Interactive comment on “Distributions and assemblages of larval fish in the East China Sea in the northeasterly and southwesterly monsoon seasons 2008” by Chen et al.

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Response to Anonymous Referee#1

Thanks for the very constructive comments. We have made presentation following reviewer’s suggestions and revised the figures. Below, we copied reviewer’s comments in bold, followed by our responses. Updated figures and tables are shown in the end of this document.

General comments:

The manuscript showed ichthyoplankton communities in relation to hydrographic conditions in winter (northeasterly monsoon season) and summer (southwesterly monsoon season) 2008 in the East China Sea. This type of studies has been reported in many papers in the waters around Taiwan and the East China Sea (e.g., Okazaki and Nakata 2007; Lo et al. 2010; Hsieh et al. 2012). Unfortunately, the current manuscript fails to show properly new findings, so authors may need to emphasize differences from the previous outcomes and discuss more relevance to the previous ones. Since few studies have been conducted in the center of the East China Sea, it would be advantage of this study.

[Response] Thanks for the comment. We add a summarized table (table 5) that compared with previous studies and our study, more detail comparison was discussed. Because this comment is related with the following questions, we therefore replied as follow.

As no clear statements on the aims were mentioned in introduction, it would be hard for readers to understand focus of this study. What are motivations of this study? Although authors addressed that this study was a part of the Long-term Observation and Research of East China Sea (LORECS) to assess the impacts of the reduction in Changjang River discharges on marine environments, it would be difficult to show contribution of this single year-study in the project LORECS. So, it would be better to address this in acknowledgement. The last paragraph of introduction requires clear aims of this study to discriminate from the previous studies.

[Response] Following the suggestions, we have almost completely rewritten the manuscript. In this revision, we have clarified the differences from the previous studies. The paragraph in Introduction section has been revised as following:

P.7077 line6: (The changes in the revision are shown in italic.)

Many studies have been conducted on the changes in the structure of larval fish assemblages in relation to the hydrographic conditions, such as current transportation (Sassa et al., 2006), seasonal changes (Hsieh et al., 2011), and food availability and competition (Sassa et al., 2008). For ECS such studies have been made on a shelf break area (Okazaki and Nakata, 2007) and the waters around Taiwan (Hsieh et al., 2010). *The former mainly focus on larval fish effect by Kuroshio in summer, and the latter was larval fish with South China Sea Surface Current and Kuroshio Current on waters around Taiwan also in summer.* Recently, more attentions have been made on effects of monsoon systems on marine environments, particularly on the circulation pattern especially in Taiwan Strait (Lo et al., 2010; Hsieh et al., 2010, 2011, 2012). With these there were the studies on the spatio-temporal difference in larval fish assemblages in relation to local hydrographic features between different monsoon seasons in the northwest Pacific Ocean (Hsieh et al., 2011, 2012). *However, the previous studies mainly reported the investigation of larval fish assemblages in the waters around Taiwan, related issue over the central East China Sea has yet well understood. This study therefore provided the rarely found result of field survey of larval fish associated with hydrographic features in the East China Sea.*

P.7077 line 16:

We have been conducting the Long-term Observation and Research of East China Sea (LORECS) since 1997 to determine the biogeochemical cycle and main plankton loop to assess the impacts of the reduction in Changjiang River discharges on marine environments caused by the construction of Three Gorges Dam in 2003 (Gong et al., 2007). *This study was a part of the LORECS but the influence of artificial environment changes was difficult to display in an annual data. For this reason, this survey focuses on changes of different monsoons. We tried to investigate the species composition, spatial distributions of fish larval assemblages and abundance of larval fish in the ECS. In addition, we compared larval fish between the two distinct monsoon seasons and their relationships to environment factors on the continental shelf of East China Sea. Moreover, we discussed and determined the effect larval abundance factors.*

Authors concluded that environmental factors affecting larval abundance are water temperature during winter and food availability during summer. Results supporting the conclusions, however, include ambiguity and arbitrariness. First, no definition on primary production and zooplankton as a food source for larval fish was mentioned in the text. Does zooplankton wet weight mean zooplankton collected simultaneously with fish larvae or another zooplankton ring net for examining food availability, such as

density of copepod nauplii? In the case of the former procedures (at least the context means so), it would be difficult to evaluate food availability for larval fish. Even though authors noted its difficulty in discussion, they concluded that food availability affects spatial distribution of larvae in summer based only on a positive relationship between larval abundance and primary production.

[Response]In general, there was no direct evidence that zooplankton or phytoplankton were prays for larval fish but they must existed a correspondence relationship. In previous studies authors usually used zooplankton abundance and chlorophyll-a concentration as indicators of the amount of fish larval food sources. In this study, zooplankton collected with fish larvae by the ORI net with a mesh size of 330 um mesh. We add sentences about how to collect and analysis of primary production and zooplankton in the "Materials and methods" section.

P7078 line 13:
Larval fish and zooplankton abundance were calculated and standardized as CPUE (number of individuals/1000m3) and zooplankton Wt (g/1000 m^3).

P.7078 line 15:
Hydrographic data and water samples for nutrients, chlorophyll a and primary productivity measurements were taken by the CTD (SBE9/11 plus, Seabird Inc., USA) and Rosette (Model 1015, General Oceanics Inc., USA). Nutrient samples were collected with Teflon coated Go-Flo bottles (20L, General Oceanics Inc., USA) mounted on a rosette sampler and stored under liquid nitrogen until analysis. Analytic methods for the determination of nutrients (nitrate, phosphate and silicate), chlorophyll-a and primary productivity are described (Chen et al., 2009; Gong et al., 2011).

P.7078 line 24:
CPUEs is used in describing and comparing larval distributions between geographical regions. Zooplankton Wt is used in describing zooplankton abundance. Chlorophyll-a concentration and primary productivity (PP, mgC/m^2d) are used in describing the phytoplankton biomass and productivity of phytoplankton. Therefore, in this study, we used the zooplankton Wt, chlorophyll-a concentration, and primary productivity as indicators of the amount of fish larval food sources.

On the other hand, larval abundance in winter positively correlated with zooplankton wet weight in addition to SST, but authors concluded that larval abundance is affected by water temperature rather than food availability. As authors noted difficulties on evaluating food availability, it would be plausible that SST affected larval abundance

than did food availability in winter. Differences in conclusions between summer and winter, however, are based on the arbitrary logics. Authors need to clarify definition of primary production and zooplankton wet weight and understand what these indices mean.

[Response] In winter, a significant, positive correlation was found only between CPUE and sea surface temperature. In summer, CPUE were significantly, positively correlated with primary production and zooplankton wet weights. In this study, zooplankton collected with fish larvae by the ORI net with a mesh size of 330 um mesh; thus larval fish was dominated by the pre-flexion and flexion stages. Therefore, it is difficult for larval fish to eat zooplankton we collected. In addition zooplankton was related with SST in previous surveys. Hence, it is difficult to explain the direct relationship of food supported between larval fish and zooplankton. For these reasons, we discussed the relationship between zooplankton and larval fish in discussion paragraph of 4.2.

Analysis for ichthyoplankton communities are OK but their distribution patterns in relation to environmental factors includes many problems. I suggest that the current manuscript need major changes including a critical focus on this study, new data analysis in results and much more detailed discussion on relevance to the previous studies.

[Response]We add a compared table of previous studies and this study (Table 5).
P.7084 line24:

Many biological features, such as trophic level, life style and migration, are not obviously different among larval stages and species. Fish larvae are pelagic plankton in the early life stages of fishes whose ecological features differ from their adults (Leis, 2006). Therefore, ecological features were not the main reason for group structures. Table 5 was a summary obtained from the several previous studies of larval assemblage and comparable with this study. According to previous studies, larval assemblages were almost effect on different current, China Coastal current and Kuroshio especially. In this study, there were three larval fish assemblages, inshore assemblage, offshore assemblage and summer coastal assemblage in ECS. Even then, our result still showed that the abundance of the larvae differed significantly at each of the assemblages between the two monsoon seasons. The summer coastal assemblage had the highest average CPUE, about 2061 ind./1000m^3, that was about 12 times higher that of the inshore assemblage and 7 times higher than that of offshore assemblage. Moreover, spatial distribution and species composition among the three assemblages were also differed significantly. As paragraph of the previously discussion, we suggest that it depends on primary production supply.

In previous studies, larval assemblage could be basically divided into two categories, cold/warm period group, and coast/kuroshio group. Our result spanning summer and winter was including the above mentioned groups. In the northeasterly monsoon season, the offshore assemblage occupied a few shelf areas at the latitudes from 26ºN to 28ºN, while the inshore assemblage occupied the southern area of ECS. This inshore assemblage receded toward the Changjiang River estuary and bank in the southwesterly monsoon season. *Hsieh et al. (2011) proposed the China Coastal Current group come from the coastal waters of mainland China when the northeasterly monsoon reigned and Kuroshio group was from the offshore Kuroshio waters year-round.* Scorpaenid larvae were dominant *of inshore assemblage* in both monsoon seasons. Wu (2000) indicating their optimal temperature ranged between 10 ~ 14 ºC that fairly well corresponded to the temperature < 19 ºC, salinity < 33 psu) of the southward China Coastal Current (Jan et al., 1998; Chen and Wang, 2006). In addition, Adult scorpaenid preferred to live the shallow near-shore waters with rocky bottom and belong to settled habitat type (Okiyama, 1988), so the place of adult scorpaenid life was its spawning ground.

The spatial distributions of the offshore assemblage stations were found to be fairly stable in the shelf waters. However, the two most dominant species were *Valamugil* spp. and *Sigmops gracilis* in the northeasterly monsoon season but changed to *Trachinocephalus myops* and *Auxis* larvae in the southwesterly monsoon season. Among them *Valamugil* larvae was widely distributed in the ECS and Taiwan Strait, but their taxonomy and ecology are still not clear (Durand et al., 2012). *T. myops* and *Auxis* larvae were abundant taxa important to the warm Taiwan Strait Current (Hsieh et al., 2012); while *Sigmops gracilis* have been recorded as the dominant species in the Kuroshio water (Hsieh et al., 2011). *Hsieh et al. (2011) reported that S. gracilis and Auxis larvae were abundant in Kuroshio group and transitional group (MIXG). Chen et al. (2012) also reported Auxis larvae were in the transitional and offshore area.* As shown in Fig. 7a, *Sigmops gracilis* was well related to the warm and saline water. Nakabo (2002) indicates that this adult species mainly inhabit the deeper oceanic waters and its larvae are pelagic life and abundant in the Kuroshio Current and offshore waters. In general, the larvae are pelagic plankton, sensitive to environmental changes (Ohshimo et al., 2012), and their survival depends on availability of food supply and suitable temperature. Moreover, Parmesan and Yohe (2003) also point out the current context of marked environmental changes may affect species distributions, natural resources and biodiversity. The above suggested that the change in the dominant species in the ECS between the two monsoon seasons might be due to the northward intrusion of Taiwan Strait Current and Kuroshio Current in the southwesterly monsoon season.

The summer coastal assemblage was biggest among the three assemblages. It was found in the coastal waters and the Changjiang River estuary and along its bank. *Su et al. (2011) proposed that seasonal turbulence enhances biological production potentially influencing growth and survival of larvae. Gong et al. (2011) also reported Changjiang River floods* *enhanced coastal ocean phytoplankton biomass potentially enhancing fish production. Therefore summer coastal assemblage was well received by influent of Changjiang River flood. E. japonicus* was the 3rd dominant species in this assemblage. It was distributed mainly at the Changjiang River estuary and south side of the river bank, similar to that reported by Iseki and Kiyomoto (1997), who also states that the estuary is its major spawning ground. Gobiid type 2 and *Saurida* larvae were the two most dominant species of the assemblage. Although the gobiid type 2 occur widely in the coastal waters of ECS, the larvae taxonomy and phylogeny of gobiidae are not well established and morphological characters useful for species diagnosis of the larvae are insufficient, resulting in the constraint in the species identification. It is not easy to identify larval fish to species level (Thacker and Roje, 2011; Ko et al., 2013). In order to solve the above problems, it has been suggested to employ bio-technique methodology (Spies et al., 2006; Ko et al., 2013).

Specific comments:

The last paragraph of 4.2 misleads the outcomes. It is described that larval (abundance?) increased with primary production but not SST and zooplankton wet weight. . .. This is incorrect, just larval abundance positively correlated with primary production but not with SST and zooplankton wet weight. . .. If authors would like to mention changing states, it would need to compare seasonal differences in larval abundances between winter and summer.

[Response]We revised the zooplankton Wt (g) into standardization zooplankton Wt (g/1000m^3). The paragraph has been revised as following and the figure 6 was corrected. In this study the situations of winter and summer were different. In winter, a significant, positive correlation was found only between CPUE and sea surface temperature. In summer, CPUE were significantly, positively correlated with primary production and zooplankton wet weights. We revised the result paragraph of 3.2 and rewrite the discussion paragraph of 4.2.

P.7080 line 19 (the result of 3.2):

Figure 6 shows the relationships between CPUEs and the environmental variables: sea surface temperature, primary production and zooplankton wet weight. In the northeasterly monsoon season, CPUE were significantly, positively correlated (r = 0.61, p < 0.05) with sea surface temperature only. There was no significantly correlation between CPUE and zooplankton Wt, when station E20 where a shrimp bloom occurred was excluded (r = -0.06, p > 0.05) (Fig. 6c). In the southwesterly monsoon season, a significant, positive correlation was found only between CPUE and primary production (r = 0.64, p < 0.05). A positive correlation was also found between CPUE and zooplankton Wt, when Station E19A where Changjiang River discharges occurred was excluded (r = 0.82, p < 0.05) (Fig. 6f).

P.7083 line 18 (paragraph of 4.2):

The major factors of larval abundance were temperature and food sources. First, we discussed sea temperature influence on abundance of larvae. In this study the abundance of larval fish in the northeasterly monsoon season was found to be much lower than that in the southwesterly monsoon season in the ECS (Table 2), a fairly similar result obtained by Hernandez et al. (2010). It has been known that larval fish are significantly abundant in the warm season (Meekan et al., 2003) and the low temperature (< 20 ºC) in general is not suitable for larval fish to live. Batty and Blaxter (1992) and Stoll and Beeck (2012) also indicate that growth and swimming ability of larval fish was impeded by the low temperature. Okazaki and Nakata (2007) suggest that the abundance of larval fish and species number are less so at lower temperature and increased with the warm temperature.

However, CPUE in our result were significantly positively correlated with sea surface temperature in the winter but not in summer. One reason was that in winter the sea temperature was variable and cold, so fish larvae increased with the increases of sea temperature. Another reason was that in summer the sea temperature was stable and warm (ca. 22~30 ºC), so temperature was not a limiting factor for larval survive any longer. The suitable warm temperature is considered to an important factor affecting the survival and production of larval fish in the northeasterly monsoon season (Zenitani et al., 2009). Based on the above, it is interesting that the larval increased with primary production and zooplankton but not SST in the southwesterly monsoon season contrast with the northeasterly monsoon season (Fig. 6). This suggested that the influence of SST on survival and production of larval fish decreased as the environment became warmer (> 25 ºC).

Food sources were another key for larval survive after the burn off all nutrient of yolk sac. In previous studies authors used zooplankton abundance and primary production measurements as indicators of the amount of fish larval food sources (e.g., Hsieh et al., 2010; Chen et al., 2012). Hsieh et al. (2010) was found abundance of larval fish was positively related to zooplankton wet weight and presumed to relate to availability of food sources. CPUE in our result were significantly positively correlated with zooplankton and primary production in the summer but not in winter. However, development stages of the larval fish collected with the ORI net with a mesh size of 330 um mesh was dominated by the pre-flexion and flexion stages. The mouth development at these stages was not completely established to enable the larvae to capture most of mature zooplankton.

Therefore, even zooplankton was also known to be the primary prey for larval fish. Mouth widths of larval fish must match with the prey sizes in predation (Cunha and Planas, 1999). Fifty percent of the larvae are able to capture prey when the size of the prey was equal to 85% of the width of the mouth. When the prey size is less than 57% of the width of the mouth, more than 95% larvae were able to capture them (Hunter and Kimbrell, 1980). In addition, Chen et al., (2012) was found that sea surface temperature was significantly positively correlated with zooplankton wet weight. Therefore, it was difficult for this study to examine whether zooplankton wet weight was a causal factor for the fish larval abundance, even they were significantly, positively correlated in the southeastern monsoon season (Fig. 6). The primary production is the biomass index of food availability for fish (Chen et al., 2004), suggesting that the production and survival of larval fish were influenced by primary production availability in the southwesterly monsoon season.

Although distribution patterns (neritic, oceanic benthic pelagic) in the adult stage are shown as superscripts in Table 3, these information do not contribute in discussion at all. It might be better to show spawning season of each species to compare it with the larval production.

[Response]Thank you for suggestion and we modified the table 3.
P.7085 line 22:

Among them *Valamugil* larvae was widely distributed in the ECS and Taiwan Strait, and mostly spawn in winter (table 3), but their taxonomy and ecology are still not clear (Durand et al., 2012). Spawning period of *T. myops* was February to October (spring to autumn, table 3) and warm sea temperature area (Sadovy and Cornish, 2000). Thus, *T. myops* and *Auxis* larvae were abundant taxa important to the warm Taiwan Strait Current (Hsieh et al., 2012); while *Sigmops gracilis* have been recorded as the dominant species in the Kuroshio water (Hsieh et al., 2011).

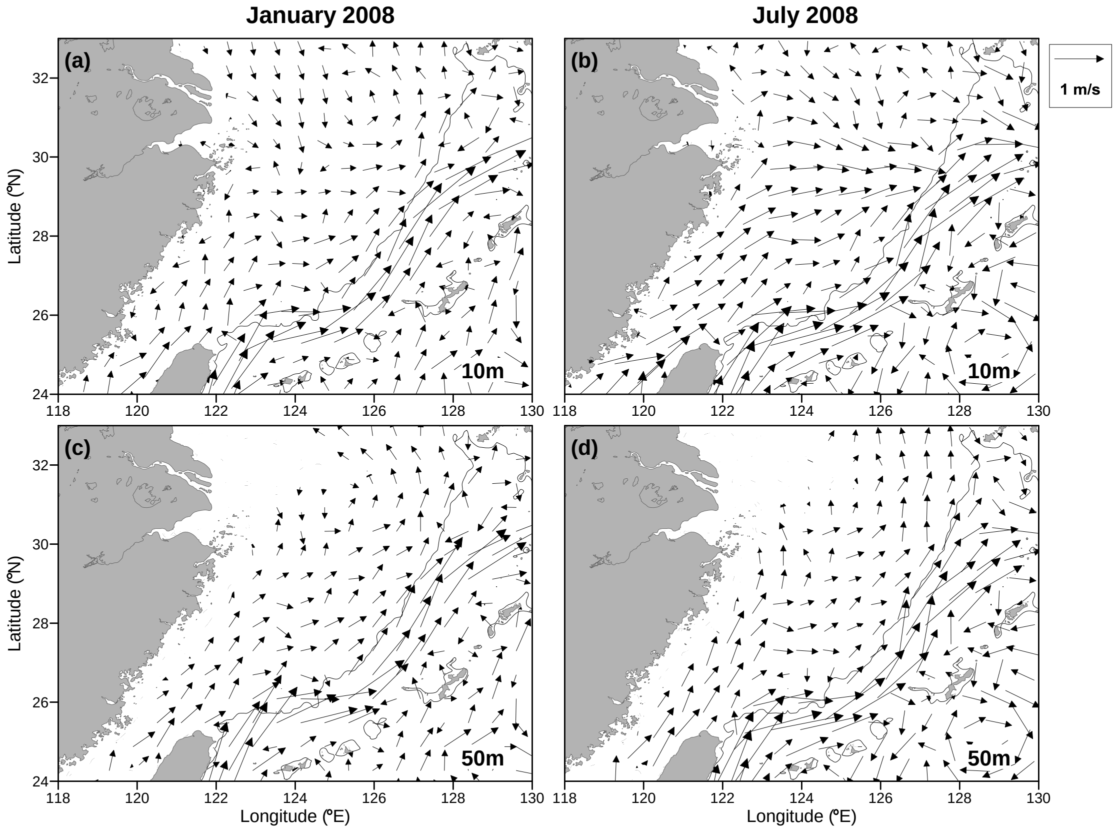
In results of hydrographic conditions in p. 7079, lines 18-24 and Fig. 3, it would be hard to identify changes in current structures from winter to summer in Fig. 3 as explained in the texts. Is the flow rate shown using not only length but also color of arrows?

[Response]Thank you for pointing out the problems. We have carefully taken care of writing. The paragraph has been revised as following and changed the figure 3 in monochrome:
P. 7079 lines 13-24:

In the wintertime, the strong northeasterly monsoon wind drove the near-surface current (10m) along the China coast to flow southward while which on the northwest off Taiwan still flow toward the north. During this time, the current in the lower layer along the China coast remained to flow northward (in an opposite direction from which in the near-surface) since the influence of wind stress became weak in this depth. In the summertime, the southwesterly wind enhanced the northward current in the Taiwan Strait, resulting in an eastward current on the shelf along 30ºN, due to a north-south convergence in this region. Note that in the 50 m depth, this eastward current was absent. To the east of Taiwan, the Kuroshio Current seems to be strengthened and diminished by the summer and winter monsoon respectively.

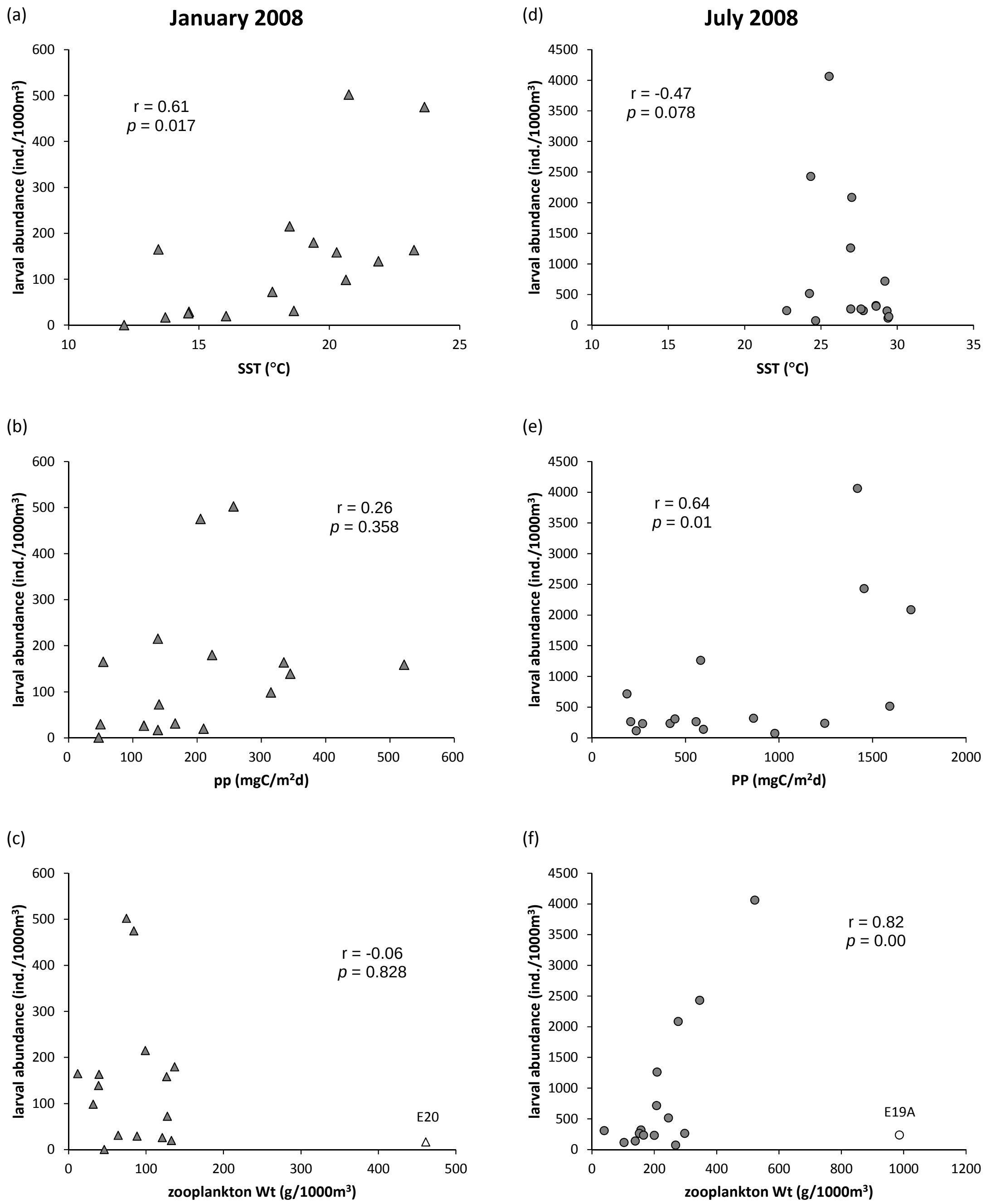
P. 7077, line 20, LORECES should be LORECS.

[Response]Corrected.



January 2008
July 2008
(a)
(b)
(c)
(d)
10m
10m
50m
50m
1 m/s
Latitude (ºN)
Longitude (ºE)
32
30
28
26
24
118
120
122
124
126
128
130

Fig. 3.



(a)
January 2008
r = 0.61
p = 0.017
larval abundance (ind./1000m³)
SST (°C)
(d)
July 2008
r = -0.47
p = 0.078
larval abundance (ind./1000m³)
SST (°C)
(b)
r = 0.26
p = 0.358
larval abundance (ind./1000m³)
pp (mgC/m²d)
(e)
r = 0.64
p = 0.01
larval abundance (ind./1000m³)
PP (mgC/m²d)
(c)
r = -0.06
p = 0.828
E20
larval abundance (ind./1000m³)
zooplankton Wt (g/1000m³)
(f)
r = 0.82
p = 0.00
E19A
larval abundance (ind./1000m³)
zooplankton Wt (g/1000m³)

Fig. 6.

Table 3. The abundance (CPUE, ind./1000m^3) and percentage contribution of dominant larval fish (> 80%) of three larval fish assemblages in ECS, 2008 (NE, the northeasterly monsoon season; SW, the southwesterly monsoon season). *The ecological information of species spawning season was remarked (specie level only, 1, spring; 2, summer; 3, autumn; 4, winter).*

Inshore assemblage			**Offshore assemblage**			**Summer coastal assemblage**	
Species	**NE (11)**	**SW (3)**	**Species**	**NE (5)**	**SW (8)**	**Species**	**SW (5)**
	Abu. (%)	**Abu. (%)**		**Abu. (%)**	**Abu. (%)**		**Abu. (%)**
Scorpaenidae	223 (26.45)	112 (20.18)	*Valamugil* sp.[4]	323 (22.61)		Gobiidae type 2	2344 (22.75)
Gobiidae	58 (6.89)	54 (9.64)	*Trachinocephalus myops*[1,2,3]		295 (12.79)	*Saurida* spp.	2234 (21.68)
Gobiidae type 1		88 (15.76)	*Sigmops gracilis**	230 (16.13)		*Engraulis japonicus*[1,2]	1378 (13.38)
Benthosema pterotum[1,2,3,4]	18 (2.09)	67 (12.09)	*Auxis* spp.		204 (8.83)	Gobiidae type 1	804 (7.80)
Trachurus japonicus[1]	66 (7.83)		Gobiidae type 1		172 (7.45)	*Bregmaceros* spp.	768 (7.45)
Gobiidae type 2	64 (7.66)		*Champsodon* spp.	32 (2.25)	121 (5.24)	*Cynoglossus* spp.	645 (6.26)
Engraulis japonicus[1,2]		64 (11.57)	*Bregmaceros* spp.	34 (2.38)	118 (5.13)	Sciaenidae	619 (6.01)
Apogontidae		60 (10.72)	*Diaphus* B group	102 (7.15)	39 (1.68)	Other species	1513 (14.68)
Scomber spp.	52 (6.16)		Sciaenidae		139 (6.03)	Total	10304 (100)
Saurida spp.	17 (1.98)	34 (6.07)	*Diaphus* A group	131 (9.18)		Average	2061
Callionymidae	33 (3.87)		Callionymidae	78 (5.50)	36 (1.57)		
Triglidae	31 (3.74)		Ophichthidae		98 (4.22)		
Trichiurus lepturus[1,2,3]	28 (3.38)		Bothidae	13 (0.89)	75 (3.26)		
Bregmaceros spp.	26 (3.04)		Apogontidae		83 (3.58)		
Teraponidae	24 (2.84)		*Cynoglossus* spp.		63 (2.72)		
Terapon jarbua[1,2,3,4]	22 (2.62)		*Vinciguerria nimbaria*[1,2,3,4]	29 (2.01)	23 (1.01)		
Gadidae	22 (2.60)		Ostraciidae		47 (2.02)		
Other species	66 (18.85)	26 (13.97)	Gobiidae		43 (1.84)		
Total	750 (100)	505 (100)	Serranidae type 1	13 (0.92)	26 (1.13)		
Average	68	168	*Myctophum asperum*[4]	37 (2.61)			
			Benthosema pterotum[1,2,3,4]		35 (1.51)		
			Ceratoscopelus warmingi[1,2,3,4]	33 (2.30)			
			Lophiidae		31 (1.36)		
			Ophidiidae		31 (1.35)		
			Percophidae		31 (1.34)		
			Engraulis japonicus[1,2]		24 (1.02)		
			Pleuronectidae		22 (0.94)		
			Decapterus maruadsi[1,2]		22 (0.94)		
			Mullidae		21 (0.92)		
			Maurolicus spp.	21 (1.48)			
			Myctophum orientale[3,4]		21 (0.90)		
			Leiognathidae		20 (0.87)		
			Decapterus spp.		19 (0.82)		
			Lampanyctus spp.	17 (1.19)			
			Synagrops spp.	15 (1.03)			
			Gempylidae	15 (1.02)			
			Notoscopelus spp.	14 (0.99)			
			Dentex tumifrons[4]	11 (0.80)			
			Other species	280 (19.56)	451 (19.53)		
			Total	1428 (100)	2310 (100)		
			Average	286	289		

*, lacked information

Table 5. Summary the several previous studies with this survey.

Scoure	Period	Survey area	Current	Larval abundance (ind./1000m^3)	Larval assemblage
Hsieh et al. (2007)	March 2005	25.7~26.2°N and 120~122°E	Kuroshio Current (KC)	6.7-352.2	coast assemblage transition assemblage Kuroshio edge assemblage
Okazaki and Nakata (2007)	May 2001	28.5~31.2°N and 126.5~128.5°E	Kuroshio Current (KC) Tsushima Warm Current (TWC)	Daytime: 202.7±202.4 Nighttime: 311.2±165.2	off-shelf/Kuroshio assemblage shelf break assemblage
Lo et al. (2010)	February and May 2003	21.5~26°N and 119~123°E	China Coastal Current (CCC) Kuroshio Current (KC) South China Sea Surface Current (SCSSC)	February: 979±388 May: 924±121	February: W1, W2, W3 assemblage May: S1, S2, S3 assemblage
Hsieh et al. (2011)	February, June, August, and November 2004	26°N and 121~123°E	China Coastal Current Kuroshio Current (KC) South China Sea Surface Current	February: 1300±1027 June: 1130±614 August: 1130±289 November: 377±167	SCSSC group CCC group KC group MIX group
Su et al. (2011)	February and August 2004	22~26°N and 121~123°E	China Coastal Current Kuroshio Current	441±141	summer shelf assemblage winter-summer shelf assemblage winter-summer Kuroshio assemblage winter shelf and summer Kuroshio assemblage
Chen et al. (2012)	June 2009	25.1~26.2°N and 120~123°E	Kuroshio Current	Total: 238.29	coastal group shelf group mixed shelf group Kuroshio group
Hsieh et al. (2012)	February 2003 to November 2004.	21.5~26°N and 119~121.5°E	China Coastal Current Kuroshio Current South China Sea Surface Current	949±186	cold-period northern Taiwan Strait assemblage southern Taiwan Strait assemblage warm-period northern Taiwan Strait assemblage
This study	January and July 2008	25~32°N and 120~127°E	China Coastal Current Kuroshio Current Taiwan Strait Current (TSC)	January: 2288 July: 13246	Inshore assemblage Offshore assemblage Summer coastal assemblage

Add the references:

Sadovy, Y., and Cornish, A.S.: Reef fishes of Hong Kong. Hong Kong University Press, Hong Kong, 321, 2000.

Su, W. C., Lo, W. T., Liu, D. C., Wu, L. J., and Hsieh, H. Y.: Larval fish assemblages in the Kuroshio waters east of Taiwan during two distinct monsoon seasons, Bull. Mar. Sci., 87, 13-29, 10.5343/bms.2010.1010, 2011.