BASIC STUDIES ON BIOLOGICAL FEATURES ON 'IKAN SEBELAH', *Psettodes erumei*

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ABSTRACT

One of the many ways to contribute to fisheries science is by studying the basic biology and distribution of resource species. Basic biological features of 200 tails of Indian halibut, *Psettodes erumei*, from Kota Kinabalu fish market were examined. Measurements of 7 body parts, counting of 5 fin rays, counting of vertebrae, and determination of the head-sided ratio were the major experiments. The ratio between the left and the right-sided halibut were not evenly divided. There were more female than male among young halibut. It was discovered that the left liver and the right liver were not in the same size for both sided fish. Halibuts observed were found to have 22, 23 and 24 vertebrae.

ABSTRAK

Mempelajari mengenai asas biologi dan pengagihan sumber spesies, merupakan salah satu cara menyumbang kepada sains perikanan. Asas ciri biologi bagi 200 ekor 'Indian halibut', *Psettodes erumei*, yang diperolehi di pasar ikan Kota Kinabalu, telah diperiksa. Pengukuran 7 bahagian badan, pengiraan 5 sirip, pengiraan vertebra, dan penentuan nisbah arah kepala, merupakan eksperimen penting. Nisbah antara ikan berkepala arah ke kiri dan ke kanan adalah tidak sama. Terdapat lebih banyak bilangan betina daripada jantan di kalangan *P. erumei* muda. Didapati bahawa hati kiri dan hati kanan berbeza dari segi saiz bagi kedua-dua arah kepala ikan. *P. erumei* didapati mempunyai 22, 23 dan 24 bilangan vertebra.

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1.	RM	=	Ringgit Malaysia
2.	cm	=	Centimeter
3.	kg	=	Kilogram
4.	TL	=	Total length
5.	SL	=	Standard length
6.	HL	=	Head length
7.	UJL	=	Upper jaw length
8.	CPL	=	Caudal peduncle length
9.	BH	=	Body height
10.	BW	=	Body width
11.	%	=	Percentage
12.	x	=	Mean

CHAPTER 1

INTRODUCTION

1.1 *IKAN SEBELAH*

1.1.1 Background of *Ikan Sebelah*

Flatfishes (Pleuronectiformes) are a successful group of marine shallow-water fishes with approximately 520 extant species (Nelson, 1976). This includes the halibut, flounder, sole, plaice, sand dab, and turbot. The *ikan sebelah* order is divided into six or seven different families. These families are organized by;

(i) which side of the body their eyes are found, left or right side, and

(ii) whether they have small or large teeth.

It is widely known as *ikan sebelah* by the local people. It could be found throughout the world seas from the sub artic to the tropics (*Yamashita, 2000*) with a wide range of species. The Japanese flounder, *Paralichthys olivaceus*, can be found in the Japan Sea, the western and southern coasts of Korea, the coasts China, Yellow Sea and the East China Sea (Kinoshita *et al.*, 2000). The Atlantic halibut, *Hippoglossus hippoglossus*, is a large flatfish found in the boreal and sub arctic parts of the North

Atlantic (Kristiansen *et al.*, 2004). These are just some of the species; there are many more that could be found around the globe. *Psettodes erumei*, the target species in this experiment could be found in the Indian waters, the Indo-West Pacific: Red Sea and East Africa to Japan and Australia, and also in the Malaysian waters.

Ikan sebelah is a valuable group of mainly benthic feeders. Fish such as brill, flounder, halibut, lemon sole, plaice, sole and turbot are caught on the sea bed of the continental shelf in many parts of the world, especially in more temperate areas (Bone *et al.*, 1982)

Ikan sebelah are the only marine fish species that habitually swim and lie on one side. It is usually oval and compressed laterally. It is asymmetrical with both eyes being present either on the right or left side. As larvae, they are bilaterally symmetrical and they swim normally as other fishes do, with one eye on both sides of the head. But as they develop and begin swimming on one side, one eye will 'migrate' to the other side of the head, either to the left or right, depending on the species. During this time, changes also occur in the skeletal and the digestive systems of the body. They also lose all coloration on the eyeless (blind) side of the body and develop cryptic coloration on the eyed (ocular) side of the body during metamorphosis (Gibb, 1996). This explains why the under side or blind side of *ikan sebelah* is usually pale, whitish and somewhat translucent, while the upper side or eyed side is coloured (camouflaged) to match the

environment. *Ikan sebelah* such as *Pleuronectes* made remarkable matches to their backgrounds (Bone *et al.*, 1982). They spend most of their time buried under a layer of sand or mud on the sea bottom. This fish is mainly piscivorous whereby they feed on small fishes and other small crustaceans.

Psettodes erumei is from the phylum of Chordata, the class of Actinopterygii, the order of Pleuronectiformes and the family of Psettodidae. It is also known as the Indian halibut, Oriental halibut and Indian spiny turbot. According to the Sabah Fisheries Department, this particular species is also known as Togok in Sabah. *P. erumei* have dark brown eyes, which ranged right on top of the head but can be to the left or right side, large mouth with strong and sharp teeth and powerful jaws. This fish have the same characteristics as most other *ikan sebelah* species. This fish also usually found on sand and muddy bottoms. They are also predatory on small fishes and crustaceans. The only unique things about *P. erumei* are that this species exist in two sides; left side and right side, and that this fish has thicker flesh than any other *ikan sebelah* species.

1.1.2 Location of Studies

The observation was made in the Universiti Malaysia Sabah's hatchery. The supply of fish was from the Kota Kinabalu fish market. This fish is inexpensive; the price

is around RM5 to RM8 per kilogram. According to the fishmongers, the halibut were usually caught from the wild near islands around Sabah.

1.1.3 Problems of *P. erumei*

Indian halibut (*Psettodes erumei*), is the target species in this study. This species is one of the new candidates for aquaculture in Asia. The choice of halibut was made because of its large size and thick flesh, but as a new comer with so little information, its performance in aquaculture is still uncertain.

P. erumei is a new candidate for aquaculture industry, yet not so many studies have been conducted regarding this particular species. Apart from knowing that this fish could be eaten, many people still do not know much about *P. erumei.* Thorough information about this fish is yet to be gained. A database for any fish species is very important in order to conduct more advance studies in the future.

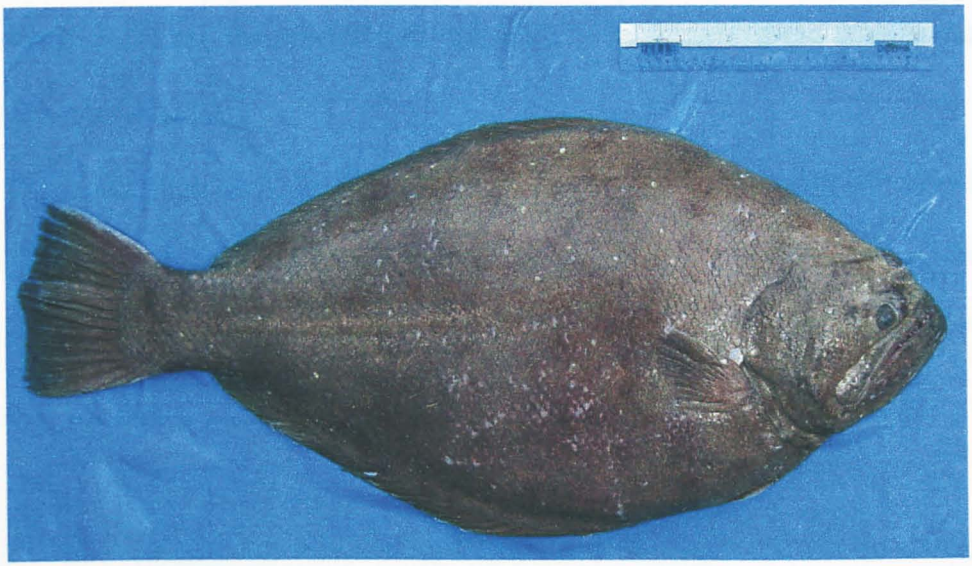

Photo 1.1 Indian halibut, *P. erumei.* Total length: 37.8 cm, standard length: 32.7 cm, body weight: 0.1993 kg.

In this present study, biological features of this particular species will be examined: (1) length of five body parts, body height and, body width, (2) number of fin rays on five body parts, (3) number of the left-eyed and right-eyed fish, (4) internal organs and stomach contents, (5) number of vertebrae.

1.2 OBJECTIVES

The aim of this study is to gain knowledge of biological features of this particular species. Information on biological features of *P. erumei* is very important, since this fish is a new candidate for aquaculture industry.

Apart from that, the objective of this study is to determine the ratio between the left and the right-sided fish.

The description of *P. erumei* to science contributes to providing information for other scientists to better understand this unique organism. Thus, could lead to more advance studies in the future, which is then could contribute to the development of the aquaculture industry.

CHAPTER 2

LITERATURE REVIEW

2.1 Metamorphosis in *Ikan Sebelah*

Ikan sebelah in particular undergoes dramatic changes in its body form, from symmetrical to asymmetrical. Among the vertebrates, this form in adult *ikan sebelah* is the most dramatic right-left asymmetry. The characteristic feature in its metamorphosis is the migration of the eyes; one appears to migrate from one side to the other. In the aquaculture of *ikan sebelah*, abnormal eye location in juveniles is a serious problem (Okada *et al.*, 2003).

Ikan sebelah are a natural paradigm to study a developmental adaptation to a changing living situation (Graf *et al.*, 2001). When they hatch, they look like most other larval fishes, less than an inch long and nearly transparent. And, like all other fish, they have one eye on each side of their head. Then, after a specific period of time, different for every species but usually within a few weeks of hatching, they undergo a major structural reorganization of bones, muscles and nerves. The bones of the skull begin to twist and become reshaped. One eye starts to 'migrate' to the other side of the head, and takes up residence alongside the other. If the right eye 'migrates' to the left side, the *Ikan sebelah*

is left-eyed (sinistral), and the fish is right-eyed (dextral) if the left eye 'migrates' to the right side. In *P. erumei* case, both sided fish are exist; the left-eyed and the right-eyed fish.

Recent advances in larval fish biology revealed that most marine fishes, particularly those hatched from small pelagic eggs, undergo metamorphosis associated with larva-juvenile transformation. The most typical example of first metamorphosis can be seen in i*kan sebelah*, defined as true or first metamorphosis (Gwak *et al.*, 1998).

During metamorphosis, it rotates 90^0 about the longitudinal axis to become better adapted to an adult lifestyle in the bottom (Graf *et al.*, 2001).

2.2 Body Shape

During the evolution of the different fish groups, could be seen that there have been many changes from the assumed ancestral fusiform (spindle) shape, and as a result, living fishes are so varied that they are hard to be categorized and defined briefly. Many modern fishes have retained fusiform streamlined body shape, but every other kind of body shape could also be found (Bone *et al.*, 1982). The head is somewhat rounded at the front. Fish have no neck, and so the head blends smoothly into the trunk. The trunk, in turn, narrows into the tail. Aside from this basic similarity, fish have a variety of shapes.

Ikan sebelah have a laterally compressed body shape, and all of them have an unusual flattened body form well suited to life on the bottom.

2.3 Fin Rays

Fins are movable structures, which help fishes swim and keep their balance. Fishes move their fins by means of muscles. Except for a few finless species, all spiny-finned bony fish have rayed fins. These fins consist of a web of skin supported by a skeleton of rods known as rays. Some ray-finned fish have soft rays. Others have both soft rays and rays which are stiff and sharp to the touch. Fish fins are classified based on their position in the body as well as based on their structure. A fin is either median or paired, if classified in this way.

Median fins are vertical fins on a fish's back, underside, or tail. They include dorsal, anal, and caudal fins. The dorsal fin grows along the back and helps a fish keep upright. Almost all fish have at least one dorsal fin, and many have two or three. The anal fin grows on the underside. Like a dorsal fin, it also helps a fish remain upright. Some fish have two anal fins. The caudal fin is at the end of the tail. A fish swings its caudal fin from side to side to propel itself through the water as well as to help in steering.

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