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Shark Catfish (*Helicophagus waandersii* Bleeker, 1858) Gillnetting in the Mun River, Thailand

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ABSTRACT

Three mesh sizes, 4.5, 5.5 and 6.5 cm, for shark catfish gillnetting in the Mun River, Thailand were compared to length at first maturity and length at 50% maturity. In case of single mesh consideration, all meshes caught the fish at the smaller size than maturity stage. In multi-meshes management, it was found that the minimum recommended mesh size should be over 5.5 cm. Shark catfish will have an opportunity to spawn at least once before being exploited. During the closed season, fishermen can be accepted to use other types of fishing gear or the use of > 5.5 cm gillnet in the open water zone apart from the spawning and nursing ground along the Mun River which covered from Kang Tana rapid through Sawang Veerawong sub-District (flood plain area).

Key words: *Helicophagus waandersii* Bleeker, shark catfish, gillnet selectivity, the mun river

INTRODUCTION

Gillnet is the most important fishing gear in World's inland fisheries *e.g.* Greece (Stergiou and Erzini, 2002); Sri Lanka (Pet *et al*., 1995) and Thailand (Jutagate *et al*, 2001). Some papers mentioned to efficiency of gillnet by studying its selectivity as well as the relationship between selectivity and fish morphology (Reis and Pawson, 1999; Hovgård and Lassen, 2000; Kurkilahti *et al*., 2002). Gillnet is classified as a 'passive gear', *i.e.* the fish have to swim into the net to get caught. Theoretically, gillnet selection curve was suggested as a 'bell-shaped' similar to the normal distribution (Sparre and Venema, 1998), or two-peaked model (Hovgård and Lassen, 2000) depend on the different catch processes. The bell-shaped model, however, is the most classical method as suggested by Holt (1963) because of ease of application. It is based upon standard linear regression and can be done even though using a scientific calculator. Holt's method compares the catch in the same length group from two 'nearly' the same mesh size of gillnets. In case of multi-meshes approach, Sparre and Venema (1998) proposed the model for adjusting altogether as a 'common' selectivity curve.

The Mun River, which is a part of the Mekong River basin, has a total length of 641 km and runs through 11 provinces (Doungsawasdi and Chookajorn, 1991). Inhabitants along the Mun riverbanks use the river for many purposes *i.e.* domestic uses, agriculture, livestock raising, fisheries, industries, transportation and recreation (Amornsakchai *et al.*, 2000). The main fishing gears around this area are gillnets, beach seines, traps and long line hooks (Jutagate and Matson, 2003).

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Shark catfish, (*Helicophagus waandersii* Bleeker, 1858) is one of the commercial native species in the Mekong River basin and the Mun River. People consume it both in fresh and salty grilled style. The yield of shark catfish is mainly from riparian fisheries because it cannot be presently cultured in mass scale. The main fishing gears to catch shark catfish are gillnets, beach seine, hooks and traps (Khoa and Huong, 1993; Rainboth, 1996; Singhanouvong *et al.*, 1996). For gillnetting, local fishermen usually use in multi-mesh sizes depend on fish target species, fish size, season and area. In the lower Songkhram River basin, shark catfish can be caught by beach seine and stationary trawl net in the main river channel, and barrage fisheries in the floodplain area (Boonyaratpalin *et al.*, 2002).

Since the important of shark catfish in this area, well-managed strategies of the fish stock should be concerned for the sustainable fisheries. In terms of fishery management and conservation, knowledge of the selectivity of fishing gears and their impact upon the stock is needed to implement an effective regulation. This paper aims to present multi mesh sizes gillnet selectivity curve and the impact on shark catfish population under the matured length-based.

MATERIALS AND METHODS

Study site

The experiment was carried out on monthly basis during May through July 2004 in the Mun River. Three mesh sizes of gillnet -- 4.5, 5.5 and 6.5 cm -- were set up. Each net is 10 m long and 100 meshes depth. Riparian fishermen decided by themselves for fishing locations, fishing time and fishing activities. Individual fish total length was measured to the nearest 0.1 cm. Number of shark catfish was recorded separated by mesh size.

Data analysis

1. Estimation of optimum length for being caught (L_c)

Bell-shaped selection curve was used to estimate the selectivity of gillnet under the method of Holt (1963). The optimum length for being caught (L_c) and selection factor (SF) were estimated.

2. Single mesh selectivity curve

Two contiguously mesh size, 4.5 via 5.5 and 5.5 via 6.5 cm, were matched for computing the L_c separately.

In each pair:

Selectivity curves were constructed using the expected values. Two expected selection values were summed up together to construct the common selection curve. The X-intercept of the linear regression equation from the method of Holt (1963) was the 'common' L_c. Selection factor was also estimated.

3. Multi-meshes selectivity curve

Index of the number in the population for each mesh size was estimated and summed up as a representative from each pairs. Each pairs of mesh size were averaged into 5.0 and 6.0 cm for multi-meshes selection. Optimum length for being caught (L_c) was computed and constructed selectivity curve by the same process. The selection curve would be explained in term of three mesh sizes of gillnet.

4. Various size models

A model for various mesh sizes was computed using the method described by Sparre and Venema (1998). A common selection factor was also estimated. The length at first maturity and the length at 50% maturity (L_m) of female shark catfish were estimated elsewhere using Thapanand's method (Thapanand, *per. com.*) and Matson's Formula (Matson, 1997). Optimum mesh size for shark catfish gillnetting was decided by Comparing the L_c with $L_{m.}$

RESULTS AND DISCUSSION

The total number of shark catfish, ranged from 13.0 – 49.0 cm (total length: TL), in the study were 1,756 fishes. Size frequency distribution separated by mesh sizes was shown in Figure 1.

The result showed multimodal distribution which could be classified in three groups after changing into probability unit. It was meant that shark catfish was caught by three different processes as suggested by Hovgård and Lassen (2000). Theoretically, the data should be split and estimated independently. Practically, however, the estimator had to assume that the selectivity curve is unimodal since it was impossible to separate the data in the field (Hamley and Regier,1973). This study was focused on the length of shark catfish as a multi-meshes of gillnet fisheries management based on maturity size. Therefore, the type of catching process was ignored.

Optimum length for being caught, estimated from the various mesh size models, was showed in Table 1. Selection factors were shown in Table 2. Multi meshes selectivity curve was shown in Figure 2, respectively.

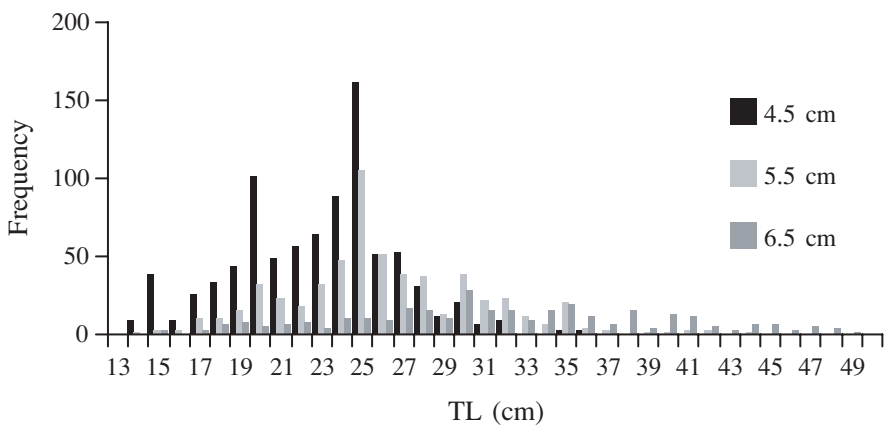

Figure 1 Frequency distribution of shark catfish caught by three mesh sizes of gillnets.

Table 1 Optimum length for being caught (L_c), estimated from various mesh size models (Sparre and Venema, 1998), compared with length at first maturity and length at 50% maturity (L_m).

Mesh (cm)	Status	L_c (cm)
4.5	Single mesh	23.33
5.5	Single mesh	28.52
6.5	Single mesh	33.71
4.5 and 5.5	Represent for two meshes	26.92
5.5 and 6.5	Represent for two meshes	30.29
4.5, 5.5 and 6.5	Multi-meshes	29.56
Maturity	Method	Length
Length at first maturity	From Thapanand's method	27.36
Length at 50% maturity	From Matson's Formula	43.18
Effective Ranged for shark catfish's female broodstock	Modified from probability of captured by Thapanand (*per. com.*)	38.56 – 45.46

Table 2 Selection factors from the study (Holt, 1963).

Mesh (cm)	Selection Factor (SF)
4.5 and 5.5	5.3839
5.5 and 6.5	5.0476
Common SF from various mesh sizes model	5.1854
Overall SF from multi meshes	5.3744

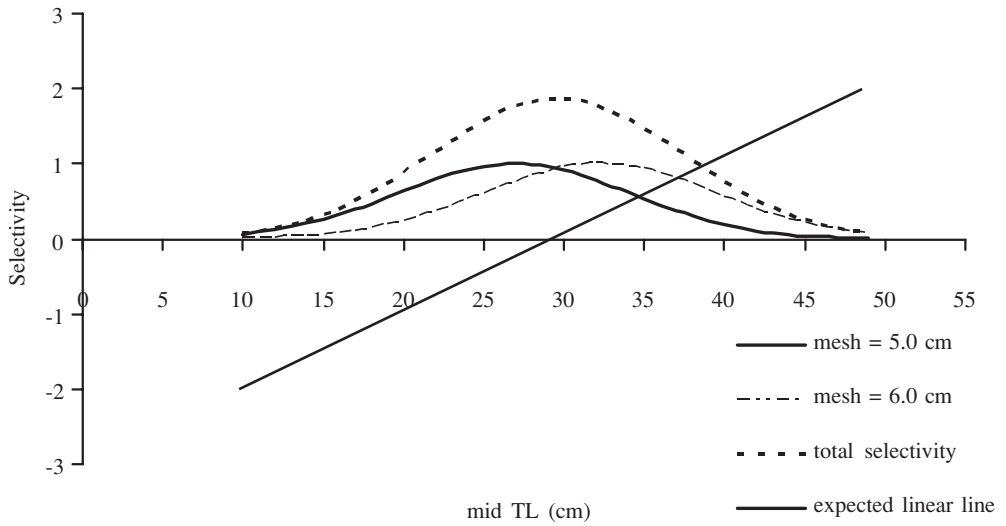

Figure 2 Multi-meshes size selectivity curve of shark catfish gillnetting. The X-intercept of the linear line is the optimum length for being caught (29.56 cm).

It was seen by means of single mesh that L_c was increased by mesh size. In term of multi-meshes size, the L_c was reduced to 29.56 cm since the mesh of 4.5 and 5.5 cm could catch the small fish which is the majority in catch composition. To give the fish had an opportunity for reproduction, minimally once, before being caught; the L_m was approached as a criterion for deciding an optimum mesh size.

All of the L_cs, as shown in Table 1, were less than L_m and the effective range for female's broodstock. If the length at first maturity (27.36 cm) was considered, gillnet at the mesh size over 5.5 cm could be used. Nonetheless, the female fish at the size less than 38.56 cm – a lower limit to be a 'good' mother – the quantity and quality of eggs as well as maternal condition is not good enough to give strong quality of the recruitment. It was said straightforwardly that all meshes were destructed the parental stock. Conversely to the fact, local fishermen have to use all of such meshes throughout the year alternately by season, area, and fish size. In addition, gillnet is a flexible fishing gear for multi-species catching. The management regime should be optimized for reducing any controversies.

Ideally, optimum mesh size, estimating from overall selection factor (5.3744), for female shark catfish should be up to 7.0 cm. But for the holistic viewpoint of multi-meshes/multi-species of gillnet, the 5.5 cm mesh was the compromised mesh size for shark catfish fisheries. This mesh size can prevent the incident of 'recruitment overfishing' from small-meshed gillnets (Amarasinghe, 1988).

In the inland fisheries of Thailand,

according to the Department of Fisheries, the closed season is enforced during 16 May to 15 September. It is mostly coincided with freshwater fish spawning season. Gillnet is prohibited to operate whereas hook (not long line), scoop net (size > 2 × 2 m^2) and traps are allowed (Jutagate and Mattson, 2003). For the 'half and half' management, fishermen should use other types of gears or the use of > 5.5 cm gillnet in the open water zone apart from the spawning and nursing ground along the Mun River which covered from Kang Tana rapid through Sawang Veerawong sub-District (flood plain area).

CONCLUSION

The 5.5 cm mesh of gillnet is recommended as a minimum mesh size for shark catfish fisheries in the Mun River. It will give an opportunity for fish to spawn, at least once, before being exploited.

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