Species Composition, Density and Distribution of Fish Larvae in the Cambodian Water

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Abstract

The species composition of fish larvae in different habitats are very important for fisheries management. In total of 2,606 individual representing 47 families were collected between 10 – 21 November from 22 stations in Cambodian water. Sample was collected using a oring net from the surface layer and an oblique haul each station. Time for haul depended on water depth. The mean density of ichthyoplankton at this area was 658 ind./1000 m^3 .The catches consisted primarily of fish larvae, indicating that the Cambodian water was important as nursery ground for fish. The top major families were Gobiidae (42.55% contribution), Engraulidae (9.98% contribution), Bothidae (9.22% contribution), Bregmacerotidae (42.55% contribution) and Caragidae (9.98% contribution) were dominant in the catch. Station 16 had highest density amongst the stations. The average diversity index was 1.72. The average evenness index was 0.88. The average family richness was 11 families. Amongst 47 families, 10 appeared to be commercially important and they are inhabit inshore as adults fish.

Key words: Species composition, Fish larvae, Oring net, Cambodian water

I. Introduction

Cambodian water is one of large marine ecosystem, which coast of Cambodia is along 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 Sihanoukville 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 km^2 (Chamchang,2008) and relatively shallow with an average depth of about 50 meters.

Ichthyoplankton research is a key role in our understanding of the ecology and evolution of fish and their constituent populations. Research into the distribution and abundance of ichthyoplankton is likely to improve our understanding of the interrelationships between fish species during their early life stages, estimate the size of a spawning stock from habitat. In this present work, the study of ichthyoplankton is a part of the biological oceanographic survey aimed for fishery management (Rezagholinejad,2016). The understanding of abundance and distribution of fish larvae inconjunction with ecological conditions could fill up the gap in the study of fish life history.

Nowadays, little information is available about the ichthyoplankton of the Cambodian water. Hence, the study aimed to investigate the species composition, density and distribution of fish larvae in Cambodian water.

II. Materials and Methods

2.1 Study site

Ichthyoplankton samples were collected at 22 station in Cambodian water (9°12′-11°24′ N and 101°98′ – 103°62′ E) during November 10 – 21, 2016 using the vessel Koyo Maru.

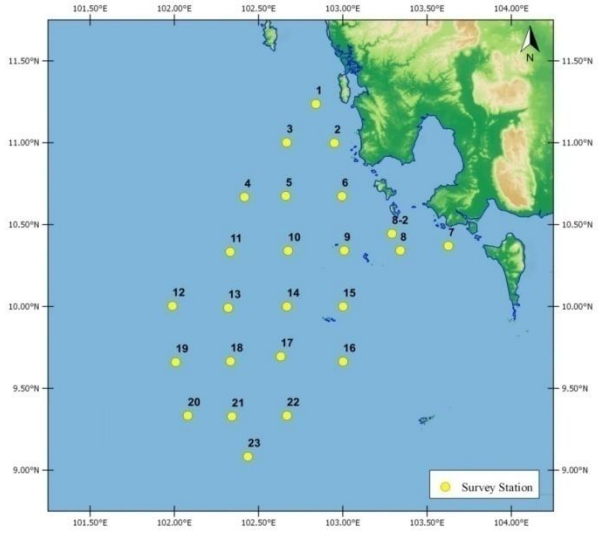

Figure1. Position of Oring net operation

2.2 Sampling Procedures

All fish larvae were collected by Oring net 130 cm. in diameter (mesh size of upper part2 mm. and lower part 335µm.).A flow meter was attached to the mouth of net to determine the volume of sea water filtered during each tow. The sampling period depended on water depth from the surface layer and an oblique haul each station at ship speed of 2 knots. Collected specimens were preserved in 10 % formalin sea water buffered and then analyzed identified in the laboratory, after which they were changed to 70 % ethyl alcohol solution.

2.3 Laboratory Method

Fish larvae were identified mainly to family level base upon description given in number of reference for larval fishes (Leis and Carson-Ewart, 1983; Russell, 1976; Okiyama, 1988;).Unidentified larvae were placed in unknown category due to the samples were too small to identify and damaged larvae were placed in incomplete category

2.4 Data Analysis

The fish larvae were identified through keys provided by, Nelson (2006). The number of total fish larvae and the top five most abundant families which were standardized to number caught per 1000 m^3, at the different sampling stations to compare the distribution of fish larvae, their abundance and diversity. In order to calculate diversity of fish larvae assemblage Diversity index ($H^{'}$). Family richness index (Margalef, 1958) and **evenness index** (Pielou, 1996)**.**

III. Results

Total fish larvae

In total of 2,606 fish larvae (the average of total larvae 95 ind./1000 m^3),the fish larvae assemblage comprised 48 families. The density of ichthyoplankton at this study site was 0 to 658 individual/1000 m^3. Five dominant families, Gobiidae (42.55%) was the family which had the highest abundance that is followed by Engraulidae (9.98%), Bothidae (9.22%) Bregmacenrotidae (7.96%) and Carangidae (7.28%) (Table 1) were observed consistently throughout the station in the investigated area. The highest density was observed at station 16 and the lowest at station 20. Base on the constancy of occurrence, 5 families of Gobiidae, Engraulidae, Bothidae, Bregmacerotidae and Carangidae were consider as constant families of which Engraulidae, Bothidae, Carangidae were the commercial important family.

Referring to the category adult's habitat, 3 families were neritic fish, 26 families were inshore-reef fish, 11 families were shallow to oceanic fish and 2 families (Ophidiidae, Exocoetidae) were oceanic fish

Table.1 Density of fish larvae at Cambodia water between 10 – 21 November 2015.

Family	Ind./1000 m^3	% of total fish larvae	Family	Ind./1000 m^3	% of total fish larvae
Gobiidae	30	42.55	Tetraodontidae	1	0.34
Engraulidae*	7	9.98	Priacanthidae*	1	0.27
Bothidae*	7	9.22	Scorpaeridae	1	0.26
Bregmacenrotidae	6	7.96	Lethrinidae*	1	0.24
Carangidae*	6	7.28	Sphyraenidae*	1	0.24
Nemipteridae*	3	4.30	Serranidae*	1	0.16
Clupeidae*	2	2.67	Sillaginidae*	1	0.14
Callionymidae	2	2.57	Citharidae	1	0.11
Leptocephalus	1	1.59	Siganidae	1	0.11
Lutjanidae*	1	1.50	Antennariidae	1	0.08
Leiognathidae	1	1.24	Polynemidae	1	0.08
Scombridae	1	1.08	Carapidae	1	0.07
Cynoglossidae*	1	0.99	Ophidiidae	1	0.05
Mullidae*	1	0.70	Exocoetidae	1	0.04
Sciaenidae	1	0.63	Centriscidae	1	0.04
Apogonidae	1	0.55	Paralichthyidae	1	0.04
Platycephalidae	1	0.54	Syngnathidae	1	0.04
Synodontidae*	1	0.54	Holocentridae	1	0.04
Champsodontidae*	1	0.52	Opistognathidae	1	0.04
Labridae*	1	0.43	Terapontidae*	1	0.04
Monacanthidae	1	0.35	Gerreidae*	1	0.03
Cepolidae	1	0.34			

* Commercial fish

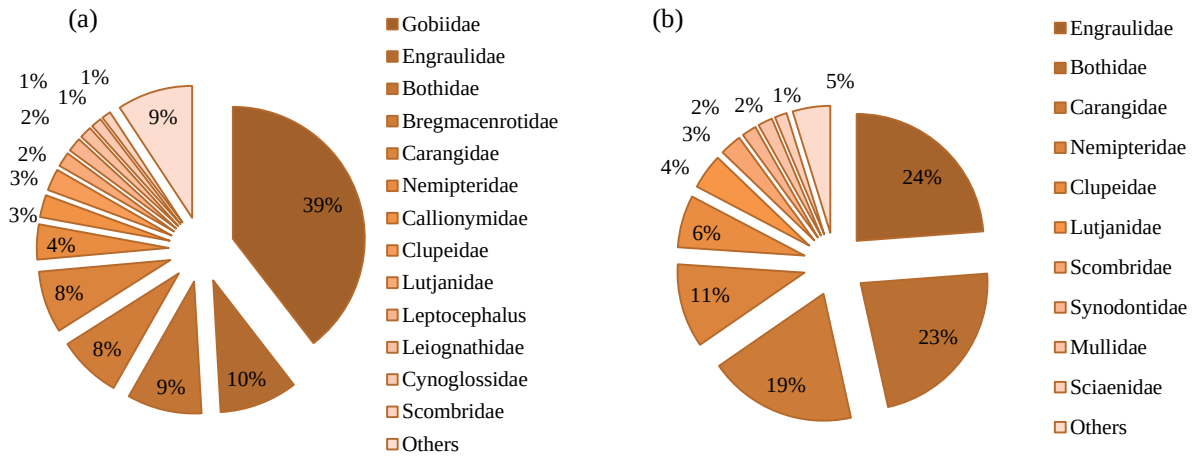

Figure.2 Total of fish larvae a) Percent of total fish larvae b) Percent of total commercial fish

Distribution of the top five commercial fish larvae

For fish larvae were found 42 families, 10 families all of them (Fig.2b) (more than 44% of total fish larvae) were important commercial species. Five commercial fish were the most density family comprising Engraulidae, Bothidae, Carangidae, Nemipteridae and Clupeidae

Engraulidae

Engraulids larvae were observed at 11 out of 22 sampling station, most of them situated in station 16, follow by station14 and station 10. In summary, almost engraulids larvae were distributed in near shore. (Fig.3a)

Bothidae

Bothids larvae were observed at 18 out of 22 sampling station, They were the second most **abundant** family of commercial fish in this study. They were largely distributed but more abundant near shore. (Fig.3b)

Carangidae

Carangids larvae were ranked the third density of the total commercial fish (Fig.4b). They were commercially important fish have constituted 8 % of the total fish larvae (Fig.4a). Almost found in all station, they were largely distributed. (Fig.3c)

Nemiteridae

Nemiterids larvae were observed at 11 out of 22 sampling station, They were important in both commercial and artisanal fisheries, which were ranked the fifth density of the total commercial fish. Mostly they were distributed in near shore. (Fig.3d)

Clupeidae

Clupeids larvae were ranked the fifth of total commercial fish, observed at 9 out of 22 sampling station. They were distributed in mid-southern part on Cambodian water. (Fig.3e)

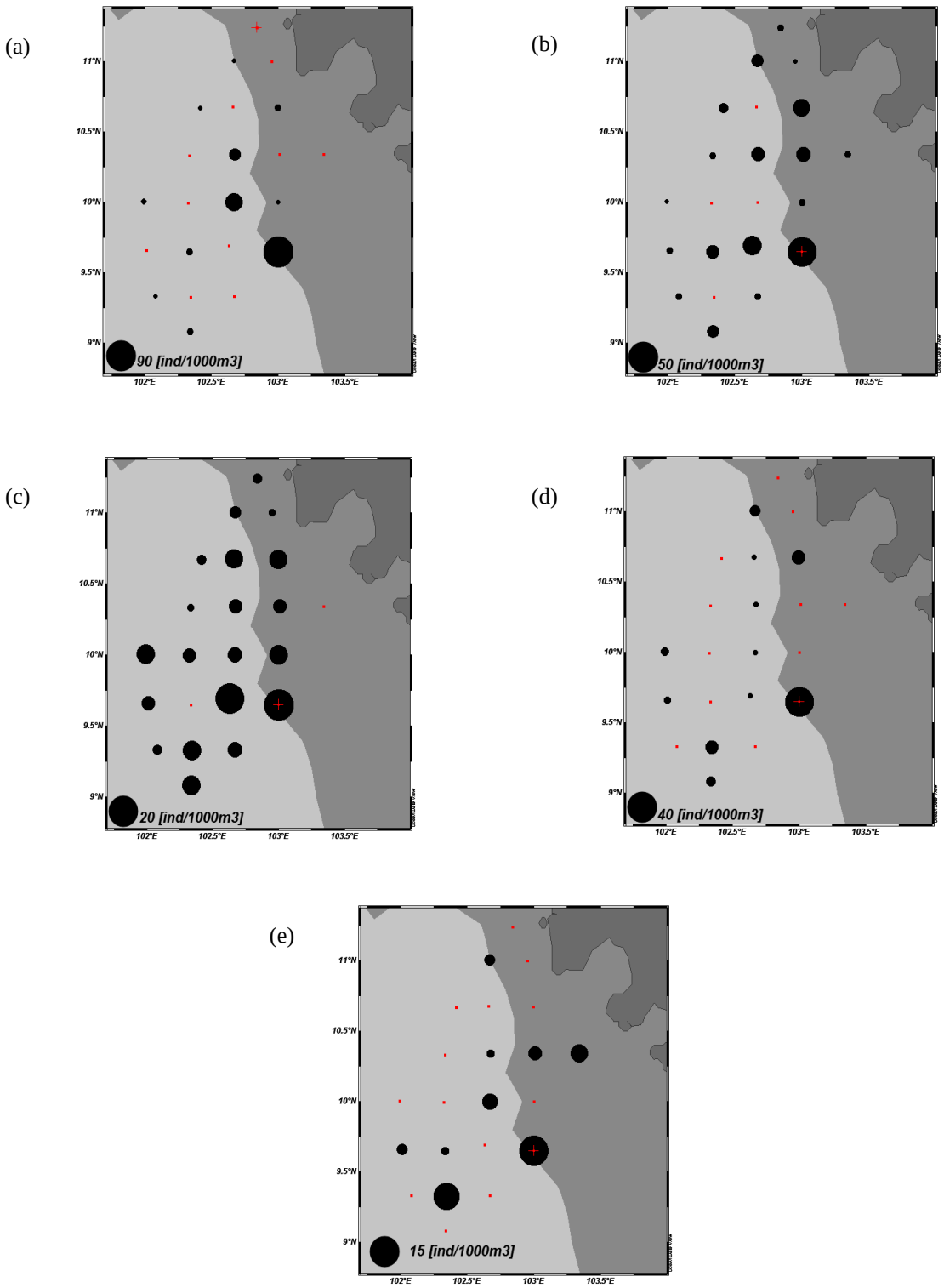

Figure.3 Distribution of top five commercial fish larvae a) Engraulidae b) Bothdae c) Carangidae d) Nemipteridae e) Clupeidae

Ecological indices

The average diversity index was 1.72 in the investigate area. (Table 2)The highest value of diversity index (H′) was at station 19 (2.44) , follow by station 16 (2.37) and station 12 (2.10) with the lowest at station 8 (0.87). The average evenness index was 0.80 in the investigate area. The highest value of evenness index was at station 22 (0.99) and the lowest at station 14 (0.39). Average family richness showed 11 families in the investigate area. The

highest value of family richness was at station 21 (24 families), while was found with lowest value at station 3 and 13 (3 families)

Table.2 Ecological index of fish larvae

Station	Diversity index	Evenness index	Family richness
ST.01	1.52	0.95	5
ST.02	1.75	0.98	6
ST.03	2.05	0.76	15
ST.04	1.87	0.90	8
ST.05	1.88	0.82	10
ST.06	2.37	0.82	18
ST.08	0.87	0.79	3
ST.09	1.43	0.74	7
ST.10	2.07	0.73	17
ST.11	1.67	0.93	6
ST.12	2.10	0.80	14
ST.13	0.96	0.87	3
ST.14	1.21	0.39	22
ST.15	1.79	0.86	8
ST.16	1.68	0.55	21
ST.17	1.73	0.66	14
ST.18	1.74	0.84	8
ST.19	2.44	0.84	18
ST.20	1.37	0.99	4
ST.21	1.89	0.60	24
ST.22	1.47	0.92	5
ST.23	1.95	0.81	11
Average	1.72	0.80	11

IV. Discussion

This study was the total fish larvae belonging to 43 families observed in Cambodian water. In addition, a comparative analysis of our data with the results of ichthyoplakton surveys carried out in November 20-23, 2005 (Chamchang, 2008) was made. These authors identified 32 families (the density of fish larvae was 0-783 ind./1000m^3), including Gobiidae, Engraulidae and Bothidae was dominant, in the sample collected in Cambodian water. A comparison of ichthyoplankton collected in Chang Island, Trat province; Thailand (Songchisawat, 1989) surveys carried out in January-December 1987,which nearby area Cambodian water showed that Gobiidae, Engraulidae and Bregmacerotidae was dominant. Similar with the study by Termvidchakorn (2016), who surveys in Ao Trat and Chong Chang between March 2014 and January 2015, found that Gobiidae was the dominant family. Gobiidae are distributed widely in the coastal areas regardless of climate and factors such as temperature and biological variables (Ara et al.,2012; Kwak and Klumpp, 2003; Blaber et al.,1997)

This study first report for analysis diversity index and evenness index in Cambodian water. A comparison studies by Termvidchakorn (2016), that nearby area Cambodian water found that the average diversity index was 2.07 (this study was 1.72) and the average evenness index was 0.80 (this study 0.80). Factor that can contributes difference of diversity index and

evenness index are food and availability, predator abundance, larval behavior and physical condition (Leis, 1991). The spatial distribution in species composition and density appear to be considerable for fish larvae communities utilizing Cambodian water, where was coastal area.