



**Establishment and Operation of a Regional System of
Fisheries *Refugia* in the South China Sea and Gulf of Thailand**

**SPECIES COMPOSITION AND DISTRIBUTION OF
MARINE FISH LARVAE IN KOH KONG PROVINCE**

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Table of Contents

Abbreviations	4
Acknowledgments	5
Abstract.....	5
1. Introduction	6
2. Materials and Methods	7
2.1. Sampling sites	7
2.2. Sampling procedures.....	7
2.3. Laboratory procedure	8
2.4. Sorting	9
2.5. Data analysis.....	10
3. Results	10
3.1. Larvae abundant and their value habitat.....	10
3.2. Monthly variation of larvae quantity and family	11
3.3. Distribution of larvae fish by station	12
3.4. Family. composition	12
4. Discussion	13
5. Conclusion	13
6. References	13
Figure 1 Map of coastal area and Bay	6
Figure 2 : Bongo net for sampling marine fish larvae	7
Figure 3: Sampling preparation.....	8
Figure 4 : Fish larvae identification in the laboratory	10
Figure 5 : Variation larvae quantity and family	11
Figure 6 : Distribution of fish larvae by station.....	12
Figure 7 : Family composition by quantity	12
Table 1: Survey station positions	7
Table 2: The abundance of family and their habitat	10
Table 3: The percentage of fish larvae by family	11
ANNEX 1: Distribution of fish larvae by station	14
ANNEX 2: Monthly variation of larvae quantity and family	14
ANNEX 3: The peak period of Family Scombridae	15

Abbreviations

Individual	inds
Global Environment Facility	Gef
Southeast Asian Fisheries Development Center	SEAFDEC
Fishery Administration	FiA

Acknowledgments

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Abstract

Marine fish larvae survey was conducted in the location of Peam Krasaop, Chrouy Pras and Koh Yon near the border of Thailand, in the Koh Kong province of Cambodia water. The aimed of the study to identify the spawning ground of marine fish especially the short Mackerel (*Rastrelliger brachysoma*) and management its critical habitat of bloodstock transboundary for sustainable fisheries in the region. The species composition and distribution of larval fish reported is based on sampling a bongo net with 1-metre diameter and 500µm mesh size in 8 stations, 4 stations at Peam Krasaop, 2 stations at Koh Yon near Thai border and 2 stations at Chrouy Pras communes of Koh Kong province. A total of 348 larval fish belong to 14 families identified. Samples were collected from March to December 2019; in 2020 from January to March. Scombridae was the most abundant 42%, had followed by Engraulidae 19%, Gobiidae 11%, Clupeidae 10%, Apogonidae 6%, Aploactinidae 4%, Carangidae 3%; the rest 4 families 2%. Almost family were commercial value, they distributed near shore. The 1st spawning of Scombridae was in between January and March and the 2nd spawning was in between September and December.

Key words: Fish larvae, Bongo net, Refugia, short mackerel

1. Introduction

Cambodian water is one of large marine ecosystem, which coast of Cambodia is along of the Gulf of Thailand from Thai border in the northwest to the Vietnamese border to southeast. The coastal area includes several large bays and extends across the provinces of Kon Kong and Kampot and the municipalities of Sihanouk ville and Kep. The offshore marine area contains numerous islands. The coast covers a length of some 435 km along Gulf of Thailand, and the EEZ of approximately 55,600 km²(Chamchang,2008) and relatively shallow with an average depth of about 50 meters.

Fish resources in theSouth China Sea is an important subject of consideration by the countries bordering this area. Koh Kong is one part in the Gulf of Thailand due to the limitation of such knowledge on fish larvae in terms of biology, morphology, spawning ground, spawning peak, spawning period for this area is needed for proper fishery man-agreement. The previous import studied onfishlarvaein Cambodia, the first conducted by SEAFDEC in 2008 and the second by Japan National University collaboration with SEAFDEC by ship KOYO MARU in 07-18 November 2016 at 24 stations, the survey found 57 families of fish larvae occurred from 24 stations, the most abundance family was Gobiidea, Carangidae, Bregmacerotidae Nemipteridae, Bothidae and Engraulidae in Cambodia water.

A collaborative researchprojectbetweenDepartment of Fisheries Conservation of FiA and SEAFDEC was carried out fish larvae sampling from March 2019 to March 2010 in Koh Kong province. The objectives of this study to identify fish larvae composition, as well as the spawning grounds, spawning periods, spawning peaks, that information may be used to formulate a fisheries refugia and management program.



Figure 1 Map of coastal area and Bay

2. Materials and Methods

2.1. Sampling sites

Samples were collected at 8 stations, 4 stations at Peam Krasaop, 2 stations at Koh Yon near Thai border, and other 2 stations at Chrouy Pras commune in Koh Kong province from March to December 2019 and from January to March 2020.

Table 1: Survey station positions

Station	Latitude_(N)	Longitude_(E)	Note
1	0280658	1268881	Peam Krasaop
2	0274835	1274167	Peam Krasaop
3	0273056	1283297	Koh Yon
4	0273540	128641	Peam Krasaop
5	0270809	1281513	Koh Yon
6	0287417	1258595	Chrouy Pras
7	0280697	1271240	Peam Krasaop
8	0287208	1252491	Chrouy Pras

2.2. Sampling procedures

Sampling was collected 2 times per day in each station by bongo net with 500 μ m mesh size. It was obliquely towed below 2-3m from water surface. fish larvae were kept in plastic jars and preserved them immediately in 10% formalin. All specimens were transferred to the Fisheries Administration laboratory.



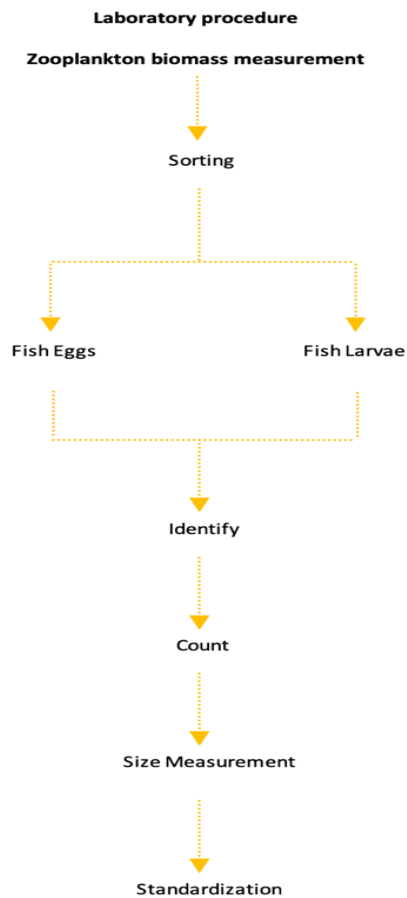
Figure 2 : Bongo net for sampling marine fish larvae



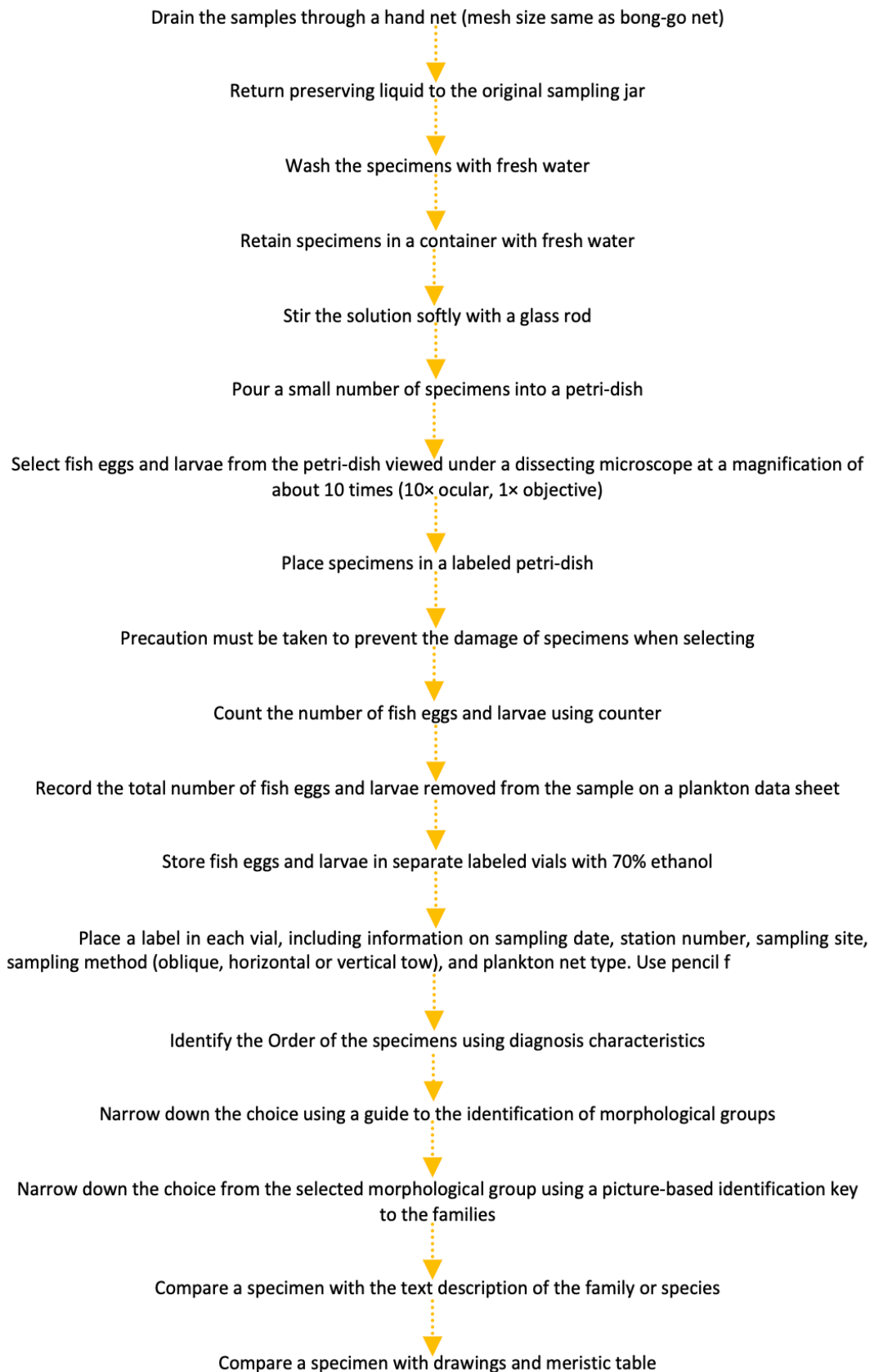
Figure 3: Sampling preparation

2.3. Laboratory procedure

Fish larvae were identified mainly to family level base upon description given in number of reference for larval fishes (Larval Fish Identification Guide for the South China Sea and Gulf of Thailand, Leisand Carson-Ewart, 1983; Russell, 1976; Okiyama, 1988; Unidentified larvae were placed in unknown category due to the samples were too small and damaged larvae were placed in incomplete category.



2.4. Sorting



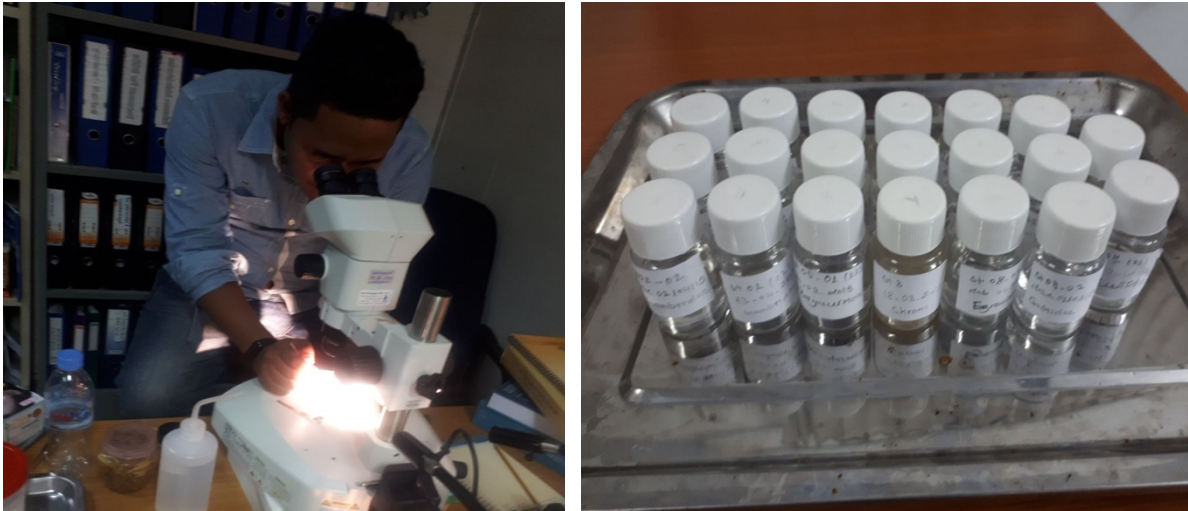


Figure 4 : Fish larvae identification in the laboratory

2.5. Data analysis

Monthly sampling was taken from 8 stations; however, sample in July 2019 was canceled due to technical problem during sampled. Prior to analysis was identify all fish at family level and estimated their quantity. Data was stored and analysis by MS Excel.

3. Results

3.1. Larvae abundant and their value habitat

A total of fish larva identify were 348 inds, belonged to 14 families. The family was ranked by abundant and their value habitat (see table2).

Table 2: The abundance of family and their habitat

Family	Value		Habitat		Inds
	Economic	Non-Economic	Pelagic	Coral reefs	
Scombridae	√				147
Engraulidae	√				65
Gobiidae	√		√		39
Clupeidae	√				36
Apogonidae		√			21
Aploactinidae		√			13
Carangidae		√	√		9
Mullidae		√	√		6
Cheilodactylidae					4
Bothidae	√				3
Bregmacerotidae			√		2
Lactariidae					1
Terapontidae				√	1
Triacanthidae					1

Scombridae was the most abundant 42%, following by Engraulidae 19%, Gobiidae 11%, Clupeidae 10%, Apogonidae 6%, Aploactinidae 4%, Carangidae 3%, the rest 5 families comprised 2%; almost larvae distributed near shore.

Table 3: The percentage of fish larvae by family

Family	Individuals	Percent (%)
Scombridae	147	42.24
Engraulidae	65	18.68
Gobiidae	39	11.21
Clupeidae	36	10.34
Apogonidae	21	6.03
Aploactinidae	13	3.74
Carangidae	9	2.59
Mullidae	6	1.72
Cheilodactylidae	4	1.15
Bothidae	3	0.86
Bregmacerotidae	2	0.57
Lactariidae	1	0.29
Terapontidae	1	0.29
Triacanthidae	1	0.29

3.2. Monthly variation of larvae quantity and family

Monthly larvae quantity and family varied, the highest larvae occurred in February 2020 (6 family, 93 inds) and in March 2019 (6 family, 38 inds), the lowest quantity in September 2019 (Fig. 5, Annex 2)

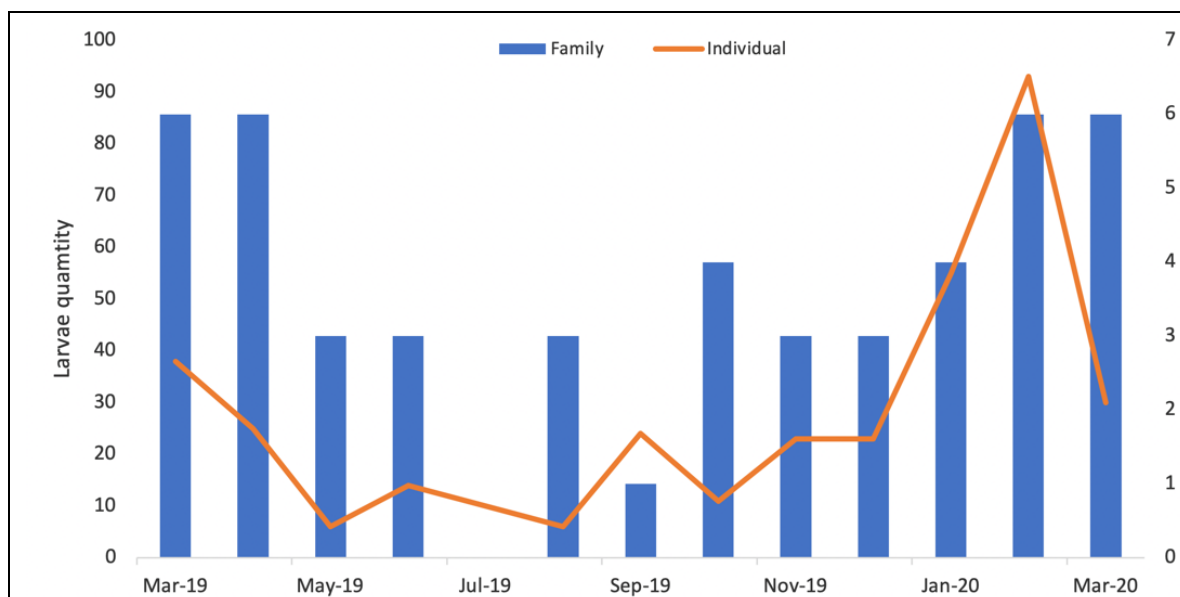


Figure 5 : Variation larvae quantity and family

3.3. Distribution of larvae fish by station

The distribution of larval fish was changed from station to station, the highest larvae occurred in station 7 followed station 2, station 3, station 5 and the lowest quantity presented in the station 1 and station 6 (Fig. 6, Annex 1)

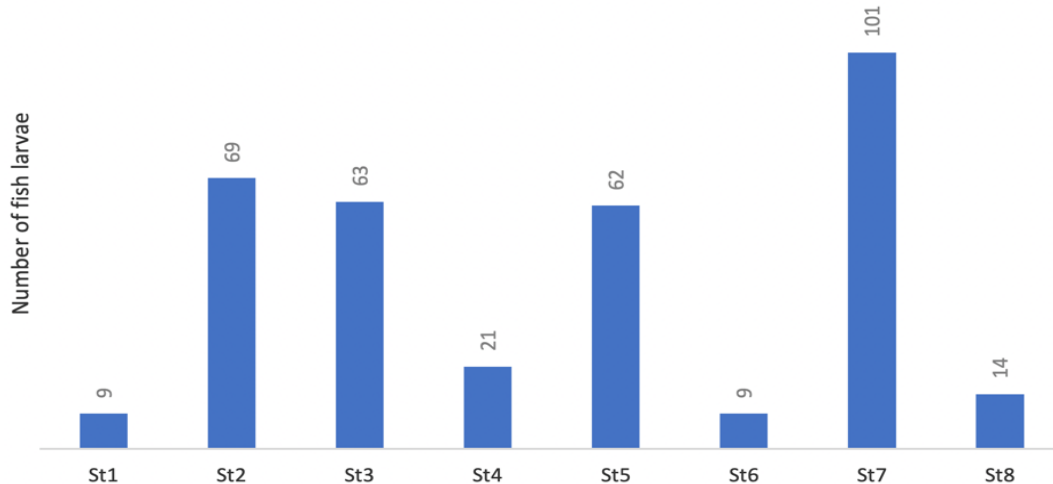


Figure 6 : Distribution of fish larvae by station

3.4. Family. Composition

A total of 14 families were identified, all of them were important commercialvalue. The four-commercialvalue was Scombridae 42%, Engraulidae 19%, Gobiidae 11% and Clupeidae 10%, the rest 5 family was 1% to 6% of the total larvae.

Scombridae

Scombrids were ranked the first of total larvae, it observed at 7 of 8 stations (St1,2,3,4,5,7 and 8) comprised of 42% total larvae in samples (Fig.7)

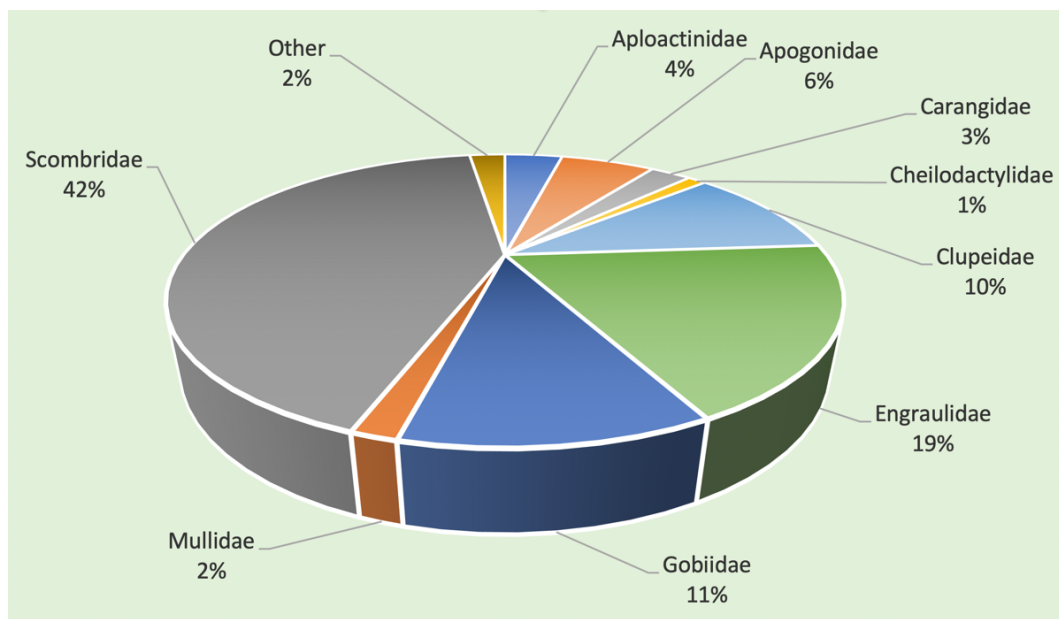


Figure 7 : Family composition by quantity

Engraulidae

The engraulids are key components of coastal fisheries and very important commercially value. Engraulids larvae were the high abundant observed in 4 stations, most of them found in the station 7, follow by station 2, almost engraulids larvae were distributed near shore (Fig.7, Annex 1)

Gobiidae

Gobiidae larvae were ranked the third in the sample (Fig.7). They were commercially value. Almost found in 6 of 8 stations (Annex 1)

Clupeidae

The clupeoids include many of the most important food fishes in the world, and are also commonly caught for production of fish oil and fish meal. The clupeoids larvae were ranked the fourth in the samples, it found in the 6 of 8 stations, (Annex 1)

4. Discussion

During fish larvae sampling (2019-2020) shown larvae presented in all stations; however, Scombridae was most abundant occurred between January and March in the station 2, 3, 4 and station 5; others family occurred in all station with less quantity. Almost fish families were commercial value and they distributed near shore.

5. Conclusion

Overall observation; the ages of larval fish were in stage 3, 4 and stage 5 in all stations. In terms of larvae morphology indicated the 1st spawning of Scombridae was in between January and March and the 2nd spawning was in between September and December (Annex 3).

6. References

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ANNEX 1: Distribution of fish larvae by station

Family	Stations								Total
	1	2	3	4	5	6	7	8	
Aploactinidae		1	7	1	1		1	2	13
Apogonidae	2	4	10	1			3	1	21
Bothidae			1		2				3
Bregmacerotidae					2				2
Carangidae					6			3	9
Cheilodactylidae			2	1	1				4
Clupeidae	1	1		2	1	7	24		36
Engraulidae	1	5					58	1	65
Gobiidae	2			1	26	1	5	4	39
Lactariidae			1						1
Mullidae		1	1	1		1	2		6
Scombridae	3	56	41	14	23		8	2	147
Terapontidae		1							1
Triacanthidae								1	1
Total	9	69	63	21	62	9	101	14	348

ANNEX 2: Monthly variation of larvae quantity and family

Month	Family	Individual	Percent (%)
Mar-19	6	38	10.92
Apr-19	6	25	7.18
May-19	3	6	1.72
Jun-19	3	14	4.02
Aug-19	3	6	1.72
Sep-19	1	24	6.90
Oct-19	4	11	3.16
Nov-19	3	23	6.61
Dec-19	3	23	6.61
Jan-20	4	55	15.80
Feb-20	6	93	26.72
Mar-20	6	30	8.62

ANNEX 3: The peak period of Family Scombridae

Month	Families	Total (individuals)	Percentage (%)
Mar-19	Scombridae	16	10.88
Apr-19	Scombridae	1	0.68
May-19	Scombridae	2	1.36
Sep-19	Scombridae	24	16.33
Oct-19	Scombridae	8	5.44
Nov-19	Scombridae	2	1.36
Dec-19	Scombridae	17	11.56
Jan-20	Scombridae	49	33.33
Feb-20	Scombridae	21	14.29
Mar-20	Scombridae	7	4.76