ABSTRACT

This study was conducted to obtain the ichthyoplankton composition, abundance and distribution data in the Sarawak Exclusive Economic zone (EEZ) of South China Sea by performing one time sampling at 38 stations within three different neritic zones (inner, middle and outer). Samplings were performed from 19th August to 6th October 2015 using a bongo net (0.5 m opening diameter, mesh-size of 330 μm and 500 μm) obliquely towed at speed of 2 to 3 knots, for about 20 minutes (10 minutes downward and 10 minutes upward). Each net was attached with a flow meter to measure the volume of water filtered. The physicochemical water parameters (temperature, salinity, turbidity, dissolved oxygen and pH) at surface water were measured at 38 stations, while selected physicochemical water parameters were measured only at 15 stations according to depth profile. Preserved ichthyoplankton were identified to family level and the development of fish larvae was identified (pre-flexion, flexion and post-flexion stages. The density of ichthyoplankton and Jaccard's dissimilarity index were calculated. The one-way ANOVA and Tukey's test was used to determine the significant difference of physicochemical water parameters among 38 stations, while Pearson correlation coefficient was used to analyse the relationship between mean values of selected 15 physicochemical water parameters according to depth profiles at three neritic zones. The influence of environmental factors on ichthyoplankton family abundance according to neritic zone was tested with Canonical Correspondence Analyses (CCA). Checklist of ichthyoplankton was prepared with general description of each family. Throughout this study, a total of 3,935 fish eggs belonging to six orders and 12 families were successfully collected, while 5,264 fish larvae with 16 order, 59 families and 40 species were obtained. The ichthyoplankton samples contained commercial family, five families of fish egg and 16 families of fish larvae. For fish larvae, 36 families are new

records for Sarawak waters, while 10 families are new records for the South China Sea EEZ waters. Balistidae and Scombridae larvae were found at three different neritic zones comprising all development stages (pre-flexion, flexion and post-flexion). High abundance of fish eggs was recorded in three families namely Carangidae, Clupeidae and Scombridae (> 10%), while fish larvae had three dominant families namely Gobiidae, Engraulidae, Scombridae (> 6%). Based on neritic zone, the dominant fish larvae species was *Encrasicholina punctifer* (2.94 FL/100 m^3) at inner neritic zone, while at middle and outer neritic zones were dominated by *Tenualosa toli* with 1.37 FL/100 m^3 and 0.88 FL/100 m^3, respectively. The highest mean density of fish egg and fish larvae were recorded at inner neritic zone with 24.57 ± 14.85 FE/100 m^3 and 35.16 ± 13.58 FL/100 m^3, respectively. The highest Jaccard's dissimilarity index of fish egg was recorded between middle and outer neritic zones while the highest Jaccard's dissimilarity index of fish larvae was recorded between inner and outer neritic zones. The range of physicochemical parameters were within the range of Malaysia Marine Water Quality Criteria and Standard (MMWQS). CCA showed that eggs of Malacostidae and Muraenidae were associated with outer neritic zone, high salinity, DO and turbidity while Labridae, Scombridae and Sphyraenidae eggs were associated at inner neritic zone with higher temperature and pH. For fish larvae, Chlorophtalmidae, Plesiopidae, Pomacentridae and Sphyraenidae were not associated with all environmental factors (neritic zone, temperature, salinity, turbidity, dissolved oxygen and pH). In conclusion, this study had shed some useful information regarding the species checklist, composition, abundance and distribution of ichthyoplankton in the Sarawak EEZ of the South China Sea that can act as baseline data for future fishery management.

Keywords: Ichthyoplankton, composition, abundance, distribution, Sarawak EEZ, South China Sea

Komposisi, Kelimpahan dan Taburan Iktioplankton di Zon Ekonomi Eksklusif (ZEE) Sarawak, Laut China Selatan

ABSTRAK

Kajian ini telah dijalankan untuk mendapatkan data mengenai komposisi, kelimpahan dan taburan iktioplankton di Zon Ekonomi Eksklusif (ZEE) Sarawak, Laut China Selatan dengan satu kali pensampelan di 38 stesen mengikut tiga zon berbeza (pesisir, tengah laut dan laut dalam). Pensampelan dilakukan dari 19 Ogos hingga 6 Oktober 2015 dengan menggunakan jaring bongo (diameter bukaan 0.5 m, saiz mata jaring 330 µm dan 500 µm) yang ditunda secara oblik pada kelajuan 2 hingga 3 knot, selama kira-kira 20 minit (10 minit ke bawah dan 10 minit ke atas). Setiap jaring dipasang dengan meter alir untuk mengukur jumlah isipadu air yang ditapis semasa pensampelan. Parameter fizikokimia air (suhu, saliniti, turbiditi, oksigen terlarut dan pH) diukur pada permukaan air di 38 stesen, sementara parameter fizikokimia air terpilih hanya diukur di 15 stesen mengikut profil kedalaman. Iktioplankton yang telah diawet seterusnya dikenalpasti sehingga tahap famili dan peringkat pertumbuhan larva ikan (pra-fleksi, fleksi dan post-fleksi) juga telah dikenalpasti. Densiti iktioplankton dan indeks ketidaksamaan Jaccard telah dikira. Ujian ANOVA sehala dan Tukey digunakan untuk menentukan perbezaan parameter air fizikokimia yang signifikan antara 38 stesen sementara koefisien korelasi Pearson digunakan untuk menganalisis hubungan antara nilai purata parameter fizikokimia air dan kedalaman air di tiga zon. Pengaruh faktor persekitaran terhadap kelimpahan famili iktioplankton mengikut zon telah diuji dengan Analisis Kesepadanan Kanonikal (CCA). Sejumlah 3,935 telur ikan yang terdiri daripada enam order dan 12 famili berjaya dikumpulkan manakala 5,264 larva ikan dengan 16 order, 59 famili dan 40 spesies diperolehi. Iktioplankton terdiri daripada lima famili telur ikan dan 16 famili larva ikan famili yang komersial. Untuk larva ikan, 36 famili adalah catatan baru untuk perairan

Sarawak, sementara 10 keluarga adalah rekod baru untuk perairan ZEE Laut China Selatan. Balistidae dan Scombridae larva didapati di tiga zon berbeza bagi semua peringkat pertumbuhan (pra-fleksi, fleksi dan post-fleksi). Kelimpahan telur ikan yang paling tinggi dicatatkan bagi tiga famili iaitu Carangidae, Clupeidae dan Scombridae (> 10%), manakala larva ikan mempunyai tiga famili dominan iaitu Gobiidae, Engraulidae, Scombridae (> 6%). Berdasarkan zon, spesies larva ikan dominan adalah Encrasicholina punctifer *(2.94 FL / 100 m^3) di zon persisir, sementara di zon tengah dan luar pesisir dikuasai oleh* Tenualosa toli *dengan 1.37 FL/100 m^3 dan 0.88 FL/100 m^3. Densiti purata tertinggi telur dan larva ikan dicatatkan di zon persisir dengan 24.57 ± 14.85 FE/100 m^3 dan 35.16 ± 13.58 FL/100 m^3. Indeks ketidaksamaan Jaccard paling tinggi bagi telur ikan direkodkan di antara zon tengah laut dan laut dalam manakala bagi larva ikan dicatat di antara zon persisir dan laut dalam. Julat parameter fizikokimia berada dalam jangkauan Kriteria dan Standard Kualiti Air Laut Malaysia (KSKAM). CCA menunjukkan bahawa telur Malacostidae dan Muraenidae dikaitkan dengan zon di laut dalam, saliniti, DO dan turbiditi yang tinggi manakala Labridae, Scombridae dan Sphyraenidae dikaitkan di zon persisir, suhu dan pH yang tinggi. Hanya larva Chlorophtalmidae, Plesiopidae, Pomacentridae dan Sphyraenidae tidak dikaitkan dengan semua faktor persekitaran (zon, suhu, saliniti, turbiditi, oksigen terlarut dan pH). Kesimpulannya, kajian ini memberikan maklumat mengenai senarai spesis, komposisi, kelimpahan dan taburan iktioplankton di ZEE Sarawak, Laut China Selatan yang bertindak sebagai data asas bagi pengurusan perikanan pada masa hadapan.*

Kata kunci: *Iktioplankton, komposisi, kelimpahan, taburan, ZEE Sarawak, Laut China Selatan*