SOME POPULATION PARAMETERS OF ENDEAVOUR SHRIMP (*Metapenaeus ensis* de Haan) IN BALIKPAPAN SURROUNDING WATERS, EAST KALIMANTAN

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ABSTRACT

Study on the population parameters of endeavour shrimp (*Metapenaeus ensis* de Haan) was conducted in Balikpapan waters, East Kalimantan. Population parameters of the endeavour shrimp were calculated based on data collected during period of survey, March 2006-November 2006. Result showed that the growth parameter (K) of endeavour shrimp was 1.6/year with maximum carapace length (L$_\infty$) of 42.0 mm. Instantaneous total mortality (Z), natural mortality (M), and fishing mortality (F) were 4.52/year, 2.18/year, and 2.34/year, respectively. The exploitation rate (E) was estimated to be 0.52/year which indicated that the status of endeavour shrimp stock in Balikpapan surrounding waters was categorized as fully exploited. It is, therefore, recommended that additional amount of fishing effort of the endeavour shrimp in this area should be stopped in the next year.

KEYWORDS: population parameters, endeavour shrimp, Balikpapan waters

INTRODUCTION

Endeavour shrimp (*Metapenaeus ensis* de Haan) which has local name "udang dogol" is one of important economic shrimp resources in Balikpapan surrounding waters. In this area, catch landed of this shrimp species was about 25% of total penaeid shrimp yearly production (Suman *et al.*, 2006). This shrimp resource has been exploited since long time ago. Yet commercial fishing activity toward the resource has only been started since 1960 due to the present of trawl fishery development in this area. Since that period, fishing activity of the shrimp has been intensively developed and increased from year to year due to increasing number of fishing effort and the fishermen (Naamin, 1978).

Shrimp resource is categorized as renewable resources, but intensively fishing activity year by year will deplete the resource. As it has occurred toward the shrimp resource in Balikpapan surrounding waters, this condition would threat sustainability of the stock as a result depletion of the stock will come soon. Naamin (1984) stated that increasing fishing effort to certain level can increase the catch. After certain level of the catch is reached, called maximum sustainable yield, the catch will decrease even though the effort is increased. Cunningham *et al.* (1985); Withmarsh (1990) added that the more the effort increased, the more the resources were being exploited. Meanwhile the resources themselves had maximum capability to the long run of yield. Hence the catch ability coefficient would rise until maximum sustainable yield was reached, but as fishing was further intensified (increase in effort), the productivity would be decline. Therefore, exploitation of the shrimp resource should be managed and fishing effort should be regulated properly in order to enhance the stock sustainability.

The shrimp stock and fishing activity in Balikpapan surrounding waters should be managed properly to give chance the stocks to recover themselves so that sustainability of the stocks can be kept in the future. Some research toward the shrimp stock status need to be done in order to obtain scientific data for management purpose. This report discusses some population parameters of the endeavour shrimp stock in Balikpapan surrounding waters. It hopes that these data can be used for future stock identification and management purpose.

MATERIALS AND METHODS

Samples of the endeavour shrimp were taken from field research in Balikpapan and surrounding waters (Figure 1) conducted from March 2006-November 2006. Biometric studies (carapace length, sex, and gonad maturity identifications) were taken from 1,600 samples. Growth rate (K) and maximum carapace length (L$_\infty$) were analyzed by tracing modus of monthly carapace length distribution using ELEFAN program (Sparre & Venema, 1992; Gayanilo *et al.*, 1993). Total mortality (Z) was calculated from catch curve (Sparre & Venema, 1992; Gayanilo *et al.*, 1993) and natural mortality (M) was predicted using combination of Pauly empiric equation (Pauly, 1985) and fishing mortality rate (F)=Z-M, where exploitation rate (E)=F/Z (Sparre & Venema, 1992).

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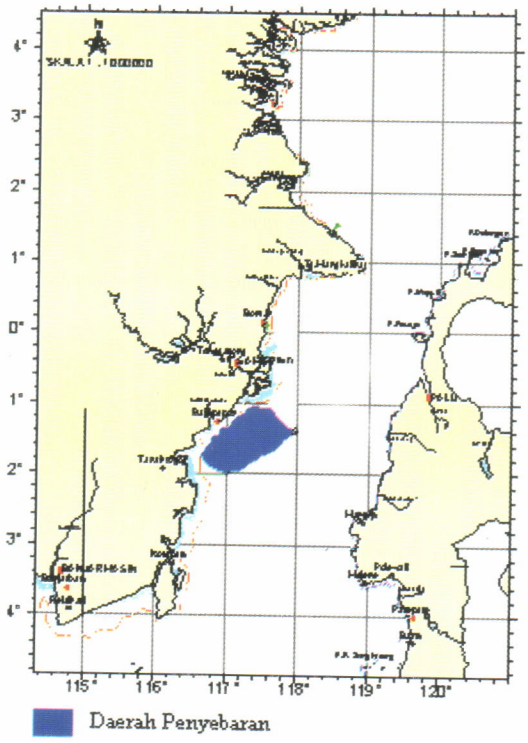

Figure 1. Fishing ground of endeavour shrimp in Balikpapan surrounding waters.

RESULTS AND DISCUSSIONS

General Condition of Shrimp Fisheries

In general, there are 9 species of shrimps caught in Balikpapan and surrounding waters. They are divided into three groups, namely white shrimp (*Penaeus merguiensis*), endeavour shrimp (*Metapenaeus ensis*), and others (*Metapenaeus lysianassa, M. brevicornis, M. dobsoni, Parapenaeopsis stylifera, Parapenaeopsis* sp., *Solenocera subnuda,* and *Palaemon* sp.). In the last 10 years, beside these three groups, tiger prawn (udang windu) also occurred in Balikpapan surrounding waters and together with white shrimp, the catch of this species dominated shrimp landed (Figure 2).

Since restriction of trawl to be operated in Balikpapan and surrounding waters, dogol and trammel net have become dominant fishing gears operated in this area. Jaring dogol (fishermen call this gear as belly net) was first introduced in 1981 and adopted from fishermen of north coast of Java Sea waters (Suman *et al.*, 2006). Trammel net is usually categorized as bottom gillnet (Nomura, 1974); Brandt (1972) classified this into entangled net. This gear consists of three pieces of net (*triple walled net*), namely outer net (2 pieces) and inner net (1 piece). Both outer nets have mesh size much higher than that of the inner net. This specific construction leads to the shrimp which enters the outer nets will be entangled in the outer nets and walleyed in inner net. In Japan, this gear is actually and effectively used to catch fish (Matuda & Kitahara, 1967). However in Indonesia, with several modifications in size and material, trammel net can be applied to catch shrimp (Wudianto *et al.*, 1988). In Balikpapan surrounding waters, the trammel net is operated in one way method by sweeping the net in the bottom of the waters, as an active fishing gear.

Sea survey in Balikpapan surrounding waters showed that fishing rate of the shrimp varied from 0.14-2.22 kg/hauling and its stock density was 28.5 kg/km^2 (Suman *et al.*, 2006). Fishing ground of the shrimp was stretched from Samboja estuarine in the east part to Penajam waters in the west with the depth of 5-40 m (Figure 1). While fishing season occurred during entire year and peak seasons happened twice a year in May and September.

Population Parameters

Basically ELEFAN program is applied to interpret carapace length frequency data by tracing the movement of carapace length time series data plotted to von Bertalanffy curve. Line which passes through the highest amount of modus will illustrate the growth curve (Sparre & Venema, 1992).

By tracing monthly data of carapace length frequency, growth rate (K) of the endeavour shrimp in Balikpapan surrounding waters was predicted to be 1.6 per year (Figure 3) with the maximum carapace length (L_∞) was 42.0 mm. Therefore, von Bertalanffy growth equation was ilustrated as $Lt=42.0\ [1-e^{-1,6(t-to)}]$.

Value K of the shrimp was higher than 1 which indicated that the shrimp was categorized as fast growth species (Gulland, 1983; Naamin, 1984). The faster the growth rate and the shorter the age of shrimp illustrated that fishing mortality rate of the shrimp was high. This condition informed that more attention should be paid to the sustainable utilization of the stock. Carefully assessment on correct time to exploit the stock should be based on sustainability of the stock and economic point of view. If the shrimps are caught too late, they will die useless. Yet benefit will not be obtained optimally when the stock is exploited too early.

Based on growth parameter obtained where K=1.6 and L_∞=42.0 mm, catch curve can be drawn. Mortality rate (Z) prediction would be 4.52 per year (Figure 4).

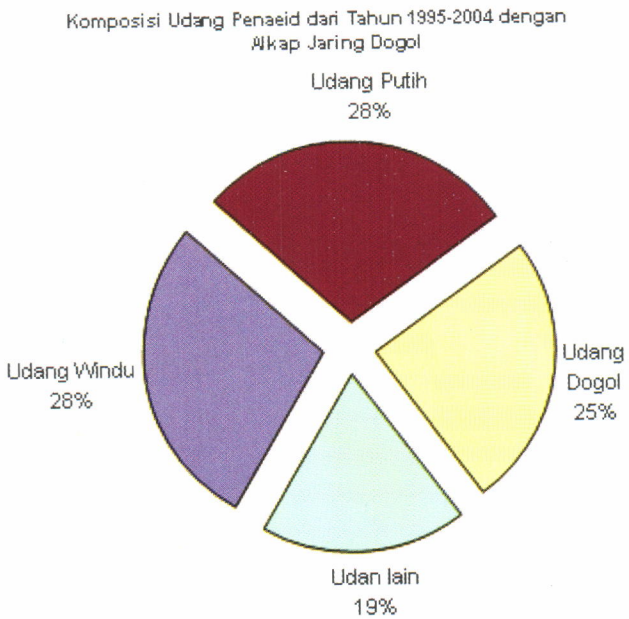

Figure 2. Shrimp landed composition (1995-2004) caught by Dogol in Balikpapan surrounding waters.

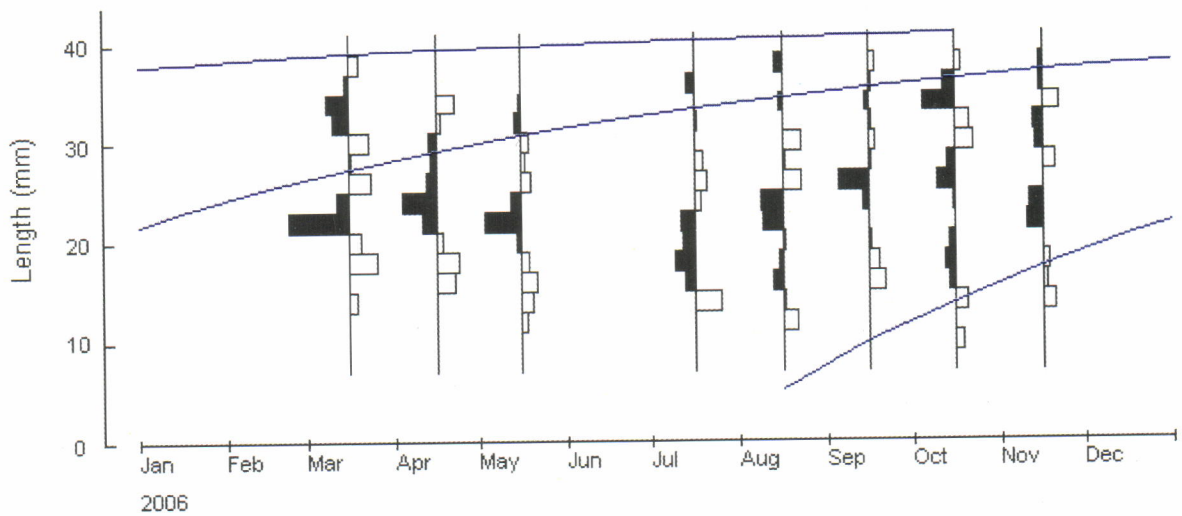

Figure 3. Monthly data of carapace length frequency distribution of endeavour shrimp (*M. ensis*) analysed by ELEFAN method in Balikpapan surrounding waters.

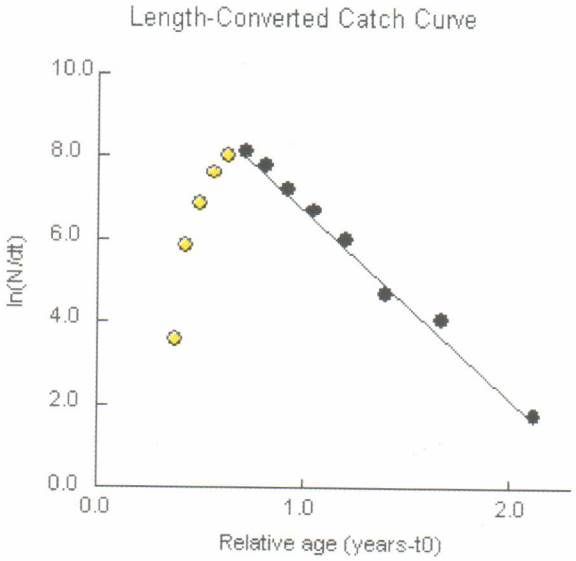

Figure 4. Value of Z as the slope of the endeavour shrimp (*M. ensis* de Haan) in Balikpapan surrounding waters.

While natural mortality (M) and fishing mortality (F) rates calculated by Pauly (1980) were about 2.18 and 2.34 respectively.

Pauly *et al.* (1984) reported that value of Z and F of Indian shrimp in Versoba waters, respectively were 5.29/year and 3.0/year. While value of Z and F of *Metapenaeus kutchensis* were 5.83/year and 2.20/year, respectively. It was presented that difference in value of shrimp mortality rates in several waters were caused by different level of effort number, predator, and environment condition.

Using exploitation rate equation (E)=F/Z, it was obtained that E of endeavour shrimp in Balikpapan surrounding waters was 0.52/year. Based on Pauly criterion (Pauly *et al.*, 1984), it was concluded that fully exploited of the shrimp stock has occurred in Balikpapan surrounding waters because rational fishing of fish or shrimp stock can be gained if values of E in that waters equals to 0.5. If value of E is more than 0.5, the stock will be threatened thus effort has to be decreased in order to sustain the stock.

CONCLUSSIONS

1. Values of growth rate (K) and maximum carapace length (L_∞) of the endeavour shrimp (*M. ensis)* in Balikpapan and surrounding waters were 1.6/year and 42.0 mm, respectively.

2. Values of total mortality (Z), natural mortality (M), and fishing mortality (F) of the endeavour shrimp (*M. ensis)* were 4.52/year, 2.18/year, and 2.34/year, respectively.

3. Carefully utilization of the endeavour shrimp (*M. ensis* de Haan) in Balikpapan surrounding waters should be applied in order to maintain stock sustainability in the future due to high growth and mortality rates of the stock.

4. The endeavour shrimp stock in Balikpapan surrounding waters was categorized as fully exploited (E=0.52) so that the additional amount of fishing unit in this area should be stopped.

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