

## MORPHOLOGICAL IDENTIFICATION OF GROUPER SPECIES (FAMILY SERRANIDAE) FROM TENGUYUN TRADITIONAL MARKET, TARAKAN ISLAND

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### ABSTRAK

Mengidentifikasi jenis ikan kerapu adalah langkah awal untuk memahami keanekaragaman spesies ikan kerapu dan mendukung pembentukan sistem pengelolaan perikanan yang berkelanjutan. Di Indonesia, ikan kerapu tersebar luas, termasuk di perairan Kalimantan Utara. Studi ini fokus pada identifikasi jenis ikan kerapu dari keluarga Serranidae berdasarkan karakteristik morfologisnya yang diperdagangkan di pasar tradisional Tenguyun di Pulau Tarakan. Selama penelitian, semua ikan kerapu yang tersedia di pasar ini dikumpulkan untuk diklasifikasikan spesiesnya. Dari penelitian ini, ditemukan empat spesies ikan kerapu dari family Serranidae di Pulau Tarakan, yaitu *Epinephelus coioides* (kerapu lumpur), *Epinephelus lanceolatus* (kerapu kertang), *Plectropomus oligacanthus* (kerapu sunu), dan *Cephalopholis cyanostigma* (kerapu karang bintik biru). Hasil penelitian diharapkan memberikan kontribusi dalam memperkaya database tentang ikan kerapu yang ditangkap oleh nelayan lokal Kalimantan Utara, guna memfasilitasi dasar pengelolaan sumber daya perikanan yang lebih efektif.

Kata kunci: Ikan kerapu, Morfologi, Tarakan, Kalimantan Utara

## IDENTIFICATION OF GROUPER FISH SPECIES (FAMILY SERRANIDAE) FROM THE TENGUYUN TRADITIONAL MARKET, TARAKAN ISLAND, BASED ON MORPHOLOGICAL CHARACTERISTICS

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### ABSTRACT

Identifying grouper fish species is the first step toward understanding the diversity of grouper species and supporting the development of a sustainable fisheries management system. In Indonesia, groupers are widely distributed, including in the waters of North Kalimantan. This study focuses on identifying grouper species from the Serranidae family based on their morphological characteristics, which are traded in the traditional Tenguyun market on Tarakan Island. During the research, all groupers available in this market were collected to classify their species. From this study, four species of groupers from the Serranidae family were found on Tarakan Island, namely *Epinephelus coioides* (mud grouper), *Epinephelus lanceolatus* (giant grouper), *Plectropomus oligacanthus* (coral trout), and *Cephalopholis cyanostigma* (bluespotted grouper). The research results are expected to contribute to enriching the database on groupers caught by local fishermen in North Kalimantan, to facilitate a more effective fisheries resource management foundation.

Keywords: Grouper fish, morphology, Tarakan, North Kalimantan

## BACKGROUND

Tenguyun Market on Tarakan Island, North Kalimantan, plays a vital role in the local economy, serving as a central hub for fishery products from both the island and surrounding regions. It provides significant opportunities for fishermen and fish vendors to sell their catches, contributing to the livelihood of the local community.

One of the most sought-after fish at the market is grouper, a key predator in coral reef ecosystems (Ritonga et al., 2022). Groupers belong to the Serranidae family, particularly the Epinephelinae subfamily, and are identified based on their morphological characteristics, such as operculum shape, body patterns, and coloration (Ma & Craig, 2022).

Ecologically, groupers are adaptable carnivores found in a range of habitats, from shallow reefs to deeper waters (Ellis, 2019; Santoso, 2022). They vary greatly in size, from 30 cm to 160 cm when fully grown (Jones et al., 2019), and inhabit diverse environments like coral reefs, sandy shores, and rocky or muddy seabeds (Tuapetel et al., 2018).

However, rising demand and high market value have led to overfishing, threatening grouper populations in Indonesia (Kadir et al., 2023; Hartati et al., 2023). To address this issue, the study aims to identify and catalog the grouper species sold at Tenguyun Market based on their physical traits, providing essential data for sustainable fishery management.

## RESEARCH METHODS

### Sampling Location and Site

Sampling was conducted at Tenguyun Traditional Market, Tarakan Island, North Kalimantan, from May to June 2022. The groupers were then taken to the laboratory for identification.

### Collection and Morphological Identification of Serranidae Groupers

Groupers were collected using a survey method. Sample specimens of groupers were gathered

from the traditional market. The collected fish were placed in containers, labeled, and brought to the laboratory for identification. The fish were then photographed. Identification was carried out by observing the shape of the dorsal, caudal, and anal fins, body shape, patterns, and coloration of the groupers, using the FAO Grouper Identification book by Heemstra and Randall (1993).

## RESULT AND DISCUSSION

Observations during the study revealed that three genera of grouper fish were sold at the Tenguyun Market, Tarakan Island: *Epinephelus*, *Plectropomus*, and *Cephalopholis*. The genus *Epinephelus* was represented by two species, *Epinephelus coioides* and *Epinephelus lanceolatus*, while the other two genera, *Plectropomus* and *Cephalopholis*, were each represented by a single species, *Plectropomus oligacanthus* and *Cephalopholis cyanostigma*, respectively.

According to the International Union for Conservation of Nature (IUCN), the global conservation status of these four Serranidae species is as follows: three species are classified as "Least Concern," indicating a very low risk of extinction, while one species is categorized as "Data Deficient," meaning there is insufficient information available to make a proper assessment of its extinction risk. Additionally, according to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), all four species are listed under the "Not Evaluated" category, meaning they have not yet been assessed, and their trade is currently permitted (see Table 1).

Table 1. IUCN and CITES Status of Grouper Fish

No	Genus	Species	IUCN	CITES
1	<i>Epinephelus</i>	<i>coioides</i>	LC	NE
		<i>lanceolatus</i>	DD	NE
2	<i>Plectropomus</i>	<i>oligacanthus</i>	LC	NE
3	<i>Cephalopholis</i>	<i>cyanostigma</i>	LC	NE

**Note:** LC = *Least Concern*; DD = *Data Deficient*; NE = *Not Evaluated*

### *Epinephelus coioides*

The Orange-spotted Grouper (*Epinephelus coioides*), a predatory species within the Serranidae family, is recognized for its considerable size, reaching lengths up to 1.2 meters and weights approaching 15 kg (Fishbase, 2018). Its dorsal surface exhibits a grayish-brown hue, adorned with numerous small spots ranging from brownish-orange to reddish-brown, distributed across the head, body, and median fins. The species is further characterized by irregular H-shaped dark bars along the body, with the brownish-orange spots often aligning in rows, particularly in juvenile individuals. Larger specimens frequently display dark blotches on the head, especially behind the eyes and on the operculum (Heemstra and Randall, 1993).

This species typically inhabits turbid coastal reefs and brackish environments, favoring areas with muddy or rubble substrates. Juveniles are frequently observed in shallow estuarine habitats, often seeking refuge among mangrove roots or in sandy, muddy, or gravelly substrates. These juvenile groupers feed primarily on small fish, shrimp, and crabs. The Orange-spotted Grouper is both eurythermal and euryhaline, demonstrating a broad tolerance to varying temperatures and salinity levels, which underscores its adaptability within diverse marine ecosystems. Its diet, composed predominantly of small fish, shrimp, and crabs, highlights its role as a versatile predator in its natural habitat (Heemstra and Randall, 1993; Martinez, 2020).

*E. coioides* has an extensive geographical range within the Indo-West Pacific region, extending from the southern Red Sea to Natal in the west, and reaching as far as the western Pacific, including the Ryukyu Islands and New South Wales. In the Oceanian region, its distribution encompasses Palau in the Northern Hemisphere and Fiji in the Southern Hemisphere. Recent reports have also documented its presence along the Mediterranean coast of Israel (Ranjan et al., 2017).



Figure 1. *Epinephelus coioides*

### *Epinephelus lanceolatus*

The grouper exhibits a robust body form, with body depth approximately 2.4 times the standard length, and body width around 1.5 times its depth. The head length measures about 2.2 times the standard length, while the interorbital region is generally flat to slightly convex, complementing a convex dorsal head profile. The preopercle is subangular with fine serrations along the edge and rounded corners, and the upper edge of the operculum is slightly convex. The nostrils are almost equal in diameter, and the maxilla extends past the vertical plane aligned with the posterior edge of the eye. The pelvic fins are relatively short, terminating before the anus, and the caudal fin is rounded (Megarajan, 2017). Smaller adult individuals display a pattern of irregular white or yellow spots scattered across blackened areas of the body. Additionally, the fins show irregular black markings with numerous small black dots dispersed throughout (He et al., 2019).

*E. lanceolatus*, commonly known as the giant grouper, has the broadest distribution among grouper species, although it is infrequently encountered across its range. This species inhabits the Indo-Pacific region, extending from the Red Sea across to Algoa Bay in South Africa and as far east as the Pitcairn Islands, including populations in Hawaii (USA). In the western Pacific, it is found as far north as southern Japan and as far south as Australia, with its range covering areas from northern Western Australia to northern New South Wales. Although present throughout the Indian Ocean, sightings are rare north of the Maldives. Within South and Southeast Asia, this species has been documented in Japan, mainland China, Hainan Island, the Philippines, Thailand,

Malaysia, and Indonesia. In Indian waters, it is recorded from the Andaman and Nicobar Islands and along the coasts of Andhra Pradesh and Odisha (Ranjan *et al.* 2017).



Figure 2. *Epinephelus lanceolatus*

### ***Plectropomus oligacanthus***

The morphology of this species is characterized by an elongated and robust body, with a depth that is approximately three times its standard length. The length of the head is measured at 2.7 times the standard length, while the length of the snout is 2.8 times that of the head. Additionally, the suborbital depth is approximately 3.3 times the head length. The interorbital region is flat, with rounded edges at the orbits, and is devoid of scales. The preopercle exhibits a broadly rounded shape, featuring three prominent spines oriented ventrally along its lower half. Both the interopercle and subopercle are smooth, while the opercle possesses three flat spines, with the upper and lower spines covered by a layer of skin. The midlateral region of the upper jaw contains between one to four enlarged, fixed canines (Heemstra and Randall, 1993).

The dorsal fin comprises seven or eight slender spines along with 10 to 12 rays. The base of the spinous portion of the dorsal fin is comparable in length to that of the soft-rayed section. The anal fin is characterized by three slender spines and eight rays. Both the soft dorsal and anal fins exhibit an anteriorly pointed configuration, with the second to fourth rays of each fin being elongated, measuring approximately 1.5 times the head length. The pectoral fin contains 14 to 16 rays and is shorter than the pelvic fin, while the caudal fin is slightly notched (Ma *et al.*, 2018).

In terms of coloration, the head, body, and fins display a spectrum ranging from reddish-brown to red, adorned with horizontal and oblique blue lines on the posterior region of the head and anterodorsally along the body. Vertical blue lines, or dashes, are visible on the anterior portion of the body, particularly in adult specimens, accompanied by numerous blue spots distributed across the body and the caudal fin. The dorsal and anal fins are similarly decorated with blue lines and spots (Heemstra and Randall, 1993). The pectoral fins are pale yellowish in hue, with the basal two-thirds of the rays appearing dark brown, accented by a few blue lines near the base of the fin. The pelvic fins feature brownish-red rays complemented by blue membranes.

*P. oligacanthus* inhabits Indo-West Pacific: Philippines, Indonesia, New Guinea, northeastern Australia (Cape York to northern Great Barrier Reef) Belau, Truk, Caroline Islands, Marshall Islands, and the Solomon Islands (Fishbase.se).



Figure 3. *Plectropomus oligacanthus*

### ***Cephalopholis cyanostigma***

The body of this species is moderately compressed, with its width contained approximately 2.0 times within the body depth, which itself measures slightly less than the head length. The head length is approximately 2.3 times in the standard length. The interorbital region presents a flat to slightly convex profile, with a width nearly equal to that of the eye diameter and the maxilla. The preopercle is rounded, featuring fine serrations along the edge, and has a fleshy lower margin. Both the subopercle and interopercle are generally smooth or may display minor serrations. The operculum's upper edge is prominently convex, with a nearly vertical rear edge. The maxilla is

covered in scales and extends past the posterior edge of the eye (Heemstra and Randall, 1993).

The dorsal fin comprises IX spines and 15 to 17 soft rays, with the fin membrane showing slight indentations between the spines. The anal fin consists of III spines and 8 soft rays. Notably, the pectoral fins are longer than the pelvic fins, with the length of the pectoral fin measuring about 1.5 times the head length. The pelvic fins typically do not extend to the anus, with their length contained within approximately 1.8 to 2.1 times in the head length. The caudal fin has a rounded shape. Body scales are ctenoid, with additional auxiliary scales appearing in adults (Ma et al. 2018).

The body coloration is brown, adorned with numerous small, black-edged blue ocelli distributed across the head, body, and fins. Ocelli located on the head and chest are typically larger and more prominently black-edged than those found on the upper body. The fins generally exhibit smaller ocelli (except at the base of the pectoral fins), each encircled by a distinct black edge. The body patterning frequently includes dark, chain-like bars. The pectoral fins are colored to resemble the body on the proximal half, while the distal half is marked by an orange-yellow hue, with either a dark or white edge and a black submarginal line. The proximal two-thirds of the pectoral fins contain blue ocelli that diminish in size toward the distal end. The median fins are darker than the body, with a posterior margin tinged in bluish-white and bordered by a blackish submarginal band (Fishbase.se).



Figure 4. *Cephalopholis cyanostigma*

## CONCLUSION

The research results indicate that four species of grouper fish from the Serranidae family were found in the Tengn Traditional Market on Tarakan Island, namely *Epinephelus coioides*, *Epinephelus lanceolatus*, *Plectropomus oligacanthus*, and *Cephalopholis cyanostigma*. These groupers are classified as "Least Concern" by the IUCN and "Not Evaluated" by CITES.

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