UNIVERSITI PUTRA MALAYSIA

SPECIES COMPOSITION, DISTRIBUTION AND FEEDING GUILDS OF FISHES FROM SUNGAI PULAI SEAGRASS BEDS, MALAYSIA

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By

JIMMY ANAK AJAK

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, In fulfillment of the requirement for the Degree of Master Science

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DEDICATION

I dedicated this work to my lovely wife, Nora, my daughter, Johanna, my son Jason, my family for their great support, commitment, understanding, confidence and assistance in me in order to finish this work and also for the memory of my late father.

Abstract of the thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

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May, 2007

Chairman : Associate Professor Aziz bin Arshad, PhD

Faculty : Science

A study was undertaken to investigate the fish species composition and their temporal and spatial distribution and feeding guilds in the Sg. Pulai seagrass bed. Fish specimens for the study were collected from April 2002 to June 2003 using the trammel nets of 640m in total length and 1.6 m height. Fishes were sampled from three subtidal Sg. Pulai seagrass beds namely Tanjung (Tg.) Adang Darat Shoal, Tg. Adang Laut Shoal and Merambong Shoal. A total of 2371 fish specimens were caught from the three sites representing 72 species and 37 different families.

Six most dominant fish species comprising of *Triacanthus biaculeatus, Arius maculatus, Arius tenuispinis*, *Plotosus lineatus*, *Anodontostoma chacunda* and *Hilsa kelee* were selected for the study on feeding guilds. Analysis on the feeding guild showed two different types of food-based component viz animal and plant origins. Bivalves, gastropods, crustaceans, copepods and polychaete worms were amongst the major gut content of the animal-based diets while seagrass fragment made up the sole plant-based

section. The animal-based diets were consistently recorded from *T. biaculeatus A. maculatus A. tenuispinis* and *P. linaetus* stomach contents. All the four fish species showed a carnivorous type of feeding habit. The gut contents of *A. chacunda* and *H. kelee* were comparatively filled up with seagrass fragments, bivalves, gastropods and copepods, indicating the omnivorous type of feeding mode of the two clupeids species. These results suggested two major modes of feeding guilds that exist amongst the seagrass fishes. Throbab analyzed showed the similar results with the RLG values.

In terms of spatial distribution, Tg. Adang Laut Shoal was inhabited by 28 families that consisted of 43 fish species and 11 of them were inclusive of species from the other study sites. Tg. Adang Darat Shoal was inhabited by 23 families and 37 different species of fishes. Four species found here exclusive to this seagrass bed and not recorded from the other two study sites. The fish caught within Merambong shoal seagrass bed were almost similar in species to the Tg. Adang Laut and Tg. Adang Darat shoals with the exception of *Dasyatis zugei* and *Gerres filamentous*. A total of 21 families and 28 species of seagrass fishes were finally recorded in the Merambong Shoal.

The study also revealed that several fish species were exclusively confined to one particular habitat either the vegetated or the non-vegetated sites. The results also indicated that families Leiognathidae and Engraulidae were consistently been recorded around the seagrass areas throughout the study period. In addition, the results may also indicates that other fish families were not permanent dwellers of the Sg. Pulai seagrass beds and their presence in the study areas could well be due to occasional feeding and spawning activities.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

KOMPOSISI, TABURAN DAN TABIAT PEMAKANAN IKAN DARI KAWASAN RUMPUT LAUT SUNGAI PULAI, MALAYSIA

Oleh

JIMMY ANAK AJAK

Mei, 2007

Pengerusi : Profesor Madya Aziz bin Arshad, PhD

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Kajian ini dijalankan untuk mengkaji komposisi ikan, ruang, taburan mengikut faktor ruang dan masa serta tabiat pemakanan ikan yang terdapat di kawasan rumput laut di Sungai Pulai. Penyampelan spesimen ikan telah dijalankan dari April 2002 hingga Jun 2003 dengan menggunakan pukat tiga lapis yang berukuran 640 m panjang dan 1.6 m tinggi. Tiga kawasan rumput Laut di Sg. Pulai telah dipilih sebagai kawasan persampelan iaitu; Beitng Tanjung (Tg.) Adang Darat, Beting Tg. Adang Laut dan Beting Merambong. Sejumlah 2371 spesimen ikan telah dikenalpasti yang terdiri daripada 72 spesies dan 37 famili yang berbeza.

Sebanyak enam spesies ikan yang mempunyai kelimpahan yang tinggi seperti *Triacanthus biaculeatus, Arius maculatus, Arius tenuispinis*, *Plotosus lineatus*, *Anodontostoma chacunda* dan *Hilsa kelee* dipilih untuk tujuan kajian tabiat pemakanan. Analisis tabiat pemakanan ikan menunjukkan dua komponen makanan utama iaitu makanan berasaskan haiwan dan juga berasaskan tumbuhan, dwicengkerang, krustasea,

siput gastropod, kopepod dan cacing polychaeta adalah komponen utama makanan berasaskan haiwan manakala cebisan daun rumput laut merupakan makanan berasaskan tumbuhan. Makanan berasaskan haiwan didapati secara konsisten pada ikan *Triacanthus biaculeatus, Arius maculatus, Arius tenuispinis* dan *Plotosus linaetus.* Keempat-empat spesies ikan tersebut menunjukkan tabiat pemakanan karnivor. Analisis kandungan isi perut *Anadontostoma chacunda* dan *Hilsa kelee* secara komperatif mendapati ianya dipenuhi oleh cebisan daun rumput laut, dwicengkerang, siput gastropod dan kopepod yang mana menunjukkan bahawa kedua-dua ikan ini mempunyai tabiat pemakanan omnivor. Analisa RLG dan 'aras tropik' menyokong keputusan yang dihasilkan melalui kajian kandungan isi perut spesies ikan.

Dari segi taburan ikan mengikut masa dan ruang pula, Beting Tg. Adang Laut didiami oleh 28 famili yang terdiri daripada 43 spesies, dan 11 spesies daripadanya merupakan spesies yang sama dengan kawasan kajian yang lain. Beting Tg. Adang Darat pula didiami 23 famili dan 37 spesies. Empat spesies yang dijumpai di kawasan ini adalah berbeza dan tidak dijumpai di Beting Tg. Adang Darat dan Beting Tg. Adang Laut. Ikan yang ditangkap di Beting Merambong pula hampir sama dengan yang direkodkan oleh Beting Tg. Adang Laut dan Beting Tg. Adang Darat kecuali spesies *Dasyatis zugei* dan *Gerres filamentous.* Sejumlah 21 famili dan 28 spesies dicatatkan di Beting Merambong.

Kajian yang dijalankan mendapati hanya spesies ikan tertentu sahaja yang khusus pada habitat tertentu di antara kawasan rumput laut dan bukan rumput laut. Keputusan kajian mendapati famili Leiognathidae dan Engraulidae menunjukkan kehadiran yang

konsisten di kawasan rumput laut sepanjang kajian dijalankan. Kaijan juga menunjukkan yang famili ikan yang lain bukan merupakan spesies yang kekal di kawasan rumput laut di Sg. Pulai dan kehadiran mereka ke kawasan kajian mungkin disebabkan oleh aktiviti seperti mencari makanan and juga pembiakan.

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Jimmy Ajak.

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LIST OF ABBREVIATIONS

DoF	Department of Fisheries
GDP	Gross Domestic Products
m	meter
µ	Micro
MSY	Maximum Sustainable Yield
%	Percent
Sg.	Sungai
Tg.	Tanjung

CHAPTER I

GENERAL INTRODUCTION

The fishery sector plays a vital role in the Malaysian economy as a source of cheap protein, employment and foreign exchange earnings. It is the cheapest source of animal protein and is widely been accepted by all ethnic groups in Malaysia. The per capita fish consumption is expected to rise from 39.1 kg in 1995 to 49.0 kg in the year 2000 (Ministry of Agriculture, 1999) and expected to increase steadily in future in tandem with the increase in human population. The preference and demand for fish is expected to increase from an annual consumption of 809,300 t in 1995 to over 1,591,000 t by the year 2010 (Ministry of Agriculture, 1999).

The development of fisheries sector in Malaysia is being emphasized under the National Agriculture Policy (1992 – 2010) which aim towards a fully modern and commercialized industry. The present ninth Malaysian plan also clearly delineated fisheries sector as one of the important agricultural activity that will be given grater emphasis in order to pursue the expected greater demand for cheap source of protein in the country. Besides capture fisheries, aquaculture is the other major fishery activity that is important to the country. Aquaculture sector recorded production of 202,225 t which contributed about 13.2% to the total fish production in 2004 that showed the increased of about 2.65% compared to year2003. Even though the aquaculture sector contributed only 13% (year 2004) to the total fish production, this sector has been identify as having the most potential (DoF, 2004). Inland fisheries contributed only 4,119 t or 0.27% to the total fish production in 2004.

Over all sectors, fishing industry contributed only about 1.57% of gross domestic products (GDP) in 2004 compared to 1.35% in 2003. It provides direct employment to 89,453 fishermen recorded on licence vessel in 2004 compared to 89,433 on 2003. Advances in fishing methods led to devastating effect and extensive fishing at present affects many fish populations to a possible extinct. Increase in total catch arose depend on several factor including improved in techniques for fishing and catching fish. Improving in the technique will consecutively increase the total landing of fish; the new technique such as SONAR and remote sensing intensified the fishing operation hence resulting in higher efficiency in tonnage of fish landed. Despite effective measures been taken in regulating the fish population, many countries have already operating beyond the maximum sustainable yield (MSY).

The depletion in fish resources has often been linked not only to gear development but also attributed by the destruction in fish natural habitats both feeding and breeding habitats. Mangroves, coral reefs and seagrass beds have been alarmingly been converted for physical development and the acreage of these fragile ecosystems have increasingly been on the decline. This is despite all the measures and legislation prohibiting the destruction of living resources that has been introduced for the management of coral reef and mangrove ecosystem. As it is repeatedly been pointed out, the three ecosystems are known to be the important breeding and nursery grounds for many commercially important fish species.

Study on fish biology is therefore needed in checking the status of one of the important living resources of the aquatic ecosystem. Study on the diversity and dynamics of the fish population, feeding guilds and their dependence on nursery

ground are all important especially in generating information on the conservation plans and specific habitat requirement needed in the early stage of fish life history. Thus a project is formulated to study the fish communities in the seagrasss ecosystem. The reason being many of the seagrass resources in the peninsular has been gradually degraded and destroyed through various coastal development projects. In addition, there have not been many studies on the fish population in the seagrass areas carried out in the country.

Sungai (Sg.) Pulai is chosen as a study site due to the anticipated and forth coming effect of the port development that will contribute to some physical damages to the seagrass ecosystem. Seagrass beds in Sg. Pulai estuary is the most extensive seagrass beds known to exist in the southern region of the Peninsular Malaysia. In total, there are three major seagrass sites in the area, and they are known as Tg. Adang Darat shoal, Tg. Adang Laut shoal and Merambong shoal; all three seagrass beds are closely associated with the sandy shoals and are periodically been exposed especially during the spring low tide. The seagrass beds here are dominated by *Enhalus acoroides* and eight other seagrass species. There are 10 genera with 14 species of seagrasses in both Peninsular Malaysia and East Malaysia in total.

Seagrasses are the only group of submerged flowering plants in the marine environment and about 50 species of sea grasses are recorded around the world but this number is not proportionate to their abundance, as well as to their economic and ecological importance (Fortes, 1990). Seagrass beds have so far been valued for their role as fish nursery areas and as an area of high productivity in marine coastal ecosystem. This would significantly translated seagrass beds as major nursery areas