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Temporal variation in growth, condition factor, spawning of Fork-Tail Threadfin Bream (*Nemipterus furcosus*) in the coastal water of Kuantan, Pahang

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Abstract

Fork-tail threadfin bream (Nemipterus furcosus) is an economically important food fish in Malaysia but the capture production of this fish is decreasing gradually in the Malaysian water. However, nothing is known about the population of this species in the Malaysian water especially in the coastal water of Kuantan. Therefore, this study aimed to understand some important characteristics of fork-tail threadfin bream population in the coastal water of Kuantan. For this study, monthly samples were collected from commercial fishing trawlers for a period of one year. A total of 1587 threadfin bream specimens were studied in this research. The results showed that the growth coefficients (b value) vary from 2.41 (May) to 3.429 (October). Length-weight relationships of each month was significant (P<0.05) with all coefficients of determination values being higher than 0.723. An isometric growth of fork-tail threadfin bream was observed in January, February, March, September and November. A positive allometric growth of fork-tail threadfin bream was observed in July, August, October and November whereas, a negative allometric growth of fork-tail threadfin bream was recorded in April, May and June. The condition factor of fork-tail threadfin bream ranged from 1.25 to 1.39. Condition factors of this fish was significantly different between different sampling months (P < 0.05). The significantly lowest mean condition factor was observed in March and the highest was observed in August. The overall lowest mean gonadosomatic index (GSI) of fork-tail threadfin bream was observed in October (0.11) and highest was observed in June (2.39). No significant relationship (P > 0.05) between GSI and condition factor was observed in fork-tail threadfin bream. Comparatively very high GSI of threadfin bream was from January to August in Kuantan coastal water. Therefore, the spawning season of fork-tail threadfin bream in the Kuantan coastal water might be from February to July. The results of this study will help the management of juvenile and breeding fork-tail threadfin bream stock in order to maintain sustainable exploitation in the coastal water of Kuantan, Pahang.

Keywords: Spawning; *Nemipterus furcosus;* Growth; Condition Factor; Malaysia

1. Introduction:

Fork-tail threadfin bream (*Nemipterus furcosus*) is a commercially important fish in many countries in the world including Malaysia. In Malaysia, it is locally known as Kerisi, which supports an important commercial fisheries. Malaysian people prefer this fish due to its soft and delicately flavoured flesh. Therefore, it is one of the most important target marine fish for Malaysian fisherman. However, total production of fork-tail threadfin bream from Malaysian water is decreasing day by day (FAO, 2012) and this puts an increasing demand on the study and management of fork-tail threadfin bream population. A few studies have been conducted on the population of other economically important fish in Malaysia but the study on the fork-tail threadfin bream population in the Malaysian water is still lacking. Adequate information about population

parameters is prerequisite for the management of any wild fish stock (Rahman and Hafzath, 2012). Therefore, this study aims to provide some basic information (growth, condition factor and spawning) about fork-tail threadfin bream population in the coastal water water of Pahang.

However, understanding growth pattern is important to (i) calculate, production and biomass of a population; (ii) provide information on stocks or organism condition; (iii) compare the life history of fishes of different localities; (iv) determine the relative condition of small fish compared to large fish; and (v) set yield equations for estimating number of fish landed and compare the population in space and time (Rahman and Hafzath, 2012). The condition of a fish reflects recent physical and biological circumstances, and fluctuates by interaction among feeding conditions, parasitic infections and physiological factors (Rahman et al., 2009; Rahman and Verdegem, 2010; Gopalakrishnan et al., 2013). The gonadosomatic index (GSI) usually used to determine spawning periods (Rahman and Hafzath, 2012). However, published information on the grwoth, condition factor and spawning of wild fork-tail threadfin bream population is lacking specially in the coastal water of Kuantan, Malaysia. Therefore, The objectives of the study were to know the temporal variation of (i) growth, condition factor, gonadosomatic index; and (ii) spawning season of fork-tail threadfin bream in the coastal water of Kuantan, Malaysia.

2. Materials and method

For this study, the samples of fork-tail threadfin bream were collected from commercial fishing boat at Kompleks LKIM (Lembaga Kemajuan Ikan Malaysia), located at the estuary of Kuantan River for a period of one year. The required information like capture methods, area and time of capture were collected from fisherman. After collection, they were immediately preserved with ice, packed with ice box and transported to the laboratory. Upon arrival in the laboratory, total length (L) of fish were measured with a meter rule calibrated in centimeters. Fish length was measured to the nearest centimeter. Body weight (W) and gonad weight (GW) was measured after blot drying with a piece of clean hand towel. Gonad was collected carefully by dissecting the abdominal part of the fish. Weighing was done with a digital balance to the nearest gram. The length-weight relationship was calculated using the conventional formula $BW = a.L^b$, where coefficient a is the intercept in the y-axis, and the regression coefficient b is an exponent indicating isometric growth when close to 3. The statistical significance level of R^2 was estimated ($P<0.05$) and the parameters a and b were estimated by linear regression on the transformed equation, $logW = loga + b.logL$. The status of growth was estimated comparing with 3 (b = 3). The conclusion was made as negative allometric if b < 3 or as positive allometric if b > 3). The Fulton's condition factor was calculated for each individual fish according to the formula $K = (W/L^3) \times 100$, where K is condition factor, W is the body weight and L is total length of fish. The gonadosomatic index was calculated using the formula, $GSI (\%) = (GW/W) \times 100$, where GSI is the gonadosomatic index and GW is the gonad weight of fish. Spawning season was determined by plotting monthly mean GSI values (Y axis) along the X axis (month).

3. Results

Monthly growth and regression parameters of fork-tail threadfin bream of are presented in Table 1. Length-weight relationships (LWR) of fork-tail threadfin bream in all months were linear. Growth coefficients (b) vary from 2.41 (May) and 3.429 (October). LWRs of each month was significant (*P<0.05*) with all coefficients of determination (R^2) values being higher than 0.723. An isometric growth of fork-tail threadfin bream was observed in January, February, March, September and November. Positive allometric growths of fork-tail threadfin bream was observed in July, August, October and November whereas, negative allometric growths of fork-tail threadfin bream was recorded in April, May and June.

Table 1: Monthly descriptive statistics and estimated parameters of length-weight relationship of fork-tail threadfin bream (male and female combined) in the coastal water of Kuantan.

Month	n	a	b	R^2	P value	Growth	Equation
Aug-12	151	0.007365	3.2040	0.9655	*	+	$W = 0.007365L^{3.2040}$
Sep-12	149	0.011849	3.0420	0.8688	*	Iso	$W = 0.011849L^{3.0420}$
Oct-12	149	0.005443	3.2932	0.9421	*	+	$W = 0.005443L^{3.2932}$
Nov-12	119	0.010195	3.0864	0.9582	*	Iso	$W = 0.010195L^{3.0864}$
Dec-12	124	0.008348	3.1457	0.8992	*	+	$W = 0.008348L^{3.1457}$
Jan-13	142	0.017088	2.9140	0.9609	*	Iso	$W = 0.017088L^{2.9140}$
Feb-13	134	0.011374	3.0273	0.9532	*	Iso	$W = 0.011374L^{3.0273}$
Mar-13	129	0.015495	2.9290	0.9194	*	Iso	$W = 0.015495L^{2.9290}$
Apr-13	87	0.019756	2.8580	0.9257	*	-	$W = 0.019756L^{2.8580}$
May-13	132	0.076507	2.4101	0.7231	*	-	$W = 0.076507L^{2.4101}$
Jun-13	122	0.041649	2.6235	0.7779	*	-	$W = 0.041649L^{2.6235}$
Jul-13	149	0.009315	3.1044	0.9396	*	+	$W = 0.009315L^{3.1044}$

* Indicates significant ($P < 0.01$). +, -, iso, W and L indicate positive allometric growth, negative allometric groth, isometric growth, weight of fish and length of fish, respectively.

The condition factor of fork-tail threadfin bream ranged from 1.25 to 1.39 (Fig. 1-A). Condition factor of this fish was significant different between different samplings months ($P<0.05$). The significantly lowest mean condition factor was observed in March and the highest was observed in August. Changes of mean gonadosomatic index (GSI) of fork-tail threadfin bream in different months are presented in Fig. 2-B. The lowest GSI of fork-tail threadfin bream was observed in October (0.107) and highest was observed in June (2.39). No significant relationship ($P > 0.05$) between GSI and condition factor was observed in fork-tail threadfin bream.
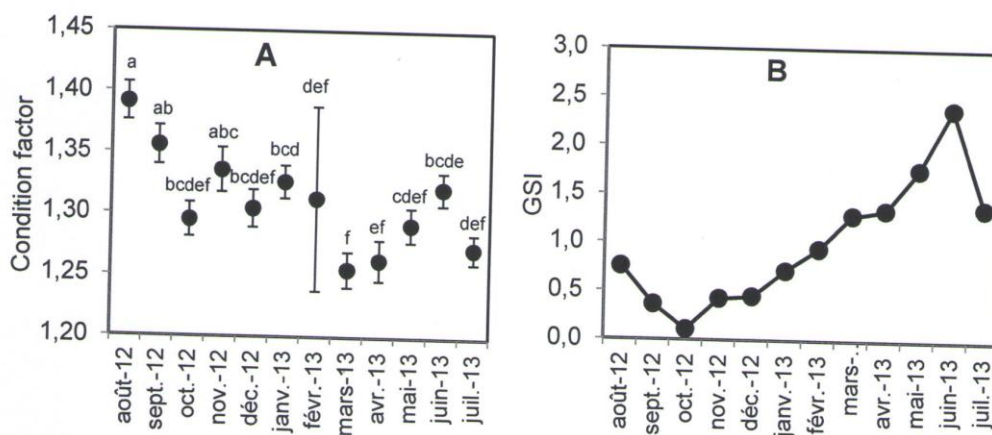

Figure 1: Monthly overall mean (± 95% confidence intervals) condition factor (A) and GSI (B) of fork-tail threadfin bream (male and female combined) in the coastal water of Kuantan. Mean with no letter in common differ significantly ($P<0.05$).

4. Discussion

This study provides information about growth, condition factor and spawning of fork-tail threadfin bream population in the coastal water of Kuantan, Malaysia. In this study, the overall growth coefficient (b-value) of the fork-tail threadfin bream was low from April to June (negative allowmetric growth) compared to other months. There is no previous study comparing the growth coefficient of fork-tail threadfin bream in the Kuantan coastal water. However, Nursyazwani (2013) observed a low growth coefficient (negative allowmetric growth) of *Nemipterus nemurus* in April in the coastal water of Kuantan. Similar low growth coefficient (negative allowmetric growth) was also observed by Rahman and Hafzath (2012) in Rastrelliger kanagurta in the coastal water of Kuantan. The low growth coefficient of fork-tail threadfin bream in the present study might be influenced by environmental or habitat factors (Rahman and Verdegem, 2007; Rahman et al., 2006; 2008). Therefore, more research is needed including analyzing environmental or habitat factors to understand the cause of low growth coefficient at this time period in the Kuantan coastal water.

Condition factor is a quantitative parameter that indicates the state of the fish including fatness and general well being of the fish (Wooton, 1990). In the present study, the overall condition factor varied from 1.25 to 1.39 that represented a fair and acceptable condition of fork-tail threadfin bream in the coastal water of Kuantan (Charles and Alan, 2003). This result in a way agree with Nursyazwani (2013), who observed almost similar values (1.21-1.44) of condition factor in *Nemipterus nemurus* collected from Kuantan coastal water. The gonadosomatic index (GSI) measures the cyclic changes in gonad weight in relation to total fish weight. Proportionally larger gonads indicate greater gonadal development (West, 1990; Jons and Miranda, 1997). Therefore, an increase in GSI suggests an approaching spawning season, and a decrease suggests spawning has occurred. In the present study, the overall mean GSI values of fork-tail threadfin bream in the coastal water of Kuantan were very high in February to July with peak in June. Based on this study, the spawning season of fork-tail threadfin bream in the Kuantan coastal water might be from February to July. The results of this study would be useful for both applied and basic use for the management of wild Asian seabass stock.

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