

# Characteristics of macrofauna and their response to aquiculture in Yueqing Bay, China

Yang Junyi, Gao Aigen, Ning Xiuren\*, Zhang Dongsheng

Laboratory of Marine Ecosystem and Biogeochemistry, SOA, Hangzhou 310012, China

**Abstract:** Four seasons of investigations on macrofauna in Yueqing Bay, China were carried out from August 2002 to May 2003. One hundred and twenty four species of macrofauna were identified, including 41 species of polychaeta, 37 species of mollusc, 22 species of crustacea, 10 species of echinoderm and 14 others. The average biomass was  $41.95 \text{ g}\cdot\text{m}^{-2}$  and the average density was  $85 \text{ ind}\cdot\text{m}^{-2}$ . The echinoderm contributed the highest proportion (about 60%) to the total biomass, and the mollusc contributed the maximum proportion (about 35%) to the total density. Biomass and density in spring were higher than those in other seasons. This article analyzes the macrofauna distribution, compares the study results with the history data of Yueqing Bay and adjacent bays, and discusses the response of macrofauna community to the aquiculture in Yueqing Bay.

**Key Words:** macrofauna; ecology; aquiculture; Yueqing Bay

Yueqing Bay is one of the main aquiculture areas in China. Recently, expansion of the aquiculture area has affected the environment of the bay to some extent where water exchange ability is weak. Especially, environment pollution, has directly influenced the benthic community, and caused the abnormal distribution of species, biomass and density<sup>[1]</sup>. To date, few studies about macrofauna in Yueqing Bay have been reported<sup>[2,8]</sup>. For the purpose of providing basic benthic environment data for related management departments, this article studies the macrofauna species composition, the biomass and density distribution, and the community structure variation in the Bay.

## 1 Materials and methods

Four cruises were made from Aug 2002 to May 2003 to investigate the macrofauna in Yueqing Bay. Eighteen sample-observing stations were designed, including 14 stations in the nonfarming areas (Y stations), two stations in the oyster-farming area (O1, O2) and two stations in the fish-culture area (as the two stations were very close to each other, F was used as the sign of both the stations). In addition, another six stations around the fish-culture area were set in May 2003.

Sampling, identifying and analyzing were made following

the National Standard of People's Republic of China [GB 12763.6-91]<sup>[3]</sup>.

Ecological parameters were calculated as follows<sup>[4]</sup>:

$$\text{Dominance index } Y = \frac{N_i}{N} \cdot f_i$$

Where  $N_i$  is the number of individuals in  $i$ th species,  $N$  is the total number of individuals in all species, and  $f_i$  is the appearance frequency of the  $i$ th species in all samples.

$$\text{Shannon-Weaver index } H' = -\sum_{i=1}^S P_i \log_2(P_i)$$

Where  $S$  is the total number of species and  $P_i$  is the proportion of total number of individuals belonging to the  $i$ th species.

$$\text{Margalef index } d = \frac{S-1}{\ln N}$$

Where  $S$  and  $N$  are as defined above.

$$\text{Simpson's diversity index } D = 1 - \sum_{i=1}^S (P_i)^2$$

Where  $S$  and  $P_i$  are as defined above.

Evenness index was calculated by the equation of Pielou

$$J = H' / \log_2 S$$

Where  $H'$  and  $S$  are as defined above.

The ABC curve (Abundance Biomass Comparison curve) drawing method: K-dominance curves are cumulatively ranked abundances (or biomass), plotted against species rank. Logging the *X* (rank) axis enables the distribution of the commoner species to be better visualized. Adding the macrofauna abundance K-dominance curve and the biomass K-dominance curve together becomes the ABC curve.

The ABC curve was used to indicate the stability of the macrofauna community. Generally, when the cumulative biomass curve is above the abundance curve, the macrofauna community is stable and the abundance has more diversity than biomass; when the cumulative biomass curve intersects or overlaps the cumulative abundance curve, the macrofauna community is disturbed and the stability is lowered<sup>[5-7]</sup>.

The data analyzing and figure drawing use the Primer V5, Surfer 8.0 and Excel software.

## 2 Results

### 2.1 Species composition and species distribution

A total of 124 species of macrofauna were identified, including 41 species of polychaeta, 37 species of mollusc, 22 species of crustacea, 10 species of echinoderm and other 14 species. Polychaeta and mollusc were the dominant groups, which accounted for 63% of the total macrofauna species in Yueqing Bay (Fig. 2).

No more than 15 species of macrofauna were identified in all stations in Yueqing Bay. Station Y13 had the most species (15 species of macrofauna identified in Y13 in spring), and the other stations had less than 10 species. The seasonal species

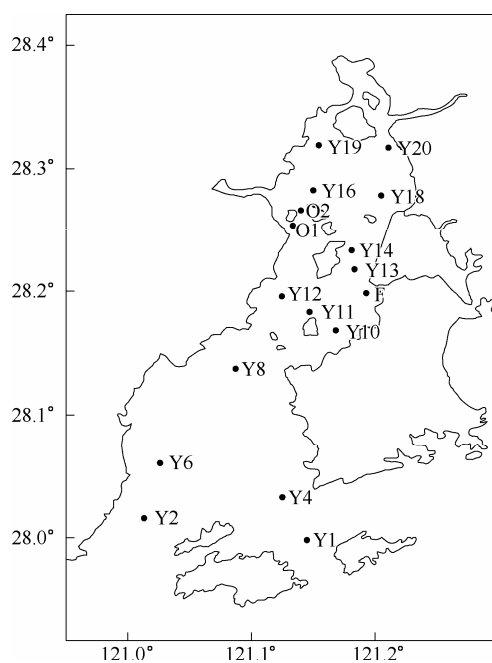


Fig 1 Macrofauna sampling station in Yueqing Bay

distribution was higher in spring and summer than in autumn and winter (Fig. 3). Table 1 shows the primary species and their dominance of macrofauna in Yueqing Bay. Generally, a species with its dominance  $Y > 0.02$  is considered to be the dominant species<sup>[4]</sup>. So, there were five dominant species: *Nassarius siquinjorensis*, *Virgularia gustaviana*, *Sternaspis scutata*, *Capitella capitata*, and *Protankyra bidentata*.

### 2.2 Species composition and biomass distribution

The average biomass of macrofauna in Yueqing Bay was  $41.95 \text{ g}\cdot\text{m}^{-2}$ . Echinoderm accounted for 60% of the total macrofauna biomass, mollusc accounted for 26%, and crustacean, polychaeta and others for about 14%. The average density of macrofauna in Yueqing Bay was  $85 \text{ ind}\cdot\text{m}^{-2}$ . Mollusc ranked first and accounted for 35% of the total macrofauna density, polychaeta ranked second and accounted for 33%, and Crustacea, Echinoderm and other groups accounted for 32% (Table 2).

The distribution of macrofauna biomass in Yueqing Bay was not even, where high biomass was found in the middle of the bay (Fig. 4). The highest biomass of  $164.42 \text{ g}\cdot\text{m}^{-2}$  occurred at Station 01 (Echinoderm was the main part, where *Amphiura vadicol*a and *Molpadia rorei* had a biomass of  $375.50 \text{ g}\cdot\text{m}^{-2}$ ). Station Y18 had the second highest macrofauna biomass ( $95.94 \text{ g}\cdot\text{m}^{-2}$ ), and the biomass at Stations Y20

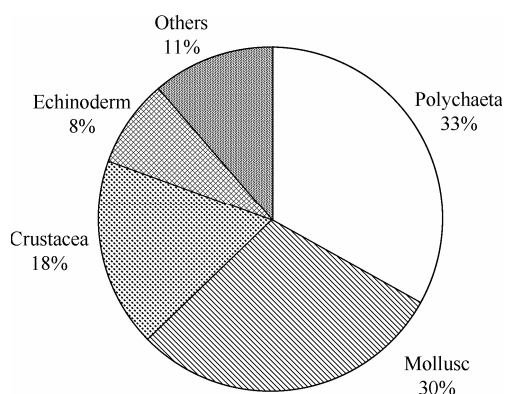


Fig. 2 Species composition of macrofauna in Yueqing Bay

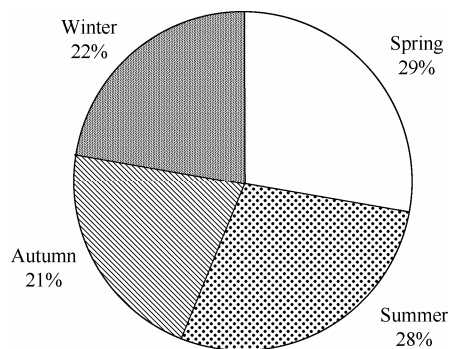


Fig.3 Seasonal species distribution of macrofauna in Yueqing Bay

Download English Version:

<https://daneshyari.com/en/article/4380507>

Download Persian Version:

<https://daneshyari.com/article/4380507>

[Daneshyari.com](https://daneshyari.com)