

Kind, Abundance and Distribution of the Fish Larvae in the South China Sea, Area II : Sarawak, Sabah and Brunei Darussalam

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ABSTRACT

Fish larvae samples were obtained from 79 stations in South China Sea of the Sarawak, Brunei and Sabah during the pre northeast monsoon season (August - September 1996) and the post northeast monsoon (April - May 1997). The standard larvae net and bongo net were used for the surface and oblique sampling. The specimens were identified which comprise of 112 families and 186 species of fish larvae observed from both cruises. For the pre northeast monsoon sampling there were 5,156 individuals observed from 86 families and 125 species in the surface horizontal haul and 16,277 individuals from 96 families and 149 species in the oblique haul. The post northeast monsoon collection showed 6,595 individuals from 79 families and 114 species collected in the surface horizontal hauls and 24,450 individuals from 94 families and 158 species observed in the oblique hauls. From the surface horizontal sampling, the abundant larvae observed were *Stolephorus* sp., *Sardinella* sp., *Upeneus* sp., *Myripristis* sp., *Holocentrus* sp., Gobiidae, *Decapterus* sp. and *Diaphus* sp. Specimens from the oblique hauls, Gobiidae, *Bregmaceros rarisquamosus*, *Nemipterus* sp., *Stolephorus* sp. and *Callionymus* sp. were the most species observed abundant in the collection. The mesopelagic fish larvae, *Hygophum* sp., *Myctophum* sp., *Pollichthys* sp. and *Lampadena* sp. were found abundant in the oblique specimens in the deep sea stations. The larvae were collected in more abundant during the early morning, night time and cloudy day sampling.

Introduction

Fish larvae in the South China Sea was an important subject for the fisheries resources study. Fisheries resources management in these area need the knowledge about spawning period, spawning and rearing ground. Due to the limitation of such knowledge in this area, a collaborative research project among the SEAFDEC member countries and the participation of the Department of Fisheries, Thailand was carried out using the M.V. SEAFDEC to investigate the available fish resources as well as the biological and physical oceanographic conditions.

Fish larvae will be investigated for their kinds, abundance and distribution. The objectives of this study were to identify the composition of fish larvae found in this area, as well as the spawning ground, spawning period, rearing ground and period, the information of collected may be used to formulate appropriate fisheries management programme in this area.

Study on fish larvae in Southeast Asia were first conducted by Delsman from 1922-1938 which described and illustrated the larvae of *Chirocentrus dorab*, *Dussumieria hasseltii*, *Clupea* sp., *Engraulis* sp., *Setipinna* sp. and *Myctophidae* sp. from the Java sea.

Previous important studies on the fisheries resources in the South China Sea were also conducted by some fisheries biologist. Vatanachai (1972) showed that there were at least 107 families of fish larvae in the South China Sea. Temvidchakorn (1983) reported that there were 72 families of fish larvae occurred in KH-81-5 cruise which sampling in the South China Sea. The composition were observed Engraulidae 16.02%, Gobiidae 14.98%, Myctophidae 12.23%, Gonostomatidae 10.19%, Lutjanidae 8.58%, Carangidae 6.72%, Bothidae 3.13%, Scombridae 2.88%, Cepolidae 2.28%, Labridae 1.88%, Holocentridae 1.86% and the other families was about 19.25%.

Material and Method

Samplings for the fish larvae were carried out (using M.V. SEAFDCE) from 9 July to 9 August 1996 during the pre northeast monsoon period and the post northeast monsoon period between 25 April and 31 May 1997. There were 79 sampling stations along the coastal and deep sea of Sarawak, Sabah and Brunei Darusalam (Figure 1, Appendix 1,2,3,4). Two types of fish larvae sampling methods were employed. The surface horizontal haul represents a study on the diurnal migration and the economical pelagic families. While the oblique haul used for the whole mass of larvae from surface to the depth of haul. The standard larvae net, 1.30 meter in diameter with a 5 mm. mesh size at the mouth part and 330 micron at the cod end, was used for the surface sampling. The bongo net, 60 cm. in diameter with mesh size 500 micron at the mouth part and 330 micron at the cod end was employed for the oblique haul.

A flow meter was attached to the mouth part of the net to determine the volume of water. The sampling period was 30 minutes with the haul speed at 2 knots. For oblique haul, the net went down to a depth of about 5 meters above the bottom surface (as measured by a depth sensor). however in the deeper area, the net will go down to a maximum depth of 150 meters only.

Collected specimens were preserved in 10% sea water formalin solution immediately after each haul. Sorting and identification was done at the laboratory. After sorting, the fish larvae were transferred and preserved in 4% sea water formalin solution. Species identification was done by using the stereomicroscope. Specimens were identified to the genera or species level. Their abundance and distribution were estimated in term of number of individuals per 1000 cubic meters (No./1000 m³) of sea water. The classification methods used for fish identification were Delsman (1922,1925,1926,1930,1932,1933,1938) Lies and Rennis (1983) Leis and Trnski (1989), Mito (1996), Moser *et al*(ed) (1984), Okiyama (1988), Fahay (1983), Ozawa 1986., and Termvidchakorn 1983.

Data on temperature, salinity and dissolved oxygen at the surface and 75 meter depth of each station were also recorded and used to determine the relationship with the abundance, and distribution of the fish larvae.

Result

There were 5,156 and 16,277 individuals of fish larvae obtained from the surface and oblique hauls during the pre northeast monsoon cruise. During the post northeast monsoon cruise, 6,595 and 24,450 individuals were observed from surface and oblique hauls. The specimens were identified which comprise of 112 families and 186 species of the fish larvae both from the pre and post northeast monsoon periods (Table 1, Appendix 5). The pre northeast monsoon specimens showed 86 families and 125 species from the surface horizontal hauls and 96 families and 149 species from the oblique hauls. The post northeast monsoon collection provided 79 families and 114 species from the surface sampling and 94 families and 158 species from the oblique hauls. Their abundance in number per 1000 cubic meters of each stations were showed on Figure 2-5 (Table 1, Appendix 5).

The most abundant fish larvae observed from the surface hauls during the pre and post northeast monsoon were *Stolephorus* sp., *Sardinella* sp., *Myripristis* sp., *Holocentrus* sp., *Upeneus* sp., Gobiidae and *Decapterus* sp., respectively. For the specimens from the oblique hauls in both cruises, the abundant larvae were Gobiidae, *Bregmaceros rarisquamosus*, *Decapterus* sp., *Nemipterus* sp., *Hygophum* sp., *Callionymus* sp. and *Apogon* sp., respectively.

The most abundant fish larvae obtained from the surface hauls of the prenortheast monsoon were *Sardinella* sp. (10.22%), *Upeneus* sp.(9.74%) Gobiidae (7.76%), *Myripristis* sp.(6.21%), *Diaphus* sp.(5.68%), *Decapterus* sp.(4.83%), *Stolephorus* sp.(4.00%) and *Selar crumenophthalmus* (3.47%) respectively. Those from the oblique hauls were Gobiidae(32.04%) ,*Bregmaceros rrsisquamosus* (8.68%), *Decapterus* sp.(4.74%), *Apogon* sp.(3.56%), *Lutjanus* sp.(2.70%), *Callionymus* sp.(2.57%), *Benthoosema* sp.(2.13%) and *Nemipterus* sp.(2.12%) respectively. During the post northeast monsoon the abundant fish larvae observed at the surface were *Stolephorus* sp.(10.49%), *Myripristis* sp.(8.83%),

Table 1 Species of the fish larvae observed from surface and oblique haul in the survey area for the pre and post monsoon cruise

	Fish larvae	STM - III		STM - IV	
		Surface	oblique	Surface	oblique
1	Megalopidae				
	<i>Megalops cyprinoides</i>	*			
2	Clupeidae				
	<i>Sardinella sp.</i>	*	*	*	*
	<i>Dussumieria sp.</i>	*	*	*	*
3	Engraulidae				
	<i>Stolephorus sp.</i>	*	*	*	*
4	Chirocentridae				
	<i>Chirocentrus dorab</i>	*			
5	Argentinidae				
	<i>Glossanodon sp.</i>		*		
	<i>Argentina kagoshimae</i>		*		
6	Opisthoproctidae				
	<i>Bathylchnop sp.</i>	*			
7	Bathylagidae				
	<i>Bathylagus sp.</i>		*		*
8	Gonostomatidae				
	<i>Diplophos sp.</i>	*	*	*	*
	<i>Pollichthys mauii</i>		*	*	*
	<i>Vinciguerria sp.</i>	*	*	*	*
	<i>Gonostoma sp.</i>	*	*	*	*
	<i>Cyclothone sp.</i>	*	*	*	
	<i>Valenciennellus sp.</i>		*		*
	<i>Maurolicus sp.</i>				*
9	Sternoptychidae				
	<i>Argyropelecus hemigymmus</i>	*	*		*
10	Chauliodontidae				
	<i>Chauliodus sp.</i>	*	*		*
11	Stomiidae				
	<i>Stomias sp.</i>		*	*	*
12	Symphysanodontidae				
	<i>Symphysanodon katayamai</i>		*		
13	Melanostomiidae				
	<i>Melanostomias sp.</i>				*
	<i>Bathophilus brevis</i>		*		*
	<i>Eustomius sp.</i>		*	*	*
14	Idiacanthidae				
	<i>Idiacanthus sp.</i>		*		*
15	Chanidae				
	<i>Chanos chanos</i>	*	*	*	
16	Aulopodidae				
	<i>Aulopus japonicus</i>	*	*	*	*
17	Synodontidae				
	<i>Saurida undosquamis</i>	*	*	*	*
	<i>Synodus variegatus</i>	*	*	*	*
	<i>Trachinocephalus myops</i>	*	*	*	*
18	Chlorophthalmidae				
	<i>Chlorophthalmus sp.</i>		*		*
19	Ipnopidae				
	<i>Ipnops sp.</i>		*	*	*
20	Scopelarchidae				
	<i>Scopelarchus sp.</i>		*		*
	<i>Scopelarchoides sp.</i>				*

Table 1 continue

	Fish larvae	STM - III		STM - IV	
		Surface	oblique	Surface	oblique
21	Notosudidae				
	<i>Scopelosaurus sp.</i>	*	*	*	*
22	Myctophidae				
	<i>Hygophum sp.</i>		*		*
	<i>Benthoosema sp.</i>	*	*	*	*
	<i>Diogenichthys sp.</i>		*	*	*
	<i>Myctophum sp.</i>	*	*	*	*
	<i>Symbolophorus evermanni</i>	*	*		*
	<i>Centrobranchus sp.</i>				*
	<i>Tanningichthys sp.</i>				*
	<i>Lampanyctus sp.</i>	*	*		*
	<i>Lobianchia sp.</i>	*			
	<i>Ceratoscopelus sp.</i>				*
	<i>Lampadena sp.</i>	*	*	*	*
	<i>Diaphus sp.</i>	*	*	*	*
	<i>Notoscopelus sp.</i>				*
23	Paralepididae				
	<i>Sudis atrox</i>		*		*
	<i>Paralepis sp.</i>		*		*
	<i>Lestidium sp.</i>	*	*	*	*
	<i>Lestidiops indopacifica</i>	*	*		
	<i>Uncisudis quadrimaculata</i>		*		
	<i>Stemonosudis sp.</i>				*
24	Osmosudidae				
	<i>Osmosudis lowei</i>		*		
25	Alepisauridae				
	<i>Alepisaurus sp.</i>				*
26	Evermanellidae				
	<i>Evermanella sp.</i>		*		*
27	Hemiramphidae				
	<i>Hemiramphus sp.</i>	*	*	*	*
28	Belonidae				
	<i>Tylosaurus coccodylus</i>				*
29	Exocoetidae				
	<i>Exocoetus sp.</i>	*	*	*	*
	<i>Cypselurus sp.</i>	*		*	*
	<i>Hirundichthys sp.</i>		*	*	*
30	Antennariidae				
	<i>Antennarius sp.</i>	*	*	*	*
31	Lophiidae				
	<i>Lophias sp.</i>	*	*	*	*
	<i>Lophiomus sp.</i>				*
32	Chaunacidae				
	<i>Chaunax sp.</i>	*	*	*	*
33	Ceratiidae				
	<i>Cyrtopsarus sp.</i>		*		
34	Pegasidae				
	<i>Pegasus sp.</i>	*		*	*
35	Bregmacerotidae				
	<i>Bregmaceros rarisquamosus</i>	*	*	*	*
	<i>Bregmaceros macelellandii</i>		*		*
36	Fistulariidae				
	<i>Fistularia sp.</i>	*	*	*	*

Table 1 continue

	Fish larvae	STM - III		STM - IV	
		Surface	oblique	Surface	oblique
37	Solenostomidae				
	<i>Solenostomus sp.</i>		*		
38	Syngnathidae				
	<i>Syngnathus sp.</i>	*	*		*
	<i>Hippocampus sp.</i>	*			
39	Centriscidae				
	<i>Centriscus scutatus</i>	*	*	*	*
40	Brotulidae				
	<i>Brotula sp.</i>	*	*	*	*
41	Carapidae				
	<i>Carapus sp.</i>	*	*	*	*
42	Diretmidae				
	<i>Diretmoides sp.</i>		*		*
43	Melamphaidae				
	<i>Scopelogadus sp.</i>		*		
	<i>Scopeloberyx sp.</i>		*		*
	<i>Melamphase sp.</i>		*		*
44	Holocentridae				
	<i>Holocentrus sp.</i>	*	*	*	*
	<i>Myripristis sp.</i>	*	*	*	*
45	Sphyraenidae				
	<i>Sphyraena sp.</i>	*	*	*	*
46	Atherinidae				
	<i>Atherina sp.</i>	*			
47	Trachipteridae				
	<i>Trachipterus sp.</i>	*			
48	Percichthyidae				
	<i>Synagrops philippinensis</i>		*	*	*
49	Serranidae				
	<i>Epinephelus sp.</i>	*	*	*	*
	<i>Chelidoperca hirundinacea</i>	*	*	*	*
	<i>Anthias sp.</i>		*	*	*
50	Theraponidae				
	<i>Therapon jarbua</i>	*	*	*	*
	<i>Therapon theraps</i>	*	*		
51	Priacanthidae				
	<i>Priacanthus tayenus</i>	*	*	*	*
52	Apogonidae				
	<i>Apogon lineatus</i>		*	*	*
	<i>Apogon nigrofasciatus</i>		*	*	*
	<i>Apogon sp.</i>	*	*	*	*
	<i>Gymnopogon sp.</i>	*	*	*	*
53	Sillaginidae				
	<i>Sillago sp.</i>	*			
54	Branchiostegidae				
	<i>Branchiostegus sp.</i>		*		*
55	Coryphaenidae				
	<i>Coryphaena hippurus</i>	*	*	*	*
56	Carangidae				
	<i>Decapterus sp.</i>	*	*	*	*
	<i>Selar crumenophthalmus</i>	*	*	*	*
	<i>Megalaspis cordyla</i>				*
	<i>Alectis ciliaris</i>	*	*	*	*
	<i>Caranx ignobilis</i>	*	*	*	*
	<i>Caranx (Selaroides) leptolepis</i>	*	*	*	*
	<i>Caranx mate</i>	*	*	*	*
	<i>Caranx speciosus</i>	*	*	*	*
	<i>Caranx sp.</i>	*	*	*	*

Table 1 continue

	Fish larvae	STM - III		STM - IV	
		Surface	oblique	Surface	oblique
	<i>Elagatis bipinnulata</i>	*	*	*	
	<i>Scomberoides lysan</i>	*	*	*	*
	<i>Zonichthys nigrofasciata</i>	*	*	*	*
57	Parastromatidae				
	<i>Parastromateus niger</i>				*
58	Meneidae				
	<i>Mene maculata</i>		*	*	
59	Bramidae				
	<i>Brama sp.</i>		*	*	*
60	Lutjanidae				
	<i>Lutjanus sp.</i>	*	*	*	*
61	Nemipteridae				
	<i>Nemipterus sp.</i>	*	*	*	*
62	Gerreidae				
	<i>Gerres sp.</i>	*	*	*	*
63	Lobotidae				
	<i>Lobotes surinamensis</i>	*		*	
64	Leiognathidae				
	<i>Leiognathus sp.</i>	*	*	*	*
65	Pomadasyidae				
	<i>Plectorhynchus sp.</i>	*	*	*	*
66	Lethrinidae				
	<i>Lethrinus sp.</i>	*	*	*	*
67	Mullidae				
	<i>Upeneus sp.</i>	*	*	*	*
68	Haemulidae				
	<i>Diagramma sp.</i>				*
69	Monodactylidae				
	<i>Monodactylus argenteus</i>			*	
70	Ehippididae				
	<i>Platax tiara</i>		*	*	*
71	Scatophagidae				
	<i>Scatophagus argus</i>		*	*	
72	Chaetodontidae				
	<i>Chaetodon sp.</i>	*	*	*	*
73	Pomacanthidae				
	<i>Centropyge sp.</i>	*	*		*
74	Pomacentridae				
	<i>Pomacentrus sp.</i>	*			
	<i>Chromis sp.</i>	*	*	*	*
	<i>Abudefduf sp.</i>	*	*	*	*
75	Cepolidae				
	<i>Acanthocephala sp.</i>	*	*	*	*
76	Labridae				
	<i>Halichoeres sp.</i>	*	*	*	*
77	Scaridae				
	<i>Scarus sp.</i>		*	*	*
78	Champsodontidae				
	<i>Champsodon sp.</i>	*	*	*	*
79	Chiasmodontidae				
	<i>Chiasmodon sp.</i>				*
80	Blenniidae				
	<i>Blennius sp.</i>	*	*	*	*
81	Callionymidae				
	<i>Callionymus sp.</i>	*	*	*	*
82	Echeneidae				
	<i>Echeneis naucrates</i>	*	*	*	*
83	Histiophoridae				

Table 1 continue

	Fish larvae	STM - III		STM - IV	
		Surface	oblique	Surface	oblique
	<i>Histiophorus sp.</i>	*	*	*	*
84	Scombridae				
	<i>Rastrelliger sp.</i>	*	*	*	*
	<i>Scomber sp.</i>		*		*
	<i>Scomberomorus sp.</i>	*	*	*	*
	<i>Acanthocybium solandri</i>		*		*
	<i>Euthynus sp.</i>	*	*	*	*
	<i>Auxis sp.</i>		*	*	*
	<i>Katsuwonus pelamis</i>		*	*	*
	<i>Thunnus sp.</i>				*
85	Trichiuridae				
	<i>Trichiurus lepturus</i>	*	*		*
86	Gempylidae				
	<i>Gempylus sp.</i>	*	*	*	*
87	Acanthuridae				
	<i>Acanthurus sp.</i>	*	*	*	*
88	Siganidae				
	<i>Siganus sp.</i>		*	*	*
89	Tetragonuridae				
	<i>Tetragonurus sp.</i>	*	*	*	*
90	Nomeidae				
	<i>Psene cyanophys</i>				*
	<i>Nomeius sp.</i>		*		*
	<i>Cubiceps sp.</i>	*	*	*	*
91	Stromatidae				
	<i>Pampus sp.</i>				*
92	Sciaenidae				
	<i>Sciaena sp.</i>	*	*		*
	<i>Nibea japonicus</i>				*
93	Polynemidae				
	<i>Polynemus sp.</i>	*			
94	Schneideriidae				
	<i>Schneideria sp.</i>	*	*	*	*
95	Typanchaniidae				
	<i>Typanchen sp.</i>	*	*	*	*
96	Trichonotidae				
	<i>Trichonotus sp.</i>		*		
97	Gobiidae	*	*	*	*
98	Platycephalidae				
	<i>Platycephalus sp.</i>	*	*	*	*
99	Scorpaenidae				
	<i>Scorpaenoides sp.</i>	*	*	*	*
	<i>Minous sp.</i>	*	*	*	*
100	Triglidae				
	<i>Lepidotrigla sp.</i>	*	*	*	*
101	Dactylopteridae				
	<i>Dactylopterus sp.</i>	*	*	*	*
102	Psettodidae				
	<i>Psettodes erumei</i>	*	*	*	*
103	Paralichthyidae				
	<i>Paralichthys sp.</i>		*	*	*
	<i>Pseudorhombus sp.</i>	*	*		*
	<i>Samarius sp.</i>		*		
104	Soleidae				
	<i>Solea sp.</i>	*			*
	<i>Aserraggodes sp.</i>	*	*	*	*

Table 1 continue

	Fish larvae	STM - III		STM - IV	
		Surface	oblique	Surface	oblique
105	Bothidae				
	<i>Bothus sp.</i>	*	*	*	*
	<i>Engyprosopon sp.</i>	*	*	*	*
	<i>Arnoglossus sp.</i>	*			*
106	Cynoglossidae				
	<i>Cynoglossus sp.</i>	*	*	*	*
107	Citharidae				
	<i>Brachypleura novaezeelandiae</i>	*	*		*
108	Tetraodontidae				
	<i>Tetraodon sp.</i>	*	*	*	*
109	Diodontidae				
	<i>Diodon sp.</i>	*	*	*	*
110	Balistidae				
	<i>Balistes sp.</i>	*	*	*	*
111	Monacanthidae				
	<i>Monacanthus sp.</i>	*	*	*	*
	<i>Aluterus sp.</i>	*	*	*	*
112	Eel larvae (<i>Leptocephalus sp.</i>)	*	*	*	*

Holocentrus sp.(8.04%), *Upeneus sp.*(6.57%) and Gobiidae(5.38%) respectively while the oblique hauls were Gobiidae(29.44%), *Bregmaceros rarisquamosus* (16.26%), *Nemipterus sp.*(2.86%), *Hygophum sp.*(2.78%) and *Callionymus sp.*(2.49%), respectively.

The abundance and distribution of the fish larvae in South China Sea and coastal area of Sarawak, Sabah and Brunei are summarized as followed :

1. Family Megalopidae

Megalopidae larvae which occurred at the surface sample of the pre northeast monsoon cruise were *Megalops cyprinoides* which was only one specimens observed at the station number 19 with the depth of 65 meters.

2. Family Clupeidae

Sardinella sp. *Dussumieria sp.* were 2 genera of Clupeidae larvae occurred in these sampling cruises. *Sardinella sp.* was the most abundant fish larvae from the surface specimens of the pre northeast monsoon. There were 527 and 224 individuals from 20 and 13 stations in the surface sampling from the pre and post northeast monsoon cruises, respectively. The oblique sampling showed 181 and 173 individuals from 11 and 19 stations of the pre and post monsoon cruises, respectively. The larvae were distributed at the stations which the depth less than 100 meters (Figure 6-9).

Dussumieria sp. larvae occurred in both the surface and oblique samples in pre and post northeast monsoon collection. There were 3 and 4 individuals from 3 and 1 stations in the surface sampling from pre and post northeast monsoon cruise respectively. The oblique sampling showed 23 and 13 individuals from 9 stations each of pre and post northeast monsoon cruise, respectively. The depth of stations which the larvae occurred was less than 75 meters.

3. Family Engraulidae

Engraulidae larvae occurred in both surface and oblique samples with *Stolephorus sp.* was the most abundant in the surface sample of the post northeast monsoon cruises. There were 206 and 692 individuals from 23 and 30 stations in the surface sampling of pre and post northeast monsoon cruises, respectively. The oblique sampling showed 199 and 603 individuals from 21 and 37 stations during pre and post northeast monsoon cruises, respectively. The larvae mostly occurred at the coastal sta-

tions which the depth was less than 100 meters (Figure 10-13).

4. Family **Chirocentridae**

Chirocentrus dorab occurred only in the surface sampling of the pre northeast monsoon cruise. There were 13 individuals from 7 stations of coastal area which the depth was less than 75 meters.

5. Family **Argentinidae**

Argentinidae was one of the mesopelagic fish and the larvae occurred only in the oblique sampling of the pre northeast monsoon cruise. There were 2 genera of Argentinidae larvae occurred in the specimens. These 2 genera were *Glossanodon* sp. and *Argentina kagoshimae*. Only one specimen of *Glossanodon* sp. occurred in the deep sampling station (Station No.64) which the depth was more than 1,261 meters and 4 individuals of *Argentina kagoshimae* were observed from 3 stations at the deep area.

6. Family **Opisthoproctidae**

Opisthoproctidae larvae occurred in the surface sampling of the pre northeast monsoon cruise belong to the genus *Bathilychnops* sp. which was a mesopelagic fish. There were 6 individuals observed from 3 stations by the surface haul. The larvae usually occurred in the stations that the depth was more than 100 meters.

8. Family **Gonostomatidae**

There were 7 genera of Gonostomatid larvae occurred in the surface and oblique sampling of pre and post northeast monsoon cruises. Most of the Gonostomatid larvae obtained from deep area especially in early morning, cloudy day or night time sampling.

Diplophos taenia larvae occurred in both surface and oblique samples of the pre and post northeast monsoon. There were 36 and 2 individuals observed from 9 and 1 stations of surface and oblique samples in the pre northeast monsoon, while the post northeast monsoon period showed 2 and 5 individuals from 1 and 4 stations of the surface and oblique samples.

Pollichthys mauii. larvae occurred in the oblique samples of both pre and post northeast monsoon cruises and surface sample of post northeast monsoon. There was 4 individuals from 4 stations of the surface sampling of the post northeast monsoon. The oblique sampling of pre and post northeast monsoon showed 129 and 370 individuals from 35 and 42 stations. The larvae showed the distribution in the deep area stations.

Vinciguerria sp. larvae occurred in both surface and oblique haul of the pre and post northeast monsoon cruises. There were 1 and 86 individuals from 1 and 27 stations of surface and oblique hauls of the pre northeast monsoon cruises. The post northeast monsoon cruise showed 45 individuals each from 11 and 13 stations of surface and oblique collection.

Gonostoma sp. showed 1 and 221 individuals from 1 and 38 stations of the surface and oblique hauls in pre northeast monsoon cruises. There were 17 and 209 individuals from 8 and 34 stations of the surface and oblique hauls of the post northeast monsoon cruise. Most of the larvae were collected from the oblique hauls in the deep area stations. The surface capture usually occurred in the early morning and night time.

Valenciennellus sp. showed 11 and 17 individuals from 2 and 3 stations in the oblique samples of the pre and post northeast monsoon cruises, respectively. The larvae occurred only in the deep area which the depth were than 2000 meters.

Maurolicus sp. occurred in the deep area station showed 4 individuals from station number 61 of the oblique haul in the post northeast monsoon cruise. The depth of this station was more than 2000 meters.

Cyclothone sp. showed 126 and 7 individuals from 28 and 3 stations in the surface and oblique hauls from pre northeast monsoon and 3 individuals from station number 55 in the surface haul of the post northeast monsoon cruise.

9. Family Sternoptychidae

Only one species of *Argyropelecus hemigymnus* occurred in the sampling from surface haul of the pre northeast monsoon while the larvae occurred in oblique sampling of both pre and post monsoon cruises. There were 2 individuals from station number 50 which the depth was more than 200 meters. The oblique samples showed 47 and 58 individuals from 20 and 22 stations of pre and post northeast monsoon cruises.

10. Family Chauliodontidae

Chauliodus sp. larvae occurred in the sampling from both surface and oblique hauls in the pre northeast monsoon cruise and occurred in the haul of the post northeast monsoon cruise. There were 1 and 10 individuals observed from 1 and 6 stations of the surface and oblique hauls of the pre northeast monsoon cruise while the post northeast monsoon cruise only 1 individual each was observed from 5 stations. The larvae usually occurred in stations which the depth was more than 1000 meters.

11. Family Stomiidae

Only one genus of *Stomias* sp. larvae was occurred in these sampling cruises. There were 1 individual observed in each of 5 stations from oblique haul of the pre northeast monsoon cruise. There were 2 and 9 individuals collected from 2 and 6 stations in surface and oblique hauls of the post northeast monsoon cruise. The depth of the stations were more than 100 meters.

12. Family Symphyganodontidae

Symphyganodon katayamai larvae occurred only 1 individual was observed from 2 stations by oblique haul of pre northeast monsoon cruise in the deep area stations that the depth was more than 2000 meters.

13. Family Melanostomiidae

Three genus of Melanostomiidae larvae occurred in the samples.

Melanostomias sp. larvae occurred only in the oblique haul of the post northeast monsoon cruise. There were 4 individuals from 2 stations which the depth was more than 200 meters.

Eustomias sp. larvae was observed at 3 and 1 individuals from 2 and 3 stations of surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise provided 1 individual each from 1 and 2 stations of surface and oblique hauls. The larvae occurred in the station which the depth was more than 500 meters.

Bathophilus brevis larvae showed only one individual from station number 38 of the oblique haul of post northeast monsoon which the depth was more than 1000 meters.

14. Family Idiacanthidae

Idiacanthus sp. larvae were observed at 6 and 8 individuals from 4 and 6 stations in the oblique haul of pre and post northeast monsoon cruises, respectively. Larvae occurred in the station which the depth was more than 1000 meters.

15. Family Chanidae

Chanos chanos larvae showed 4 and 3 individuals from 3 and 3 stations of surface and oblique hauls of pre northeast monsoon cruise while the post northeast monsoon cruise only 1 individual was observed each of 6 stations from surface haul. The larvae occurred only in the coastal area.

16. Family Aulopodidae

Aulopus japonicus larvae showed 8 and 1 individuals from 5 and 1 stations by surface and oblique hauls in pre northeast monsoon. The post monsoon cruise 8 and 12 individuals from 4 and 7 station were observed in surface and oblique hauls. The depth of occurrence station was more than

1000 meters.

17. Family Synodontidae

Three species of this family were observed in these research cruises. There were *Saurida undosquamis*, *Synodus variegatus* and *Trachinocephalus myops*.

Saurida undosquamis showed 11 and 148 individuals from 5 and 32 stations by surface and oblique hauls from pre northeast monsoon cruise and 29 and 347 individuals from 27 and 41 stations of surface and oblique haul of post northeast monsoon cruise. *Saurida undosquamis* was the most abundant among the 3 species observed especially from the oblique specimens.

Synodus variegatus larvae showed 21 and 40 individuals from 11 and 21 stations by surface and oblique hauls from the pre monsoon cruise. The post monsoon cruise provided 2 and 101 individuals from 2 and 26 stations in surface and oblique haul specimens.

Trachinocephalus myops larvae showed 16 and 33 individuals from 10 and 19 stations of surface and oblique hauls from the pre northeast monsoon cruise. The post northeast monsoon cruise provided 39 and 78 individuals from 16 and 27 stations by surface and oblique hauls. All of the stations observed Synodontidae larvae were coastal area stations.

18. Family Chlorophthalmidae

Chlorophthalmus sp. larvae occurred only in the post northeast monsoon cruise. There were 1 and 11 individuals from 1 and 4 stations of surface and oblique hauls. The depth of the occurrence station was more than 1000 meters.

19. Family Ipnopidae

There were 3 individuals of *Ipnops* sp. larvae from 2 stations by oblique haul in pre northeast monsoon. The post northeast monsoon cruise showed 7 and 1 individuals from 6 and 1 stations of surface and oblique hauls sampling. The depth of the occurrence station was more than 1000 meters.

20. Family Scopelarchidae

There were 2 genus of Scopelarchidae larvae occurred in these research cruise. These were *Scopelarchus* sp. and *Scopelarchoides* sp.

Scopelarchus sp. larvae were occurred at 28 and 15 individuals from 13 and 8 stations of oblique haul from pre and post northeast monsoon cruises, respectively. The depth of the occurrence station was more than 1000 meters.

Scopelarchoides sp. larvae observed only one individual from station number 21 by the oblique haul of post northeast monsoon cruise which the depth of the station was more than 500 meters.

21. Family Notosudidae

Only one genus of *Scopelosaurus* sp. larvae occurred in the sampling from both surface and oblique hauls in the pre and post northeast monsoon cruises. There were 2 and 14 individuals from 2 and 4 stations of surface and oblique hauls from pre northeast monsoon cruise. The post northeast monsoon cruise showed 1 and 3 individuals from one station each of the surface and oblique samples. Depth of occurrence stations was more than 1000 meters.

22. Family Myctophidae

Myctophidae larvae was a large group of mesopelagic fish which occurred in surface samples. There were 13 genus observed *Hygophum* sp., *Benthoosema* sp., *Diogenichthys* sp., *Myctophum* sp., *Symbolophorus* sp., *Centrobranchus* sp., *Tanningichthys* sp., *Lampanyctus* sp., *Lobianchia* sp., *Ceratoscopelus* sp., *Lampadena* sp., *Diaphus* sp. and *Notoscopelus* sp.

Hygophum sp. larvae showed 238 and 679 individuals from 28 stations by oblique haul of pre and post northeast monsoon cruises. Most of the larvae occurred in the deep area stations.

Benthoosema sp. larvae showed 4 and 346 individuals from 3 and 29 stations of surface and oblique hauls from pre northeast monsoon cruise. There were 80 and 178 individuals from 7 and 20

stations of the surface and oblique hauls from post northeast monsoon cruise. *Benthoosema* sp. larvae showed a strongly mesopelagic fish which occurred in the deep area by oblique sampling (Fig. 14-15).

Diogenichthys sp. larvae were observed at 95 individuals from 15 stations of the oblique samples from pre northeast monsoon cruise. There were also 46 and 218 individuals from 5 and 22 stations of surface and oblique hauls of post northeast monsoon cruise.

Myctophum sp. larvae showed 103 and 286 individuals from 8 and 45 stations of surface and oblique haul from pre northeast monsoon cruise. There were 129 and 397 individuals also observed from 10 and 41 stations of surface and oblique hauls from post northeast monsoon cruise.

Symbolophorus evermanni larvae showed 1 and 18 individuals from 1 and 2 stations by surface and oblique hauls from pre northeast monsoon and 51 individuals from 9 stations of the oblique hauls from the post northeast monsoon cruise.

Centrobranchus sp. larvae observed only 1 individuals from station number 41 by the oblique haul post northeast monsoon cruise.

Tanningichthys sp. larvae showed 13 individuals from 3 stations of the oblique hauls in post northeast monsoon cruise.

Lampanyctus sp. larvae were 89 and 99 individuals from 5 and 11 stations of surface and oblique hauls from pre northeast monsoon cruise and 149 individuals from 17 stations by oblique haul from post northeast monsoon.

Ceratoscopelus sp. larvae were 25 individuals from 2 stations of the oblique samples from post northeast monsoon cruise.

Lobianchia sp. larvae was observed only one individual from station number 67 by the surface haul of pre northeast monsoon cruise.

Lampadena sp. larvae showed 3 and 143 individuals from 1 and 15 stations of the surface and oblique hauls of pre northeast monsoon cruise. The post northeast monsoon provided 102 and 338 individuals from 12 and 26 stations of surface and oblique haul.

Diaphus sp. larvae showed 293 and 332 individuals from 26 and 37 stations of surface and oblique hauls from pre northeast monsoon cruise while the post northeast monsoon samples observed 267 and 161 individuals from 29 and 24 stations from surface and oblique hauls (Figure 16-19).

Notoscopelus sp. larvae were 22 individuals from 4 stations of the oblique haul in post northeast monsoon cruise.

Myctophid larvae usually occurred in the station which the depth was more than 100 meters.

23. Family Paralepididae

Six genus of this family were occurred in these research cruises. There were *Sudis atrox*, *Paralepis* sp., *Lestidium* sp., *Lestidiops* sp., *Uncisudis* sp. and *Stemonosudis* sp.

Sudis atrox larvae occurred only in the oblique samples of both pre and post northeast monsoon cruises. There were 8 and 5 individuals from 6 and 4 stations, respectively.

Paralepis sp. larvae were observed at 21 and 24 individuals from 11 and 8 stations of the oblique hauls of pre and post monsoon cruises.

Lestidium sp. larvae showed 1 and 18 individuals from 1 and 11 stations of surface and oblique hauls from pre and post northeast monsoon cruises. The post northeast monsoon cruise provided 3 and 32 individuals from 2 and 9 stations of surface and oblique hauls from post northeast monsoon cruise.

Lestidiops sp. larvae showed 1 and 2 individuals from 1 station each by surface and oblique hauls from pre northeast monsoon and 1 individual from station number 53 in the oblique haul of the post monsoon cruise.

Uncisudis quadrimaculata larvae were observed at 2 individuals from station number 63 in the oblique haul of pre northeast monsoon cruise.

Stemonosudis sp. larvae were observed at 34 individuals from 11 stations by the oblique haul from pre northeast monsoon cruise.

The occurrence depth of the larvae observed in this family were more than 150 meters.

24. Family Osmosudidae

There were 2 individuals of *Osmosudis lowei* occurred in the oblique haul from 2 stations of pre northeast monsoon cruise. The depth of the occurrence stations were more than 1000 meters.

25. Family Alepisauridae

Only 1 individuals of *Alepisaurus* sp. larvae were occurred in stations number 38 by the oblique hauls from post northeast monsoon cruise. The depth of this station was more than 1000 meters.

26. Family Evermannellidae

There were 1 and 3 individuals observed from 1 and 2 stations by the oblique haul of the pre and post northeast monsoon cruises. The depth of the occurrence station were more than 1000 meters.

27. Family Hemiramphidae

Hemiramphus sp. larvae occurred in these research cruise from both surface and oblique hauls but for the oblique haul, *Hemiramphus* sp. were obtained in the night early morning or the cloudy day stations. There were 89 and 17 individuals observed from 37 and 13 stations by surface and oblique hauls of pre northeast monsoon cruise. The post northeast monsoon showed 66 and 16 individuals from 31 and 9 stations of surface and oblique specimens. Most larvae occurred in the surface haul more than in oblique haul.

28. Family Belonidae

There were 4 individuals from 3 stations of *Tylosaurus coccodylus* occurred only in the oblique haul of the post northeast monsoon cruise.

29. Family Exocoetidae

There were 3 genus of Exocoetid larvae observed in these studies. *Exocoetus* sp., *Cypselurus* sp. and *Hirundichthys* sp. were true pelagic species which occurred mostly in the surface haul which collected at night or early morning and on cloudy day. There were very few specimens collected from each station but *Exocoetus* sp. had a wider distribution and collected at more stations.

Exocoetus sp. larvae showed 28 and 5 individuals from 16 and 5 stations of the surface and oblique hauls of the pre northeast monsoon cruise. There were 30 and 6 individuals observed from 21 and 6 stations of surface and oblique specimens of the post northeast monsoon cruise.

Cypselurus sp. larvae showed 20 and 2 individuals from 14 and 2 stations of the surface and oblique hauls in the pre northeast monsoon cruise. There were 13 and 3 individuals observed from 6 and 3 stations by the surface and oblique hauls of post northeast monsoon cruise.

Hirundichthys sp. larvae occurred only in the post northeast monsoon cruise. There were 28 and 7 individuals observed from 14 and 4 stations of surface and oblique specimens.

30. Family Antennariidae

Antennarius sp. larvae showed 6 and 24 individuals from 4 and 16 stations by surface and oblique hauls from pre northeast monsoon cruise. There were 3 and 34 individuals observed from 3 and 17 stations of surface and oblique haul in post northeast monsoon. Most of the larvae collected by oblique haul and the larvae which observed in the surface collection during night and early morning or cloudy day periods.

31. Family Lophiidae

There were 2 genus of this family occurred *Lophias* sp. and *Lophiomus* sp.

Lophias sp. larvae showed 4 and 25 individuals collected from 3 and 13 stations of surface and oblique hauls from pre northeast monsoon cruise. There were 1 and 40 individuals observed from 1 and 21 stations by surface and oblique hauls from post northeast monsoon cruise.

Lophiomus sp. larvae were observed at 14 individuals from 8 stations by oblique haul from post

northeast monsoon cruise.

Larvae of this family occurred mostly in the oblique collection which the depth of the stations were more than 100 meters.

32. Family Chaunacidae

Chaunax sp. larvae showed 9 and 8 individuals collected from 3 and 5 stations of surface and oblique hauls from pre northeast monsoon cruise. There were 1 individual each observed from 1 and 3 stations by surface and oblique hauls in post northeast monsoon cruise. The larvae usually occurred in the near shore stations which the depth was about 100 meters.

33. Family Ceratiidae

Cryptopsarus sp. were observed at 7 individuals from 6 stations by oblique haul from pre northeast monsoon cruise. The depth of the occurrence station was more than 200 meters.

34. Family Pegasidae

Pegasus sp. larvae is a small group of larvae which showed only 1 individuals each from 2 stations by surface sampling of the pre northeast monsoon cruise and also 1 individual each were observed from 4 and 3 stations by surface and oblique samplings in the post northeast monsoon cruise.

35. Family Bregmacerotidae

There were 2 species of Bregmacerotidae occurred in these sampling cruise. These 2 species were *Bregmaceros rarisquamosus* and *B. macelellandii*.

Bregmaceros rarisquamosus occurred in both surface and oblique hauls of pre and post northeast monsoon cruises. There were 33 individuals observed from 12 stations of the surface haul in pre northeast monsoon cruise and 188 individuals from 14 stations in the surface haul from post northeast monsoon cruise. There were 1,412 individuals of larvae from 60 stations in pre northeast monsoon cruise and 3,976 individuals from 68 stations in oblique post northeast monsoon cruise. The most abundant observed in pre northeast monsoon cruise was estimated at 178.62 individuals per 1000 cubic meters from station number 36 and for post northeast monsoon cruise was 460.62 individuals per 1000 cubic meters from station number 43. The bregmaceros larvae occurred in the surface sampling when the light intensity was limited especially in the early morning, cloudy day or at the night time (Figure 20-21).

Bregmaceros macelellandii larvae occurred only in the oblique sampling of both pre and post northeast monsoon cruises. There were 168 and 73 individuals from 35 and 31 stations in pre and post northeast monsoon cruises.

36. Family Fistulariidae

The larvae of *Fistularia* sp. occurred in both surface and oblique samples of pre and post northeast monsoon cruises. There were 4 and 14 individuals from 3 and 10 stations in the surface and oblique samples in the pre northeast monsoon, while the post northeast monsoon showed 9 and 29 individuals from 8 and 17 stations of the surface and oblique samples. They showed the possibility to be a subsurface or demersal species.

37. Family Solenostomidae

Solenostomus sp. larvae is a small family occurred in the oblique haul of the pre northeast monsoon cruise. Only one individual was observed from station number 1 which is a shallow area.

38. Family Syngnathidae

There were 2 genera of *Syngnathus* and *Hippocampus* larvae occurred in the samples but only 3 specimen of *Hippocampus* sp. were obtained from 2 stations by the surface hauls of the pre northeast monsoon. The *Syngnathus* sp. occurred in both surface and oblique samplings in the pre north-

east monsoon. There were 3 and 17 individuals observed from 2 and 6 stations in the surface and oblique hauls of pre northeast monsoon. There were 8 individuals from 5 stations also observed in the oblique hauls of post northeast monsoon cruise.

39. Family Centriscidae

Only one species of *Centriscus scutatus* occurred in both surface and oblique collection. There were 3 and 5 individuals observed in 2 and 4 stations by the surface and oblique haul from pre northeast monsoon cruise. While in the post northeast monsoon observed only one individual each from 1 and 4 stations in the surface and oblique collection.

40. Family Brotulidae

Brotula sp. larvae occurred in both surface and oblique hauls of the pre and post northeast monsoon cruises. There were 19 and 103 individuals from 13 and 30 stations by surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon showed 24 and 163 individuals from 13 and 31 stations in surface and oblique samples.

41. Family Carapidae

Carapus sp. larvae occurred in both surface and oblique hauls of pre and post northeast monsoon cruises. There were 2 and 3 individuals observed from 2 stations in pre northeast monsoon samples. The post northeast monsoon cruise provided 8 and 10 individuals in 5 and 8 stations from surface and oblique hauls.

42. Family Diretmidae

Diretmoides was only one genus of the family Diretmidae which occurred only in the oblique sampling of both pre and post northeast monsoon cruises. There were 5 and 1 individuals observed from 4 and 1 stations in pre and post northeast monsoon cruises.

43. Family Melamphaidae

There were 3 genera of the family Melamphaidae occurred in the oblique samplings of pre and post northeast monsoon cruises. These 3 genera were *Scopelogadus* sp., *Scopeloberyx* sp. and *Melamphase* sp.

Scopelogadus sp. larvae were observed at 4 individuals from 2 stations from the oblique sampling in pre northeast monsoon cruise.

Scopeloberyx sp. larvae were observed at 7 and 15 individuals from 6 and 8 stations by the oblique haul in pre and post northeast monsoon cruise.

Melamphase sp. larvae were observed at 4 and 8 individuals from 3 and 5 stations of oblique haul in pre and post northeast monsoon cruise.

44. Family Holocentridae

The two genus of Holocentrid larvae occurring in the sample were *Holocentrus* sp. and *Myripristis* sp. This family had a possibility to be a pelagic group because of the surface occurrence.

Holocentrus sp. were observed at 153 and 36 individuals from 31 and 23 stations by surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise provided 530 and 54 individuals from 38 and 18 stations by surface and oblique hauls (Figure 22-23).

Myripristis sp. showed 320 and 41 individuals from 17 and 12 stations from surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon provided 582 and 109 individuals from 15 and 13 stations by the surface and oblique hauls (Figure 24-25).

45. Family Sphyraenidae

Only one genus of *Sphyraena* sp. occurred in the sampling of both surface and oblique hauls in the pre and post northeast monsoon cruises. There were 22 and 17 individuals of larvae observed from 13 and 14 stations in surface and oblique haul of the pre northeast monsoon cruise. The post

northeast monsoon cruise showed 56 and 43 individuals in 26 and 22 stations from surface and oblique samples. It was very difficult to identify this genus between pelagic and demersal group, but it was an economical important in this area.

46. Atherinidae

Atherina sp. larvae is a small group of larvae which showed 1 and 3 individuals collected from station number 1 and 16 by surface hauls in pre northeast monsoon cruise. The larvae occurred in the shallow and near shore stations.

47. Trachipteridae

Trachipterus sp. larvae is a small family which showed only 1 individual collected from station number 77 by surface haul in pre northeast monsoon cruise which the depth of this station is 95 meters.

48. Family Percichthyidae

Synagrops philippinensis larvae showed 32 individuals collected from 11 stations by oblique haul from pre northeast monsoon cruise while the post northeast monsoon cruise represented 2 and 17 individuals from 1 and 6 stations by surface and oblique hauls of post northeast monsoon cruise.

49. Family Serranidae

There were 3 genera of serranid larvae occurring in the samples from both the surface and oblique hauls with the number in the oblique haul samples higher than surface hauls in both the pre and post northeast monsoon cruise. These 3 genus were *Epinephelus* sp., *Chelidoperca hirundinacea*, and *Anthias* sp. For the surface haul, *Epinephelus* sp. 35 and 66 individuals were collected from 12 and 17 stations of the pre and post northeast monsoon cruises. There were 8 individuals observed in each station of *Anthias* sp. from 4 and 7 stations in the pre and post northeast monsoon cruises. For the oblique haul, there were 72 and 116 individuals of *Epinephelus* sp. observed from 34 stations in both the pre and post northeast monsoon cruises and for *Anthias* sp. 57 and 25 individuals were observed from 26 and 17 stations in the pre and post northeast monsoon cruises. *Chelidoperca hirundinacea* showed 64 and 215 individuals from 12 and 35 stations in the oblique haul of pre and post northeast monsoon cruises.

50. Family Theraponidae

Two species of *Therapon jarbua* and *T. theraps* were observed in these sampling cruises. *Therapon jarbua* larvae were observed at 23 and 5 individuals from 12 and 5 stations by surface and oblique sampling in the pre northeast monsoon cruise. The post northeast monsoon provided 28 and 14 individuals in 14 and 1 stations of the surface and oblique specimens which most of the larvae were collected from the surface hauls.

Therapon theraps larvae occurred only in the pre northeast monsoon cruise. There were 16 and 47 individuals observed from 6 and 1 stations by surface and oblique hauls.

The occurrence of *Therapon jarbua* was greater than *Therapon theraps* in term of number and distribution.

51. Family Priacanthidae

There were 23 and 101 individuals of *Priacanthus tayenus* from 8 and 33 stations in the surface and oblique specimens from the pre northeast monsoon samplings. The post northeast monsoon sampling observed 28 and 244 individuals from 15 and 44 stations in the surface and oblique samples. *Priacanthus tayenus* showed a demersal characters as collected from the oblique sampling.

52. Family Apogonidae

There were at least 4 species of apogonid larvae occurring in the sampling of both surface and oblique hauls from the pre and post northeast monsoon cruises. These were *Apogon lineatus*, *Apogon*

nigrofasciatus, *Apogon* sp. and *Gymnopogon* sp. The occurrence of the *Apogon lineatus* in the pre northeast monsoon cruise was 159 individuals observed from 20 stations in the oblique specimens and the post northeast monsoon cruise showed 28 and 136 individuals collected from 9 and 25 stations in the surface and oblique samples. The *Apogon nigrofasciatus* showed 3 and 18 individuals from 2 and 8 stations in the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon showed 3 and 48 individuals from 1 and 18 stations in the surface and oblique hauls. *Apogon* sp. were observed at 55 and 579 individuals from 17 and 47 stations in surface and oblique hauls of pre northeast monsoon while the post northeast monsoon cruise showed 159 and 566 individuals from 30 and 50 stations of surface and oblique hauls.

Gymnopogon sp. larvae were observed at 2 and 52 individuals from 1 and 14 stations of surface and oblique haul of pre northeast monsoon cruise. There were 1 and 5 individuals observed from 1 and 7 stations by surface and oblique haul of post northeast monsoon cruise.

53. Family Sillaginidae

Only one individuals of *Sillago* sp. larvae were occurred in station number 76 by the surface collection in pre northeast monsoon cruise.

54. Family Branchiostegidae

Branchiostegus sp. larvae occurred only in the oblique samples of both pre and post northeast monsoon cruises. There were 1 and 12 individuals observed from station number 10 of both pre and post northeast monsoon cruises.

55. Family Coryphaenidae

The specimens which occurred in both sampling cruises were *Coryphaena hippurus*. There were 33 and 24 individuals observed from 21 and 8 stations which occurred in both surface and oblique collections in the pre northeast monsoon while the post northeast monsoon sampling showed 35 and 11 individuals collected from 19 and 8 stations by surface and oblique hauls.

56. Family Carangidae

Carangid is a large group of larvae comprising the *Decapterus* sp., *Selar crumenophthalmus*, *Megalaspis cordyla*, *Alectis ciliaris*, *Caranx ignobilis*, *Caranx leptolepis*, *Caranx mate*, *Caranx speciosus*, *Caranx* sp. *Elagatis bipinnulata*, *Scomberoides lysan* and *Zonichthys nigrofasciata*.

Decapterus sp. were obtained from both surface and oblique hauls of the pre and post northeast monsoon cruises. There were 249 and 772 individuals observed from 36 and 42 stations of the surface and oblique specimens in pre northeast monsoon cruise. The post northeast monsoon cruise showed 318 and 601 individuals from 45 and 58 stations of the surface and oblique specimens (Figure 26-29).

Selar crumenophthalmus occurred in both the surface and oblique specimens of the pre and post northeast monsoon cruises. There were 179 and 7 individuals from 18 and 3 stations of the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 46 and 26 individuals from 10 and 1 stations in the surface and oblique samples.

Megalaspis cordyla larvae occurred only from 2 stations of the post northeast monsoon cruise. There were 50 and 3 individuals observed from station number 20 and 21 while the depth of the station was about 100 meters.

Alectis ciliaris larvae were observed at 2 and 8 individuals from 2 and 6 stations by surface and oblique haul in pre northeast monsoon cruise. The post northeast monsoon cruise showed 20 and 3 individuals collected from 12 and 3 stations by surface and oblique hauls.

Caranx ignobilis larvae showed 17 and 23 individuals collected from 9 and 12 stations by surface and oblique hauls in pre northeast monsoon cruise. The post northeast monsoon cruise provided 28 and 1 individuals from 12 and 1 stations of surface and oblique sampling.

Caranx leptolepis showed 13 and 16 individuals observed from 7 stations by the surface and oblique hauls in the pre northeast monsoon cruise. The post northeast monsoon cruise showed 3 and 32 individuals observed from 2 and 5 stations in the surface and oblique collection.

Caranx mate was collected from both surface and oblique sampling of the pre and post northeast monsoon cruises. There were 2 and 26 individuals from 2 and 7 stations in the surface and oblique haul of the pre northeast monsoon cruise. For the post northeast monsoon cruise, there were 6 and 23 individuals observed from 2 and 8 stations of the surface and oblique specimens.

Caranx speciosus showed 14 and 23 individuals collected from 8 and 6 stations by surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise provided 16 and 29 individuals observed from 6 and 5 stations in the surface and oblique specimens.

Caranx sp. showed 14 and 111 individuals collected from 12 and 20 stations of the surface and oblique hauls in the pre northeast monsoon cruise. The post northeast monsoon cruise showed 23 and 60 individuals observed from 10 and 15 stations in the surface and oblique hauls of the post northeast monsoon cruise.

Elagatis bipinnulata larvae showed 11 and 1 individuals observed from 7 and 1 stations by surface and oblique collection of the pre northeast monsoon cruise. The post northeast monsoon cruise were observed 25 individuals from 10 stations by the surface collection.

Scomberoides lysan showed 7 and 2 individuals collected from 5 and 2 stations of the surface and oblique hauls in the pre northeast monsoon cruise. The post northeast monsoon cruise provided 17 and 9 individuals from 11 and 3 stations of the surface and oblique specimens.

Zonichthys nigrofasciata showed 36 and 10 individuals collected from 22 and 9 stations in the surface and oblique specimens of the pre northeast monsoon cruise. The post northeast monsoon cruise provided 16 and 12 individuals from 14 and 7 stations in the surface and oblique collection.

The carangidae larvae usually aggregate to the floating substances like jelly fish, log and sea weed.

57. Family Parastromatidae

Only one species of *Parastromateus niger* larvae occurred in the oblique haul of post northeast monsoon cruise. There were 3 individuals of larvae occurred in station number 11 which the depth was about 100 meters.

58. Family Meneidae

There is only one species of moon fish in the world. *Mene maculata* occurred in the surface collection of pre northeast monsoon and oblique collection of the post northeast monsoon. There were 7 individuals from 5 stations collected by surface haul in the pre northeast monsoon. The post northeast monsoon showed only 1 individual from station number 17 by oblique haul.

59. Family Bramidae

Brama sp. larvae were observed at 5 individuals from 4 stations by oblique haul in pre northeast monsoon collection while the post northeast monsoon cruise showed 1 and 14 individuals from 1 and 8 stations in surface and oblique collection.

60. Family Lutjanidae

Lutjanus sp. occurred in both surface and oblique samples in the pre and post northeast monsoon cruises. There were 119 and 439 individuals observed from 32 and 50 stations in surface and oblique specimens of the pre northeast monsoon. For the post northeast monsoon, there were 171 and 329 individuals collected from 27 and 51 stations in the surface and oblique specimens. The occurrence of the larvae showed demersal characteristic from their abundance and distribution (Figure 30-33).

61. Family Nemipteridae

Nemipterus sp. occurred in both surface and oblique collection of pre and post northeast monsoon cruises but it was more abundance in the oblique sampling. There were 82 and 345 individuals observed from 22 and 39 stations by the surface and oblique sampling in the pre northeast monsoon cruise. The post northeast monsoon cruise showed 27 and 699 individuals collected from 6 and 47 stations by surface and oblique sampling. The larvae showed demersal characteristic in their abun-

dance and distribution (Figure 34-35).

62. Family Gerreidae

Gerres sp. occurred in both surface and oblique hauls of pre and post northeast monsoon cruises. There were 75 and 21 individuals observed from 13 and 4 stations in the surface and oblique hauls of pre northeast monsoon. The post northeast monsoon showed 40 and 52 individuals collected from 10 and 5 stations by the surface and oblique sampling.

63. Family Lobotidae

Lobotes surinamensis is the only one species in this family. The larvae occurred in the surface sampling of both pre and post northeast monsoon cruises. Both sampling cruises showed 5 individuals collected from 3 and 2 stations.

64. Family Leiognathidae

Leiognathus sp. occurred in both surface and oblique hauls of pre and post northeast monsoon cruises. There were 15 and 312 individuals observed from 9 and 30 stations of surface and oblique hauls in the pre northeast monsoon. The post northeast monsoon showed 12 and 233 individuals collected from 7 and 35 stations in the surface and oblique collections (Figure 36-37).

65. Family Pomadasyidae

The genus *Plectorhynchus* occurred in both surface and oblique hauls of the pre and post northeast monsoon sampling. There were 4 and 173 individuals observed from 3 and 22 stations by surface and oblique hauls in the pre northeast monsoon cruise. The post northeast monsoon cruise showed 21 and 252 individuals from 7 and 45 stations in surface and oblique specimens.

66. Family Lethrinidae

Lethrinus sp. showed 6 and 22 individuals from 6 and 11 stations in the surface and oblique hauls of the pre northeast monsoon cruise. For the post northeast monsoon cruise, 10 and 23 individuals were observed from 9 and 15 stations by surface and oblique collection.

67. Family Mullidae

The larvae in this family, *Upeneus sp.*, was an abundant species in the surface collection for pre and post northeast monsoon cruises. There were 502 and 149 individuals observed from 49 and 26 stations of the surface and oblique hauls in the pre northeast monsoon cruise. For the post northeast monsoon cruise, 433 and 191 individuals were observed from 50 and 34 stations of the surface and oblique hauls. The larvae showed pelagic characteristic by their abundance and distribution in the surface collections (Figure 38-41).

68. Family Haemulidae

Six individuals of *Diagramma sp.* larvae were obtained from station number 12 by the oblique hauls in post northeast monsoon cruise.

69. Family Monodachthylidae

Only one individuals of *Monodachthylus argenteus* larvae was occurred in station number 16 of the surface sampling from post northeast monsoon cruise.

70. Family Ehippidae

Platax tiara was identified from pre and post northeast monsoon cruise. Twenty individuals of *Platax tiara* larvae were collected from 8 stations by the oblique haul in pre northeast monsoon cruise. There were 4 and 13 individuals were also observed from 3 and 5 stations in the surface and oblique collections of the post northeast monsoon cruise.

71. Family Scatophagidae

Only one individuals of *Scatophagus argus* larvae was obtained from station number 7 of the surface collection in post northeast monsoon cruise which this station was a coastal station.

72. Family Chaetodontidae

Chaetodon sp. was obtained from the surface and oblique hauls of the pre and post northeast monsoon cruises. There were 5 and 6 individuals collected from 3 and 5 stations in the surface and oblique collection in pre northeast monsoon cruise. The post northeast monsoon provided 27 and 5 individuals from 8 and 4 stations by surface and oblique hauls.

73. Family Pomacanthidae

Centropyge sp. larvae occurred in the surface of the pre northeast monsoon and oblique sampling of the pre and post northeast monsoon cruises. One individuals each were observed from 4 stations by surface haul of pre northeast monsoon. There were 3 and 9 individuals observed from 3 and 1 stations by the oblique collection of pre and post northeast monsoon.

74. Family Pomacentridae

There were 3 genera of pomacentrid larvae occurring in these specimens. There were *Pomacentrus* sp., *Chromis* sp. and *Abudefduf* sp. *Pomacentrus* sp. larvae were obtained only from the surface hauls during the pre northeast monsoon cruise. There were 17 individuals were observed from 3 stations. *Chromis* sp. larvae were occurred in both surface and oblique hauls of the pre and post northeast monsoon sampling, there were 15 and 4 individuals from 7 and 3 stations in the surface and oblique hauls of pre northeast monsoon while the post northeast monsoon cruise provided 43 and 41 individuals from 15 and 11 stations by surface and oblique hauls. *Abudefduf* sp. larvae were also observed from both surface and oblique hauls of pre and post northeast monsoon cruises, there were 15 and 4 specimens from 7 and 3 stations in surface and oblique hauls of pre northeast monsoon while the post northeast monsoon cruise provided 31 and 8 individuals from 8 and 3 stations by surface and oblique collection.

75. Family Cepolidae

Acanthocephala sp. larvae were obtained from both surface and oblique hauls during pre and post northeast monsoon cruises but collection from oblique hauls showed more abundance than surface hauls. There were 3 and 51 individuals collected from 3 and 17 stations in the surface and oblique hauls of the pre northeast monsoon cruise. For the post northeast monsoon cruise, there were 9 and 77 individuals were observed from 4 and 21 stations in the surface and oblique hauls.

76. Family Labridae

Halichoeres sp. larvae occurred in both surface and oblique hauls of the pre and post northeast monsoon cruises. There were 48 and 110 individuals observed from 17 and 36 stations in the surface and oblique hauls of the pre northeast monsoon cruise. For the post northeast monsoon cruise, there were 13 and 262 individuals observed from 5 and 38 stations in the surface and oblique hauls.

77. Family Scaridae

Scarus sp. larvae occurred in the surface haul of the post northeast monsoon cruise but observed in the oblique haul of both pre and post northeast monsoon. There were 91 individuals collected from 27 stations in oblique haul of pre northeast monsoon cruise. The post northeast monsoon cruise provided 8 and 38 individuals from 5 and 20 stations by surface and oblique hauls.

78. Family Champsodontidae

The larvae of this family were *Champsodon* sp. There were 5 and 179 individuals observed from 3 and 41 stations by the surface and oblique hauls of the pre northeast monsoon cruise. There were 1 and 238 individuals also collected from 1 and 45 stations by the surface and oblique hauls of

the pre northeast monsoon cruise. The post northeast monsoon showed 1 and 238 individuals observed from 1 and 45 stations by the surface and oblique hauls (Figure 42-43).

79. Family Chaiasmodontidae

There were 2 individuals of *Chaiasmodon* sp. larvae occurred in station number 49 by oblique haul in post northeast monsoon cruise.

80. Family Blenniidae

Blennius sp. larvae occurred in both surface and oblique hauls of pre and post northeast monsoon cruises. There were 31 and 27 individuals collected from 14 stations by surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon showed 17 and 26 individuals observed from 11 and 16 stations in the surface and oblique haul samples. *Blennius* sp. was the demersal group.

81. Family Callionymidae

Callionymus sp. was an abundant larvae in the oblique haul samples and occurred in both surface and oblique hauls of the pre and post northeast monsoon cruises. There were 17 and 419 individuals collected from 12 and 57 stations by the surface and oblique hauls in pre northeast monsoon cruise. The post northeast monsoon showed 28 and 608 individuals observed from 14 and 63 stations by the surface and oblique sampling. Demersal characteristic showed by this species due to their abundance and distribution in the oblique collection of both cruises (Figure 44-45).

82. Family Echeneidae

Echeneis naucrates larvae occurred in both surface and oblique hauls of pre and post northeast monsoon cruises. There were 11 and 13 individuals observed from 6 stations by surface and oblique hauls in pre northeast monsoon cruise. For the post northeast monsoon cruise, there were 3 and 40 individuals collected from 2 and 16 stations by surface and oblique hauls.

83. Family Histiophoridae

Histiophorus sp. larvae were obtained from both surface and oblique hauls of pre and post northeast monsoon cruises. There was 37 and 5 individuals observed from 16 and 5 stations in the surface and oblique haul in pre northeast monsoon cruise. There were 19 and 2 individuals also collected from 10 and 2 stations of the surface and oblique haul in the post northeast monsoon cruise.

84. Family Scombridae

Scombrid was an economic family which the larvae occurred in both surface and oblique hauls of these cruises.

There were 8 genera of Scombrid larvae occurring in this area. There were *Rastrelliger* sp., *Scomber* sp., *Scomberomorus* sp., *Acanthocybium solandri*, *Euthynnus* sp., *Auxis* sp., *Katsuwonus* sp. and *Thunnus* sp.

Rastrelliger sp. showed 12 and 82 individuals from 6 and 17 stations in the surface and oblique hauls of pre northeast monsoon. For the post northeast monsoon cruise, there were 16 and 22 individuals observed from 5 and 8 stations by surface and oblique hauls.

Scomber sp. larvae occurred only in the oblique haul of pre and post northeast monsoon cruises. There were 56 and 61 individuals observed from 12 and 21 stations of pre and post northeast monsoon cruises.

Scomberomorus sp. occurred in both surface and oblique hauls of pre and post northeast monsoon cruises. There were 90 and 21 individuals collected from 18 and 9 stations by the surface and oblique hauls of the pre northeast monsoon cruise. For the post northeast monsoon cruise, there were 48 and 62 individuals observed from 8 and 13 stations of the surface and oblique haul samples.

Acanthocybium solandri larvae occurred only in the oblique collection of pre and post northeast monsoon cruises. Only one individual occurred in the station number 51 of the pre northeast

monsoon and station number 39 of the post northeast monsoon cruise.

Euthymus sp. occurred in both surface and oblique hauls of pre northeast monsoon cruise. There were 164 and 19 individuals observed from 34 and 9 stations in surface and oblique hauls of pre northeast monsoon cruise. For the post northeast monsoon collection, there were 193 and 56 individuals collected from 26 and 8 stations by the surface and oblique hauls.

Auxis sp. larvae occurred in the oblique hauls of the pre northeast monsoon and in both surface and oblique hauls of post northeast monsoon cruise. There were 56 individuals observed from 24 stations by oblique haul of pre northeast monsoon cruise. The post northeast monsoon showed 200 and 10 individuals from 37 and 4 stations of surface and oblique hauls.

Katsuwonus pelamis larvae were observed at 28 individuals from 8 stations of oblique haul in pre northeast monsoon cruise. There were 59 and 41 individuals also observed from 12 and 7 stations in surface and oblique hauls of post northeast monsoon cruise.

Thunnus sp. larvae were observed at 17 individuals from 6 stations of the oblique haul in post northeast monsoon cruise.

85. Family Trichiuridae

Trichiurus lepturus occurred in both surface and oblique hauls of pre northeast monsoon cruise but in the post northeast monsoon cruise it was observed in the oblique collection. There were 2 and 28 individuals collected from 2 and 11 stations of surface and oblique hauls in the pre northeast monsoon cruise, The post northeast monsoon cruise showed 21 individuals from 10 stations by oblique haul.

86. Family Gempylidae

Gempylidae is a family which related to family Trichiuridae. *Gempylus* sp. larvae occurred in both surface and oblique sampling of pre and post northeast monsoon cruises. There were 31 and 14 individuals observed from 13 and 10 stations of surface and oblique haul from pre northeast monsoon cruise. The post northeast monsoon cruise provided 61 and 21 individuals from 17 and 12 stations of surface and oblique hauls collection.

87. Family Acanthuridae

Acanthurus sp. larvae occurred in both surface and oblique collection of pre and post northeast monsoon cruises. There were 24 and 36 individuals observed from 11 and 16 stations of surface and oblique hauls in pre northeast monsoon cruise. The post northeast monsoon cruise provided 78 and 20 individuals from 6 and 12 stations in surface and oblique haul collection.

88. Family Siganidae

Siganid was a coastal species which occurred in the shallow water. *Siganus* sp. larvae were observed 3 and 9 individuals from 3 and 2 stations in surface and oblique hauls of pre northeast monsoon cruise. The post northeast monsoon cruise provided 10 and 6 individuals from 6 and 1 stations in surface and oblique haul collections.

89. Family Tetragonuridae

Tetragonurus sp. larvae was a small group occurred in both surface and oblique hauls of pre and post northeast monsoon cruises. There were 1 and 4 individuals observed from 1 and 3 stations in surface and oblique collections of pre northeast monsoon cruise. The post northeast monsoon provided 8 and 2 stations from 2 and 1 stations in surface and oblique collections.

90. Family Nomeidae

There were 3 genera of Nomeidae larvae occurred in these survey cruises. There were *Psene cyanophys*, *Nomeius* sp. and *Cubiceps* sp. which was the most abundant among these 3 genus.

Only one individual of *Psene cyanophys* larvae occurred at station number 19 by oblique haul

in the post northeast monsoon cruise.

Nomeius sp. larvae occurred in the oblique haul of both pre and post northeast monsoon cruises. There were 2 and 8 individuals observed from 2 and 4 stations of pre and post northeast monsoon cruises.

Cubiceps sp. larvae occurred in both surface and oblique hauls of pre and post northeast monsoon cruises. There were 2 and 13 individuals observed from 2 and 6 stations in surface and oblique haul of pre and post northeast monsoon cruises. The post northeast monsoon cruise provided 13 and 16 individuals from 7 and 10 stations in surface and oblique collections.

91. Family Stromatidae

Three individuals of *Pampus argenteus* larvae were obtained from stations number 26 in the oblique hauls of post northeast monsoon cruise collection.

92. Family Sciaeneidae

There were 2 genus of Sciaeneidae occurred in these two survey cruises. There were *Sciaena* sp. and *Nibea japonicus*. For *Sciaena* sp. only one individual was observed in each station number 56 and 31 in the surface collection of pre and post northeast monsoon. There were 122 and 113 individuals observed from 19 and 20 stations in the oblique haul of pre and post northeast monsoon cruise.

Only one individual of *Nibea japonicus* occurred in station number 69 in oblique haul of post northeast monsoon cruise.

93. Family Polynemidae

There were 2 individuals of *Polynemus* sp. larvae occurred in station number 31 in oblique haul of pre northeast monsoon cruise.

94. Family Schneideriidae

Schneideria sp. larvae occurred in both surface and oblique hauls of the pre and post northeast monsoon cruises. There were 2 and 23 individuals collected from 2 and 12 stations by surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 8 and 59 individuals from 2 and 3 stations in the surface and oblique haul samples.

95. Family Typaucheniiidae

Typanthen sp. larvae occurred in both surface and oblique hauls of the pre and post northeast monsoon cruises. There were 33 and 143 individuals collected from 15 and 27 stations by the surface and oblique hauls in the pre northeast monsoon cruise. The post northeast monsoon cruise showed 7 and 302 individuals from 3 and 41 stations in surface and oblique haul samples.

96. Family Trichonotidae

Only one individual of *Trichonotus* sp. occurred in station number 17 from the oblique haul of pre northeast monsoon cruise.

97. Family Gobiidae

Gobiidae was the only group of larvae that identified at the family level, being the most abundant larvae in the oblique hauls of both the pre and post northeast monsoon cruise. There were 400 and 5,215 individuals observed from 42 and 77 stations in the surface and oblique hauls of the pre northeast monsoon. The post northeast monsoon showed 355 and 7,197 individuals collected from 49 and 76 stations in surface and oblique haul samples (Figure 46-49).

98. Family Platycephalidae

Platycephalus sp. were obtained from the surface and oblique hauls in the pre and post northeast monsoon cruises. There were 1 and 39 individuals observed from 1 and 14 stations in the pre

monsoon cruise. For the post northeast monsoon cruise, there were 5 and 58 individuals collected from 2 and 21 stations of the oblique haul samples.

99. Family Scorpaenidae

There were 2 genera of scorpaenid larvae occurring in both surface and oblique hauls of pre and post northeast monsoon cruises. There were the *Minous* sp. and *Scorpaenoides* sp.

Minous sp. larvae showed 11 and 36 individuals from 8 and 21 stations in the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 44 and 108 individuals from 16 and 36 stations in the surface and oblique samples.

Scorpanoides sp. larvae showed 15 and 25 individuals from 15 and 21 stations by the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 16 and 46 individuals collected from 8 and 24 stations in the surface and oblique haul samples.

100. Family Triglidae

Lepidotrigla sp. larvae was only species identified in the family Triglidae. There were 3 and 20 individuals observed from 3 and 13 stations in the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 4 and 45 individual collected from 4 and 17 station in the surface and oblique hauls.

101. Family Dactylopteridae

Dactylopterus sp. larvae was identified from the family Dactylopteridae. There were 100 and 52 individuals collected from 32 and 18 stations by the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 106 and 30 individuals observed from 19 and 30 stations in the surface samples.

102. Family Psettodidae

Psettodes erumei larvae was obtained from the surface and oblique hauls of the pre and post northeast monsoon cruise. There were 1 and 11 individuals collected from 1 and 7 stations by the surface and oblique hauls in pre northeast monsoon cruise. While the post northeast monsoon cruise showed 2 and 5 individuals observed from 1 and 4 stations in surface and oblique collections.

103. Family Paralichthyidae

There were 3 genera of Paralichthyidae larvae occurred in both surface and oblique sampling of the both cruise. These 3 genus were *Paralichthys* sp., *Pseudorhombus* sp. and *Samarius* sp.

Paralichthys sp. larvae was obtained from both surface and oblique hauls of pre and post northeast monsoon cruises. There were 2 and 30 individuals observed from 1 and 13 stations in surface and oblique hauls of pre northeast monsoon cruise. The post northeast monsoon cruise showed 3 and 33 individuals collected from 2 and 13 stations in surface and oblique haul samples.

Pseudorhombus sp. larvae occurred in the oblique samples of the pre and post northeast monsoon cruises. There were 2 and 12 individuals observed from 2 and 8 stations in pre and post northeast monsoon collections.

Threr were 5 individuals of *Samarius* sp. larvae collected from 3 stations in the oblique haul of pre northeast monsoon cruise.

104. Family Soleidae

There were 2 genera of Soleidae occurred in both sampling cruises. These 2 genus were *Solea* sp. and *Aserragodes* sp.

Solea sp. larvae occurred in both sampling cruises. Only one individual was occurred at station number 32 in the surface collection of pre northeast monsoon collection. While the post northeast monsoon cruise provided 22 individuals from 11 station in the oblique sampling.

Aserraggodes sp. larvae were 4 and 17 individuals collected from 4 and 14 stations by the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon showed 1

and 13 individuals observed from 1 and 10 stations in the surface and oblique hauls.

105. Family Bothidae

There were 3 genus of bothid larvae occurred in both surface and oblique hauls of pre and post northeast monsoon cruises. These 3 genus were *Bothus* sp., *Engyprosopon* sp. and *Arnoglossus* sp.

Bothus sp. larvae showed 26 and 138 individuals collected from 9 and 36 stations by surface and oblique hauls of the pre northeast monsoon cruise. The post monsoon cruise showed 8 and 265 individuals from 5 and 48 stations in surface and oblique haul samples.

Engyprosopon sp. larvae were observed at 46 and 154 individuals from 19 and 37 stations in the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 107 and 253 individuals collected from 26 and 51 stations in the surface and oblique haul samples.

Arnoglossus sp. larvae were observed at 26 individuals from 13 stations in surface sampling of pre northeast monsoon cruise. While the post northeast monsoon cruise showed 140 individuals collected from 34 stations by oblique collections.

106. Family Cynoglossidae

Cynoglossus sp. larvae was obtained from both surface and oblique hauls of pre and post northeast monsoon cruises. There were 13 and 157 individuals observed from 9 and 46 stations in surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 6 and 184 individuals collected from 4 and 43 stations in surface and oblique haul samples.

107. Family Citharidae

Brachypleura novaezeelandiae larvae was the only species identified in the family Cithacidae. There were 2 and 9 individuals from 1 and 4 stations in the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 45 individuals from 20 station in the oblique haul sample.

108. Family Tetraodontidae

Tetraodon sp. larvae was obtained in both surface and oblique hauls of the pre and post northeast monsoon cruises. There were 17 and 52 individuals observed from 10 and 25 stations in the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 57 and 165 individuals from 16 and 39 stations in the surface and oblique haul samples.

109. Family Diodontidae

Diodon sp. larvae was obtained from both surface and oblique hauls in the pre and post monsoon cruise. There were 17 and 13 individuals observed from 11 and 10 stations in the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 9 and 67 individuals collected from 7 and 18 stations in the surface and oblique haul samples.

110. Family Balistidae

Balistes sp. larvae was obtained from both surface and oblique hauls of pre and post northeast monsoon cruises. There were 29 and 48 individuals observed from 22 and 24 stations in the surface and oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 32 and 63 individuals collected from 17 and 16 stations by the surface and oblique haul sampling.

111. Family Monacanthidae

Monacanthus sp. and *Aluterus* sp. were 2 genera of the family Monacanthidae occurring in these sampling cruises.

Monacanthus sp. was obtained from both surface and oblique hauls of pre and post northeast monsoon cruises. There were 27 and 104 individuals observed from 14 and 20 stations in surface and

oblique hauls of the pre northeast monsoon cruise. The post northeast monsoon cruise showed 27 and 382 individuals from 11 and 33 stations in the surface and oblique haul samples.

Aluterus sp. showed 5 and 2 individuals collected from 3 and 1 stations by surface and oblique hauls of the pre northeast monsoon cruise. There were 6 and 5 individuals observed from 4 and 3 stations in the surface and oblique hauls of the post northeast monsoon cruise.

112. Eel larvae (*Leptocephalus* sp.)

The eel larvae were sorted out from the sample but were not identified to the family or genus because of time constraint. There were 43 and 99 individuals observed from 13 and 45 stations in surface and oblique hauls of pre northeast monsoon cruise. In post northeast monsoon cruise showed 27 and 75 individuals collected from 10 and 38 stations by surface and oblique sampling.

Discussion

There were very few studies on fish larvae in the South China Sea especially along the Sarawak, Brunei and Sabah area. However there were some information on studied of the fisheries resource in Brunei area. This study was intended to concentrate on species composition (at the genera level), Abundance and distribution of larvae by the surface and oblique samplings. There were about 112 families and 186 species of fish larvae observed in these pre and post northeast monsoon cruises. The results from this study showed that more families of fish larvae were observed than the studies by Vatanachai (1972) and Termvidchakorn (1983) because there were more complete sampling procedures in a large area which cover both shallow and deep area which the sampling stations were well represent most area. The most abundance larvae observed in the surface of pre northeast monsoon sampling was *Sardinella* sp. while in the post northeast monsoon cruise was *Stolephorus* sp. These 2 species were collected mostly during early morning, at night time or cloudy days sampling periods. These larvae were more abundant in the surface sampling may probably due to phototaxis activities. The oblique samples showed more abundant of Gobiidae larvae which consisted about 75% of all specimens in the oblique haul sampling of pre and post northeast monsoon cruises. *Bregmaceros rarisquamosus* larvae was the second most abundant species observed in the oblique collection. Some fish larvae were found aggregated to floating substances, such as Carangidae and Nomeidae larvae.

In the deep area, mesopelagic fish larvae were occurred in both surface and oblique collections which may be due to the sampling time because of the highly phototaxis activities. *Diaphus* sp., *Benthosoms* sp., *Hygophum* sp. and *Myctophum* sp. usually occurred in the sampling stations that the depth was more than 100 meters. The oblique haul sampling obtained more mesopelagic larvae than the surface haul sampling. The mesopelagic larvae also occurred in the surface haul during the early morning, night time or cloudy day samplings. Some species of mesopelagic larvae may occurred only in the oblique haul due to true mesopelagic character which their diurnal migration in the deep area which the oblique haul operation could cover that depth.

There were some differences between the species composition of larvae observed in the shallow coastal zone and deep area or open sea which was very difficult to identified the occurring because of the slope of the continental shelf. The pelagic and demersal characters of larvae were identified from their abundance and distribution in the surface and oblique sampling.

Larvae which showed pelagic character were *Sardinella* sp., *Stolephorus* sp., *Myripristis* sp., *Holocentrus* sp., *Upeneus* sp., *Decapterus* sp., *Euthynus* sp. and *Diaphus* sp.

The demersal character were Gobiidae, *Bregmaceros rarisquamosus*, *Decapterus* sp., *Apogon* sp., *Nemipterus* sp., *Callionymus* sp., *Hygophum* sp., *Myctophum* sp., *Benthosema* sp.

The factors which effected on the abundant and distribution of larvae were

1. The sampling area which the depth was the limiting factor for species composition and abundant.
2. Sampling time which due to the light intensity can effected on phototaxis activities of larvae.
3. The characteristic of larvae, themselves which mesopelagic families mostly occurred in the

Fig. 1 Oceanographic station of the survey Area II: Sarawak, Sabah and Brunei Darussalam waters

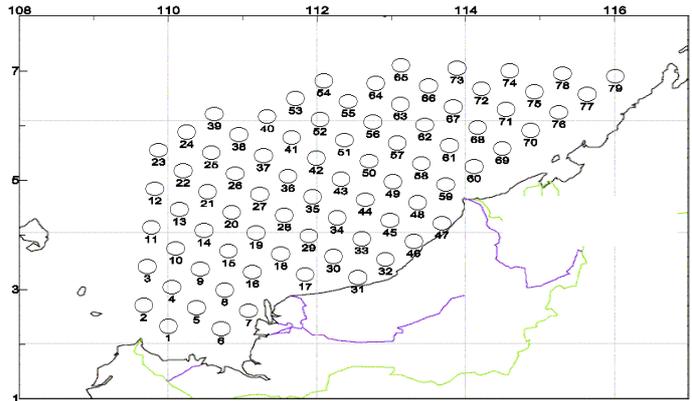


Fig. 2 Abundance and distribution of total fish larvae obtained from the surface haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

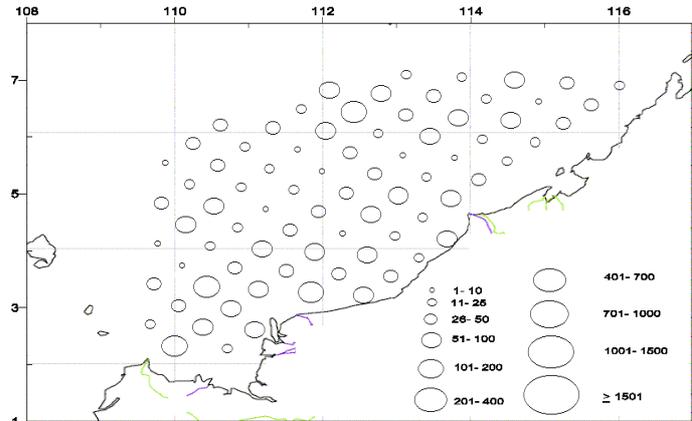


Fig. 3 Abundance and distribution of total fish larvae obtained from the oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

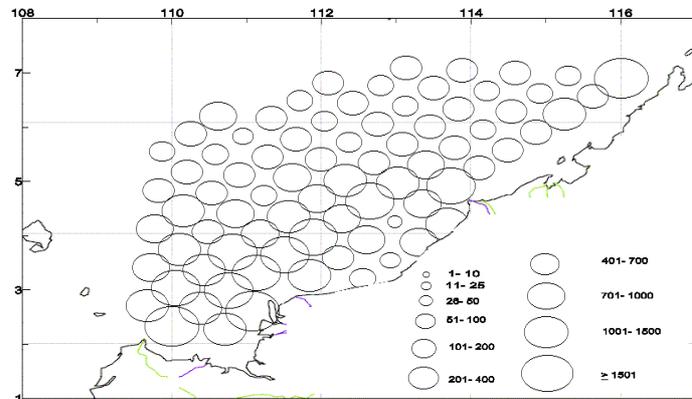


Fig. 4 Abundance and distribution of total fish larvae obtained from the surface haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

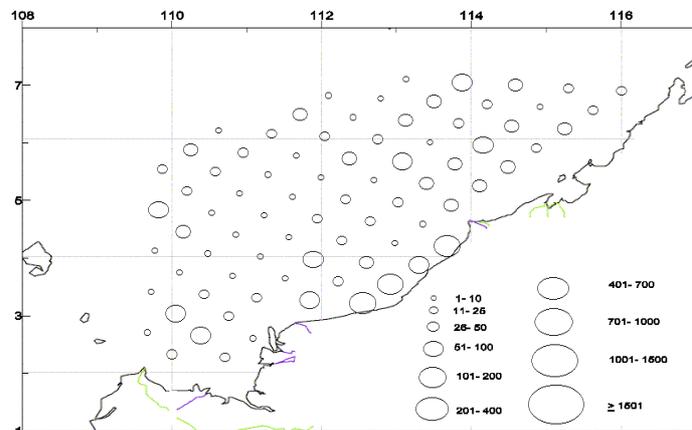


Fig. 5 Abundance and distribution of total fish larvae obtained from the oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

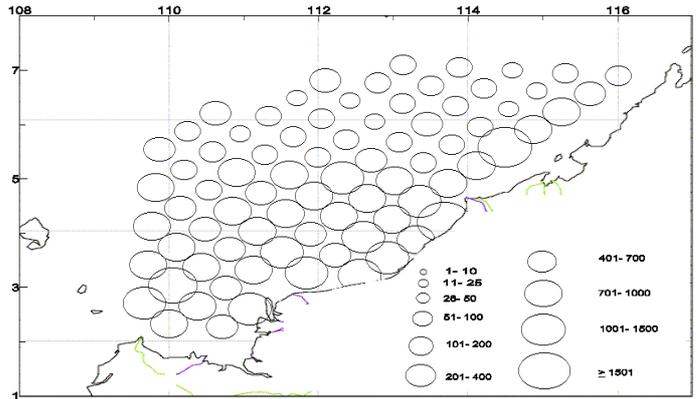


Fig. 6 Abundance and distribution of *Sardinella* sp. larvae (No./1000m³) obtained from the surface haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

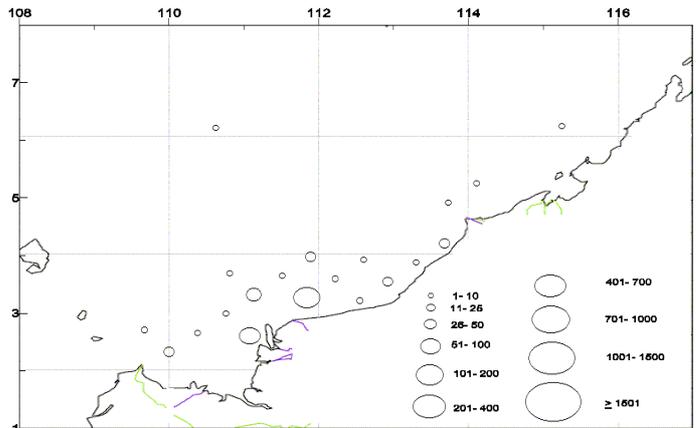


Fig. 7 Abundance and distribution of *Sardinella* sp. larvae (No./1000m³) obtained from the oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

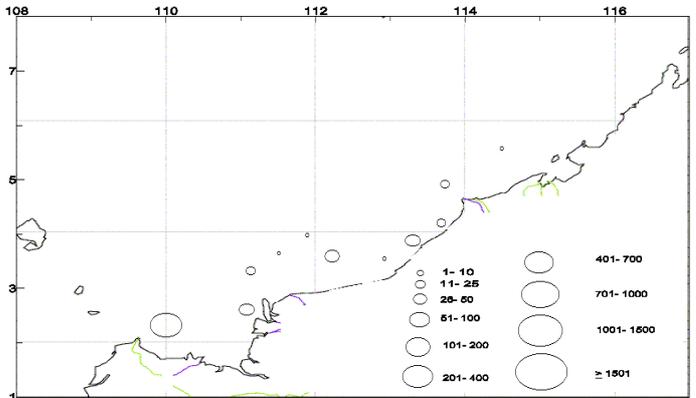


Fig. 8 Abundance and distribution of *Sardinella* sp. larvae (No./1000m³) obtained from the surface haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

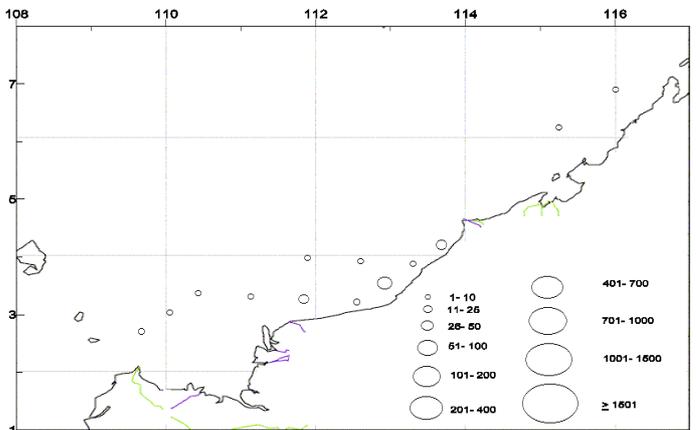


Fig. 9 Abundance and distribution of *Sardinella* sp. larvae (No./1000m³) obtained from the oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

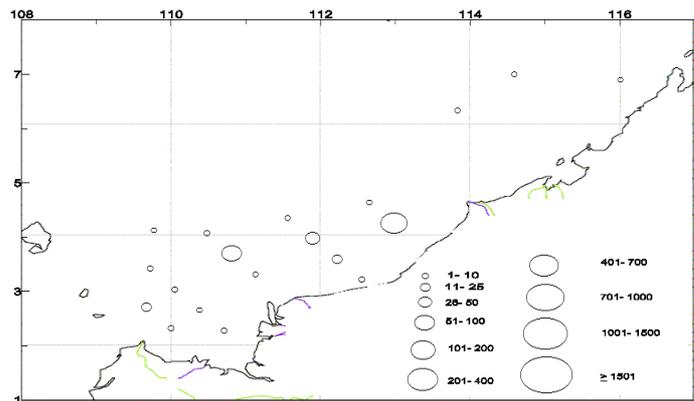


Fig. 10 Abundance and distribution of *Stolephorus* sp. larvae (No./1000m³) obtained from the surface haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

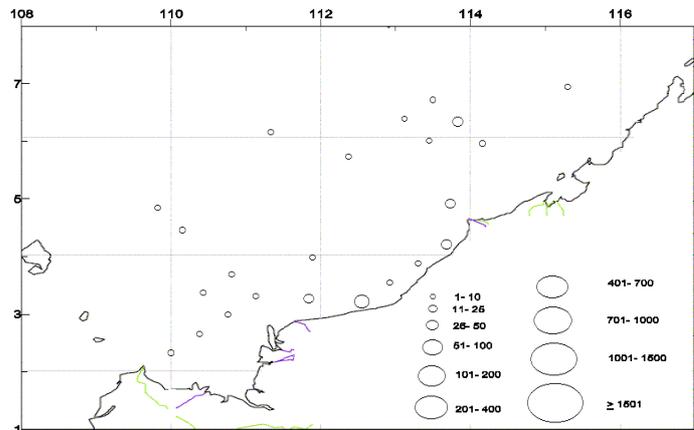


Fig. 11 Abundance and distribution of *Stolephorus* sp. larvae (No./1000m³) obtained from the oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

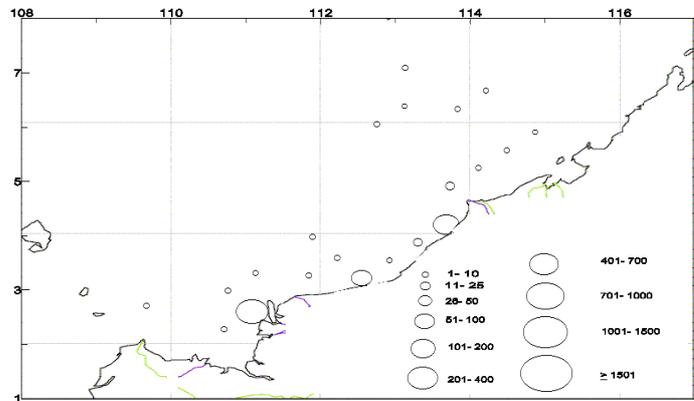


Fig. 12 Abundance and distribution of *Stolephorus* sp. larvae (No./1000m³) obtained from the surface haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

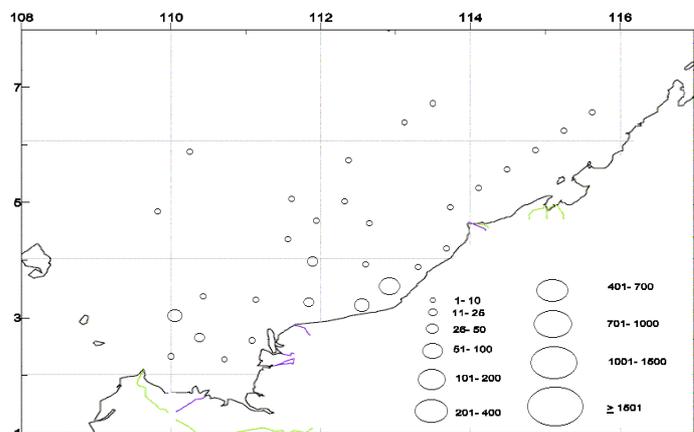


Fig. 13 Abundance and distribution of *Stolephorus* sp. larvae (No./1000m³) obtained from the oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

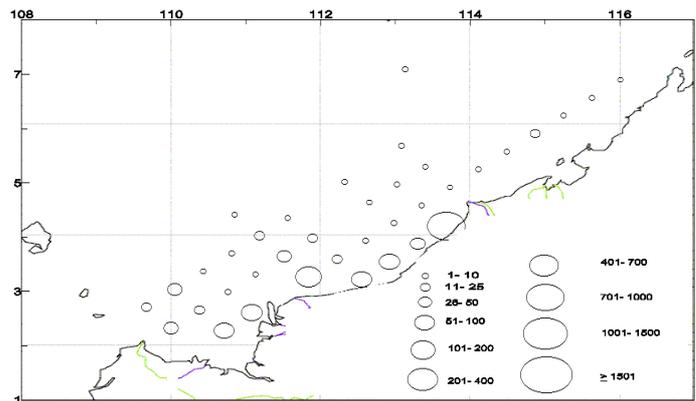


Fig. 14 Abundance and distribution of *Benthoosema* sp. larvae (No./1000m³) obtained from the oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

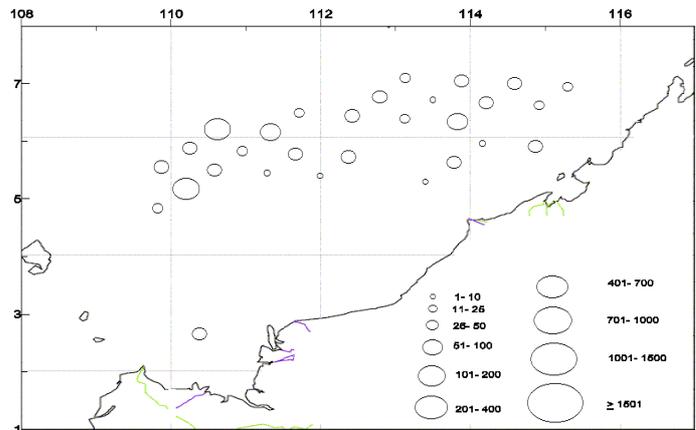


Fig. 15 Abundance and distribution of *Benthoosema* sp. larvae (No./1000m³) obtained from the oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

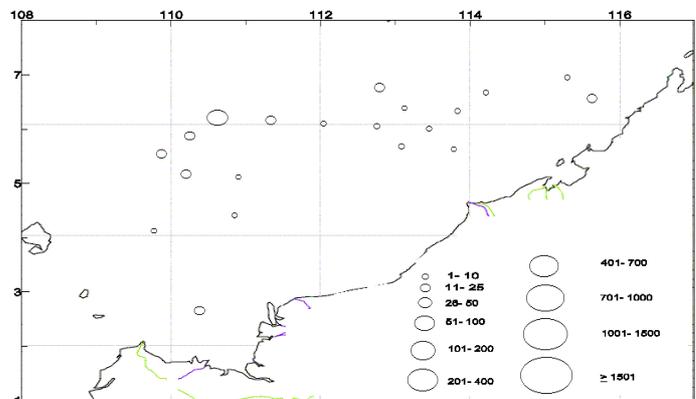


Fig. 16 Abundance and distribution of *Diaphus* sp. larvae (No./1000m³) obtained from the surface haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

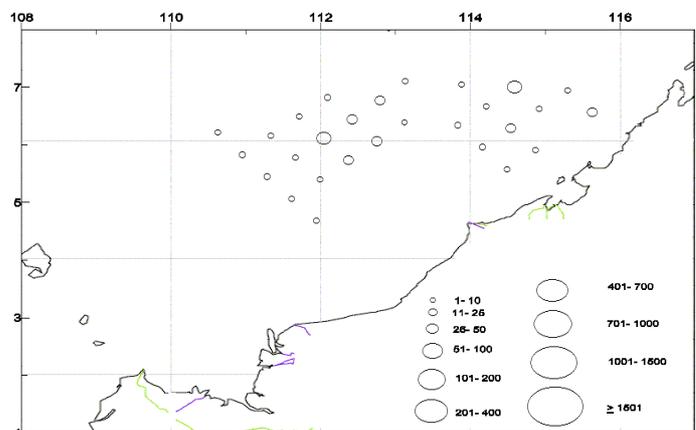


Fig. 17 Abundance and distribution of *Diaphus* sp. larvae (No./1000m³) obtained from the oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

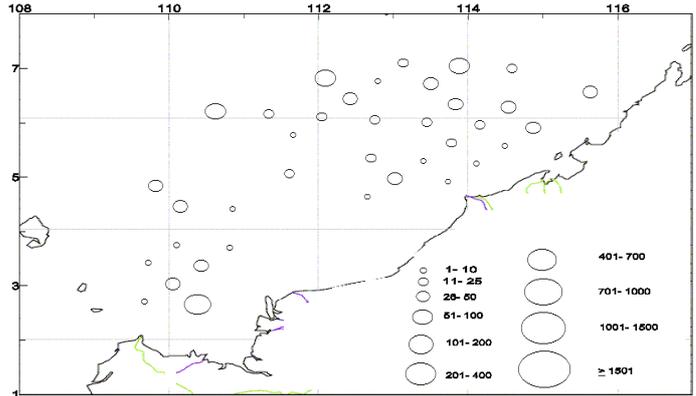


Fig. 18 Abundance and distribution of *Diaphus* sp. larvae (No./1000m³) obtained from the surface haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

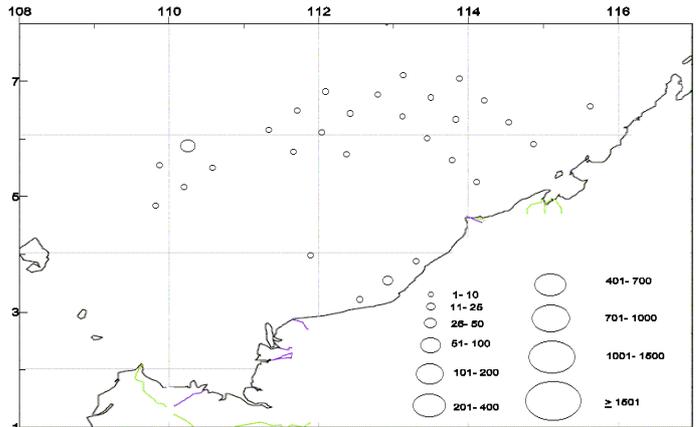


Fig. 19 Abundance and distribution of *Diaphus* sp. larvae (No./1000m³) obtained from the oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

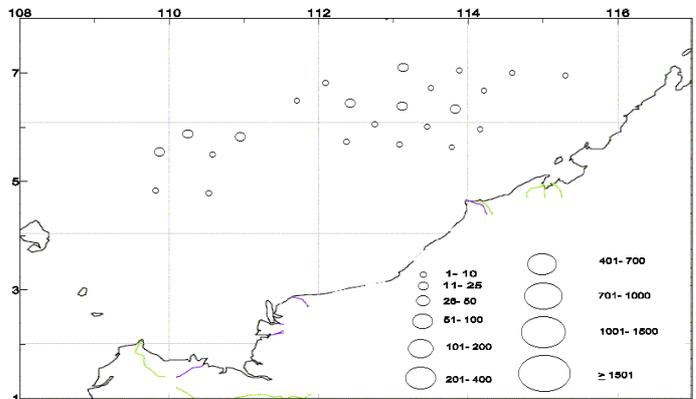


Fig. 20 Abundance and distribution of *Bregmaceros rarisquamosus* larvae (No./1000m³) obtained from the oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

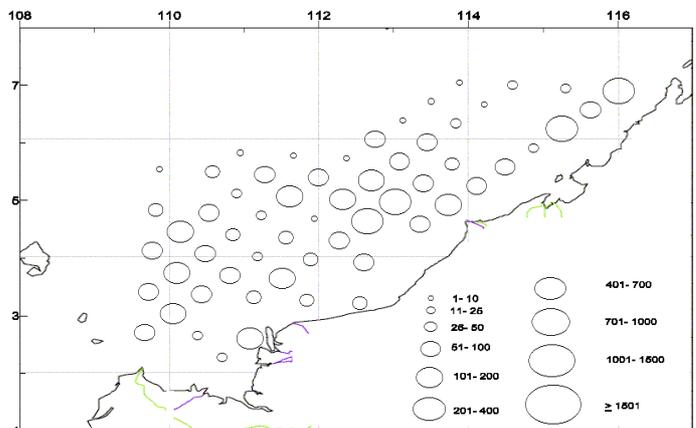


Fig. 21 Abundance and distribution of *Bregmaceros rarisquamosus* larvae (No./1000m³) obtained from the oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

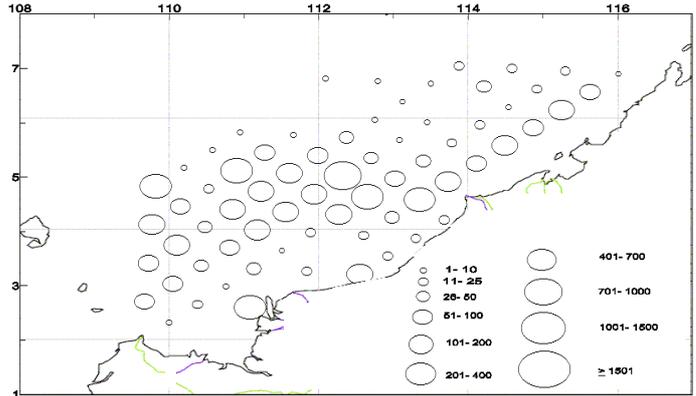


Fig. 22 Abundance and distribution of *Holocentrus* sp. larvae (No./1000m³) obtained from surface haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

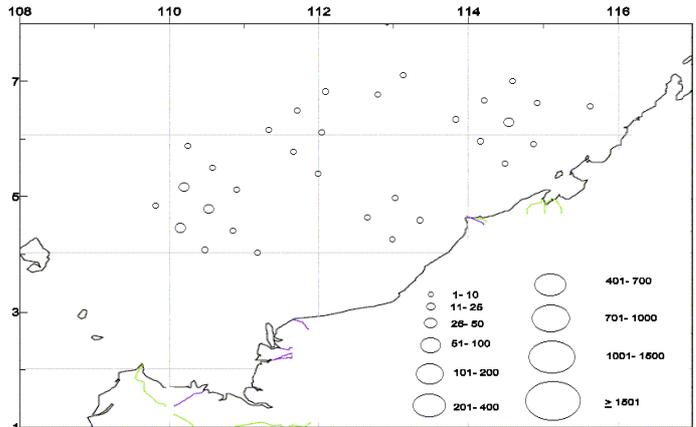


Fig. 23 Abundance and distribution of *Holocentrus* sp. larvae (No./1000m³) obtained from surface haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

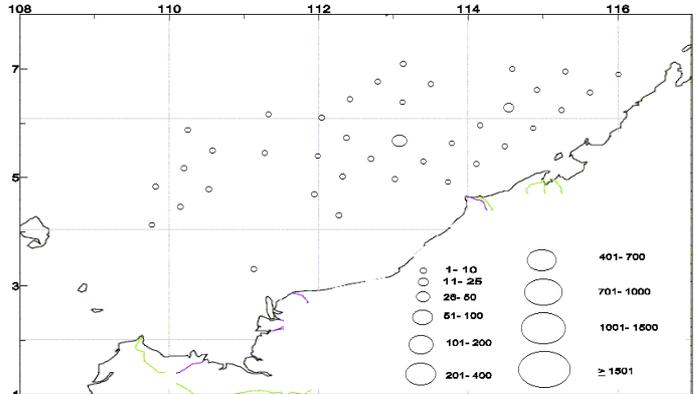
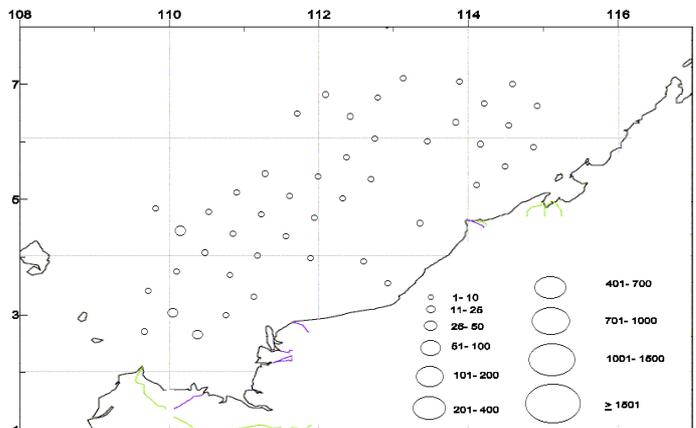


Fig. 24 Abundance and distribution of *Myripristis* sp. larvae (No./1000m³) obtained from surface haul in the Area II between July and 9 August 1996 by M.V.SEAFFDEC



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Fig. 25 Abundance and distribution of *Myripristis* sp. larvae (No./1000m³) obtained from surface haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

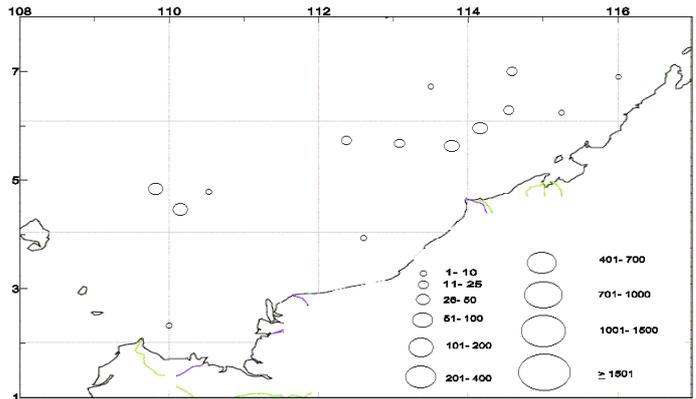


Fig. 26 Abundance and distribution of *Decapterus* sp. larvae (No./1000m³) obtained from surface haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

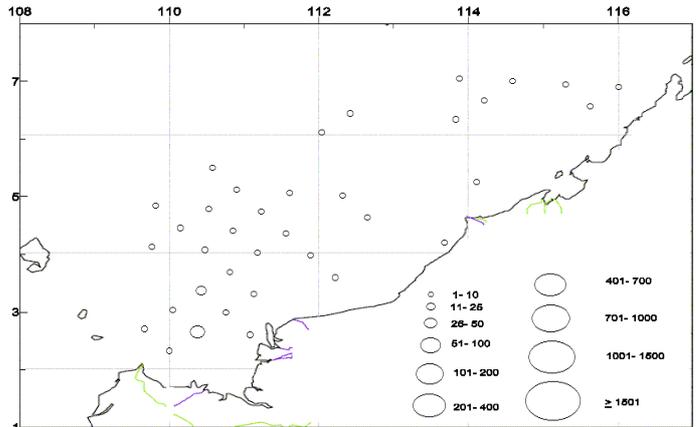


Fig. 27 Abundance and distribution of *Decapterus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

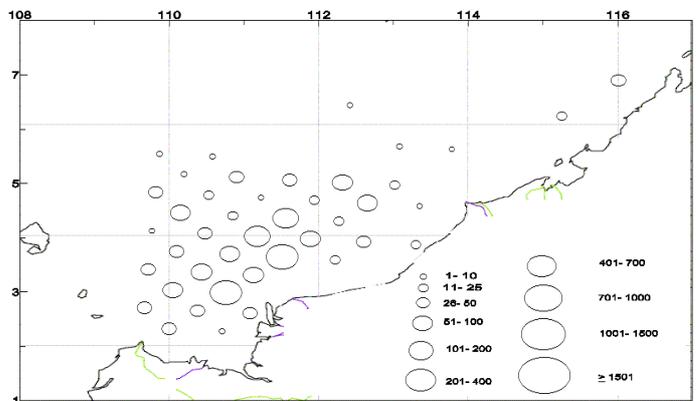
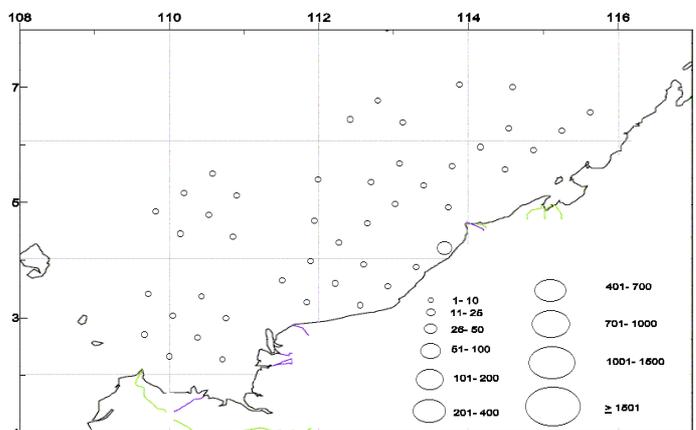


Fig. 28 Abundance and distribution of *Decapterus* sp. larvae (No./1000m³) obtained from surface haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC



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Fig. 29 Abundance and distribution of *Decapterus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

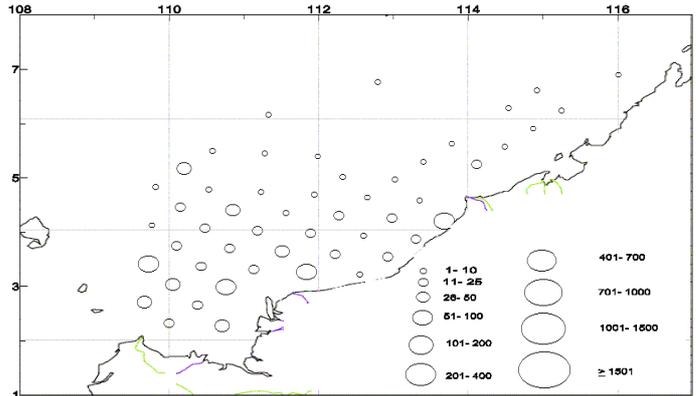


Fig. 30 Abundance and distribution of *Lutjanus* sp. larvae (No./1000m³) obtained from surface haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

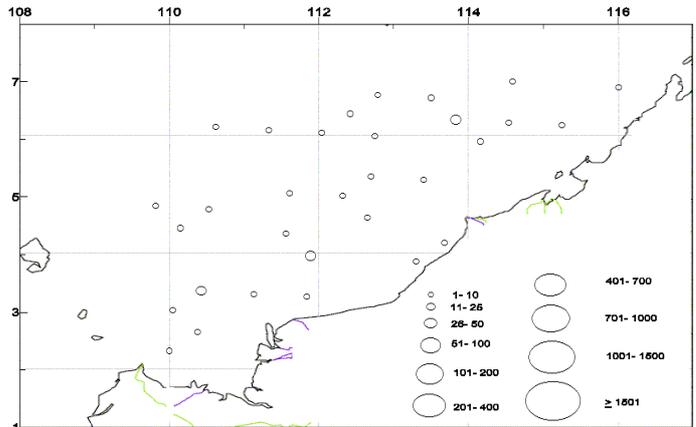


Fig. 31 Abundance and distribution of *Lutjanus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

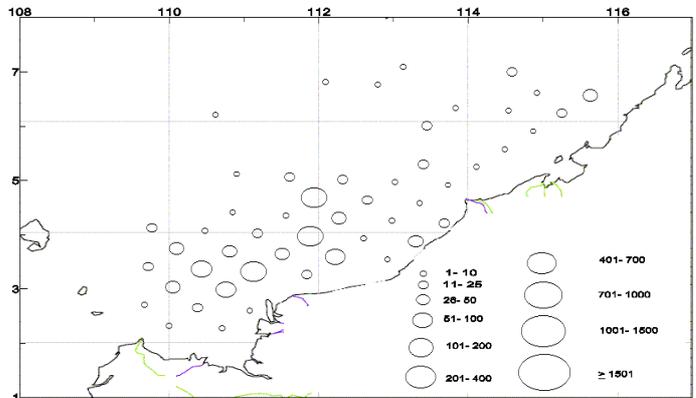


Fig. 32 Abundance and distribution of *Lutjanus* sp. larvae (No./1000m³) obtained from surface haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

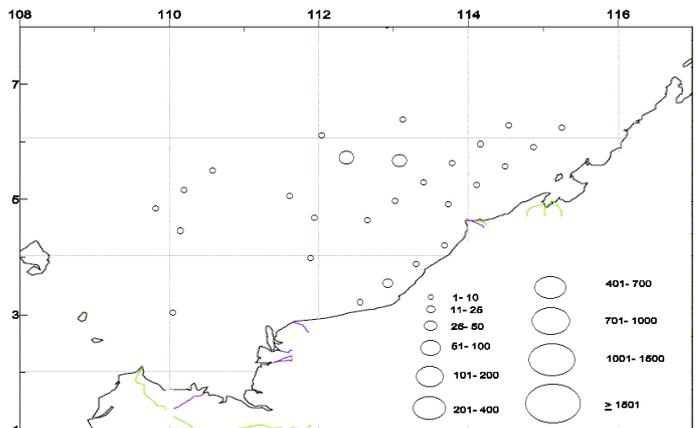


Fig. 33 Abundance and distribution of *Lutjanus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

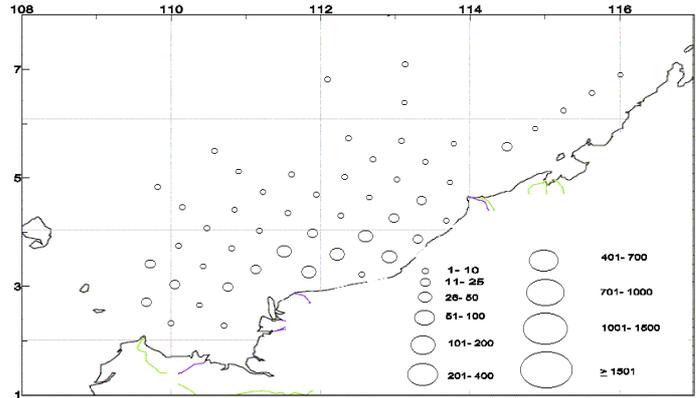


Fig. 34 Abundance and distribution of *Nemipterus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

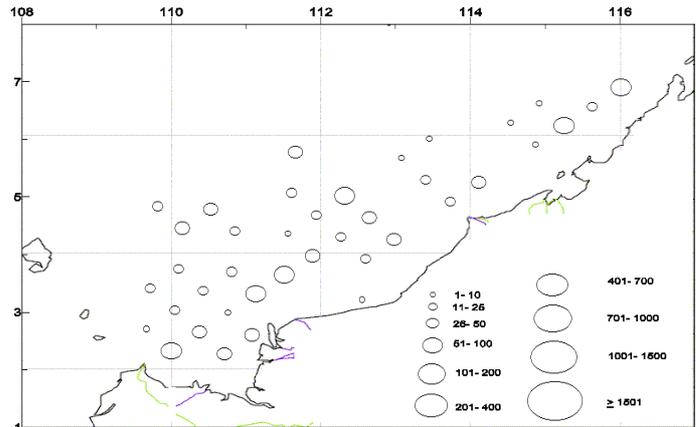


Fig. 35 Abundance and distribution of *Nemipterus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 25 April and 31 May 1996 by M.V.SEAFFDEC

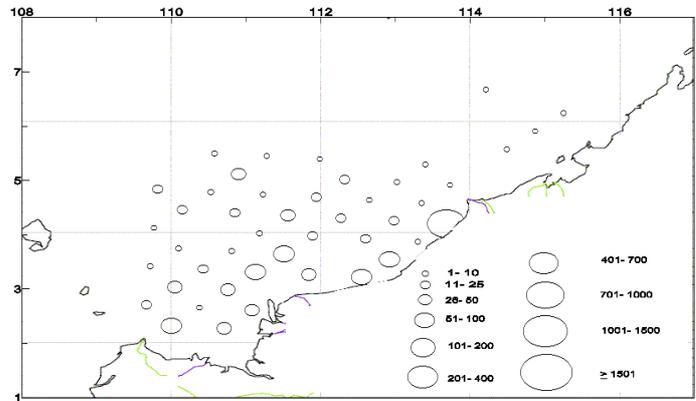
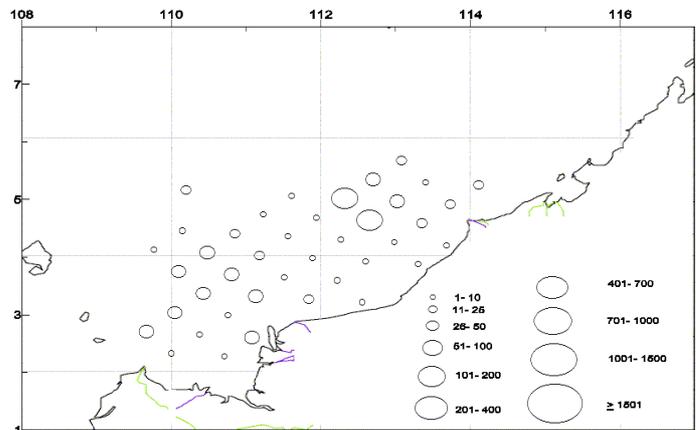


Fig. 36 Abundance and distribution of *Leiognathus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC



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Fig. 37 Abundance and distribution of *Leiognathus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

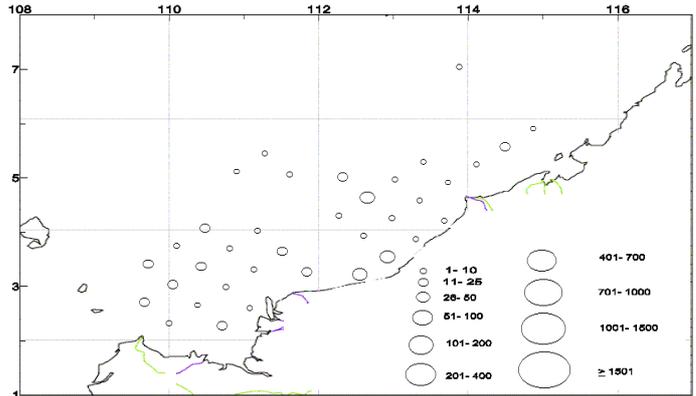


Fig. 38 Abundance and distribution of *Upeneus* sp. larvae (No./1000m³) obtained from surface haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

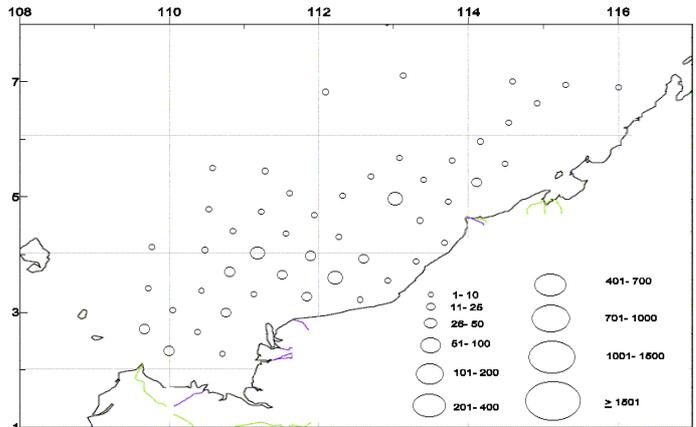


Fig. 39 Abundance and distribution of *Upeneus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

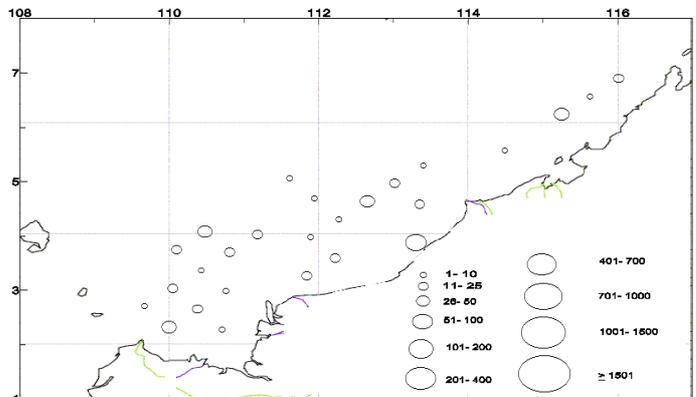


Fig. 40 Abundance and distribution of *Upeneus* sp. larvae (No./1000m³) obtained from surface haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

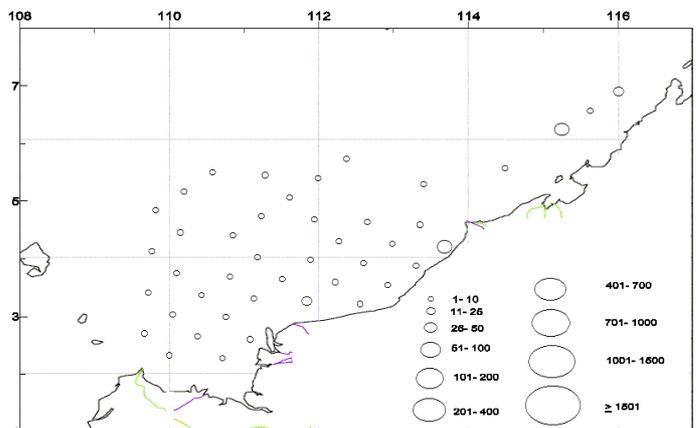


Fig. 41 Abundance and distribution of *Upeneus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

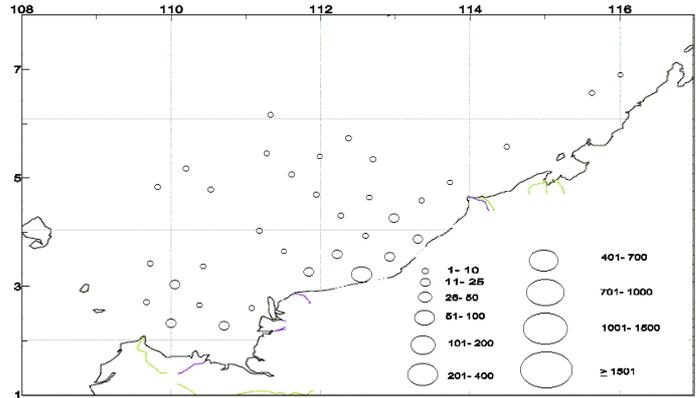


Fig. 42 Abundance and distribution of *Champsodon* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

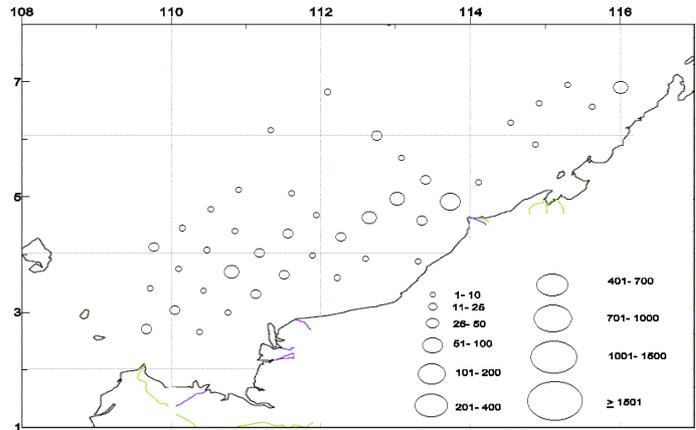


Fig. 43 Abundance and distribution of *Champsodon* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

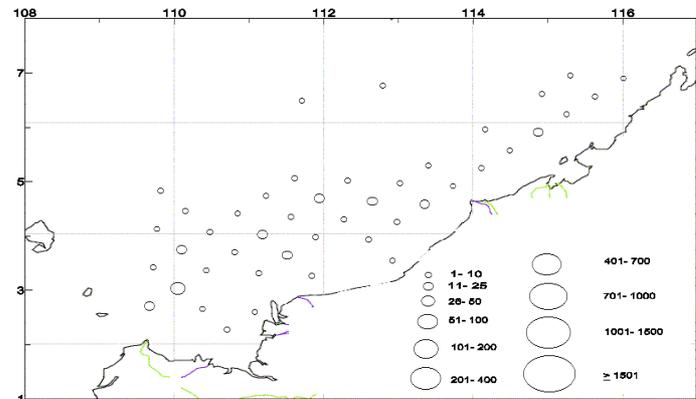
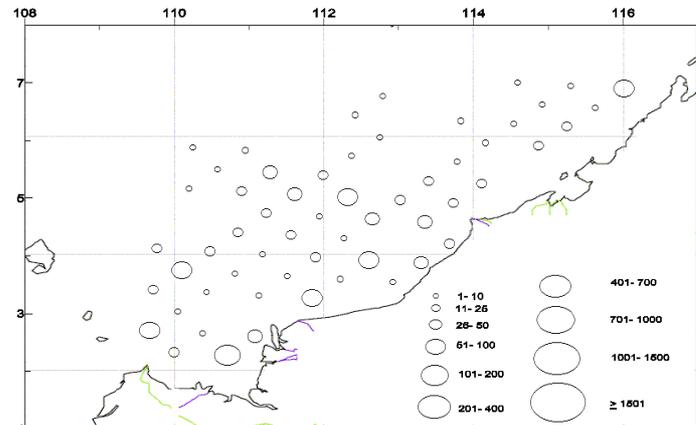


Fig. 44 Abundance and distribution of *Callionymus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC



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Fig. 45 Abundance and distribution of *Callionymus* sp. larvae (No./1000m³) obtained from oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

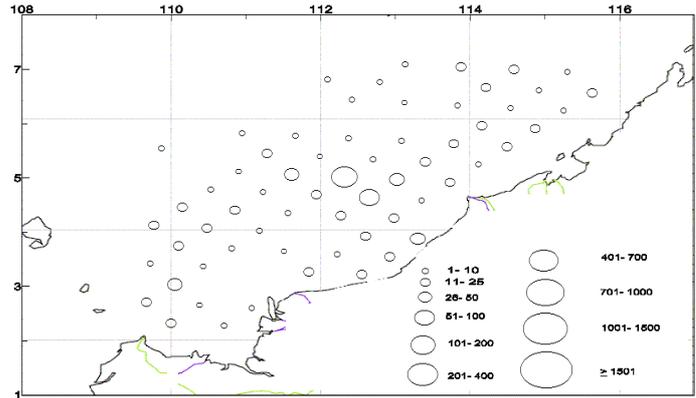


Fig. 46 Abundance and distribution of *Gobiidae* larvae (No./1000m³) obtained from surface haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

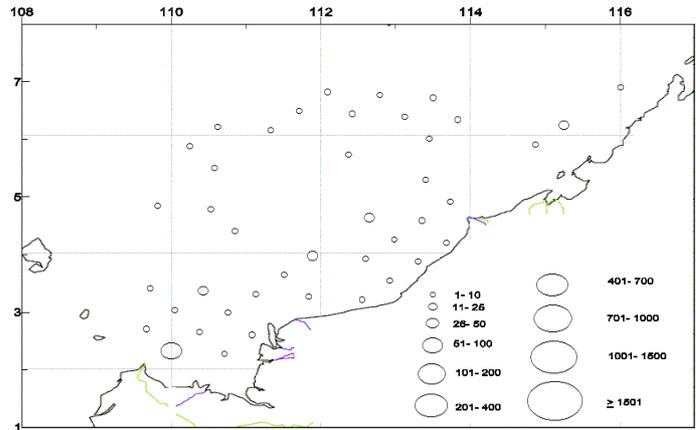


Fig. 47 Abundance and distribution of *Gobiidae* larvae (No./1000m³) obtained from oblique haul in the Area II between 9 July and 9 August 1996 by M.V.SEAFFDEC

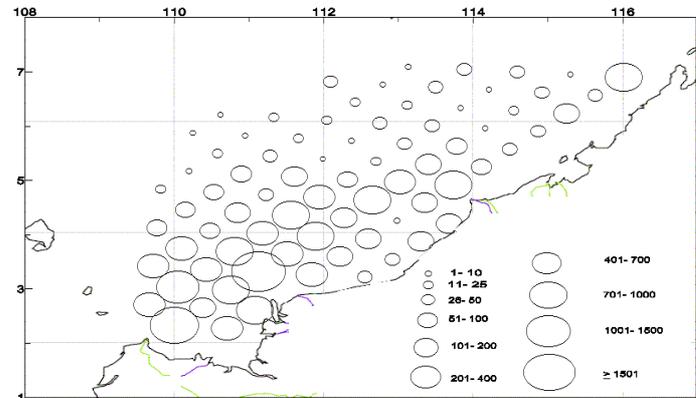


Fig. 48 Abundance and distribution of *Gobiidae* larvae (No./1000m³) obtained from surface haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC

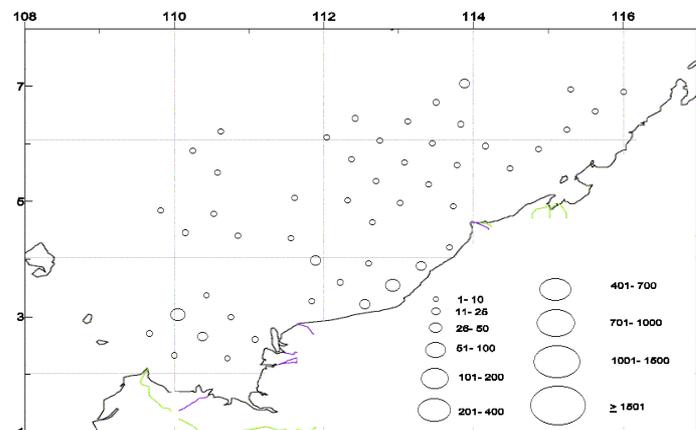
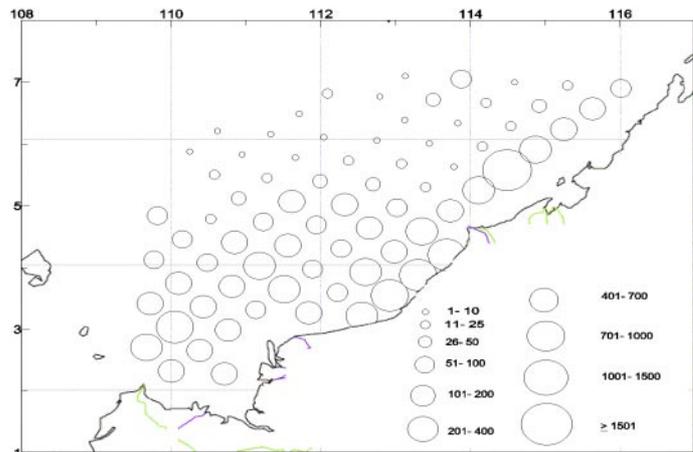


Fig. 49 Abundance and distribution of *Gobiidae* larvae (No./1000m³) obtained from oblique haul in the Area II between 25 April and 31 May 1997 by M.V.SEAFFDEC



deep area and were collected by oblique haul or surface haul in the early morning, night time and cloudy day sampling.

Conclusion

1. There were three character of fish larvae occurred in these sampling cruise. These were pelagic, demersal and mesopelagic larvae.
2. Mesopelagic larvae occurred in the deep area station which mostly collected by oblique haul.
3. Phototaxis were effected to the abundant of mesopelagic larvae
4. Fish larvae found in abundance from surface haul of the pre and post northeast monsoon cruise were *Sardinella* sp., *Stolephorus* sp., *Myripristis* sp., *Holocentrus* sp., *Upeneus* sp., *Decapterus* sp. and *Euthynnus* sp., respectively. For the oblique hauls, these were *Gobiidae*, *Bregmaceros rarisquamosus*, *Decapterus* sp., *Apogon* sp., *Nemipterus* sp., *Callionymus* sp., *Hygophum* sp., *Myctophum* sp. and *Benthosema* sp., respectively.
5. Fish larvae in the shallow water or coastal area were more abundant than the deeper water or open sea.

Acknowledgements

I am grateful to Dr. Maitree Duangsawasdi, for his encouragement and valuable suggestion. Sincere appreciation is expressed to Captain, crews and scientists on the M.V. SEAFFDEC for their cooperation at sea. Many thanks are due to SEAFFDEC staff who have supported these work.

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Appendix 1 The surface horizontal haul data of standard fish larvae net obtained from M.V.SEAFFDEC in 1996

Stn. No.	Date	Time	Position		Depth (m.)	Rev	Volume (m3)
			Latitude	Longitude			
1	7/10/96	0606-0638	02-20.0N	110-00.0E	36	16280	1840.908
2	7/10/96	1029-1100	02-42.8N	109-40.3E	54	17502	1979.089
3	7/10/96	1624-1652	03-25.3N	109-43.3E	79	18353	2075.318
4	7/10/96	2040-2108	03-02.5N	110-03.0E	66	14935	1688.818
5	7/11/96	0600-0630	02-39.8N	110-22.6E	85	15774	1738.69
6	7/11/96	1021-1048	02-17.0N	110-42.3E	41	14001	1583.203
7	7/11/96	1447-1506	02-36.8N	111-04.9E	35	10483	1185.395
8	7/11/96	1853-1918	02-59.5N	110-45.3E	39	15762	1782.333
9	7/12/96	0548-0618	03-22.3N	110-25.6E	65	20365	2302.831
10	7/12/96	1013-1043	03-45.1N	110-05.9E	85	15572	1760.848
11	7/12/96	1428-1503	04-07.8N	109-46.2E	100	14221	1608.080
12	7/12/96	2016-2044	04-50.3N	109-49.2E	118	14794	1672.874
13	7/13/96	0539-0607	04-27.6N	110-08.9E	115	15560	1759.491
14	7/13/96	1003-1033	04-04.8N	110-28.6E	94	15954	1804.044
15	7/13/96	1417-1443	03-42.1N	110-48.3E	66	18001	2035.515
16	7/13/96	1836-1901	03-19.3N	111-07.9E	62	14320	1619.275
17	7/14/96	0703-0723	03-16.3N	111-50.3E	29	14907	1685.652
18	7/14/96	1120-1145	03-39.1N	111-30.6E	50	11853	1340.312
19	7/14/96	1559-1626	04-01.8N	111-10.9E	70	8625	975.297
20	7/14/96	2030-2100	04-24.6N	110-51.2E	89	17223	1947.540
21	7/15/96	0539-0608	04-47.3N	110-31.5E	117	14078	1591.910
22	7/15/96	0957-1025	05-10.1N	110-11.8E	145	14515	1641.325
23	7/15/96	1409-1439	05-32.8N	109-52.0E	145	18530	2095.333
24	7/15/96	1839-1907	05-52.6N	110-14.8E	530	14177	1603.105
25	7/16/96	0537-0605	05-29.9N	111-34.5E	207	12625	1427.608
26	7/16/96	1013-1042	05-07.1N	110-54.2E	123	16618	1879.128
27	7/16/96	1431-1500	04-44.4N	111-13.9E	95	17864	2020.023
28	7/16/96	1852-1921	04-21.6N	111-33.7E	80	13596	1537.407
29	7/17/96	0540-0610	03-58.9N	111-53.4E	57	16335	1847.127
30	7/17/96	1011-1040	03-36.1N	112-13.0E	32	15828	1789.796
31	7/17/96	1910-1936	03-13.4N	112-32.7E	22	15122	1709.963
32	7/19/96	0537-0605	03-33.1N	112-55.4E	32	16847	1905.023
33	7/19/96	1004-1032	03-55.9N	112-35.7E	48	15025	1698.995
34	7/19/96	1423-1451	04-18.6N	112-16.0E	71	20181	2282.024
35	7/19/96	1839-1908	04-41.1N	111-56.3E	87	18210	2059.148
36	7/20/96	0540-0608	05-04.1N	111-36.6E	109	19602	2216.552
37	7/20/96	1018-1047	05-26.9N	111-16.8E	446	14517	1641.551
38	7/20/96	1440-1510	05-49.6N	110-57.1E	1063	16129	1823.833
39	7/20/96	1930-1958	06-12.4N	110-37.3E	1234	11272	1274.614
40	7/21/96	0538-0608	06-09.4N	111-19.8E	922	13231	1496.133
41	7/21/96	1020-1050	05-46.6N	111-39.6E	1300	11654	1317.809
42	7/21/96	1510-1540	05-23.9N	111-59.3E	132	16858	1906.267
43	7/21/96	1923-1953	05-01.1N	112-19.0E	105	15541	1757.343
44	7/22/96	0537-0605	04-38.4N	112-38.7E	90	13402	1515.469
45	7/22/96	1000-1028	04-15.6N	112-58.5E	67	13231	1496.133
46	7/22/96	1422-1442	03-52.9N	113-18.1E	22	10872	1229.382
47	7/22/96	1819-1840	04-12.7N	113-40.8E	28	10955	1238.768
48	7/24/96	0848-0918	04-35.4N	113-21.1E	79	16183	1829.939
49	7/24/96	1258-1328	04-58.2N	113-01.4E	105	15964	1805.175
50	7/24/96	1719-1748	05-20.9N	112-41.7E	520	12228	1382.716
51	7/25/96	0540-0610	05-43.7N	112-21.9E	192	17239	1949.349
52	7/25/96	1002-1032	06-06.4N	112-02.2E	1650	10298	1164.476
53	7/25/96	1519-1952	06-29.2N	111-42.4E	1941	17704	2001.930
54	7/25/96	2054-2123	06-48.9N	112-05.2E	2008	11546	1305.597
55	7/26/96	0542-0612	06-26.2N	112-24.9E	1318	7771	878.728
56	7/26/96	1026-1056	06-03.4N	112-44.7E	1136	12755	1442.308
57	7/26/96	1500-1529	05-40.7N	113-04.5E	2355	16425	1857.304
58	7/26/96	2009-2038	05-17.9N	113-24.2E	1622	14514	1641.212
59	7/27/96	0538-0607	04-55.2N	113-43.9E	95	11458	1295.646
60	7/27/96	0947-1017	05-15.0N	114-06.6E	235	13997	1582.751
61	7/27/96	1403-1434	05-37.7N	113-46.9E	2142	17952	2029.974
62	7/27/96	1910-1939	06-00.5N	113-27.1E	2567	8855	1001.304
63	7/28/96	0540-0608	06-23.2N	113-07.4E	1623	13890	1570.651
64	7/28/96	1050-1120	06-46.0N	112-47.6E	1261	11600	1311.703
65	7/28/96	1532-1602	07-05.7N	113-10.4E	1535	16646	1882.294
66	7/28/96	2013-2044	06-43.0N	113-30.1E	1883	11573	1308.650
67	7/29/96	0542-0612	06-20.2N	113-49.9E	2820	15394	1740.721
68	7/29/96	1055-1125	05-57.5N	114-09.7E	1785	12426	1405.105
69	7/29/96	1547-1617	05-34.7N	114-29.4E	100	16471	1862.505
70	7/29/96	2014-2044	05-54.5N	114-52.1E	125	15104	1707.928
71	7/31/96	1359-1430	06-17.2N	114-32.4E	2078	15522	1755.195
72	7/31/96	1811-1841	06-40.0N	114-12.6E	2867	11380	1286.826
73	7/31/96	2327-2358	07-02.7N	113-52.8E	1836	13121	1483.695
74	7/1/96	0855-0925	06-59.8N	114-35.4E	2893	12293	1390.066
75	7/1/96	1408-1439	06-37.0N	114-55.2E	1751	19169	2167.589
76	7/1/96	1910-1940	06-14.3N	115-14.9E	111	15244	1723.759
77	7/2/96	0537-0607	06-34.0N	115-33.7E	95	12719	1438.237
78	7/2/96	1006-1037	06-56.8N	115-17.9E	1498	11181	1264.324
79	7/2/96	1616-1647	06-53.8N	116-00.4E	42	10270	1161.310

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Appendix 2 The oblique haul data of bongo net obtained from M.V.SEAFFDEC in 1996

Stn. No.	Date	Time	Position		Depth (m.)	Depth of haul (m)	Rev	Volume (m3)
			Latitude	Longitude				
1	7/10/96	0606-0638	02-20.0N	110-00.0E	36	30	18040	439.891
2	7/10/96	1029-1100	02-42.8N	109-40.3E	54	50	22091	538.671
3	7/10/96	1624-1652	03-25.3N	109-43.3E	79	74	19900	485.246
4	7/10/96	2040-2108	03-02.5N	110-03.0E	66	61	16696	407.119
5	7/11/96	0600-0630	02-39.8N	110-22.6E	85	80	16305	397.584
6	7/11/96	1021-1048	02-17.0N	110-42.3E	41	35	18706	456.131
7	7/11/96	1447-1506	02-36.8N	111-04.9E	35	30	7820	190.684
8	7/11/96	1853-1918	02-59.5N	110-45.3E	39	34	18512	451.400
9	7/12/96	0548-0618	03-22.3N	110-25.6E	65	60	22100	538.891
10	7/12/96	1013-1043	03-45.1N	110-05.9E	85	80	15193	370.469
11	7/12/96	1428-1503	04-07.8N	109-46.2E	100	95	17137	417.872
12	7/12/96	2016-2044	04-50.3N	109-49.2E	118	110	16072	391.903
13	7/13/96	0539-0607	04-27.6N	110-08.9E	115	110	16110	392.830
14	7/13/96	1003-1033	04-04.8N	110-28.6E	94	89	18418	449.108
15	7/13/96	1417-1443	03-42.1N	110-48.3E	66	61	16362	398.974
16	7/13/96	1836-1901	03-19.3N	111-07.9E	62	50	17778	433.502
17	7/14/96	0703-0723	03-16.3N	111-50.3E	29	24	11656	284.222
18	7/14/96	1120-1145	03-39.1N	111-30.6E	50	45	13446	327.870
19	7/14/96	1559-1626	04-01.8N	111-10.9E	70	65	19238	469.103
20	7/14/96	2030-2100	04-24.6N	110-51.2E	89	85	18615	453.912
21	7/15/96	0539-0608	04-47.3N	110-31.5E	117	110	15565	379.540
22	7/15/96	0957-1025	05-10.1N	110-11.8E	145	140	13895	338.819
23	7/15/96	1409-1439	05-32.8N	109-52.0E	145	140	19847	483.953
24	7/15/96	1839-1907	05-52.6N	110-14.8E	530	150	14175	345.646
25	7/16/96	0537-0605	05-29.9N	111-34.5E	207	150	16050	391.366
26	7/16/96	1013-1042	05-07.1N	110-54.2E	123	115	17450	425.504
27	7/16/96	1431-1500	04-44.4N	111-13.9E	95	90	17853	453.331
28	7/16/96	1852-1921	04-21.6N	111-33.7E	80	75	10602	258.521
29	7/17/96	0540-0610	03-58.9N	111-53.4E	57	52	21130	515.238
30	7/17/96	1011-1040	03-36.1N	112-13.0E	32	25	19588	477.638
31	7/17/96	1910-1936	03-13.4N	112-32.7E	22	15	17067	416.165
32	7/19/96	0537-0605	03-33.1N	112-55.4E	32	27	18780	457.935
33	7/19/96	1004-1032	03-55.9N	112-35.7E	48	43	18931	437.233
34	7/19/96	1423-1451	04-18.6N	112-16.0E	71	65	17911	436.745
35	7/19/96	1839-1908	04-41.1N	111-56.3E	87	80	17666	430.771
36	7/20/96	0540-0608	05-04.1N	111-36.6E	109	100	20407	497.608
37	7/20/96	1018-1047	05-26.9N	111-16.8E	446	150	9920	241.891
38	7/20/96	1440-1510	05-49.6N	110-57.1E	1063	150	18113	441.671
39	7/20/96	1930-1958	06-12.4N	110-37.3E	1234	150	11109	270.884
40	7/21/96	0538-0608	06-09.4N	111-19.8E	922	150	16948	413.263
41	7/21/96	1020-1050	05-46.6N	111-39.6E	1300	150	15122	368.738
42	7/21/96	1510-1540	05-23.9N	111-59.3E	132	125	19018	463.739
43	7/21/96	1923-1953	05-01.1N	112-19.0E	105	100	13212	322.164
44	7/22/96	0537-0605	04-38.4N	112-38.7E	90	85	13569	330.869
45	7/22/96	1000-1028	04-15.6N	112-58.5E	67	62	17861	435.526
46	7/22/96	1422-1442	03-52.9N	113-18.1E	22	17	11481	279.955
47	7/22/96	1819-1840	04-12.7N	113-40.8E	28	23	11464	279.541
48	7/24/96	0848-0918	04-35.4N	113-21.1E	79	74	13786	336.161
49	7/24/96	1258-1328	04-58.2N	113-01.4E	105	100	16139	393.537
50	7/24/96	1719-1748	05-20.9N	112-41.7E	520	150	7684	187.368
51	7/25/96	0540-0610	05-43.7N	112-21.9E	192	150	18778	457.887
52	7/25/96	1002-1032	06-06.4N	112-02.2E	1650	150	18977	462.739
53	7/25/96	1519-1952	06-29.2N	111-42.4E	1941	150	21013	512.385
54	7/25/96	2054-2123	06-48.9N	112-05.2E	2008	150	16400	399.901
55	7/26/96	0542-0612	06-26.2N	112-24.9E	1318	150	13974	340.745
56	7/26/96	1026-1056	06-03.4N	112-44.7E	1136	150	12169	296.731
57	7/26/96	1500-1529	05-40.7N	113-04.5E	2355	150	16118	393.025
58	7/26/96	2009-2038	05-17.9N	113-24.2E	1622	150	10498	255.985
59	7/27/96	0538-0607	04-55.2N	113-43.9E	95	90	11961	291.659
60	7/27/96	0947-1017	05-15.0N	114-06.6E	235	150	13787	336.185
61	7/27/96	1403-1434	05-37.7N	113-46.9E	2142	150	12617	307.656
62	7/27/96	1910-1939	06-00.5N	113-27.1E	2567	150	9052	220.726
63	7/28/96	0540-0608	06-23.2N	113-07.4E	1623	150	10725	261.521
64	7/28/96	1050-1120	06-46.0N	112-47.6E	1261	150	16879	411.581
65	7/28/96	1532-1602	07-05.7N	113-10.4E	1535	150	16505	402.461
66	7/28/96	2013-2044	06-43.0N	113-30.1E	1883	150	8257	201.340
67	7/29/96	0542-0612	06-20.2N	113-49.9E	2820	150	12770	311.386
68	7/29/96	1055-1125	05-57.5N	114-09.7E	1785	150	12455	303.705
69	7/29/96	1547-1617	05-34.7N	114-29.4E	100	95	12947	315.702
70	7/29/96	2014-2044	05-54.5N	114-52.1E	125	120	10487	255.717
71	7/31/96	1359-1430	06-17.2N	114-32.4E	2078	150	20655	503.656
72	7/31/96	1811-1841	06-40.0N	114-12.6E	2867	150	11773	287.075
73	7/31/96	2327-2358	07-02.7N	113-52.8E	1836	150	9512	231.943
74	7/1/96	0855-0925	06-59.8N	114-35.4E	2893	150	12160	296.512
75	7/1/96	1408-1439	06-37.0N	114-55.2E	1751	150	20540	500.852
76	7/1/96	1910-1940	06-14.3N	115-14.9E	111	105	7082	172.689
77	7/2/96	0537-0607	06-34.0N	115-33.7E	95	90	14290	348.450
78	7/2/96	1006-1037	06-56.8N	115-17.9E	1498	150	18377	448.108
79	7/2/96	1616-1647	06-53.8N	116-00.4E	42	36	7541	181.687

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Appendix 3 The surface horizontal haul data of standard fish larvae net obtained from M.V.SEAFFDEC in 1997

Stn. No.	Date	Time	Position		Depth (m.)	Rev	Volume (m3)
			Latitude	Longitude			
1	5/1/97	0555-0625	02-20.0N	110-00.0E	35.5	14265	3323.137
2	5/1/97	1027-1053	02-42.8N	109-40.3E	57.1	13809	3216.909
3	5/1/97	1548-1618	03-25.3N	109-43.3E	80	19051	4438.071
4	5/1/97	2035-2100	03-02.5N	110-03.0E	67	11154	2598.407
5	5/2/97	0550-0618	02-39.8N	110-22.6E	73	17128	3990.094
6	5/2/97	1008-1033	02-17.0N	110-42.3E	41.7	13418	3125.822
7	5/2/97	1404-1432	02-36.8N	111-04.9E	35	14552	3389.996
8	5/2/97	1822-1850	02-59.5N	110-45.3E	40	13080	3047.083
9	5/3/97	0554-0624	03-22.3N	110-25.6E	64	16998	3959.810
10	5/3/97	1015-1045	03-45.1N	110-05.9E	85	16061	3741.529
11	5/3/97	1440-1509	04-07.8N	109-46.2E	100	18313	4266.149
12	5/3/97	2017-2045	04-50.3N	109-49.2E	119	11262	2623.566
13	5/4/97	0550-0616	04-27.6N	110-08.9E	113	16688	3887.593
14	5/4/97	1006-1035	04-04.8N	110-28.6E	92	14666	3416.553
15	5/4/97	1418-1446	03-42.1N	110-48.3E	66	15091	3515.56
16	5/4/97	1837-1906	03-19.3N	111-07.9E	65	13280	3093.674
17	5/5/97	0552-0620	03-16.3N	111-50.3E	29	11920	2776.852
18	5/5/97	1014-1043	03-39.1N	111-30.6E	48	10928	2545.758
19	5/5/97	1420-1448	04-01.8N	111-10.9E	71	17143	3993.589
20	5/5/97	1833-1901	04-24.6N	110-51.2E	90	9470	2206.107
21	5/6/97	0549-0619	04-47.3N	110-31.5E	118	16554	3866.377
22	5/6/97	1006-1034	05-10.1N	110-11.8E	145	12834	2989.775
23	5/6/97	1436-1505	05-32.8N	109-52.0E	145	17334	4038.083
24	5/6/97	1852-1922	05-52.6N	110-14.8E	530	15643	3644.153
25	5/7/97	0545-0615	05-29.9N	111-34.5E	200	11395	2654.549
26	5/7/97	1002-1032	05-07.1N	110-54.2E	123	10723	2498.002
27	5/7/97	1421-1449	04-44.4N	111-13.9E	95	16502	3844.263
28	5/7/97	1835-1905	04-21.6N	111-33.7E	80	14132	3292.154
29	5/8/97	0550-0620	03-58.9N	111-53.4E	57	15294	3562.85
30	5/8/97	1010-1037	03-36.1N	112-13.0E	32	10071	2346.114
31	5/9/97	1924-1950	03-13.4N	112-32.7E	21	12065	2810.631
32	5/10/97	0547-0614	03-33.1N	112-55.4E	34	13752	3203.630
33	5/10/97	0948-1017	03-55.9N	112-35.7E	49	14923	3476.423
34	5/10/97	1410-1440	04-18.6N	112-16.0E	73	15693	3655.800
35	5/10/97	1838-1908	04-41.1N	111-56.3E	88	13680	3186.857
36	5/11/97	0549-0618	05-04.1N	111-36.6E	110	14715	3427.968
37	5/11/97	0957-1027	05-26.9N	111-16.8E	435	16805	3914.849
38	5/11/97	1434-1504	05-49.6N	110-57.1E	1071	15675	3651.607
39	5/11/97	1925-1955	06-12.4N	110-37.3E	1234	13673	3185.226
40	5/12/97	0547-0617	06-09.4N	111-19.8E	1173	16174	3767.853
41	5/12/97	1016-1046	05-46.6N	111-39.6E	1304	15985	3723.824
42	5/12/97	1450-1520	05-23.9N	111-59.3E	136	16469	3836.575
43	5/12/97	1857-1925	05-01.1N	112-19.0E	105	12031	2802.710
44	5/13/97	0547-0617	04-38.4N	112-38.7E	89	13342	3108.118
45	5/13/97	0940-1010	04-15.6N	112-58.5E	67	19896	4634.920
46	5/13/97	1344-1412	03-52.9N	113-18.1E	22	14764	3439.383
47	5/13/97	1740-1809	04-12.7N	113-40.8E	30	7558	1760.692
48	5/15/97	1250-1320	04-35.4N	113-21.1E	79	9534	2221.016
49	5/15/97	1705-1734	04-58.2N	113-01.4E	106	18661	4347.218
50	5/15/97	2113-2143	05-20.9N	112-41.7E	560	25008	5825.798
51	5/16/97	0547-0617	05-43.7N	112-21.9E	192	15558	3624.351
52	5/16/97	1004-1034	06-06.4N	112-02.2E	1584	16324	3802.796
53	5/16/97	1504-1534	06-29.2N	111-42.4E	1951	15956	3717.068
54	5/16/97	2021-2051	06-48.9N	112-05.2E	2009	14020	3266.063
55	5/17/97	0548-0616	06-26.2N	112-24.9E	1279	13742	3201.301
56	5/17/97	1030-1100	06-03.4N	112-44.7E	1081	17864	4161.551
57	5/17/97	1504-1534	05-40.7N	113-04.5E	2352	13420	3126.288
58	5/17/97	2047-2117	05-17.9N	113-24.2E	1617	14542	3387.666
59	5/18/97	0549-0619	04-55.2N	113-43.9E	95	13880	3233.449
60	5/18/97	1000-1030	05-15.0N	114-06.6E	233	7088	1651.202
61	5/18/97	1539-1609	05-37.7N	113-46.9E	2151	14122	3289.824
62	5/18/97	2040-2110	06-00.5N	113-27.1E	2556	14278	3326.166
63	5/19/97	0547-0617	06-23.2N	113-07.4E	1603	13204	3075.969
64	5/19/97	1009-1039	06-46.0N	112-47.6E	1267	12676	2952.968
65	5/19/97	1430-1500	07-05.7N	113-10.4E	1555	15496	3609.908
66	5/19/97	1858-1928	06-43.0N	113-30.1E	1885	14261	3322.205
67	5/20/97	0549-0618	06-20.2N	113-49.9E	1816	12315	2868.870
68	5/20/97	1032-1102	05-57.5N	114-09.7E	1792	13557	3158.203
69	5/21/97	2104-2134	05-34.7N	114-29.4E	104	12150	2830.432
70	5/22/97	0548-0618	05-54.5N	114-52.1E	132	12227	2848.370
71	5/22/97	1008-1038	06-17.2N	114-32.4E	2026	15541	3620.391
72	5/22/97	1500-1530	06-40.0N	114-12.6E	2865	15144	3527.907
73	5/22/97	1937-2007	07-02.7N	113-52.8E	1838	10390	2420.427
74	5/23/97	0546-0616	06-59.8N	114-35.4E	2893	12942	3014.935
75	5/23/97	1035-1105	06-37.0N	114-55.2E	1733	13084	3048.015
76	5/23/97	1504-1534	06-14.3N	115-14.9E	107	15927	3710.312
77	5/24/97	0551-0620	06-34.0N	115-33.7E	95	14605	3402.343
78	5/24/97	1006-1036	06-56.8N	115-17.9E	1504	13603	3168.919
79	5/24/97	1545-1612	06-53.8N	116-00.4E	45	15114	3520.918

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Appendix 4 The oblique haul data of bongo net obtained from M.V.SEAFFDEC in 1997

St. No.	Date	Time	Position		Depth (m.)	Depth of hual (m)	Rev	Volume (m3)
			Latitude	Longitude				
1	5/1/97	0555-0625	02-20.0N	110-00.0E	35.5	30	16489	896.929
2	5/1/97	1027-1053	02-42.8N	109-40.3E	57.1	52	13056	710.189
3	5/1/97	1548-1618	03-25.3N	109-43.3E	80	75	21610	1175.489
4	5/1/97	2035-2100	03-02.5N	110-03.0E	67	62	10910	593.456
5	5/2/97	0550-0618	02-39.8N	110-22.6E	73	68	15638	850.638
6	5/2/97	1008-1033	02-17.0N	110-42.3E	41.7	37	11836	643.826
7	5/2/97	1404-1432	02-36.8N	111-04.9E	35	30	17290	940.500
8	5/2/97	1822-1850	02-59.5N	110-45.3E	40	35	10798	587.634
9	5/3/97	0554-0624	03-22.3N	110-25.6E	64	59	14042	763.823
10	5/3/97	1015-1045	03-45.1N	110-05.9E	85	80	16650	905.687
11	5/3/97	1440-1509	04-07.8N	109-46.2E	100	95	16736	910.365
12	5/3/97	2017-2045	04-50.3N	109-49.2E	119	110	13164	716.064
13	5/4/97	0550-0616	04-27.6N	110-08.9E	113	106	15232	828.554
14	5/4/97	1006-1035	04-04.8N	110-28.6E	92	87	14292	777.422
15	5/4/97	1418-1446	03-42.1N	110-48.3E	66	60	16631	904.653
16	5/4/97	1837-1906	03-19.3N	111-07.9E	65	60	13003	707.306
17	5/5/97	0552-0620	03-16.3N	111-50.3E	29	25	12068	666.446
18	5/5/97	1014-1043	03-39.1N	111-30.6E	48	43	14214	773.179
19	5/5/97	1420-1448	04-01.8N	111-10.9E	71	66	17118	931.144
20	5/5/97	1833-1901	04-24.6N	110-51.2E	90	85	14015	762.354
21	5/6/97	0549-0619	04-47.3N	110-31.5E	118	113	15754	866.948
22	5/6/97	1006-1034	05-10.1N	110-11.8E	145	140	12724	692.130
23	5/6/97	1436-1505	05-32.8N	109-52.0E	145	125	17797	968.079
24	5/6/97	1852-1922	05-52.6N	110-14.8E	530	150	10030	545.588
25	5/7/97	0545-0615	05-29.9N	111-34.5E	200	150	10181	553.802
26	5/7/97	1002-1032	05-07.1N	110-54.2E	123	118	14974	814.520
27	5/7/97	1421-1449	04-44.4N	111-13.9E	95	90	15943	867.229
28	5/7/97	1835-1905	04-21.6N	111-33.7E	80	75	16583	902.042
29	5/8/97	0550-0620	03-58.9N	111-53.4E	57	53	13340	725.637
30	5/8/97	1010-1037	03-36.1N	112-13.0E	32	25	10942	595.197
31	5/9/97	1924-1950	03-13.4N	112-32.7E	21	16	12245	666.074
32	5/10/97	0547-0614	03-33.1N	112-55.4E	34	29	12092	657.752
33	5/10/97	0948-1017	03-55.9N	112-35.7E	49	44	14000	761.538
34	5/10/97	1410-1440	04-18.6N	112-16.0E	73	68	14126	788.392
35	5/10/97	1838-1908	04-41.1N	111-56.3E	88	83	12964	705.185
36	5/11/97	0549-0618	05-04.1N	111-36.6E	110	105	13084	711.712
37	5/11/97	0957-1027	05-26.9N	111-16.8E	435	150	13674	743.805
38	5/11/97	1434-1504	05-49.6N	110-57.1E	1071	120	23380	1272.313
39	5/11/97	1925-1955	06-12.4N	110-37.3E	1234	150	16024	871.635
40	5/12/97	0547-0617	06-09.4N	111-19.8E	1173	150	16098	875.660
41	5/12/97	1016-1046	05-46.6N	111-39.6E	1304	150	16355	889.640
42	5/12/97	1450-1520	05-23.9N	111-59.3E	136	130	21130	1149.379
43	5/12/97	1857-1925	05-01.1N	112-19.0E	105	100	11215	610.047
44	5/13/97	0547-0617	04-38.4N	112-38.7E	89	84	11109	604.281
45	5/13/97	0940-1010	04-15.6N	112-58.5E	67	62	19819	1078.066
46	5/13/97	1344-1412	03-52.9N	113-18.1E	22	17	16210	881.753
47	5/13/97	1740-1809	04-12.7N	113-40.8E	30	25	2470	134.357
48	5/15/97	1250-1320	04-35.4N	113-21.1E	79	74	20208	1099.226
49	5/15/97	1705-1734	04-58.2N	113-01.4E	106	100	16082	874.790
50	5/15/97	2113-2143	05-20.9N	112-41.7E	560	120	20272	1102.708
51	5/16/97	0547-0617	05-43.7N	112-21.9E	192	150	16615	903.783
52	5/16/97	1004-1034	06-06.4N	112-02.2E	1584	150	14337	779.870
53	5/16/97	1504-1534	06-29.2N	111-42.4E	1951	150	15150	824.093
54	5/16/97	2021-2051	06-48.9N	112-05.2E	2009	150	14351	780.631
55	5/17/97	0546-0616	06-26.2N	112-24.9E	1279	150	12808	696.699
56	5/17/97	1030-1100	06-03.4N	112-44.7E	1081	120	24954	1357.388
57	5/17/97	1504-1534	05-40.7N	113-04.5E	2352	150	13680	744.132
58	5/17/97	2047-2117	05-17.9N	113-24.2E	1617	150	20026	1089.326
59	5/18/97	0549-0619	04-55.2N	113-43.9E	95	90	7744	421.240
60	5/18/97	1000-1030	05-15.0N	114-06.6E	233	150	6140	333.989
61	5/18/97	1539-1609	05-37.7N	113-46.9E	2151	150	18132	986.301
62	5/18/97	2040-2110	06-00.5N	113-27.1E	2556	150	16566	901.118
63	5/19/97	0547-0617	06-23.2N	113-07.4E	1603	150	14274	776.443
64	5/19/97	1009-1039	06-46.0N	112-47.6E	1267	150	14474	787.322
65	5/19/97	1430-1500	07-05.7N	113-10.4E	1555	150	14817	805.980
66	5/19/97	1858-1928	06-43.0N	113-30.1E	1885	150	11756	639.475
67	5/20/97	0549-0618	06-20.2N	113-49.9E	1816	150	12909	702.193
68	5/20/97	1032-1102	05-57.5N	114-09.7E	1792	120	14471	787.159
69	5/21/97	2104-2134	05-34.7N	114-29.4E	104	95	16700	908.407
70	5/22/97	0548-0618	05-54.5N	114-52.1E	132	125	16234	883.058
71	5/22/97	1008-1038	06-17.2N	114-32.4E	2026	150	16478	896.331
72	5/22/97	1500-1530	06-40.0N	114-12.6E	2865	150	16988	924.073
73	5/22/97	1937-2007	07-02.7N	113-52.8E	1838	150	11345	617.118
74	5/23/97	0546-0616	06-59.8N	114-35.4E	2893	150	17064	928.207
75	5/23/97	1035-1105	06-37.0N	114-55.2E	1733	150	16724	909.712
76	5/23/97	1504-1534	06-14.3N	115-14.9E	107	100	15271	830.675
77	5/24/97	0551-0620	06-34.0N	115-33.7E	95	90	12300	669.066
78	5/24/97	1006-1036	06-56.8N	115-17.9E	1504	150	14080	765.890
79	5/24/97	1545-1612	06-53.8N	116-00.4E	45	40	11884	646.437

S2/FB2<APICHART>

Appendix 5 The occurrence of the fish larvae obtained in the survey station of Area II.

STM-III = First Cruise (9 July - 9 August 1996).

STM-IV = Second Cruise (25 April - 31 May 1997)

Stn.No.	STM-III				STM-IV			
	Surface		Oblique		Surface		Oblique	
	T.No.	T.N./1000m ³						
1	267	145	826	1878	76	23	435	485
2	39	20	413	767	25	8	513	722
3	54	26	315	649	31	7	559	476
4	71	42	605	1486	239	92	693	1168
5	174	98	355	893	202	51	586	689
6	24	15	341	745	36	12	236	367
7	101	85	320	1678	10	3	755	803
8	103	58	549	1216	40	13	219	373
9	372	162	527	978	76	19	377	494
10	11	6	334	902	12	3	419	463
11	15	9	155	371	28	7	386	424
12	49	29	126	322	215	82	433	605
13	112	64	283	720	154	40	322	389
14	33	18	171	381	5	1	177	228
15	70	34	429	1075	12	3	371	350
16	129	80	1277	2946	44	14	314	444
17	323	192	231	813	144	52	557	849
18	54	40	482	1470	16	6	675	873
19	95	97	283	603	12	3	642	689
20	48	25	223	491	20	9	375	492
21	84	53	138	364	9	2	135	158
22	25	15	74	218	43	14	120	173
23	5	2	63	130	47	12	211	218
24	71	44	77	223	152	42	103	189
25	62	43	75	192	65	24	98	177
26	26	14	109	256	9	4	447	549
27	10	5	52	119	16	4	334	385
28	62	40	218	843	10	3	475	527
29	175	95	627	1217	214	60	208	289
30	81	45	184	385	28	12	147	247
31	103	60	77	185	309	110	664	997
32	68	36	39	85	503	157	589	895
33	104	61	233	533	90	26	626	822
34	4	2	238	545	43	12	387	504
35	68	33	241	559	36	11	300	425
36	40	18	281	565	25	7	298	419
37	22	13	60	248	34	9	106	143
38	23	13	40	91	47	13	100	79
39	64	50	115	425	12	4	262	301
40	66	44	118	286	42	11	146	167
41	8	6	79	214	15	4	167	188
42	7	4	93	201	38	10	205	178
43	45	26	223	962	35	12	565	926
44	110	73	493	1490	70	23	394	652
45	23	15	19	44	24	5	633	587
46	29	24	180	643	230	67	616	699
47	106	86	213	762	217	123	363	2702
48	27	15	142	422	14	6	864	786
49	99	55	347	882	101	23	271	310
50	54	39	62	331	22	4	155	141
51	62	32	85	186	161	44	127	141
52	78	67	80	173	56	15	98	126
53	23	12	58	113	100	27	61	74
54	112	86	141	353	18	6	186	238
55	91	104	125	367	25	8	53	76
56	32	22	87	293	85	20	97	71
57	8	4	127	323	297	95	114	153
58	36	22	136	531	160	47	163	150
59	72	56	335	1149	113	35	205	497
60	55	35	102	303	54	33	188	563
61	9	4	106	345	165	50	187	190
62	99	99	88	397	21	6	183	203
63	49	31	52	199	86	28	100	129
64	89	68	70	170	23	8	122	155
65	24	13	97	241	32	9	91	113
66	50	38	71	353	86	26	94	147
67	171	98	111	356	45	16	101	144
68	25	18	58	191	202	64	123	156
69	36	19	91	288	77	27	1680	1849
70	28	16	85	332	38	13	411	465