



Diversity of commercially important grouper (Family: Epinephelidae) in Simeulue and Banyak Islands, Aceh, Indonesia

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ABSTRACT

Grouper is one of the economically important fish groups in the Simeulue and Banyak Islands. However, data on the diversity of the grouper in this region is limited. This study aimed to inventory the commercially important grouper in Simeulue and Banyak Islands. Sampling was carried out in April - September 2021 at 16 locations around Simeulue and Banyak Islands. Grouper fish were collected from fishermen's catch, fish collectors, or fish landing sites (TPI). Representatives of each species were collected and photographed. Species identification was made by fish identification books. In total, 20 species of commercial grouper consisting of six genera were recorded during the study. *Epinephelus* was the most dominant genus with ten species, followed by *Cephalopholis* with four species. In addition, seventeen species (85%) were included in the Least Concern (LC), two species (10%) were categorized as Vulnerable (VU), and one species (5%) was Data Deficient (DD). This study provides a database of commercially important grouper in Simeulue and Banyak Islands that can be used to manage the fish group.

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Introduction

The grouper is a demersal fish that mostly lives in coral reef areas in tropical and subtropical waters (Heemstra and Randall, 1993). There are at least 163 grouper species globally (Craig *et al.*, 2011). In comparison, the Fisheries Resource Center of Indonesia (2021) reported that no less than 77 species of grouper are found in Indonesian waters. The groupers are protogynous hermaphrodites wherein the sex changes from female to male in one life cycle (Craig *et al.*, 2011; Heemstra and Randall, 1993; Rhodes *et al.*, 2013).

The grouper is one of the economically important fish groups in Indonesia (Fadli *et al.*, 2021; Yulianto *et*

al., 2015). During the first quarter of 2020 (January-March), Indonesia's total grouper exports reached 4040 tons (19.97 million US\$) consisting of frozen fish, live fish, seafood products, and others. Live grouper fish products are mainly exported to Hong Kong (91.73%) and China (5.59%), followed by Malaysia (38.18%), Singapore (23.84%), and Taiwan (18.03%). Meanwhile, frozen grouper products are mainly exported to China (24.22%), Taiwan (19.20%), the United States (12.78%), and France (12.77%) (Suhana, 2020).

Simeulue and Banyak Islands are situated in the southern part of Aceh Province, Indonesia. The islands are bordered directly by the Indian Ocean.

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Like other coastal regions in Indonesia, these regions also depend on the fisheries sector (Batubara et al., 2018). In 2020, Badan Pusat Statistik data showed that the potential of the capture fisheries sector in the Simeulue and Banyak Islands area is the highest, and the grouper is one of their vital export fish commodities. The production of grouper reached 30 tons/year in Simeulue and 4 tons/year in Banyak Islands (Badan Pusat Statistik, 2020).

Nevertheless, even though the grouper is an essential fisheries resource, minimal information or studies on the grouper are available in the region. Some grouper fish inventory studies had been conducted in Aceh (Astuti et al., 2016; Fadli et al., 2021; Fadli et al., 2020; Kamal et al., 2019), yet, they did not cover Simeulue and Banyak Islands.

Only a few fish inventory studies in Simeulue and Banyak Islands had been performed earlier. For example, Batubara et al. (2017) documented 77 marine fishes in Simeulue waters, including 14 grouper species. Muchlisin et al. (2017) described 11 fish species in two lakes located on Simeulue Island. In another study, Batubara et al. (2018) reported 52 peripheral fishes in the estuary area of Simeulue Island. However, these studies covered limited sampling times and restricted areas. The comprehensive record on grouper diversity in this region is not yet assessed. Therefore, this study aimed to record all the essential commercial groupers fished in Simeulue and Banyak Islands for fisheries management and species conservation in the future.

Material and method

This research was conducted from April to September 2021. Grouper sampling was carried out in 16 locations in Simeulue and Banyak Islands (SIMAKSI Number: SI.07/K.20/TU/KSA.2.1/5/2021) (Figure 1 and Table 1). Grouper fish were collected from fishermen's catch, fish collectors, or fish landing sites (TPI). Representatives of each species were collected and photographed (Figure 2). Species identification was made by fish identification books (Craig et al., 2011; Froese and Pauly, 2021; Heemstra and Randall, 1993).

In addition, the threat status of the identified grouper species was defined by the IUCN red list (<https://www.iucnredlist.org/>) and their trade status was classified based on the CITES website (<https://checklist.cites.org>).

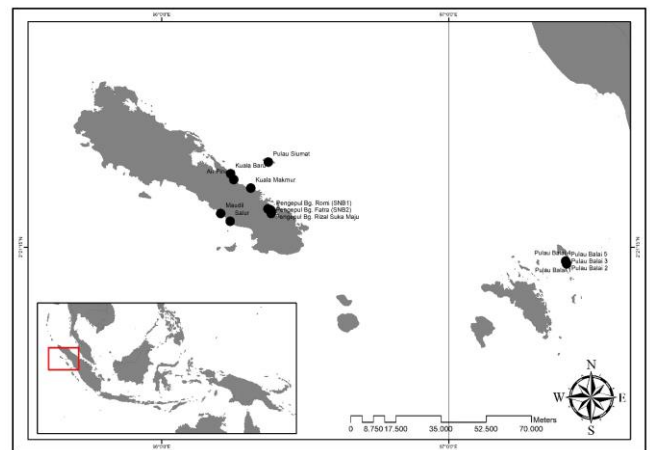


Figure 1. Research sites in Simeulue and the Banyak Islands.

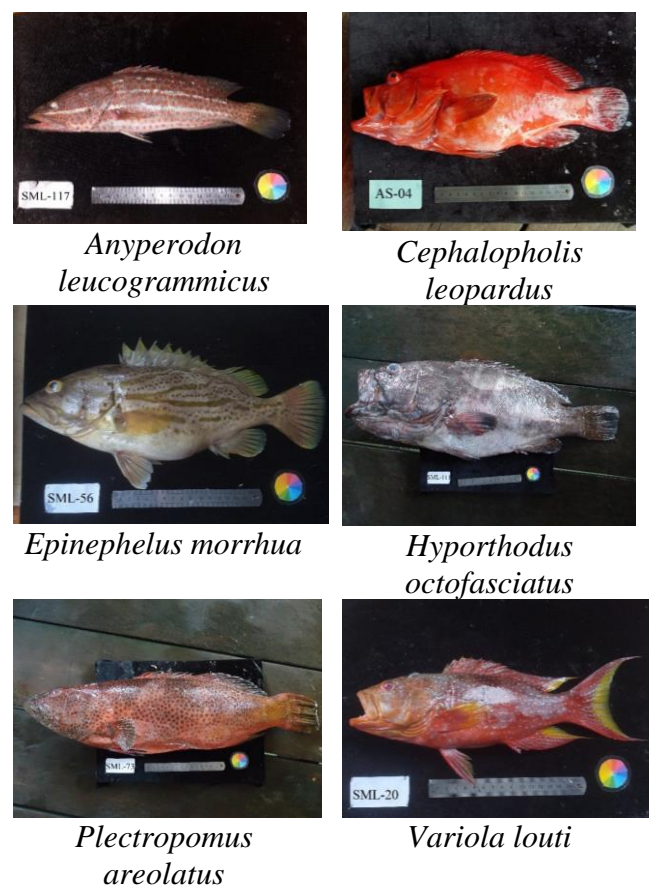


Figure 2. Documentation of some grouper species found in Simeulue and Banyak Islands.

Results

Overall, 20 grouper species belonging to six genera were recorded from 16 Simeulue and Banyak Islands sampling locations. *Epinephelus* was the most common genus (54%) (10 species: *Epinephelus areolatus*, *E. coeruleopunctatus*, *E. fasciatus*, *E. flavocaeruleus*, *E. fuscoguttatus*, *E. longispinis*, *E. macropilos*, *E. merra*, *E. morrhua*, and *E. tauvina*), followed by *Cephalopholis* (19%) (4 species: *Cephalopholis boenak*, *C. leopardus*, *C. miniata*, and *C. sonnerati*), *Plectropomus* (13%) (2 species: *Plectropomus*

areolatus and *P. leopardus*), *Variola* (12%) (2 species: *Variola albimarginata* and *V. louti*), *Anyperodon* (1%) (one species: *Anyperodon leucogrammicus*), and *Hyporthodus* (1%) (one species: *Hyporthodus octofasciatus*). In addition, the genera of *Anyperodon* and *Hyporthodus* were reported for the first time in the Aceh region (Table 1 dan Figure 3).

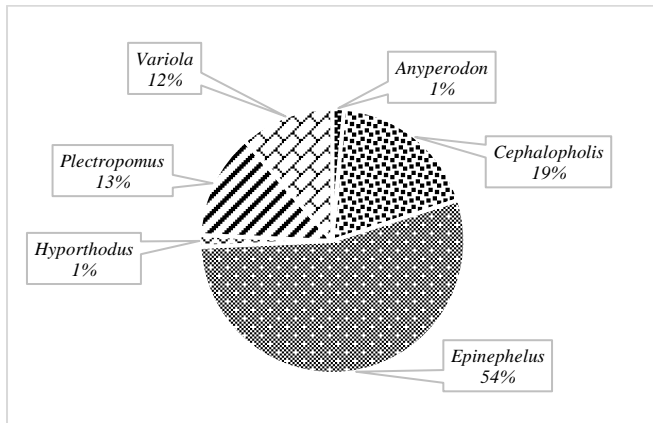


Figure 3. Composition of the grouper genus found in Simeulue and Banyak Islands.

Additionally, based on the International Union for Conservation of Nature (IUCN) category, out of 20 species, 17 species (85%) were included in the Least Concern (LC), two species (10%) were categorized as Vulnerable (VU), and one species (5%) was Data Deficient (DD). The two species in the VU category were: *E. fuscoguttatus* and *P. areolatus* (Figure 4). Moreover, four species showed a declining trend in the population (*E. fuscoguttatus*, *P. areolatus*, *P. leopardus*, and *V. albimarginata*) (<http://www.iucnredlist.org>, accessed 27 September 2021). However, none of the identified species has been evaluated by Convention on International Trades on Endangered Species of Wild Flora and Fauna (CITES) (<http://www.cites.org/>, 27 September 2021).

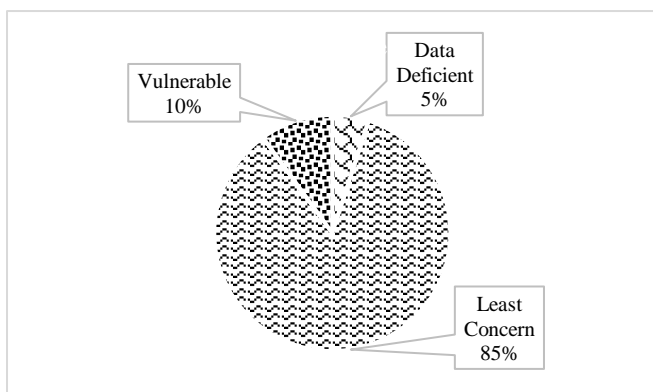


Figure 4. Percentage of grouper in each IUCN category.

Discussion

Overall, 20 grouper species belonging to six genera were recorded from Simeulue and Banyak Islands. The number of grouper species observed in this study is higher than reported in earlier research conducted in a different part of Indonesia. For example, Basith et al. (2021) reported 14 species of grouper on Madura island. In another study, Tapilatu et al. (2021) identified 16 species of commercially important grouper in the northern part of Papua. However, the observed number of grouper genera recorded in this study is similar to other studies worldwide, for instance, in the Philippines (six genera) (Alcantara and Yambot, 2016), India (six genera) (Basheer et al., 2017), and the Red Sea, Egypt (six genera) (Galal-Khallaf et al., 2019). Furthermore, the number of genera is higher than reported in peninsular Malaysia (3 genera) (Aziz et al., 2016).

Anyperodon and *Hyporthodus* were reported for the first time in the Aceh region. Both genera are not described in earlier grouper studies in Aceh (Astuti et al., 2016; Fadli et al., 2021; Fadli et al., 2020; Kamal et al., 2019). *Anyperodon leucogrammicus* is reef-associated fish and mainly lives at a depth range of 5 - 80 m (Froese and Pauly, 2021). The fish is one of the significant fisheries resources in the Arafura Sea, Indonesia (Pane et al., 2021). However, it appears that this species is not an essential fish in the grouper fishery in Aceh as the species is not recorded in other Aceh's fish landing sites. On the other hand, *Hyporthodus octofasciatus* is a deep-water grouper (Wakefield et al., 2013). They usually live at 150 - 300 m depth (Heemstra dan Randall, 1993). The Indian Ocean directly borders Simeulue and Banyak Islands with a deep ocean floor. Simeulue forearc basin has a maximum water depth of about 1300 m (Berglar et al., 2008), providing suitable habitat for the fish. This fish is suspected to be difficult to fish and has not been observed in other fish landing sites in Aceh.

This study also revealed that two of the 20 grouper species were found vulnerable by the IUCN, namely *E. fuscoguttatus* and *P. areolatus*. Due to their large size and high market demand, these two species have become a target for fishing in Simeulue and Banyak Islands. Grouper fish in the vulnerable category tend to be bigger than other groupers (Sadovy de Mitcheson et al., 2013). *Epinephelus fuscoguttatus* can reach a maximum of 120 cm and a maximum weight of around 308 kg, while *P. areolatus* can reach a maximum length of 80 cm with a reported maximum weight of 24.2 kg (Craig et al., 2011; Heemstra and Randall, 1993). *Plectropomus leopardus* and *Epinephelus fuscoguttatus* are the main grouper fish exported from Indonesia to Hong Kong

and China (Suhana, 2020). Moreover, four species recorded in this study also showed a decreasing trend in the population-based IUCN database (*E. fuscoguttatus*, *P. areolatus*, *P. leopardus*, and *V. albimarginata*). *Plectropomus areolatus* and *P. leopardus*, locally known as kerapu sunu, have the highest market value among other groupers in this region (Damora et al., 2021; Setiawan et al., 2019). In Simeulue and Banyak Islands, the price of sunu grouper reaches IDR. 165.000,-/kg in fish collectors. In Indonesia, the latest price for the sunu grouper in October 2021 is IDR. 375.000,-/kg (<https://jurnalmanajemen.com/harga-ikan-kerapu/>, accessed 12 December 2021).

Local and provincial governments should implement some fisheries management interventions to maintain the grouper fisheries to be sustainable in this region. As stated by Fadli et al. (2021) in their study, these interventions should involve prohibiting fishing activities, especially during spawning times, creating marine protected areas in grouper habitat, etc. In addition, the introduction of grouper aquaculture is also one of the strategies that can be implemented in this region. According to Rimmer and Glamuzina (2019), Indonesia is the third-ranked country in grouper aquaculture globally after China and Taiwan. The eastern coastal area of Simeulue Island was identified as appropriate for grouper net-cage culture mariculture (Purnawan et al., 2015).

Table 1. List of commercially important grouper found in Simeulue and Banyak Islands (+: found).

No	Genera	Species	Sampling site																
			SLR	MD L	SN B	SJ	SM	AM T	PI	PS	KM	AP	KB	PB1	PB2	PB3	PB4	PB5	
1	<i>Amyperodon</i>	<i>Amyperodon leucogrammicus</i>																	+
2	<i>Cephalopholis</i>	<i>Cephalopholis boenak</i>																	+
3		<i>Cephalopholis leopardus</i>								+									
4		<i>Cephalopholis miniata</i>											+						+
5		<i>Cephalopholis sonnerati</i>								+								+	+
6	<i>Epinephelus</i>	<i>Epinephelus areolatus</i>	+	+													+	+	+
7		<i>Epinephelus coeruleopunctatus</i>				+			+				+						
8		<i>Epinephelus fasciatus</i>									+								+
9		<i>Epinephelus flavocaeruleus</i>							+	+									
10		<i>Epinephelus fuscoguttatus</i>				+			+			+							
11		<i>Epinephelus longispinis</i>				+			+	+									
12		<i>Epinephelus macrospilos</i>				+			+										
13		<i>Epinephelus merra</i>				+			+										
14		<i>Epinephelus morrbua</i>				+			+										
15		<i>Epinephelus tawina</i>				+													
16	<i>Hyporthodus</i>	<i>Hyporthodus octofasciatus</i>							+										
17	<i>Plectropomus</i>	<i>Plectropomus areolatus</i>							+			+							+
18		<i>Plectropomus leopardus</i>							+			+	+				+		
19	<i>Variola</i>	<i>Variola albimarginata</i>										+		+		+			+
20		<i>Variola louti</i>							+								+		

Description: SLR: Salur; MDL: Maudil; SNB: Sinabang; SJ: Suka Jaya; SM: Suka Makmur; AMT: Amaiteng; PI: Fish Market; PS: Siumat Island; KM: Kuala Makmur; AP: Air Pinang; KB: Kuala Baru; PB1: Banyak Islands 1; PB2: Banyak Islands 2; PB3: Banyak Islands 3; PB4: Banyak Islands 4; PB5: Banyak Islands 5.

Conclusion

This study provides a database of commercially important of grouper in the Simeulue and Banyak Islands that can be used for fisheries management. Overall, 20 grouper species belonging to six genera were recorded from 16 sampling locations in Simeulue and Banyak Islands. The genera of *Amyperodon* and *Hyporthodus* were the first reported in

the Aceh region. In addition, *Epinephelus* is the dominant genus found based on the number of species.

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