UNIVERSITI PUTRA MALAYSIA

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This project report is submitted in partial fulfillment of the requirements for the degree of Bachelor of Agriculture (Aquaculture)

DEPARTMENT OF AQUACULTURE

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CERTIFICATION OF APPROVAL

DEPARTMENT OF AQUACULTURE

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This is to certify that I have examined the final project report and all corrections have been made as recommended by the panel examiners. This report complies with the recommended format stipulated in the AKU4999 project guidelines, Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia.

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ABSTRACT

An investigation of the population dynamics of Indian mackerel, *Rastrelliger kanagurta* (Cuvier, 1816) in the Marudu Bay, Sabah, Malaysia was carried out from January 2013 to September 2013. The overall relationship between total length and body weight was estimated as $W= 0.006TL^{3.215}$ or Log W= 3.215 Log TL – 0.006 (R^2 = 0.946).Monthly length frequency data of *R. kanagurta* were analyzed by FiSAT software to evaluate the mortality rates and its exploitation level. Asymptotic length (L_∞) and growth co-efficient (K) were estimated at 27.83 cm and 1.50 yr^{-1}, respectively. The growth performance index (φ') was calculated as 3.065. Total mortality (Z), natural mortality (M) and fishing mortality (F) was calculated at 4.44 yr^{-1}, 2.46 yr^{-1} and 1.98 yr^{-1}. The size for *R. kanagurta* at first recruitment is 11.5 cm. The exploitation level (E) of *R. kanagurta* was calculated at 0.45. The exploitation level was below the optimum level of exploitation (E = 0.50). The stock of *R. kanagurta* was found to be under exploited in the Marudu Bay.

ABSTRAK

Penyelidikan ini adalah mengenai populasi dinamik dan stok status ikan kembung, *Rastrelliger kanagurta* (Cuvier, 1816) di Kota Marudu, Sabah Malaysia sepanjang Januari 2013 hingga September 2013. Keseluruhan kaitan di antara jumlah panjang dan berat badan yang dianggarkan ialah $W= 0.006TL^{3.215}$ atau Log W= 3.215 Log TL – 0.006 (R^2 = 0.946). Analisis frekuensi panjang setiap bulan adalah menggunakan perisian FiSAT untuk mengira kadar kematian dan tahap eksploitasi *R. kanagurta.* Panjang asimptot (L_∞) dan pertumbuhan cekap (K) adalah 27.83 cm dan 1.50 yr^{-1}. Index prestasi pertumbuhan adalah 3.065 (φ'). Kadar keseluruhan kematian, kadar semulajadi kematian dan kadar kematian tangkapanadalah 4.44 yr^{-1}, 2.46 yr^{-1} dan 1.98 yr^{-1}. Size *R. kanagurta* di awal kemasukannya adalah 11.5 cm.Tahap eksploitasi (E) *R. kanagurta* adalah 0.45. Nilai tahap eksploitasi ini menunjukan ianya di bawah tahap eksploitasi optimum iaitu (E = 0.50). Stok *R. kanagurta* dikatakan masih lagi di bawah ekplotasi di Kota Marudu.

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LIST OF ABBREVIATIONS AND SYMBOLS

E	Exploitation rate
ELEFAN	Electronic Length Frequency Analysis
FiSAT	FAO ICLARM Stock Assessment Tools
F	Fishing mortality
g	Gram
K	Growth co-efficient of VBGF
L_∞	Asymptotic length
M	Natural mortality
mm	Millimeter
ML	Middle length
N	Natural mortality
Z	Total mortality
φ'	Growth performance index
°C	Degree celsius
%	Percentage
<	Less than
>	More than

CHAPTER 1

INTRODUCTION

Fish is a source of food for human being and also for animal. Human tend to catch fish to get the source of fish. According to Nickum *et al.* (2004), the purpose of study about fish are, fishes can be an useful indicator of environmental quality and ecological integrity; fishes serve as an important source of food for many of the world's humans; catching and observing fishes are quite popular and economically important recreational and commercial activities for lots of people; the unique adaptations and physiological specializations of fishes make them suitable for use as physiological and biomedical models; human existence is dependent on the understanding of the place and functions in the world's ecosystems, and an understanding that cannot be done without accurate and detailed knowledge of the biology of fishes.

The fishing industry in Sabah has a major and cheap source of protein and also provides an employment opportunity for the people of Sabah, as well as an income generator for the Sabah government (Ali, 2008). Kota Marudu Bay, Sabah is an area where there are lots of fishing activities conducted and important to fishermen as well. A few works like food processing have been done on aquatic species in Sabah (Awong *et al.*, 2011; Rumpet *et al*., 1998; Teh *et al*., 2005).

This is also same goes to the *R. kanagurta* population where fishermen here tend to collect them as food for their daily life. Therefore, a research on the population dynamics of the *R. kanagurta* from the Marudu Bay should be conducted. So, the species will not undergo extinction.

Indian mackerel or *Rastrelliger kanagurta* enjoys wide distribution around the world and has good domestic demand as a food fish. They are widely distributed in Indo-West Pacific, ranging from South Africa and Red Sea to Samoa, north to southern Japan (Luther, 1995). *R. kanagurta* are commercially exploited at many countries. According to Abdussamad *et al*. (2010), the production of mackerel, exploited mainly by gillnets varied widely and the fishery occurred throughout the year with peak abundance in June and also August. The spawning time is as well as recruitment also occurred throughout the year with peak in January-April. In addition, the young mackerel start entering the fishery at a size of 6 cm in April every year.

For planning and management of fish resources, knowledge of various population parameters and exploitation level (E) of that population is necessary (Amin *et al*., 2009). In the field of research of fish population dynamics, there are many tools for assessing the exploitation level and stock status. (Arshad *et al*., 2010). Of these, FiSAT (FAO-ICLARM Stock Assessment Tools) has been used most frequently in estimating the population parameters of finfish and shell-fish (Amin *et al*., 2001; 2002; Mancera and Mendo, 1996) because it only requires length-

frequency data. By using this technique, *R. kanagurta* stock can be accessed within a year with adequate length-frequency data.

Therefore, the objectives for this study were:

1 To estimate the population parameters like asymptotic length (L∞), growth co efficient (K), and mortalities rate (natural and fishing mortality).

2 To determine the recruitment pattern, size at first recruitment and standing stock size of *R. kanagurta*

3 To estimate the exploitation level of the stock of *R. kanagurta* in the Marudu Bay.

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