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A Comparison Between Two Mesh Sizes of Bongo Net for Collecting Fish Larvae

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ABSTRACT

Ichthyoplankton samples were collected using bongo nets with mesh sizes of 200 μm and 330 μm at ten stations in the in the Taiwan Strait and the waters of northern Taiwan. A total of 651 fish larvae representing 50 families were identified. Members of the Clupeidae, Myctophidae, Engraulidae, Carangidae, Scombridae, Bregmacerotidae, Synodontidae, and Bothidae families accounted for 70.7 % of the total larvae collected. The plankton samples collected did not differ significantly between the two mesh sizes in terms of mean filtered volume or the amount of organic material. Similarly, the overall larval fish density, mean length, and length distribution of the dominant taxa, with the exception of the Engraulidae family, also showed no significant differences between the two mesh sizes. However, the size distributions of the dominant families indicated that the morphologies of the fish larvae did influence the efficiency of mesh retention. Relatedly, the results indicated that the extrusion of filiform or smaller fish larvae has to be taken into account to obtain more robust estimates from 330 μm mesh nets when abundances are used in quantitative population studies. Nonetheless, the present study confirmed that icthyoplakton samples collected with the two mesh sizes are comparable when used in qualitative studies of community structures in the in the Taiwan Strait and the waters of northern Taiwan.

Key words: fish larvae, bongo net, mesh size

INTRODUCTION

The sampling of fish larvae with plankton nets is commonly employed in fisheries research (Wiebe and Benfield, 2003; Dougherty *et al*., 2010) due to the relatively low cost of the gear used, the ease of deployment, and the need to maintain a standard protocol over long periods of time (Hernandez *et al*., 2011). Plankton nets are designed to characterize the distribution and abundance of fish larvae and eggs, and to assess spawning periods. The abundances of larval fish collected can be used as independent fisheries data in order to develop an index of the abundances of fishery resources, and such data can be used by researchers to study interannual variability in fish stocks and the effects of environmental factors (Lo, 1993; Lo *et al*., 2001; Richardson *et al*., 2010; Habtes *et al*., 2014). Therefore, accurate length distributions are required when such data are used in producing estimates or indices of stock sizes or recruitment (Somarakis *et al*., 1998), especially for the quantitative assessment of ichthyoplankton (Lo, 1993; Sammons and Bettoli, 1998; Lo *et al*., 2001; Isermann *et al*., 2002). Relatedly, while widely used in broad scale surveys, factors contributing to possible sources of bias in larval fish collections have to be taken into account. These factors include the extrusion of captured material through the mesh of nets, the clogging of the mesh of nets due to the presence of large zooplankton and

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phytoplankton (Isermann *et al*., 2002; Hernandez *et al*., 2011), avoidance (McGowan and Fraundorf, 1966), and the patchiness of populations (Johnson and Morse, 1994; Habtes *et al*., 2014).

Previous studies have documented the effects of mesh size on the retention of larval fish (Somarakis *et al*., 1998; Isermann *et al*., 2002; Hernandez *et al*., 2011). In a comparison of 202 μm and 333 μm mesh plankton nets, Hernandez *et al*. (2011) reported that the fish egg densities, larval densities, and length frequency distributions largely overlapped over relatively short towing durations in the northern Gulf of Mexico. Meanwhile, Somarakis *et al*. (1998) determined that 335 μm mesh nets sufficiently retained European anchovy (*Engraulis encrasicolus*) in the Aegean Sea. These studies suggested that the extrusion of larval fish is minimal for 333 μm mesh nets used with relatively low tow speeds (0.8-1.3 m s^{-1}).

However, the extrusion of larval fish through 333 μm mesh has also been reported in some studies. Lo (1983) estimated a 0.63 retention rate for northern anchovy (*Engraulis mordax*) larvae < 4 mm with 333 μm nets in waters off California. Subsequently, Houde and Lovdal (1984) reported that larval fish abundances were approximately eight times higher in samples collected with 35 μm mesh nets than in those collected with 333 μm mesh nets in Biscayne Bay, while Comyns (1997) reported that the abundances of red drum (*Sciaenops ocellatus*) larvae collected in the Gulf of Mexico were eight times higher in samples collected with 202 μm mesh nets than in samples collected with 333 μm mesh nets. Similarly, Schobernd *et al*. (2018) revealed that smaller larvae (1.5-3 mm) were retained in greater numbers in 202 μm mesh nets than in 333 μm mesh nets, with extrusion being most evident for small, undeveloped larvae, in the Gulf of Mexico.

However, the contrasting results of these studies may have been because they were conducted in different waters in which the densities and compositions of plankton and the ontogenies and morphologies of larvae are different, which could result, in turn, in variability in filtration efficiency. Moreover, no previous studies have been done to compare plankton nets with different mesh sizes in terms of the catchability of fish larvae in the waters around Taiwan. Therefore, the objective of this study was to compare the density, composition, diversity, and length distributions of fish larvae collected using bongo nets with mesh sizes of 200 μm and 330 μm in the waters of Taiwan in the western North Pacific Ocean.

MATERIALS AND METHODS

The study was carried out at ten sampling sites (stations 1 - 10) in the Taiwan Strait and the waters of northern Taiwan (Fig. 1) on board the RV Fishery Researcher I between 23 April and 26 April 2011. Information about the sampling stations is provided in Table 1. Fish larvae were collected using Bongo nets with mouth diameters of 60 cm fitted with, respectively, 200 μm and 330 μm mesh nets. A flowmeter (Hydro-Bios, model 438 115) was mounted across the center of each net mouth to measure the volume of water filtered during each tow. Each net was towed obliquely from 100 m below the surface (or from 10 m above the bottom for stations with a depth < 100 m) to the surface at each station at a speed of 1 m s^{-1}. After the net was brought onboard, any ichthyoplankton specimens caught were immediately preserved with 95% ethanol. In the laboratory, the fish larvae were identified to the lowest taxonomic level whenever possible. Since the body shapes of larval fish of the same family are similar, fish larvae were grouped to the family level in order to increase the power of the subsequent statistical analysis. The total length (TL) was measured to the nearest 0.1 mm for all the fish larvae. Fish eggs were considered as a single group. The density of fish larvae and fish eggs was expressed as the number of individuals per 1000 m^3.

Because the data were not normally distributed (D'Agostino-Pearson test, $p < 0.05$), and because the groups had unequal variances (Bartlett's test, $p < 0.05$), non-parametric Mann–Whitney tests (Scherrer, 1984; Zar, 1999) were used to compare the mean values of tow performance, larval fish density (ind./1000 m^3), and total length (mm) between the nets with the two different mesh sizes. Kolmogorov–Smirnov asymptotic two-sample tests were then used to compare the length-frequency distributions of larval fish between the two mesh sizes for the dominant families. Statistical significance was set at α = 0.05. The significance levels were adjusted with Bonferroni correction of alpha for multiple comparisons (Sokal and Rohlf, 1995) to limit Type I error. The similarity of the species composition of the larval fish caught at the various sampling stations was measured using the Bray–Curtis similarity index based on the log (x+1)-transformed abundance of the larval fish (Bray and Curtis, 1957). Only species that accounted for 2% or more of the total number of specimens were included in the analysis. Furthermore, group-average linking was employed to illustrate the relationships among the stations in a dendrogram.

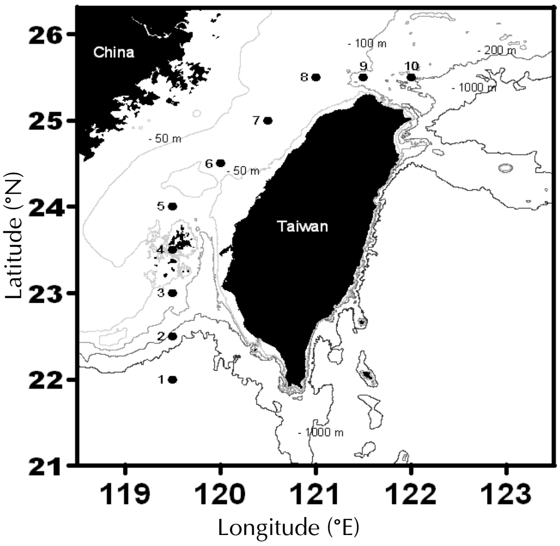

Fig. 1 Locations of sampling stations (solid circles) for fish larvae collected with the 200 μm and 330 μm mesh nets in the Taiwan Strait and waters of northern Taiwan in April 2011. Isobaths are illustrated.

Table 1 Information about sampling stations in the Taiwan Strait and waters of northern Taiwan in April 2011

Station	Latitude (°N)	Longitude (°E)	Depth (m)	Haul depth (m)
1	22.01	119.50	2394	100
2	22.50	119.50	237	100
3	23.01	119.50	73	70
4	23.43	119.50	55	40
5	24.01	119.49	61	50
6	24.51	120.02	62	54
7	25.00	120.50	74	70
8	25.50	121.00	91	75
9	25.50	121.49	112	100
10	25.50	122.00	118	100

RESULTS

1. Comparison of ichthyoplankton composition between the two mesh sizes

A total of 651 larval fish were collected, with 376 and 275 individuals observed in the 200 μm and 330 μm mesh nets, respectively (Table 2). A total of 50 families of larval fishes were identified, and the ranking of the different fish taxa in the overall composition is shown in Table 2. Forty-two and 41 families of larval fishes were observed in the 200 μm and 330 μm mesh nets, respectively. In contrast, 9 families (Pomacentridae, Paralepididae, Moridae, Priacanthidae, Nemipteridae, Synanceiidae, Dactylopteridae, Antennariidae, and Coryphaenidae) were only collected in the 200 μm mesh nets and 8 families (Platycephalidae, Sparidae, Cirrhitidae, Tetraodontidae, Stomiidae, Holocentridae, Gempylidae, and Congridae) were only collected in the 330 μm mesh net (Table 2). Members of only eight families accounted, respectively, for more than 2% of all the fish larvae caught, with these eight families collectively accounting for 70.7% of the total catch. Among those families, the Clupeidae family was the most dominant in the catches for both mesh sizes (29.3%), followed by the Myctophidae (13.1%), Engraulidae (6.5%), Carangidae (6.0%), Scombridae (5.2%), Bregmacerotidae (4.5%), Synodontidae (3.2%), and Bothidae (2.9%) families. Furthermore, twelve families (from Cirrhitidae to Coryphaenidae) made only a single appearance in both types of nets (Table 2), while unidentified fish larvae accounted for 6.8% of the total catch.

2. Filtration efficiency

The ratios of the 200 μm mesh nets over the 330 mesh nets μm in terms of filtered volume, wet weight, number of families, and number of individuals are illustrated in Fig. 2. On average, the filtered volume obtained using the 200 μm mesh nets was about 10% lower than that obtained using the 330 μm mesh nets (Fig. 2a), while the filtered volume obtained using the 200 μm mesh net was exceptionally lower at station 4. The wet weight (i.e., of organic material) obtained using the 200 μm mesh nets was higher, on average, than that obtained using the 330 μm mesh nets, except in the cases of station 9 and 10 (Fig. 2b), where the wet weights obtained using the 200 μm mesh nets were slightly lower. At stations 3 and 7, the wet weights obtained using the 200 μm mesh nets were more than two times higher than those obtained using the 330 μm mesh nets. Mann–Whitney non-parametric tests indicated that the mean values of the filtered volume and wet weight did not differ significantly between the 200 μm and 330 μm mesh nets (Table 3). The number of families caught was higher for the 200 μm mesh nets, except in the cases of stations 2 and 9 (Fig. 2c). The number of fish larvae captured was higher in the 200 μm mesh nets across all the stations except for station 5 (Fig. 2d). However, the mean values of the number of families and the number of individuals did not differ significantly between the 200 μm and 330 μm mesh nets (Table 3).

Table 2 Number of individuals and proportion (%) for each family collected in the 200 μm and 330 μm mesh nets. Dashes (-) denote absent family

Family	Number of individuals			
	200 μm	330 μm	Total	%
Clupeidae	106	85	191	29.3
Myctophidae	48	37	85	13.1
Engraulidae	27	15	42	6.5
Carangidae	24	15	39	6.0
Scombridae	23	11	34	5.2
Bregmacerotidae	11	18	29	4.5
Synodontidae	15	6	21	3.2
Bothidae	11	8	19	2.9
Gobiidae	5	5	10	1.5
Ammodytidae	7	2	9	1.4
Sciaenidae	6	3	9	1.4
Trichiuridae	6	3	9	1.4
Gonostomatidae	6	3	9	1.4
Phosichthyidae	3	4	7	1.1
Apogonidae	4	1	5	0.8
Cynoglossidae	4	1	5	0.8
Percichthyidae	4	1	5	0.8
Acropomatidae	2	3	5	0.8
Lutjanidae	2	2	4	0.6
Ophichthidae	2	2	4	0.6
Labridae	3	1	4	0.6
Callionymidae	2	2	4	0.6
Mugilidae	1	3	4	0.6
Siganidae	1	3	4	0.6
Mullidae	3	1	4	0.6
Terapontidae	1	3	4	0.6
Platycephalidae	–	3	3	0.5
Cepolidae	2	1	3	0.5
Pomacentridae	3	–	3	0.5
Paralepididae	3	–	3	0.5
Percophidae	1	2	3	0.5

Table 2 Continued

Family	Number of individuals			
	200 μm	330 μm	Total	%
Serranidae	2	1	3	0.5
Triglidae	1	1	2	0.3
Nomeidae	1	1	2	0.3
Moridae	2	–	2	0.3
Sparidae	–	2	2	0.3
Scorpaenidae	1	1	2	0.3
Leiognathidae	1	1	2	0.3
Cirrhitidae	–	1	1	0.2
Priacanthidae	1	–	1	0.2
Tetraodontidae	–	1	1	0.2
Stomiidae	–	1	1	0.2
Nemipteridae	1	–	1	0.2
Holocentridae	–	1	1	0.2
Synanceiidae	1	–	1	0.2
Dactylopteridae	1	–	1	0.2
Gempylidae	–	1	1	0.2
Congridae	–	1	1	0.2
Antennariidae	1	–	1	0.2
Coryphaenidae	1	–	1	0.2
Unidentified larvae	26	18	44	6.8
Total	376	275	651	100

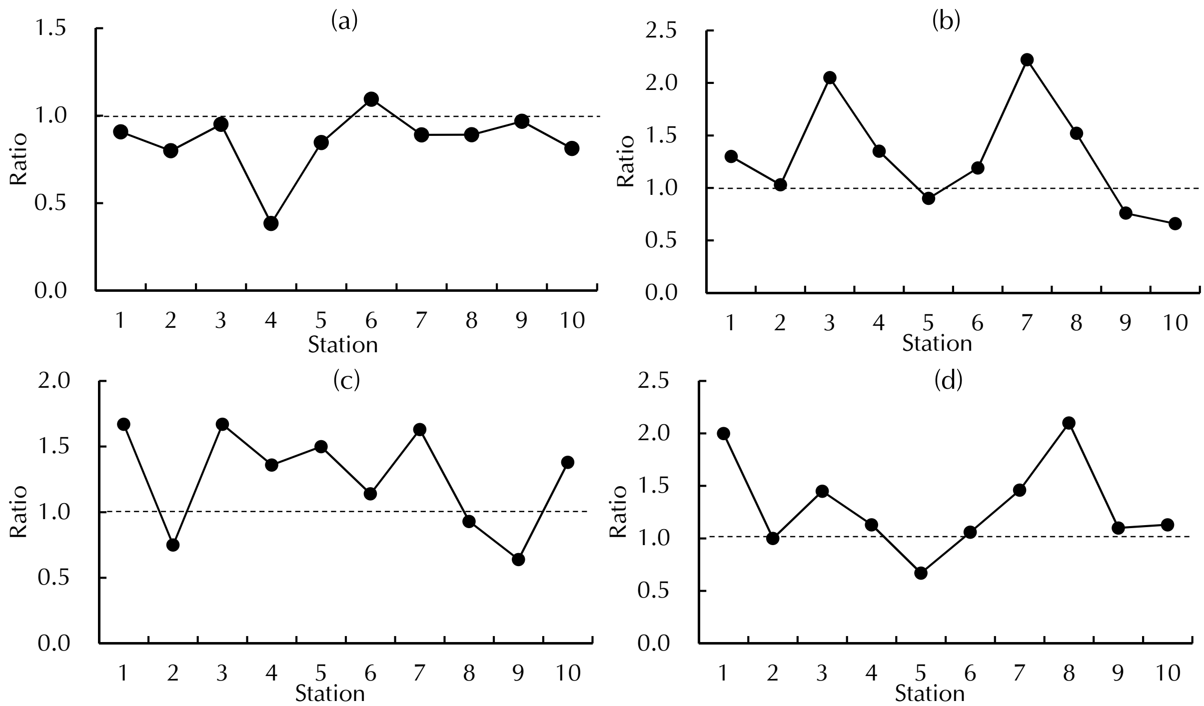

Fig. 2 The ratios of the 200 μm mesh nets over the 330 μm mesh nets in terms of the filtered volume (a), wet weight (b), number of families (c), and number of individuals (d) by station.

Table 3 Average values (with standard deviations) of tow performance, larval fish density, and larval fish total length for various groups of fish larvae collected with the 200 μm and 330 μm mesh nets in the surrounding waters of Taiwan in April 2011. Asterisk (*) indicates the difference is significant between the two types of nets at p = 0.05 (Mann-Whitney non-parametric tests)

Variable	200 μm	330 μm	p
Tow performance			
Filtered volume (m^3)	309.42 ± 134.10	359.34 ± 140.33	0.280
Wet weight (g)	8.05 ± 7.46	6.04 ± 4.38	0.557
Number of families	9.20 ± 4.76	7.60 ± 3.92	0.285
Larval fish density (n/1000m^3)			
Fish larvae, total	170.13 ± 175.61	94.19 ± 72.96	0.529
Fish eggs, total	85.56 ± 96.00	55.68 ± 61.37	0.481
Clupeidae	64.76 ± 75.01	46.10 ± 50.21	<0.001*
Myctophidae	13.21 ± 8.68	22.69 ± 26.26	<0.001*
Engraulidae	38.35 ± 60.67	15.87 ± 12.14	0.168
Carangidae	18.64 ± 30.25	15.62 ± 20.29	0.039*
Scombridae	30.64 ± 29.96	14.63 ± 9.88	0.418
Bregmacerotidae	11.22 ± 15.98	18.32 ± 32.65	0.032*
Synodontidae	6.64 ± 2.97	6.11 ± 3.93	0.611
Bothidae	5.60 ± 5.58	7.03 ± 3.66	0.647
Unidentified larvae	10.55 ± 8.13	12.65 ± 11.65	0.694
Larval fish total length (mm)			
Fish larvae, total	6.96 ± 4.52	6.94 ± 3.33	0.313
Clupeidae	8.82 ± 2.42	8.75 ± 2.59	0.735
Myctophidae	5.79 ± 2.20	6.21 ± 1.81	0.149
Engraulidae	8.98 ± 1.23	10.67 ± 3.15	0.013*
Carangidae	3.90 ± 0.97	4.59 ± 1.34	0.125
Scombridae	4.14 ± 1.29	4.21 ± 1.38	0.912
Bregmacerotidae	3.65 ± 1.18	5.65 ± 2.93	0.061
Synodontidae	7.00 ± 3.99	9.45 ± 4.43	0.149
Bothidae	4.64 ± 1.21	4.04 ± 1.06	0.301
Unidentified larvae	6.03 ± 3.90	5.76 ± 2.38	0.299

3. Tow performance

The values of tow performance (filtered volume, wet weight) and larval fish (number of fish larvae, number of families, mean length and fish eggs) collected for the two mesh sizes at each station are shown in Table 3. The average density of total fish larvae was higher in the 200 μm mesh nets, but the difference between the two types of nets was not significant (Table 3). Similarly, the density of fish eggs and unidentified larvae did not differ significantly between the two mesh sizes. For the eight dominant families, the mean density of Clupeidae, Myctophidae, Carangidae, and Bregmacerotidae differed significantly between the two mesh sizes. The average length of the total fish larvae was similar for the two types of nets (Table 3). The mean length for the eight dominant families was characterized by larger specimens obtained by the 330 μm mesh nets, except with respect to Clupeidae and Bothidae larvae. Noneteless, the Engraulidae family was the only family for which the mean length was statistically larger in the 330 μm mesh nets.

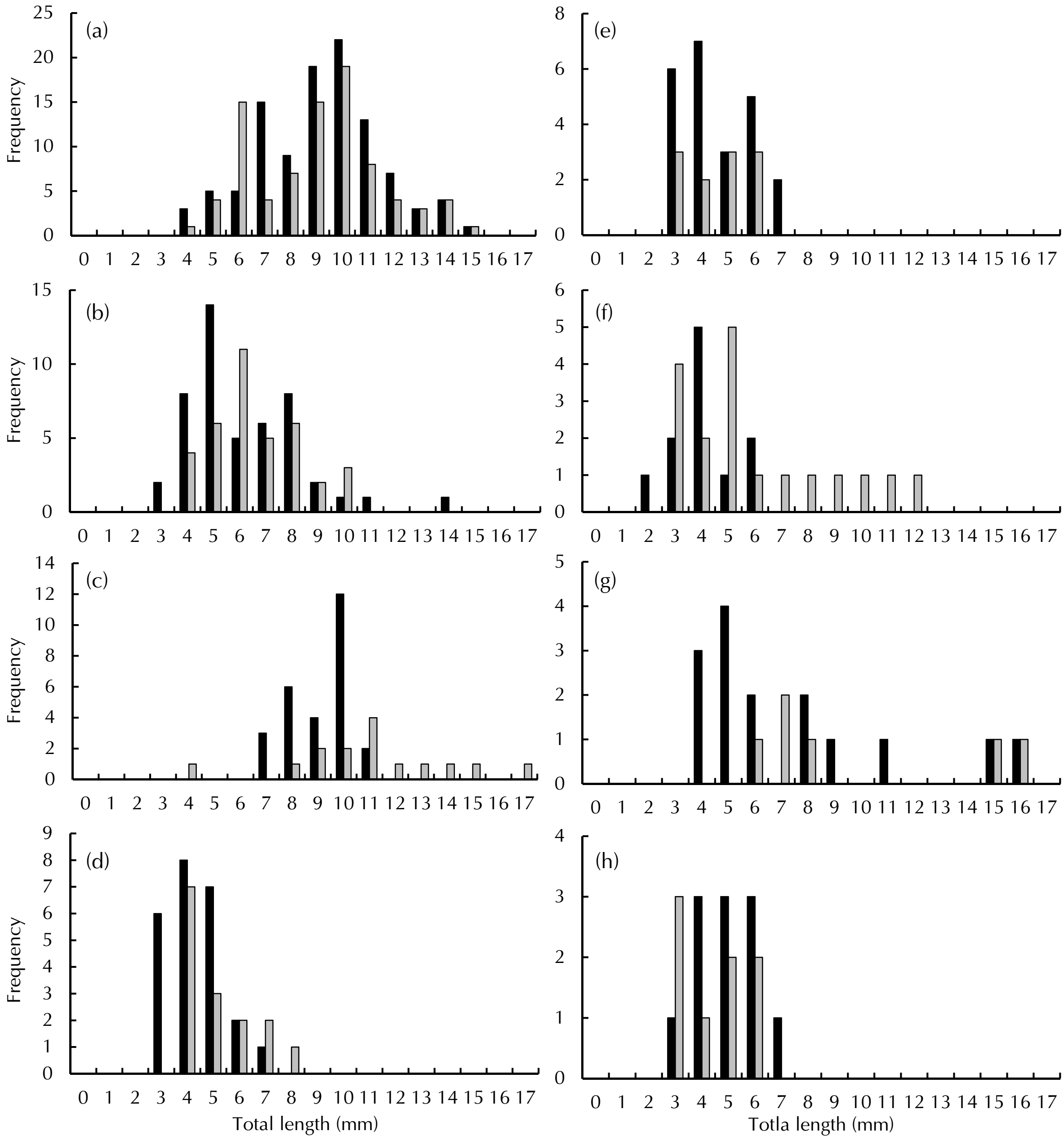

Fig. 3 Size distributions of the eight dominant families collected with the 200μm (black bars) and 330μm (grey bars) mesh plankton nets: Clupeidae (a), Myctophidae (b), Engraulidae (c), Carangidae (d), Scombridae (e), Bregmacerotidae (f), Synodontidae (g), and Bothidae (h).

4. Length frequency distributions

The length frequency distributions of the eight dominant families are illustrated in Fig. 3. For the Myctophidae family (Fig. 3b), the number of fish larvae belonging to the 3 – 5 mm size class was greater in the nets with the smaller mesh size. Similarly, for members of the Engraulidae < 10 mm (Fig. 3c), Carangidae < 5 mm (Fig. 3d), Scombridae < 4 mm (Fig. 3e), Bregmacerotidae < 4 mm (Fig. 3f), and Synodontidae < 6 mm (Fig. 3g), the nets with the smaller mesh size collected more specimens than the nets with the larger mesh size. However, the results of Kolmogorov-Smirnov asymptotic tests showed that the length frequency distributions did not differ significantly between the two mesh sizes for the dominant families, except in the case of the Engraulidae family (statistic = 0.526; df = 26, 14; $p = 0.009$) (Table 4).

Table 4 Results of Kolmogorov–Smirnov asymptotic two-sample tests for the dominant larval fish families collected by the 200 µm and 330 µm mesh nets. Asterisk (*) indicates the difference is significant between the two types of nets at $p = 0.05$

Family	K-S statistic (D)	df1	df2	*p*
Clupeidae	0.119	105	84	0.509
Myctophidae	0.232	47	36	0.211
Engraulidae	0.526	26	14	0.009*
Carangidae	0.333	23	14	0.256
Scombridae	0.186	22	10	0.959
Bregmacerotidae	0.429	10	17	0.161
Synodontidae	0.533	14	5	0.174
Bothidae	0.296	10	7	0.831

For the most abundant family, that is, the Clupeidae family (Fig. 3a), there was no difference in the size range of larval fish between the two mesh sizes. Furthermore, the differences in the length frequency distribution between the two mesh sizes were also minor. The only differences occurred in two consecutive size classes (6 mm and 7 mm). No obvious size-selective catches were observed for the Clupeidae family. For Myctophidae larvae (Fig. 3b), there were no obvious differences in the range of length distribution between the two types of nets. For filiform Engraulidae and Bregmacerotidae and Synodontidae larvae (Fig. 3c, 3f, 3g), differences in the size range were evident, with the 200 µm mesh nets failing to capture larger larval fish. For fusiform Carangidae and Scombridae (Fig. 3d, 3e), the size range of the length frequency distribution was similar in both types of nets, but the 200 µm mesh nets contained more small size class larval fish. For the Bothidae family (Fig. 3h), the size range was also similar for both types of nets.

5. Assemblage structure comparison between the two mesh sizes

A dendrogram of the cluster analysis dividing the larval fish into three groups for both mesh sizes was completed (Fig. 4). For the 200 µm mesh nets, the composition of group A (which consisted only of station 5, which was located north of the Penghu Islands) was distinct from the other assemblages, with only 5 individuals from the Clupeidae family being caught. Group B comprised stations 1 and 2, the bottom depths of which were deeper than those of the other stations (Table 1) and which were located in waters dominated by the mixing of the South China Sea Surface Water and the Kuroshio Branch Current. Group C included the other 7 stations (that is, stations 3, 4, 6, 7, 8, 9, and 10), all of which were located in the Taiwan Strait or the waters of northern Taiwan. This area was typified by shallow bottom depths (55 – 118 m). For the 330 µm mesh nets, the results of the cluster analysis were almost identical to those for the 200 µm mesh nets (Fig. 4).

DISCUSSION

1. Retention of zooplankton

In this study, the wet weights obtained were generally higher for the 200 µm mesh nets (Fig. 2b). For example, the wet weights obtained with the 200 µm mesh nets were two times higher than those obtained with the 330 µm mesh nets at stations 3 and 7 (Fig. 2b). Wu *et al*. (2011) compared different mesh sizes in terms of the selectivity of copepods in the East China Sea and showed that the lower abundance of copepods collected with the larger mesh size (330 µm) was mainly due to the loss of smaller copepods. Although we did not examine the composition of the

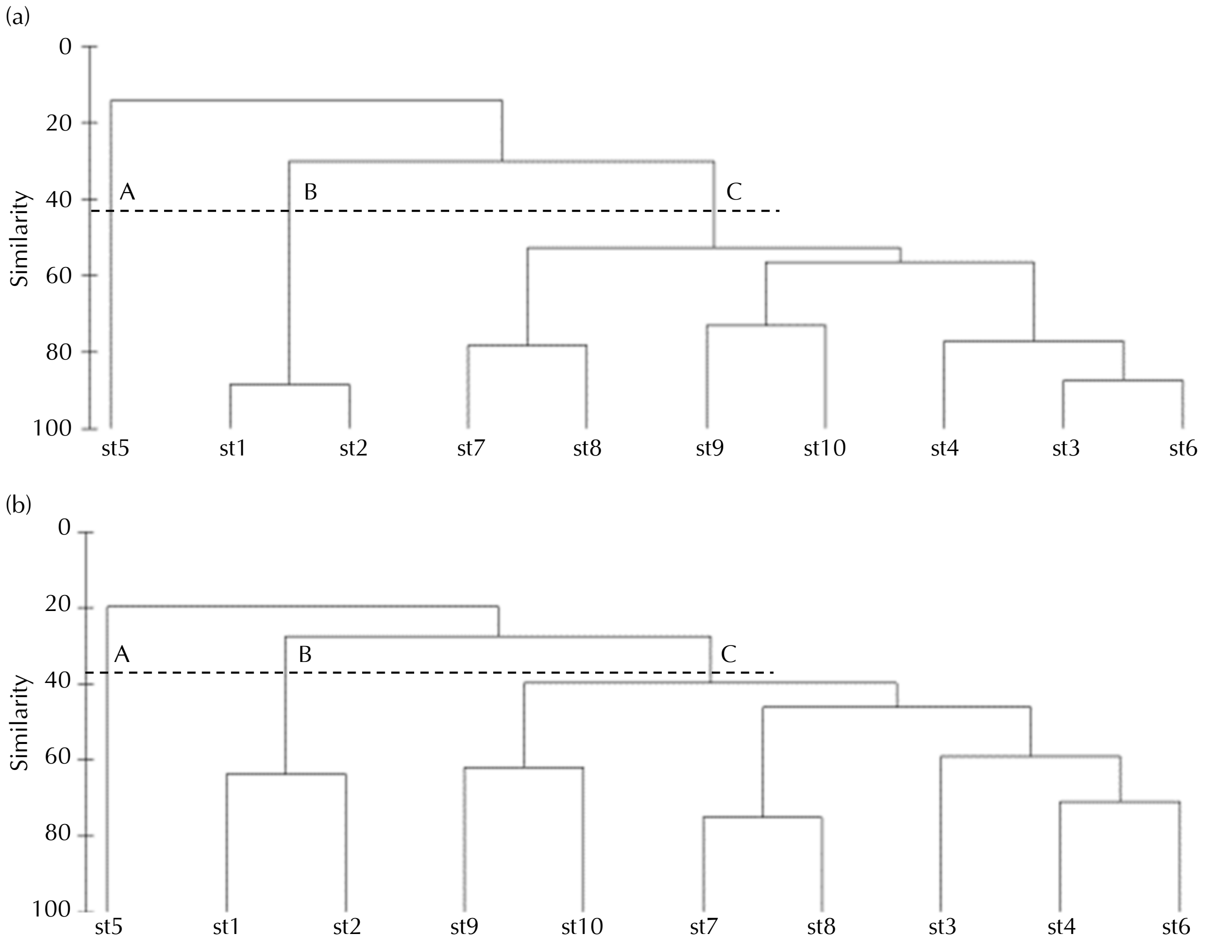

Fig. 4 Dendrograms for hierarchical clustering of species composition similarity among stations in the surrounding waters of Taiwan in April 2011, as determined by using group-average linkage of Bray-Curtis similarities calculated on log (x+1) transformed density data, for (a) the 200 μm mesh nets and (b) the 330 μm mesh nets.

zooplankton caught in this study, the loss of smaller copepods due to extrusion through 330 μm mesh nets might explain the higher average wet weight collected by the 200 μm mesh nets. However, the mean values of filtered volume and wet weight for the two mesh sizes were not statistically different (Table 3). This might have resulted, however, from the small sample size of this study. That said, the results of this study suggest that the filtration efficiencies of 200 μm mesh nets and 330 μm mesh nets in the Taiwan Strait are comparable, while also suggesting that the loss of organic plankton materials from 330 μm mesh nets should be taken into account.

2. Body shape and extrusion

The length frequency distributions did not differ statistically between the two mesh sizes for most of the dominant families (Table 4). As with the results discussed above, however, the lack of any statistically significant difference may have resulted from the small sample size of this study. We did observe, moreover, that the differences in body shape among the eight dominant families may lead to differences in the length frequency distributions between the two mesh sizes. The extrusion of smaller larvae (~2 – 4 mm) may have occur through bongo nets with a mesh size of 335μm, depending on their orientation (Somarakis *et al.*, 1998; Habtes *et al.*, 2014). In this study, relatedly, the 200 μm mesh nets contained more small size class individuals than the 330 μm mesh nets (Fig. 3), especially for filiform fish larvae (Engraulidae, Bregmacerotidae, and Synodontidae). On the other hand, the size distribution was similar between the two types of nets for other fusiform fish larvae (Myctophidae, Carangidae and Scombridae) and the Bothidae family. This indicated that the morphologies of the fish larvae did influence the efficiency of mesh retention, with greater extrusion expected for filiform fish larvae collected with the 330 μm mesh nets.

3. Extrusion of smaller fishes

Although the statistical analysis showed that the overall larval fish density, mean length, tow performance, and length distribution (with the exception of the Engraulidae family) were not significantly different between the two types of nets (Table 3), we still observed that the 200 μm mesh nets contained more families of fish larvae and more specimens (Fig. 2c, 2d), as well as higher mean larval fish density (Table 3). On the other hand, the 200 μm mesh nets failed to collect larger size classes for some taxa of fish larvae. These results suggested that the larger 330 μm mesh nets efficiently collected the late larval stages but might underestimate the larval fish density to some degree due to the extrusion of smaller size classes. The findings of this study imply that the extrusion of filiform or smaller fish larvae from 330 μm mesh nets has to be taken into account to obtain more robust estimates when abundances are used in quantitative population studies. Nonetheless, the present study confirmed that icthyoplakton samples collected with the two mesh sizes are comparable when used in qualitative studies of community structures of fish larvae in the surrounding waters of Taiwan.

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不同網目大小的浮游生物網對仔稚魚採集結果之比較

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摘　要

為瞭解不同的網目大小的浮游生物網對仔稚魚採集結果之影響，本研究利用水試一號試驗船於臺灣海峽及北部海域共 10 個測站，以網目分別為 200 µm 及 330 µm 之 Bongo 浮游生物網進行仔稚魚採集。10 個網次共採得 50 科 651 尾仔稚魚，其中大於 2% 的優勢種有 8 科 460 尾 (佔 70.7%)，依次為鯡科 (Clupeidae)、燈籠魚科 (Myctophidae)、鯷科 (Engraulidae)、鰺科 (Carangidae)、鯖科 (Scombridae)、海鰗鰍科 (Bregmacerotidae)、合齒魚科 (Synodontidae)、鮃科 (Bothidae)。在拖曳特性的部分，檢定結果顯示濾水體積與濕重的平均值在兩個網目間並沒有差異，仔稚魚總密度、平均體長及體長分布在各優勢種間並無網目間差異 (鯷科除外)。然而，觀察各優勢仔稚魚的體長分布顯示仔稚魚的體型差異可能會影響到不同網目的採集效率，亦即細長型仔稚魚存在因水流擠壓而穿逸 330 µm 網目的情形，因此，有關仔稚魚豐度量化相關研究若將逃逸率納入考量應可獲得較為精確之估值。群集分析的分群結果在兩種網目間相當的類似，顯示在臺灣海峽及北部海域以 200 µm 或 330 µm 的網目採集仔稚魚，並不會造成群聚分析時的差異。

關鍵詞：仔稚魚、浮游生物採集網、網目大小

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