Some biological aspects of the golden hind grouper
(*Cephalopholis aurantia*) harvested in the northern coast of Aceh, Indonesia (a preliminary study)

N Fadli¹, D Damora¹, Z A Muchlisin¹, I Dewiyanti¹, M Ramadhaniaty¹, A Hanif¹, C S Zahara¹, M Rusdi², F M Nur³, AS Batubara¹ and M N Siti-Azizah⁴

¹Faculty of Marine and Fisheries, Universitas Syiah Kuala, Banda Aceh, Indonesia
²Remote Sensing and Cartography Lab, Universitas Syiah Kuala, Banda Aceh, Indonesia
³Graduate School of Mathematics and Applied Science, Universitas Syiah Kuala, Jl. Tgk. Syech Abdul Rauf, Darussalam, Banda Aceh 23111, Indonesia
⁴Institute of Marine Biotechnology, Universiti Malaysia Terengganu, Terengganu, Malaysia

*Email: nurfadli@unsyiah.ac.id*

**Abstract.** *Cephalopholis aurantia* is one of the grouper species considered as the least concern (LC) based on the IUCN category. However, the data related to its biological features is limited. The present study's objective was to study some biological aspects of the golden hind grouper harvested in the northern coast of Aceh. The fishes were collected from June - August 2020 in several fish landing sites (TPI) and fish market located in Banda Aceh and Aceh Besar district. In total, 24 fish specimens were collected in this study. All samples were small and young (between 103.1 - 240.0 mm TL and 60.6 - 267.5 g). In addition, all the collected fishes were female with the gonad maturity levels varied from stage I to stage IV with the gonad weight ranged from 0.01 - 2.00 gr. This study is providing baseline data of some biological aspects of the golden hind grouper that will be valuable in developing a practical fisheries management of the species.

1. Introduction

Aceh is a province located in Indonesia's westernmost part and is also known as one of the hot spots of tropical marine biodiversity [1-3]. Like other parts in Indonesia, capture fisheries play an important role in Aceh's fisheries, including grouper fisheries. Globally, the groupers are one of the highest-priced marketed reef fishes in the world [4-6]. The groupers in Aceh are also heavily exploited to supply the local and regional markets. Based on the report of the Department of Marine and Fishery of Aceh, the annual grouper catches in Aceh rose from 4,056.2 tons in the year 2011 to 4,603.4 tons for the year 2014.

One hundred sixty grouper species were recognized in the world, with 60% were considered as Data Deficient and Least Concern (LC) based on the IUCN category for their conservation status [5, 7]. *Cephalopholis aurantia* is one of the grouper species considered as the LC category. The fish is widespread in the Indo-Pacific from islands of the western Indian Ocean to Japan and the central Pacific [8]. Collected with other groupers, *C. aurantia* had high economic value and market demand in Aceh. However, there is still limited information on the biological features of *C. aurantia* is available for this region. The absence of the initial biological data will lead their management practices to be more challenging.
The studies of groupers in the Aceh region and its adjacent waters are limited. Most of the studies in this region focused on the taxonomy, mostly utilizing the molecular approach [9-11], fishing gear to catch grouper [12], and a few studies documented on the biological aspect of groupers in Aceh [13]. Hence, the present study's objective was to study some biological aspects of the golden hind grouper (*C. aurantia*) harvested on Aceh's northern coast.

### 2. Materials and Method

The fishes were collected from June - August 2020 in several fish landing sites (TPI) and fish market located in Banda Aceh and Aceh Besar district (Figure 1) and identified based on [7, 14]. Some biological parameters, i.e., total length (TL), total weight (W), sex, maturity level, fecundity, etc. were obtained at Genetics and biodiversity Laboratory in the Faculty of Marine and Fisheries, Universitas Syiah Kuala. In addition, the length-Weight relationship was analyzed used the linear allometric model (LAM) following [15] and [16]. Furthermore, Fulton's condition (K) and Relative weight (Wr) were calculated based on [17].

![Figure 1](image_url)

**Figure 1.** Map of the grouper fishing ground (dashed line) on the northern coast of the Aceh region.

### 3. Results and Discussion

In total, 24 fish specimens were collected in this study. All samples found in this study were small and young (between 103.1-240.0 mm TL and 60.6-267.5 g), with the gonad weight ranged from 0.01-2.00 g (Table 1). In addition, all the collected fishes were female with the gonad maturity levels varied from stage I to stage IV. The gonad maturity levels on June were dominated by stage I followed by stage II and IV. On July 2020 only stage I and II were recorded while on August the gonad maturity levels were dominated by stage I followed by stage III (Figure 2).

The results of the LWRs analysis showed that fish had a $b$ value of 3.11 with a correlation coefficient of 0.96 (Figure 3a). This result indicated *C. aurantia* had a positive allometric growth pattern and a robust correlation between body weight and total length. In addition, the regression models displayed comparable growth patterns between the observed and predicted, as showed in Figure 3b.
**Table 1.** Some biological parameters of *C. aurantia* harvested on Aceh's northern coast.

| Parameters                  | Min  | Max   | Average         |
|-----------------------------|------|-------|-----------------|
| Total Length (mm)           | 103.1| 240.0 | 187.2 ± 28.6    |
| Weight (g)                  | 60.6 | 267.5 | 133.8 ± 52.5    |
| Gonad Weight (g)            | 0.01 | 2.00  | 0.42 ± 0.5      |
| Fulton’s condition (K)      | 1.82 | 3.90  | 2.68 ± 0.52     |
| Relative weight (Wr)        | 88.39| 113.06| 100.23 ± 7.13   |

**Figure 2.** The gonad maturity levels of *C. aurantia* during the study period (x axis: month; y axis: percentage).

**Figure 3.** The length-weight relationships (a) and comparison of observed and predicted growth (b) of *C. aurantia* harvested in Aceh's northern coast.

Referring to [8], the maximum length of the golden hind grouper is reaching 600 mm with a common length of 300 mm; however, no fish sample above 240 mm was found in this study indicated that the fishes collected during the study period were small and young. Besides, none a maximum size fishes were recorded in this study that might indicate overfishing already happened to this species. As reported by [5], the groupers are regarded as one of the first fish groups to be overexploited. Some studies reported an indication that the grouper already overfished in their region. For example, [18] reported the
whitespotted grouper, *E. coeruleopunctatus* in the coastal waters of Padang City, Indonesia, already overfished [18]. Another study by [19] also revealed that *E. coioides*, *E. bleekeri*, and *E. areolatus* in United Arab Emirates water were in an overfished condition.

In general, the growth pattern resulted in this study (b=3.11) is comparable with previous studies of several grouper species: *P. leopardus* (b= 3.0811), *P. oligocanthus* (b= 3.2274), *P. laevis* (b=3.5129), and *E. coioides* (b= 3.1655) harvested in Berau waters, East Kalimantan [20], *P.maculatus* (b=3.064) fished in northern Aceh [13] and several other marine fishes: *Moolgada engeli* (b= 3.22 for the male and 3.41 for the female fish) from Lambada Lhok waters in Aceh Besar, Indonesia [21]. The b value is in the predictable range of 2.5 < b < 3.5 [22]. Numerous factors, such as environmental circumstances, seasons, fish behavior, etc., could be related to the growth pattern [16, 21]. For example, [21] revealed Largescale mullet, *Liza macrolepis* , and *M. engeli* fished from Lambada Lhok waters in Aceh Besar, Indonesia had better growth patterns during the dry season. In addition, the average Fulton's condition factor was higher than 1 (2.68 ± 0.52), while the average relative weight was above 100 (100.23± 7.13). These results showed that the grouper fished in Aceh's northern coast was in admirable condition [17]. Lastly, the current study's data will help develop an applied fisheries management of the golden hind grouper on Aceh's northern region and can be used for reference material for forthcoming studies.

4. Conclusions

The results of this study showed that *C. aurantia* had a positive allometric growth pattern. The average Fulton's condition and the average relative weight showed that *C. aurantia* was in excellent health, indicating that Aceh's northern coast is a suitable environment for the fish. This study provides baseline data of some biological aspects of the golden hind grouper that will be valuable in developing a practical fisheries management of the species.

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