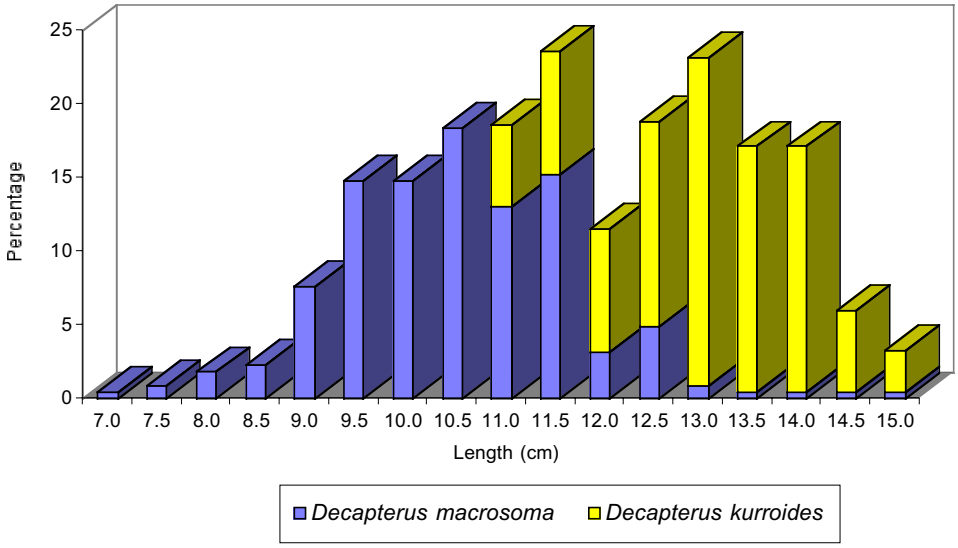

Fig. 6. Length composition of *Decapterus macrosoma and D. kurroides* in Stations 15.

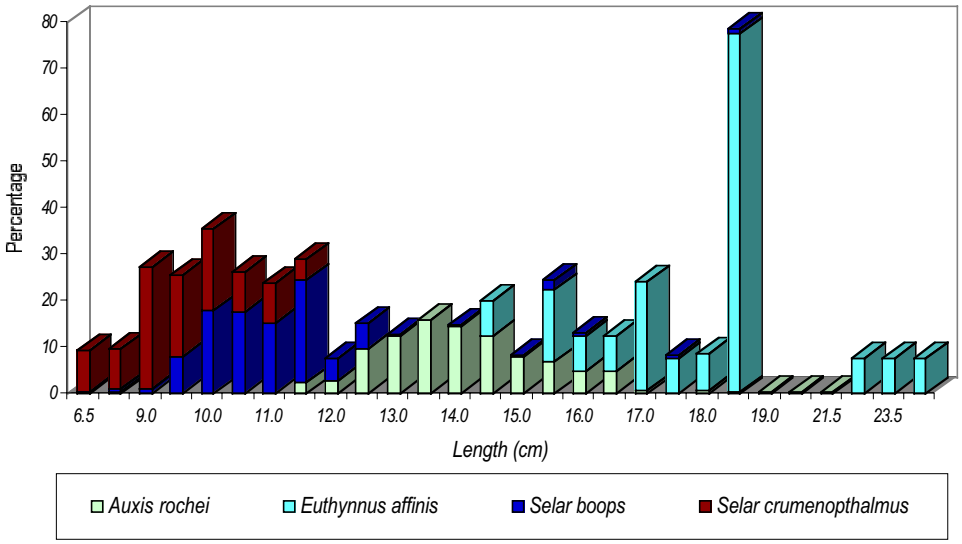

Fig. 7. Length composition of other species in Stations 15.

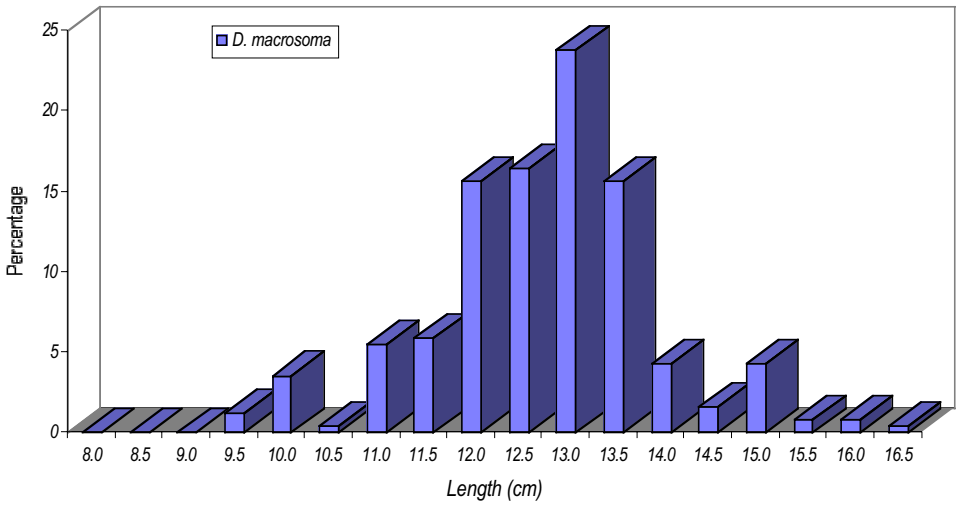

Fig. 8. Length composition of *Decapterus macrosoma* in Stations 16a.

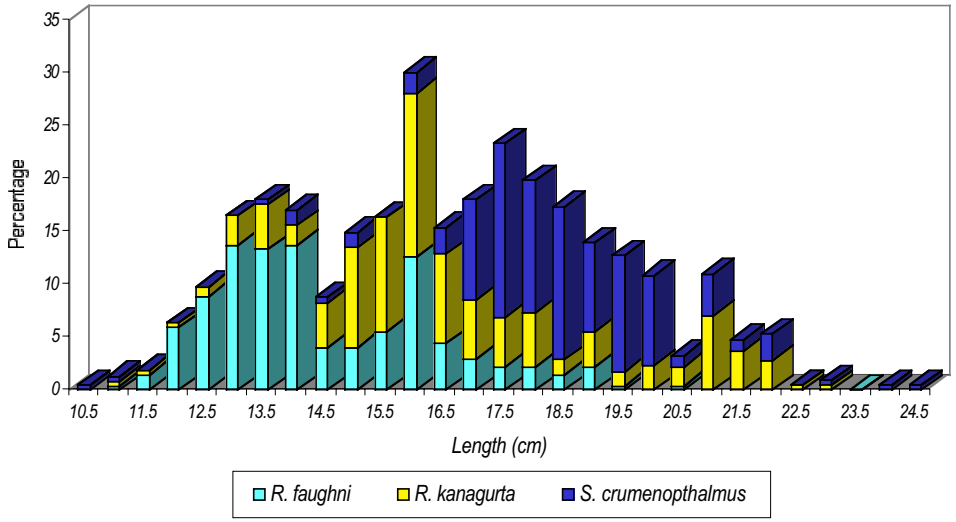

Fig. 9. Length composition of other species in Stations 16a.

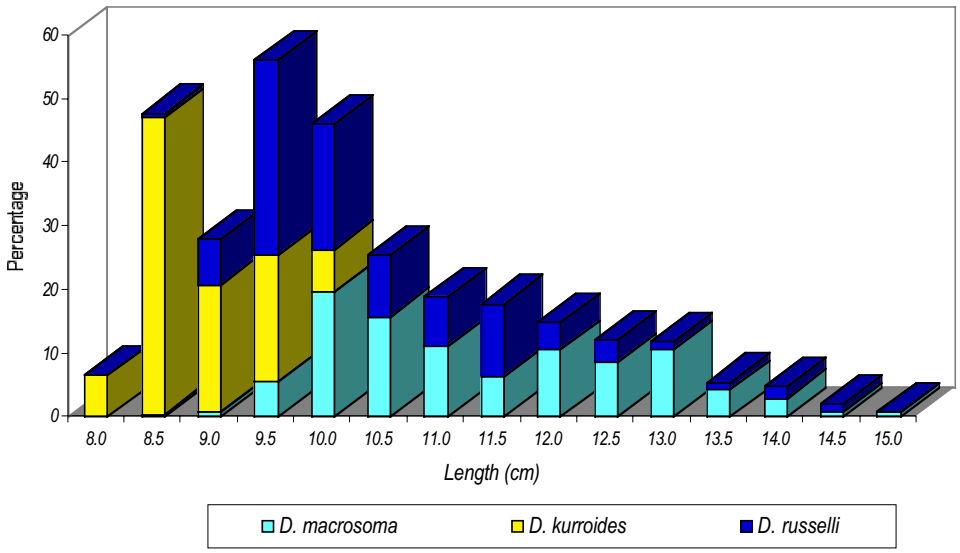

Fig. 10. Length composition of *Decapterus spp.* in Stations 16b.

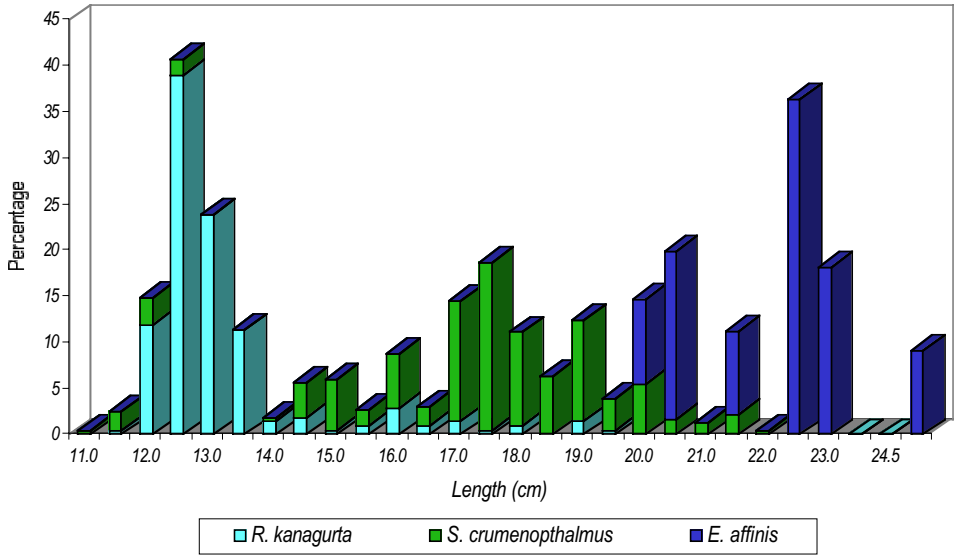

Fig. 11. Length composition of other species in Stations 16b.

Discussions

Success in purse seine fishing operation largely depends on the characteristics of the fishing ground. In the Philippines, the peak fishing season was during the Southwest Monsoon in Palawan water and Northeast Monsoon in the Visayan water (Masthawee 1986). A study made by Dickson and Pastoral (1997) on the seasonal distribution of catch for one year indicates that lowest catch rate was noted during the onset of the Northeast Monsoon in November and December while peak month occurred in the warmer month of April to June. Peak season of round scad composed mainly of *D. ruselli* and *D. macrosoma* period (August 1978 and July 1979) where 50% were small sizes having immature gonads. She also stated that only during tradewinds (April 1979 and April 1980), bigger sizes of all samples were found having 14.5 cm to 20.5 cm and 16.0 cm to 22.5 cm., respectively.

It was observed in Table 1 that *D. macrosoma* was present throughout the station and dominates the population at all times while *D. kurroides* and *D. russelli* was in lesser quantity within the surveyed area. Further, other species of Decapterus were rarely found such *as D. macarellus* and *D. maruadsi*. In the Gulf of Thailand, round scad was generally found at the depth of 20 to 70 meters of which two kinds of round scad can be found namely *D. maruadsi* and *D. macrosoma* but there are times that *D. macarellus* occurred (Bhatiyasevi, 1997).

D. macrosoma was the only species of round scad caught in station 9 (off Candon, Ilocos Sur) having 30% of the station's total catch. It was out weighed by *Auxis rochei* at 36.5%. *Auxis thazard, Euthynnus affinis, Loligo spp. Sadinella longiceps and Selar crumenopthalmus* were among the other species caught. At station 15 (off Dasol, Pangasinan) *Thunnus albacares* has the highest catch contribution of about 24.87% followed by *Selar boobs* 21.92% and 0.25% respectively. The occurrences of *Selar sp.* and *Thunnus sp.* that eat the round scads probably had cause the decrease in the population of the said fish. Other species and fish caught were *E. affinis*, *A. rochei*, *Selar spp*., *R. faughni*, *Caranx malabaricus*, *Caranx armatus*, *Scomberoides lysan* and *Priancanthus spp*. (Table 1)

Highest catch of *D. macrosoma* was observed both in the two purse seine operations at station 16 (off Subic Bay Zambales) and contributed of about 94.78% for the first hauling and 62.42% for the second hauling. The said fish remained dominant in station 24 (off Palauan, Mindoro) having 46.99%. Other species caught within the two stations were *Euthynnnus affinis, Selar spp., Rastrelliger kanagurta, Sphyraena jello, Scomberoides lysan*, *Leiognathus ruconius, Emilithcthyes nilidus, Megalaspis cordyla* and *Priacanthus sp.* (Table 1)

Tuna and tuna like fishes which includes *Auxis rochei* (bullet tuna), *A. thazard* (frigate tuna), *Thunnus albacares* (yellowfin tuna) and *Euthynnus affinis* (eastern little tuna) were caught in the upper latitude such as in latitude 16°C (Candon, Ilocos Sur) and 18°C (off Dasol, Pangsinan) having the depths of 144 and 152.5 meters respectively. Ordoñez' (1988) in his presentation of the overview of the marine fishery resources of the Philippines tuna and tuna like fishes are mostly caught in the two earlier areas mentioned. With the presence of the said fishes in the area, occurrence of *Loligo spp.* (squid) was observed extending to latitude 15°C (off Subic Bay). Other species caught at latitude 16°C were *Decapterus spp., Caranx malabaracus, Caranx armatus, Scomberoides lysan,* and *Priancanthus sp*. However, at latitude 15°C occurrences of *Sphyreana jelo*, (banded baracuda), *Rastrelliger spp., R. ruconuis, Emilichthyes nilidus, Megalaspis cordyla* and *Priancanthus sp.* were observed. Further at latitude 15°C tuna and tuna like fishes were not found since the depth of the ocean floor is only 74.34 meters (Table 1). Temperature within the area varies from 23.5 to 26°C (Table 2).

At the lower latitude of the surveyed area, occurrences of shortfin scads *(Decapterus macrosoma)*, big-eyed scads *(S. Crumenopthalmus)* and indian mackerels *(Rastrelliger kanagurta)*

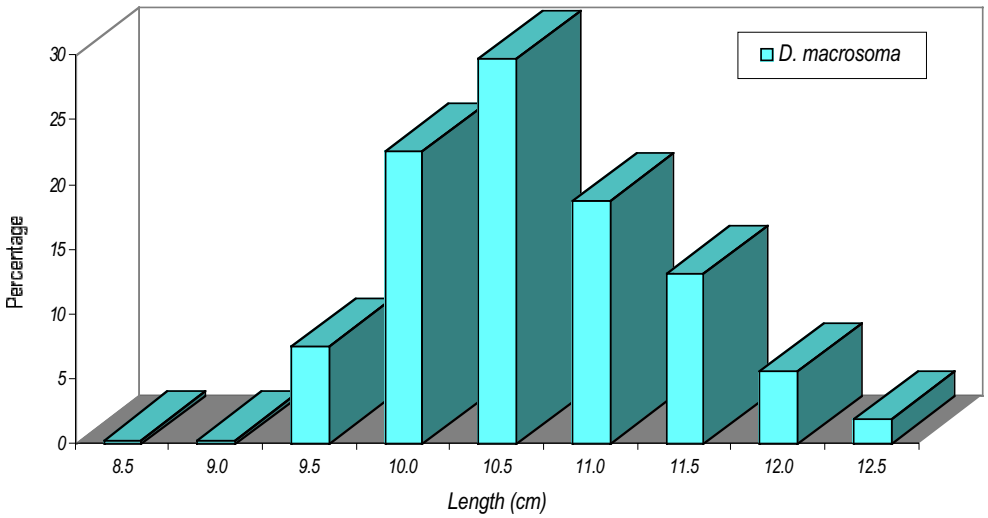

Fig. 12. Length composition of *Decapterus macrosoma.* in Stations 24.

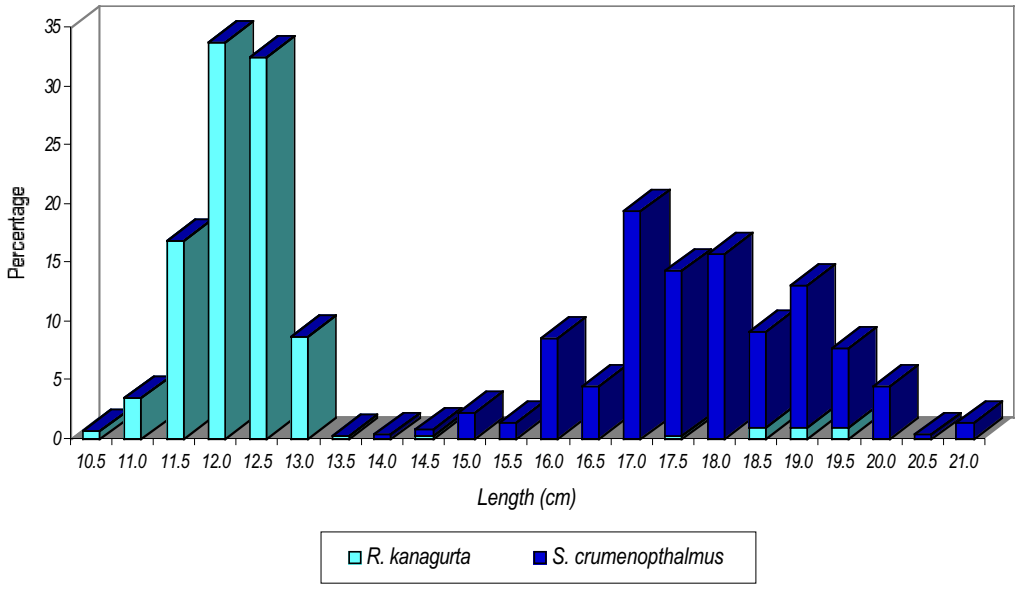

Fig. 13. Length composition of other species in Stations 24.

were observed and caught at the depth of 81 meters. Temperature within the areas was slightly higher compared to the upper latitude which ranges from 27 to 28°C. *Euthynnus affinis* and *Priacanthus sp.* were also caught at the same area.

Although there is no clear evidence on the heavy exploitation of pelagic stocks due to increasing numbers of fishing boats and fisherman, destructive fishing, capture of juvenile and man-induced stress such as pollution had apparently resulted in a decline of catch rates in the Philippines pelagic species (Malig et.al. 1987). Most of the areas in the coastal waters of Southeast Asia Regions in the Western Pacific according to Chikuni (1987) may have nearly fully exploited which includes roundscad. Excessive fishing efforts has caused a decrease in fish production, size of individual fish caught and changed in composition of fish in the Java Sea that further resulted to the extension of fishing ground to the South Sulawesi area (Naamin 1987).

Conclusions

1. Roundscad were present at all times during the surveys with the dominant species of *D. macrosoma, D. russeli* and *D. kurroides.*
2. Most of the *Decapterus spp.* found in Area III, Western Philippines were juvenile less than 13 cm, several were at Age Group I (13 cm. to 19.5 cm) and a few at matured stage of Age Group Age Group IV and V (22 cm to 28 cm).
3. Roundscads, big-eyedscads and Indian mackerels were dominantly present in the lower latitudes of the waters of Western Philippines while tuna and tuna like fishes such as yellowfin tuna, eastern little tuna, bullet tuna, frigate tuna and oceanic squid are distributed in the upper latitudes.

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