



Length-weight relationships and condition factors of the whitespotted grouper *Epinephelus coeruleopunctatus* Bloch, 1790 in the coastal waters of Padang City, Indonesia

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ABSTRACT

The whitespotted grouper *Epinephelus coeruleopunctatus* is one of the commercial marine fish species occurred in the coastal waters of Padang city, Indonesia. The population of the whitespotted grouper has been declining over last decade. Unfortunately, there was a lack of information on the biology of this species was available. Hence, the objectives of the present research were to examine the length-weight relationships and condition factors of the whitespotted grouper harvested from coastal waters of Padang city, Indonesia. The fish sampling was carried out from April to October 2013. The fish samples were weighed for total body weight and measured for total length. The result showed that the male grouper has $W = (3.1538 \cdot 10^{-5}) L^{2.8613}$, while the female has $W = (3.8617 \cdot 10^{-5}) L^{2.8384}$. Both sexes male and female displayed the negative growth pattern. The condition factor both male and female were tend 100, indicate a balance of prey and predator.

Keywords: *Epinephelus coeruleopunctatus*, growth pattern, allometric, and groupers

INTRODUCTION

Groupers are one of the most popular marine fish worldwide (Lee and Sadovy, 2000; Rhodes and Tupper, 2007; Muhammadar *et al.*, 2011; Muhammadar *et al.*, 2014). This group of fishes has been harvested intensively from the wild resulted in decreasing the production over the last decade (Pears, 2005; Rhodes *et al.*, 2008). The whitespotted grouper *Epinephelus coeruleopunctatus* is one of the commercial fish occurred in the Padang city waters. Unfortunately like as other species of grouper this species has also been rare and difficult to catch (Personal communication with local fishermen of Padang city). Presently, the abundance of the whitespotted grouper in Padang city was only about 0.004 fish/m² (Bulanin, 2010). The decreasing of the groupers worldwide was probably due to overfishing fishing (Teixiera *et al.*, 2004; Mariskha and Abdulgani, 2012) and habitat perturbation (Bulanin, 2010).

According to IUCN (2009) the whitespotted grouper *E. coeruleopunctatus* has been in the IUCN Red List as a threatened species. Therefore, the conservation of the whitespotted grouper was needed crucially. The length-weight relation is one of the important biological aspects to estimate to the growth pattern of fish (Muchlisin *et al.*, 2010). Artega (1997) stated that length-weight relationship can use to predict the population size based on space and time. Moreover, Fafioye and Oluajo (2005) reported that length-weights data can be used to determine the first time spawning age, production cycles, and reproduction. In addition, the condition factor is commonly calculated to assess the healthy and productivity of the fish population (Blackwell *et al.*, 2000; Richter, 2007) and physiological condition of fish (Froese, 2006; Rypel and Richter, 2008).

The length-weight relationships and condition factors are two of the most important biological aspects to assess the growth rate and fish condition (Muchlisin, 2010). Therefore, the information of length-weight relationships and condition factors are important to plan a better conservation strategy of the fishery resources (Muchlisin *et al.*, 2015). The objective of the present research was to assess the growth pattern of the whitespotted grouper *E. coeruleopunctatus* harvested from Padang city waters.

MATERIALS AND METHODS

The sampling was conducted in the Padang city waters during April to October 2013 in the Padang city waters (Figure 1). The fish samples were caught using hooks on 6.00 AM to 4.00 PM. The sampled fish was preserved in the ice box then transported to the laboratory in the Bung Hatta University, Padang, Indonesia for further analysis. In the laboratory, the fish samples were weighed for the body weight nearest to 0.01 mg using a digital balance and measured the total length nearest to 0.1 mm using digital calipers (Ohaus).

The growth pattern was calculated using the formula based on aimovici and Velasco (2000) as follow: $W = a \cdot L^b$, where, W is total body weight (g), L is total length (mm) and a is geometric coefficient, b is slope of the regression model. The Fulton and Relative weight condition factors were calculated based on Muchlisin *et al.* (2010); Rypel and Richter (2008) as follows: Relative weight condition factor (W_r) = $(W/W_s) \times 100$, where W is the body weight of the fish, and W_s is the predicted standard body weight for the particular fish as calculated from a composite of length-weight regression throughout the range of the species, as $W_s = aL^b$. While, the Fulton condition coefficient (K) = $WL^{-3} \times 100$, W is body weight of the fish (g), L is total length of the same fish (mm), -3 is length coefficient to ensure that the K value tends to one.

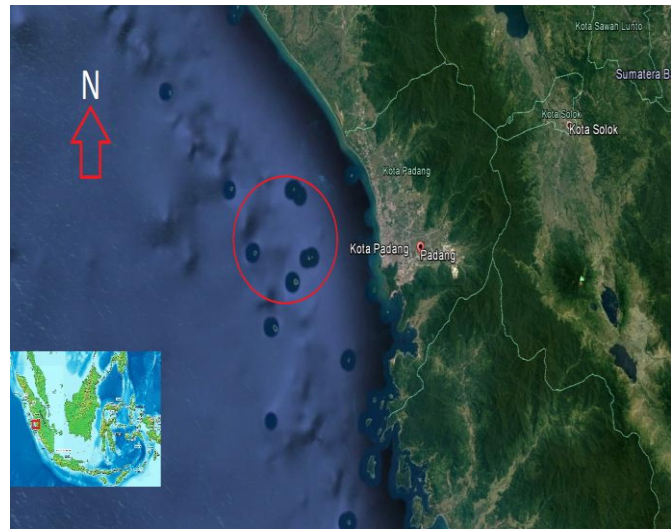


Figure 1. A map of Padang City waters showing the sampling location (red circle).

RESULTS

The results showed that the length of the fish samples ranged from 350 mm to 530 mm for male and 205 mm to 500 mm for female, while total body weight was 490 g to 2100 g for male, and 210 g to 1800 g for female. Indicate the male was bigger than female. The analysis of regression showed that the male fish has $W = 3.1538 \cdot 10^{-5} \times L^{2.8613}$ (Figure 2a), while female fish had $W = 3.8617 \cdot 10^{-5} \times L^{2.8384}$ (Figure 2b). The results of the regression model showed that the b value of male was 2.86, and 2.84 for female, it mean that the b value for both sexes male and female was less than 3, display the negative allometric growth pattern. This value indicates that increasing of the length was not balanced by the weight gain or the weight gain was slower than length gain.

The Fulton condition factor of individual male ranged 3.03-3.21 with average of 3.13 ± 0.05 , while the individual K value of female fish ranged 3.00 to 3.54 with average of 3.20 ± 0.10 . In addition, the relative body weight condition factor of male fish ranged 82.89 to 117.57 at average of 100.44 ± 9.63 , while from 64.41 to 152.59 (average value 101.25 ± 16.27) for female fish. Hence, there were no significant differences in condition factors both male and female.

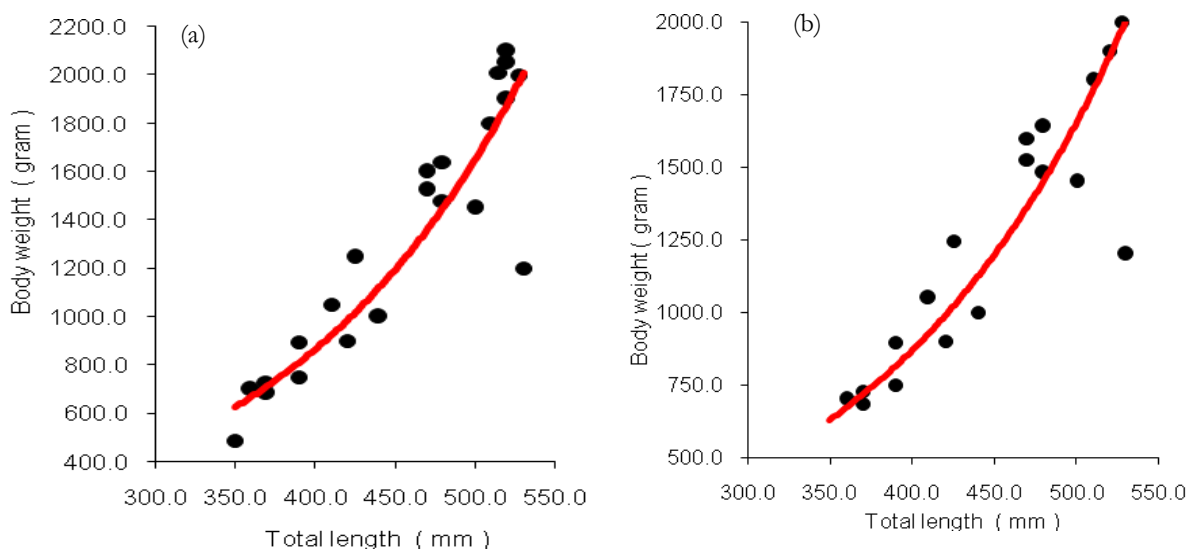


Figure 2. The length-weight relationships of the fish *Epinephelus coeruleopunctatus* for; (a) male fish, (b) female fish

DISCUSSION

The study revealed that the whitespotted grouper had the negative allometric growth pattern. The negative allometric growth pattern was also detected in several species of marine species, for example for *Mugil cephalus* and *Ambassis koopsii* in Gigieng estuary, Indonesia (Mulfizar *et al.*, 2012), *Chilomycterus spinosus* in the southern Brazil waters (Dias *et al.*, 2014), Carangidae in Mediterranean Sea (Tsagarakis *et al.*, 2015), whereas the positive growth pattern was reported in *Anchoviella lepidentostole* and *Anchoviella lepidentostole* (Dias *et al.*, 2014), *Lepidorhombus boscii*, *L. whiffiagonis*, *Platichthys flesus*, *P. lascaris*, *Solea solea*, *Epinephelus marginatus*, *E. aeneus* and *E. costae* (Tsagarakis *et al.*, 2015) and *Leiognathus fasciatus* in Gigieng estuary, Indonesia (Mulfizar *et al.*, 2012). In general the body weight condition factor of whitespotted grouper tends to 100, indicate there is a balance between prey and predator (Anderson and Neumann, 1996). However, the variation of food supply between seasons may change the condition factor seasonally (Offem *et al.*, 2007).

According to Muchlisin *et al.* (2010) the b value is determined by the fish behavior that the active swimming fish had b value tend to low. The generally, the grouper is a coral reef fish that can be categorized as passive swimming fish; However, the study showed that the whitespotted grouper in the Padang waters had a low b value (less than 3). According Fishbase (2017) the maximum length of the whitespotted grouper reaching 760 mm; however, no fish sample above 530 mm was found during the study. These are the indication that the overfishing

has occurred on whitespotted grouper in Padang city waters since no a maximum size was recorded. Therefore, the management action has to be conducted immediately.

CONCLUSION

The whitespotted grouper in the Padang city coastal waters displays the negative allometric growth pattern and the relative weight condition factor was tend to 100 indicate a balance of prey and predator

ACKNOWLEDGMENTS□

This study was supported by the Ministry of Higher Education, Science and Technology, the Republic of Indonesia through fundamental research scheme with contract number: 014/SP/HATTA-1/LPPM/II/2013. Therefore, the author thanks the Ministry of Higher Education, Science and Technology for funding this study. Sincerely thanks are also addressed to my colleagues who helped the authors in the laboratory and in the field and Mr. Agung Setia Batubara for data analysis assistance.

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Received: 6 March 2017

Accepted: 13 March 2017