BIODIVERSITAS
Volume 23, Number 10, October 2022
Pages: 4992-5000

ISSN: 1412-033X
E-ISSN: 2085-4722
DOI: 10.13057/biodiv/d231005

Ichthyofauna diversity in Pematang Matik Coastal Waters, Serdang Bedagai District, North Sumatra, Indonesia

HESTI WAHYUNINGSIH♥, SHINTA MIANTA SARI SINAGA, ADRIAN HARTANTO
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Sumatera Utara. Jl. Dr. T. Mansur No. 9, Padang Bulan, Medan Baru, Medan 20155, North Sumatera, Indonesia. Tel./fax.: +62-061-8214290, ♥email: hesti@usu.ac.id

Manuscript received: 24 July 2022. Revision accepted: 23 September 2022.

Abstract. *Wahyuningsih H, Sinaga SMS, Hartanto A. 2022. Ichthyofauna diversity in Pematang Matik Coastal Waters, Serdang Bedagai District, North Sumatra. Biodiversitas 23: 4992-5000.* Pematang Matik Coastal waters are coastal areas that have a major role in the life of various fish species. Research on fish diversity in coastal waters is very important in order to gain a better understanding on the fish diversity in coastal areas such as North Sumatra, including Indonesia. The objective of this study was to initiate an inventory of fish species, their abundance and assessment of its biodiversity based on Shannon's diversity index (H'), and evenness index (E) in Pematang Matik coastal waters. The research was conducted from September to October 2021 at four stations with different human activities by the coastal community. Fish samples were taken using fishing nets that were installed for 12 hr with two replications. In this study, 21 species of fish from 19 families were identified. The highest abundance of fish was obtained from the Mugilidae family, namely *Crenimugil crenilabis* and *Liza macrolepis*. The fish diversity index obtained was 2.19-2.95, while the uniformity index obtained was 0.719-0.968. The values of H' and E at Station 4 (absent from any human interferences) have higher values than the other three stations. The diversity, as expressed in H' value in four research stations, indicates that the coastline has a high diversity of fish species.

Keywords: Biodiversity, *Crenimugil crenilabis*, east coast of North Sumatra, fish resources, Mugilidae

INTRODUCTION

Indonesia, which has a coastline of around 99,093 km, has about 6700 species, or about 34% of all fish species worldwide (Persoon and van Weerd 2006; KKP 2017). The ichthyofauna species richness in Indonesia is second only to Brazil (Muchlisin et al. 2017). The existence of these types of fish in coastal waters has an important role for coastal communities, both directly and indirectly, as well as an important role in the ecosystem (Stacey et al. 2019). Fish play a role in maintaining the balance of the food chain cycle in the waters. As a site of care, safety, and food foraging that acts as a habitat for the life and migration of various fish species, the existence of fish species in coastal regions plays a crucial ecological function (Macura et al. 2019). The environmental conditions of the water surroundings have an impact on the diversity of these fish as well. The sustainability of aquatic species will be significantly impacted by human activity in coastal waters, either directly or indirectly. Human activities such as habitat modification, overfishing, the introduction of alien species, and natural causes like sea level rise and global climate change may pose some threats to the ichthyofauna diversity of a water region (Nikijuluw 2018).

Coastal regions have a very great potentiality for biological resources, including a diversity of ichthyofauna, and they provide some substantial ecosystem services of economic, cultural, social, and recreational value under sector of fisheries (Henseler et al. 2019). The fisheries and marine sub-sectors play a strategic role in regional and national economic development, serving as a source of raw materials for industry, and community livelihood, a source of foreign exchange through the export of fisheries products, and a means of subsistence for society. On the Eastern Coast of North Sumatra, the Serdang Bedagai District is one of the potential locations for the fish catchment area and fishery. The region is a coastline of 55 km, which includes six subdistricts, namely Bandar Khalifah, Pantai Cermin, Perbaungan, Sei Rampah, Tanjung Beringin, and Teluk Mengkudu. In Serdang Bedagai District, the fisheries and marine industries play a significant role in the livelihood of coastal communities. In 2017, the region produced 751,986 tons of fish, up 4.1% from the 722,209 tons produced in 2016. Production of captured fisheries at sea increased by 0.15% to 439,314 tons in 2017 from the previous year (Hasibuan et al. 2022). The economic value of marine capture fisheries and its productivity was calculated at 410,001,322,000 IDR, contributing to 4.57% of marine production for North Sumatra Province. Based on the annual productivity trend by the Central Bureau of Statistics in 2020, the marine capture fisheries per subdistrict in Serdang Bedagai District is still fluctuating.

Coastal livelihoods are diversifying and becoming more commodified as maritime zone developments pick up pace throughout Southeast Asia (Fabinyi et al. 2022). Pematang Matik Coast, located in Pantai Cermin Sub-district, Serdang Bedagai District, North Sumatra, is one of the coastal areas where future fishery opportunities are not yet fully appreciated. The coastal communities that subsist primarily on fishing utilize this region to harvest fish for their livelihood and small-scale fishery activity. Around the

coastal waters, there are a number of human-based activities that include farming, fishing community settlements, and coastal tourism. When examining the effects of anthropogenic activities and climatic variation in certain waters, the information of quantity and fish population is helpful to detect some indication of population shifts and other biological data. The diversity of fish species in the Pematang Matik Coastal Waters is currently poorly known. This study aims to compile a list of the fish species present in the study area as background information on the availability of fish resources in North Sumatra.

MATERIALS AND METHODS

Study area

The research was conducted from September to October 2021 in the waters of Pematang Matik Coast, Serdang Bedagai District, North Sumatra Province, Indonesia. Sampling sites were determined using purposive sampling based on the absence or presence of human activities. Four sampling sites were then designated along the coastline such as Station 1 as a residential area and tourist site (99°3'13.937" E, 3°37'9.997" N), Station 2 as an estuary area near the boat dock (99°2'56.450" E, 3°37'14.709" N), Station 3 as an area near agricultural land (99°2'18.199" E, 3°37'26.755" N), and Station 4 as a control area without human interference (99°1'56.329" E, 3°37'33.768" N). The study area and sampling sites are visualized in Figure 1.

Collection, preservation, and identification of ichthyofauna

Fish samples were collected using a 6×100-m net with a mesh size of 2.5×2.5 cm. The static net was installed at a point or 150 m from the shoreline from 07.00 AM (low tide) to 19.00 PM (high tide). The nets were inspected the next day to collect each species of ichthyofauna. The sampling efforts were conducted twice or once per month in September and October. The fish samples from a two-month sampling were counted for its individual, photographed in the field and preserved in 70% EtOH solution, labeled according to the local name, area/station, date of collection and transported to the laboratory for identification. The specimens were identified using some manual books from Allen (1999), White et al (2013), and an online database, the FishBase website (https://www.fishbase.de/search.php).

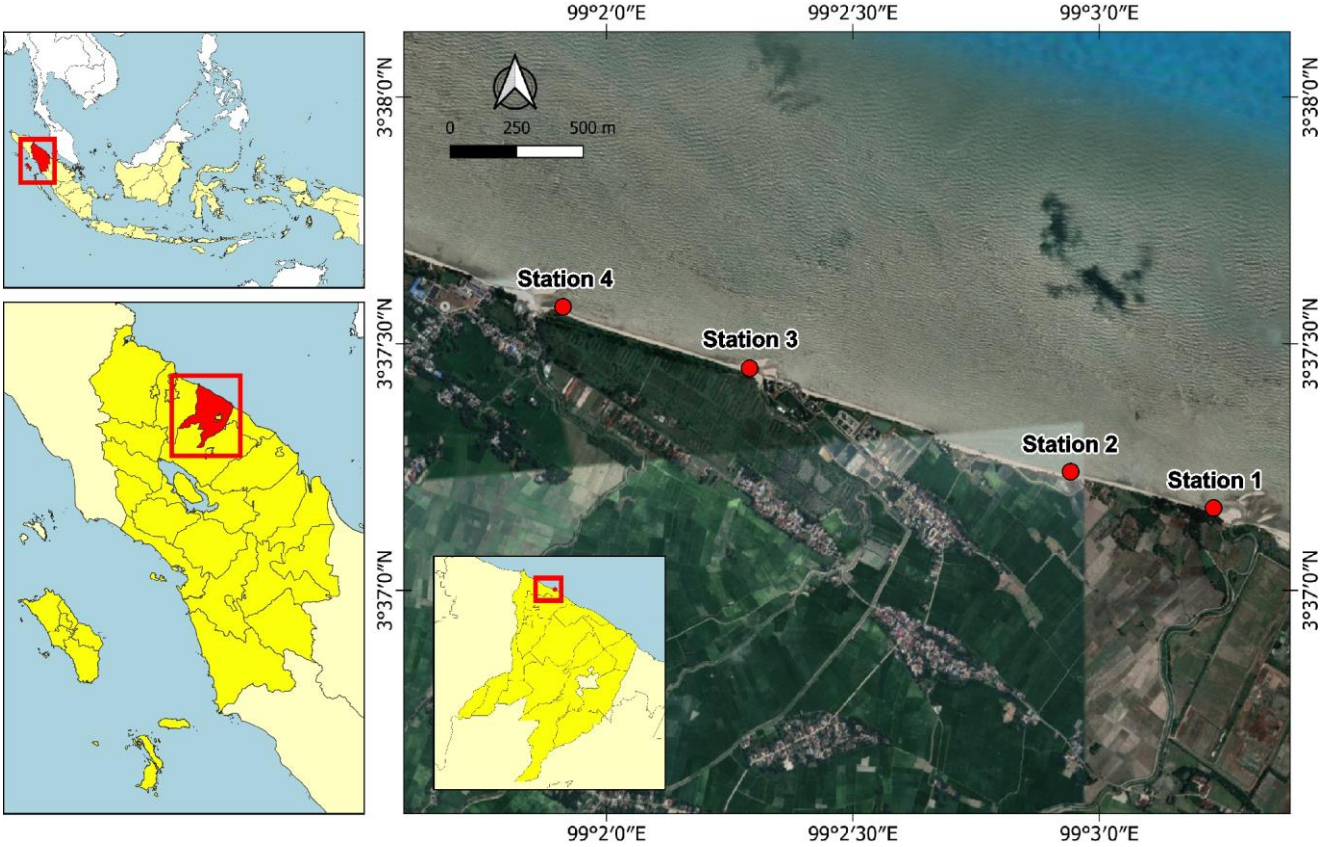


Figure 1. Map location of study area with four sampling stations (shown in brown dots) in Pematang Batik Coastal Waters, Serdang Bedagai District, North Sumatra, Indonesia

Data analysis

The number of individuals (N), species composition, diversity, and evenness were compared among sampling stations and analyzed descriptively. Shannon's diversity index (H') was used to estimate the fish species diversity:

$$H' = \sum_{i=1}^{s} pi \, ln \, pi$$

Where, H' is the Shannon's diversity index, pi is the proportion of the entire community made up of species i, ln is the natural log.

Evenness (E) was used to describe the similarity of abundances of different species in a community:

$$E = \frac{H'}{\ln S}$$

Where, E is the evenness index, H' is the Shannon's diversity index, ln S is the natural log of the total number of unique species.

RESULTS AND DISCUSSION

Ichthyofauna species checklist in Pematang Batik Coastal Waters

We collected a total of 21 coastal fish species from 19 families as presented in Table 1. The morphological characteristics of each species are presented in Table 2. The ichthyofauna community occurring in the coastal waters were mostly small pelagic species such as *belanak* (*C. crenilabis*), mullets (*L. macrolepis*), *kembung kaki* (*Rastrelliger kanagurta*), *beliak mata* (*Opisthopterus tardoore*) and so on, with some demersal species that are known to inhabit shallow waters and are regarded of high economic value commodities. In general, the fish collected from Pematang Matik Coastal Waters is of medium-sized individuals or juveniles, which may be related to the size of the net used in this study. Pematang Matik coastal waters are a habitat and food source for different fish species that prefer shallow waters. Many aquatic biotas, especially fish that are consumed by humans and have economic value, can be found in coastal areas (Souza et al. 2018). In addition, substrate type and water depth may alter the structure, diversity, and composition of a fish community (Riofrio-Lazo et al. 2022). Habitats in coastal ecosystems are very important as spawning areas, feeding areas, nurseries, and for fish migration (Seitz et al. 2014; Fierro-Arcos 2021). Fish move seasonally through different coastal habitats during their life cycle (Seitz et al. 2014; Henseler et al. 2019).

Population and ecological aspect of ichthyofauna in Pematang Batik Coastal Waters

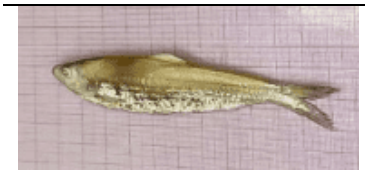
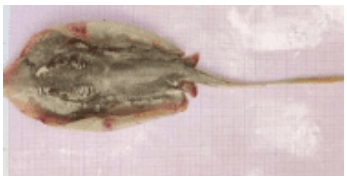
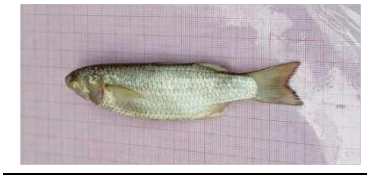
The total number of individuals (N) from each ichthyofauna species varied, as presented in Figure 2. A total of 773 fish samples were collected from the Pematang Matik coastline. The largest number of individuals was obtained from station 4 (264 ind), followed by station 2 (251 ind), station 3 (136), and station 1 (122 ind). Different observation stations have a different assemblages of fish species and its population density. In station 1, *pari kecos* (*Dasyatis annotata*) and *tenggiri* (*Scomberomorus commerson*) were recorded with the largest number of samples (20 ind). In station 2, *belanak* (*Crenimugil crenilabis*) was recorded as the highest at 31 individuals. Three species namely *senangin* (*Eleutheronema tetradactylum*), *kerongkerong* (*Terapon theraps*) and *biji nangka* (*Upeneus moluccensis*) are the dominant ones in station 3, each with a population of 23 individuals. In station 4, three different species are also documented as the dominant ones i.e., *lidah* (*Cynoglossus bilineatus*), *kurisi* (*Nemipterus japonicus*) and *tanjan* (*Sardinella gibbosa*) for 22 individuals.

Table 1. Checklist species of ichthyofauna in Pematang Batik Coastal Waters, Serdang Bedagai District, North Sumatra, Indonesia

Family	Species	Local name	Station				Distribution	Type
			1	2	3	4		
Ambassidae	*Ambassis nalua*	*Seriding*	+	+	–	+	Estuaries, bays	Demersal
Ariidae	*Hexanematichthys sagor*	*Kedukang*	+	+	+	+	Estuaries	Demersal
Carangidae	*Scomberoides comnersonnianus*	*Talang*	+	+	+	+	Coastal waters, coral reef, marine	Pelagic
Chirocentridae	*Chirocentrus dorab*	*Parang*	+	+	+	+	Estuaries, marine	Pelagic
Clupeidae	*Sardinella gibbosa*	*Tanjan*	+	–	–	+	Coastal waters, marine	Pelagic
Cynoglosidae	*Cynoglossus bilineatus*	*Lidah*	+	+	+	+	Coastal waters, marine	Demersal
Dasyatidae	*Dasyatis annotata*	*Pari kecos*	+	+	–	+	Estuaries	Demersal
Latidae	*Lates calcarifer*	*Kakap putih*	+	+	+	+	Estuaries	Demersal
Mugilidae	*Crenimugil crenilabis*	*Belanak*	+	+	+	+	Coastal waters, marine	Pelagic
	Liza macrolepis	*Mullet*	+	+	+	+	Coastal waters, marine	Pelagic
Mullidae	*Upeneus moluccensis*	*Biji nangka*	+	+	+	+	Estuaries, marine	Demersal
Nemipteridae	*Nemipterus japonicus*	*Kurisi*	+	+	+	+	Estuaries, marine	Pelagic
Polynemidae	*Eleutheronema tetradactylum*	*Senangin*	+	+	+	+	Rivers, estuaries, marine	Pelagic
Pristigasteridae	*Opthisterus tardoore*	*Beliak mata*	+	+	+	+	Estuaries, marine	Pelagic
Sciaenidae	*Johnius trachycephalus*	*Gulamah*	+	+	+	+	Rivers, estuaries, marine	Demersal
Schatophigidae	*Scatophagus argus*	*Kintang*	+	+	+	+	Rivers, estuaries, coral reef, marine	Pelagic
Scrombidae	*Rastrelliger kanagurta*	*Kembung laki*	+	+	+	+	Coastal waters, marine	Pelagic
	Scomberomorus commerson	*Tenggiri*	+	+	–	+	Coastal waters, marine	Pelagic
Sillangindae	*Sillago vincenti*	*Rejung*	+	+	+	+	Estuaries, marine	Demersal
Terepontidae	*Terapon theraps*	*Kerongkerong*	+	+	+	+	Rivers, estuaries, coral reef	Pelagic
Trichiuridae	*Trichiurus lepturus*	*Layur*	–	+	–	+	Coastal waters	Demersal

Note: +: Present; –: Absent

Table 2. Morphological characteristics of fish species in Pematang Batik Coastal Waters, Serdang Bedagai District, North Sumatra, Indonesia

Species	Description
	*Ambasis nalua* (*Seriding*) TL: 80-110 mm, SL: 65-90 mm, HL: 18 mm, FL: 20 mm, BD: 42 mm, body shape flattened, superior mouth, homocercal fork, bright body coloration with smooth surface.
	*Hexanematichthys sagor* (*Kedukang*) TL: 355-380 mm, SL: 280-320 mm, HL: 90 mm, FL: 60 mm, BD: 100 mm, body shape flattened, terminal mouth, dorsal part having 1 hard fin, ventral part consists of abdominal fin, pectoral fin and anal fin, lateral line not visible.
	*Scomberoides comnersonnianus* (*Talang*) TL: 180-250 mm, SL: 150-210 mm, HL: 30 mm, FL: 30 mm, BD: 60 mm, body shape oblong, elongated and flattened, terminal mouth, dorsal and anal fins short with curved sides, head and body greenish blue with silvery white underside slightly yellowish, pectoral fins blackish, while other fins are white, has several rings. dark coloration along the body to the tail.
	*Chirocentrus dorab* (*Parang*) TL: 170-220 mm, SL: 140-190 mm, HL: 30 mm, FL: 30 mm, BD: 25 mm, body shape taeniform like machete, silvery body coloration, shiny cycloid-type scales, homocercal fork.
	*Sardinella gibbosa* (*Tanjan*) TL: 170-300 mm, SL: 140-210 mm, HL: 30 mm, FL: 30 mm, BD: 35 mm, dorsal part with hard fins, homocercal fork, lateral line visible.
	*Cynoglossus bilineatus* (*Lidah*) TL: 200-210 mm, SL: 170-200 mm, HL: 40 mm, FL: 10 mm, BD: 50 mm, body shape elongated and flattened, dorsal and anal spines absent, lateral line visible, irregular dark blotch on gill cover.
	*Dasyatis annotata* (*Pari Kecos*) TL: 280-320 mm, SL: 160-180 mm, HL: 100 mm, FL: 15 mm, BD: 140 mm, body type depressed, whip-like tail.
	*Lates calcarifer* (*Kakap putih*) TL: 190-250 mm, SL: 165-200 mm, HL: 40 mm, FL: 35 mm, BD: 50 mm, body shape elongated, large snout, hard spines, large scales.
	*Crenimugil crenilabis* (*Belanak*) TL: 15-27 mm, SL: 95-115 mm, HL: 25 mm, FL: 20 mm, BD: 25 mm, small and pointed head shape, body shape slender and flattened, ctenoid-type scale, homocercal fork, silvery body coloration.
	*Liza macrolepis* (*Mullet*) TL: 160-200 mm, SL: 130-210 mm, HL: 250 mm, FL: 30 mm, BD: 28 mm, blunt head shape, dorsal part is black covered with visible scales.

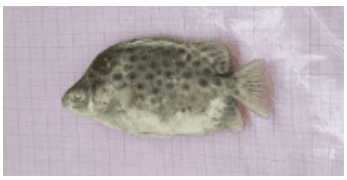
Upeneus moluccensis
(*Biji nangka*)
TL: 120-200 mm, SL: 95-150 mm, HL: 28 mm, FL: 25 mm, BD: 31 mm, body shape elongated and flattened, pink body coloration with four yellow stripes arranged horizontically along the body, ctenoid-type scale, homocercal fork.

Nemipterus japonicus
(*Kurisi*)
TL: 180-210 mm, SL: 130-155 mm, HL: 40 mm, FL: 50 mm, BD: 45 mm, body shape slightly rounded and elongated, head and dorsal part are reddish, dorsal fin is purplish gray with yellow spine in the middle part, large scales.

Eleutheronema tetradactylum
(*Senangin*)
TL: 210-245 mm, SL: 270-310 mm, HL: 30 mm, FL: 40 mm, BD: 32 mm, body shape elongated and flattened, terminal mouth, smooth scales covering the body.

Opthisterus tardoore
(*Beliak Mata*)
TL: 130-200 mm, SL: 110-180 mm, HL: 20 mm, FL: 20 mm, BD: 35 mm, body shape elongated and flattened, upper head is concave, dorsal fin located near anal fin, long anal fin, pelvic fins absent, pectoral fins are longer than head.

Johnius trachycephalus
(*Gulamah*)
TL: 170-240 mm, SL: 180-205 mm, HL: 30 mm, FL: 35 mm, BD: 4 mm, body shape flattened, symmetrical, and elongated, dorsal fin single and elongated, interior mouth, ctenoid-type scale, anal fin with 1 spine and soft rays.



Scatophagus argus
(*Kintang*)
TL: 130-200 mm, SL: 90-110 mm, HL: 250 mm, FL: 20 mm, BD: 70 mm, body shape wide, quadrangular and flattened, small snout, dorsal part is covered with black spots, eye diameter are smaller than mouth length.

Rastrelliger kanagurta
(*Kembung Laki*)
TL: 90-210 mm, SL: 140-170 mm, HL: 50 mm, FL: 40 mm, BD: 50 mm, body shape elongated, HL>BD, body covered with fine scales, dorsal part with green coloration.

Scomberomorus commerson
(*Tenggiri*)
TL: 220-340 mm, SL: 190-280 mm, HL: 35 mm, FL: 30 mm, BD: 40 mm, body shape elongated, body scales absent, homocercal fork, fork-type caudal fins.

Sillago vincenti
(*Rejung*)
TL: 170-310 mm, SL: 140-290 mm, HL: 40 mm, FL: 30 mm, BD: 32 mm, body shape elongated, terminal mouth, cycloid-type scale on head part, ctenoid-type scale on body part, concave-type caudal fins, anal fin elongated.

Terapon theraps
(*Kerongkerong*)
TL: 130-200 mm, SL: 115-150 mm, HL: 20 mm, FL: 25 mm, BD: 43 mm, visible bands present along the body, dorsal part also covered with these bands like comb with spines.

Trichiurus lepturus
(*Layur*)
TL: 350-420 mm, SL: 260-340 mm, HL: 50 mm, FL: 90 mm, BD: 35 mm, body shape anguiliform or eel-like, superior mouth, lateral line visible from the operculum to the caudal base, body scales absent.

Numerous fish species that are common in these waters and their economic potential have also been mentioned in earlier studies. The common stingray, *Dasyatis annotata* (syn. *Neotrygon annotata*), is a marine, demersal species that is commonly found offshore and feeds on crustaceans and small fishes. The species is categorized into Near Threatened (NT) based on the red list status and is considered harmless to humans (Jacobsen and Bennett 2012; Jacobsen et al. 2015). In addition to being a fish for human consumption, the economic value of stingray (*Dasyatis* spp) is now beginning to reach the convection industry as several people in Java use its leather waste as textile material (Sahubawa and Pertiwiningrum 2022). The mackerel, *S. commerson*, is a large pelagic fish that is commonly harvested from the shallow habitats on the continental shelf and are also regarded as a Near Threatened (NT) species (Collette et al. 2011). The species' population dynamics is mostly studied in Java and Sulawesi waters (Mallawa and Amir 2019). The fringelip mullet, *C. crenilabis*, is a marine, brackish species that commonly inhabit coastal waters or muddy areas with Least Concern (LC) status (Hoese and Sparks 2017). The species is also known to be associated with coral reefs, as reported from a study in Java waters (Zamani et al. 2022). The four-finger threadfin, *E. tetradactylum*, is a marine, brackish species that occur mainly in muddy and shallow areas in coastal waters with Endangered (ED) status (Motomura et al. 2015). Despite its decreasing trend in population, the species is found in a high abundance in all environments (brackish, freshwater, marine) in Musi Estuary, South Sumatra, Indonesia (Agustriani et al. 2020).

The large-scaled terapon, *T. theraps*, is a marine, brackish species that inhabit coastal waters with Least Concern (LC) status (Allen 2011). Based on a study by Takarina et al. (2021), the species is categorized as non-commercial fish that can be found in the Blanakan River Estuary, West Java, Indonesia. In addition, Setiawan et al. (2019) also reported the occurrence of *T. theraps* in the Sugihan Wetlands, South Sumatra, Indonesia, as a native species. The goldband goatfish, *U. moluccensis*, is a marine, brackish species that is commonly found in coastal waters with a muddy substrate with Least Concern (LC) status (Smith-Vaniz and Williams 2016). A report on its reintroduction to some water regions in Indonesia, including Rancabuaya Waters in West Java, Indonesia, has surfaced despite the fact that it is a consumed fish. This could lead to an unstable composition of native species (Rizal et al. 2022). The tonguesole, *C. bilineatus* (syn. *C. quadrilineatus*), is a marine, brackish and demersal species that inhabit coastal waters and estuaries with Least Concern (LC) status (Munroe et al. 2020). A recent biodiversity study by Sulistiono et al. (2022) included this species as one of the ichthyofaunas in Banten Bay, West Java, Indonesia. The Japanese threadfin bream, *N. japonicus*, is a marine, demersal species that is very abundant in coastal waters of the Indo-Pacific with Least Concern (LC) status (Al Buwaiqi et al. 2019). Although Nofrizal et al. (2022) reported that this species is a bycatch or discarded in Sibolga Waters, North Sumatra, Indonesia, the species is typically categorized as a consumption fish. The goldstripe sardinella, *S. gibbosa*, is a marine, pelagic-to-neritic species that is usually found in schools in coastal waters with Least Concern (LC) status (Santos et al. 2018). This species has been noted in the waters of North Sumatran, such as Belawan Waters, where there is moderate exploitation that needs to be watched for its long-term viability (Dewinta et al. 2020).

In general, *belanak* (*C. crenilabis*) and mullets (*L. macrolepis*), both from Mugilidae family at Station 2, were found to be the most abundant species among other fish, with 31 and 28 individuals, respectively. Members of Mugilidae family mostly inhabit shallow salt waters that utilize estuary as its habitat. A similar result was also reported by Rizwan et al. (2017), who reported the dominance of Mugilidae species in Aceh Besar Waters. In addition, *belanak* (*C. crenilabis*) lived in association with mangrove forests during the sapling period but, as adults, tend to be found in coastal waters (Notowinarto and Puspita 2019). The adaptability of fish is also influenced by the amount of food availability in their habitat (El-Azim et al. 2017). Food resources are one of the important factors for fish that can determine the extent of distribution and control of fish populations (Khoncara et al. 2018). The majority of mullets are known as detritivorous fish because their food is available in the form of organic matter manifested in the bottom sediments (Mohamed and Abood 2019). Mullets may also consume macroalgae, plankton, microorganisms, and other organic substances, including fine and coarse particle organic matter (Garcia et al. 2018).

The percentage of the total number of fish obtained at the four research stations is shown in Figure 3. The highest percentage was at station 4, which was 34% (264 ind), and the lowest was at station 1, as much as 16% (122 ind). Station 4 is an area far from community activities on Pematang Matik Beach. Such circumstances make it less likely that fish will be harmed by human activity and fish exploration, allowing fish to adapt and live in their natural habitat. However, due to their locations in densely populated areas, particularly close to residential areas, tourist destinations, and agricultural operations, Stations 1 and 3 had low total fish populations. Rural and agricultural waste can contaminate water sources during rainstorms, which pose a negative impact to the occurring fish and its habitat (Desrita et al. 2022). This activity also has an impact on the water quality, which disrupts the life of the biota in these aquatic regions (Canales et al. 2020; Desrita et al. 2022). Chemical and physical conditions of the environments, as well as the presence or absence of habitat disturbances, have a significant impact on the ichthyofauna population and community structure. Estuaries and nearshores are prone to spatiotemporal variations in their physicochemical conditions (such as water depth, temperature, and salinity) during flooding and ebb tides, which creates various shifting habitats (Potter et al. 2015).

Since this research was conducted in the rainy season (September, October), it is possible that the results obtained adequately describe the condition of the fish community in Pematang Batik Coastal Waters. This is in line with the results by Souza et al. (2018), which stated that the highest fish abundance was obtained in the rainy season compared

to the dry season and was more influenced by local variables, namely precipitation and wind speed, during the study. Related to the use of nets with specific dimensions in this study, it is possible that this will also affect the species richness and the number of individual fish caught. In general, fishermen have their own decisions in choosing the required fishing gear depending on seasonal conditions and the abundance of the targeted species (Wiyono et al. 2006). Further research on the dynamics and allocation of fishing gear by the local fishermen may be able to add valuable information about the species richness of this coastline.

The diversity index (H') of the four research stations is 2.19-2.95, while the evenness index (E) of the four research stations ranges from 0.719-0.968 (Figure 4). The highest values of H' and E were obtained at Station 4. This shows the condition of Station 4, which is far from community activities into a suitable habitat for various fish species. The species diversity index involves two components, namely the number of species or species richness and the distribution of individuals among species. Diversity will be high if one population is the same in abundance and no one dominates (Hossain et al. 2012). The number of food supplies, competition between species, disturbances, and environmental conditions all has an impact on community diversity, which causes species with high tolerance levels to thrive. The intensity of fishing has an impact on changes in species diversity within an ecosystem. Fish diversity may decline in situations of extremely high fishing pressure, resulting in a reduced diversity value. The evenness or uniformity of the community is considerably high, meaning that there is an equal amount of each species of fish that were caught. A stable community is described through this high evenness or uniformity (E) index; in contrast, the lower the uniformity index number, the less homogeneous the fish population (Rizwan et al. 2017).

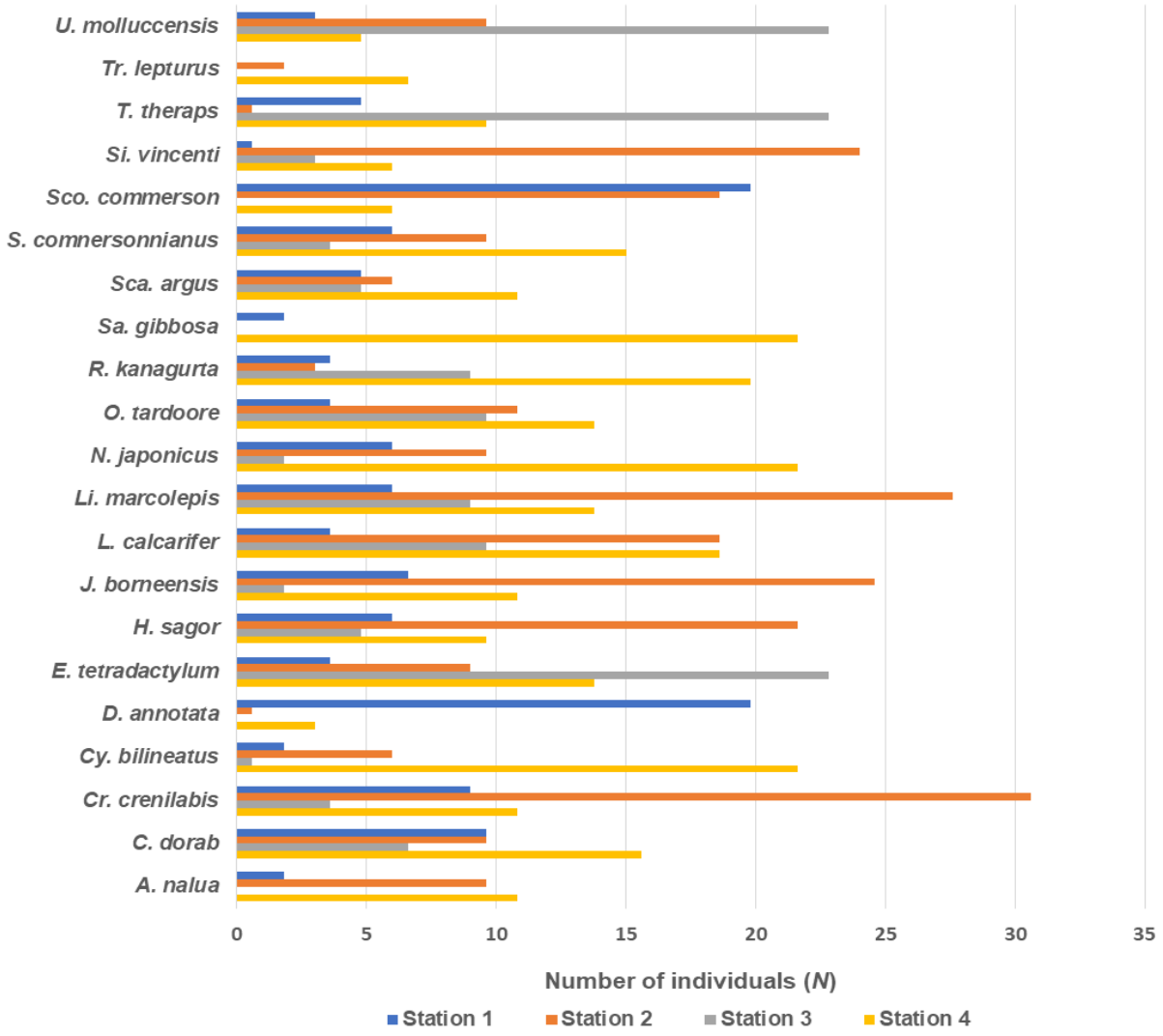


Figure 2. Total number of individuals (*N*) of ichthyofauna community during two-months sampling in Pematang Batik Coastal Waters, Serdang Bedagai District, North Sumatra, Indonesia

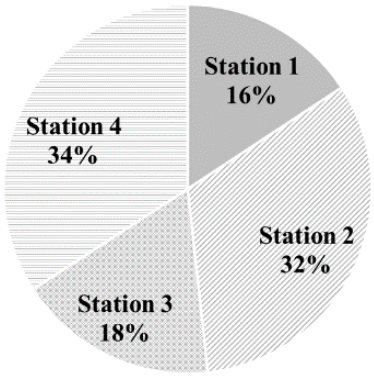


Figure 3. Percentage of total species richness of ichthyofauna in Pematang Batik Coastal Waters, Serdang Bedagai District, North Sumatra, Indonesia

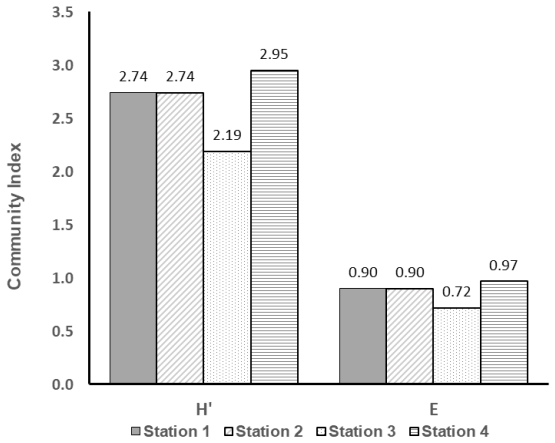


Figure 4. Diversity and evenness index of ichthyofauna community in Pematang Batik Coastal Waters, Serdang Bedagai District, North Sumatra, Indonesia

In conclusion, a total of 21 ichthyofauna species grouped into 19 families were recorded from Pematang Batik Coastal Waters, Serdang Bedagai District, North Sumatra, Indonesia. Members of Mugilidae, such as *C. crenilabis* (*belanak*) and *L. macrolepis* (mullet), were regarded as the most caught fish species in the region. The diversity index (H') of ichthyofauna assemblage in the study area ranged between 2.19-2.95 or categorized as a medium level of biodiversity with an evenness index (E) of 0.719-0.968 implying a similar pattern of harvesting among stations occurring in the water region by the coastal community.

REFERENCES

Agustriani F, Purwiyanto AIS, Putri WAE, Fauziyah F. 2020. Biodiversity of fishes in Musi Estuary, South Sumatra, Indonesia. J Suboptim Land 9: 192-198. DOI: 10.33230/JLSO.9.2.2020.505.

Al Buwaiqi B, Al Abdali FSH, Al Kindi ASM, Ambuali A, Borsa P, Carpenter KE, Russell B, Govender A. 2019. *Nemipterus japonicus*. The IUCN Red List of Threatened Species 2019: e.T46086928A46664764. DOI: 10.2305/IUCN.UK.2019-2.RLTS.T46086928A46664764.en.

Allen DJ. 2011. *Terapon theraps*. The IUCN Red List of Threatened Species 2011: e.T187935A8639142. DOI: 10.2305/IUCN.UK.2011-1.RLTS.T187935A8639142.en.

Allen G, 1999. Marine Fishes of South-East Asia. Periplus Edition, Singapore.

Canales TM, Lima M, Wiff R, Contreras-Reyes JE, Cifuentes U, Montero J. 2020. Endogenous, climate, and fishing influences on the population dynamics of small pelagic fish in the Southern Humboldt current ecosystem. Front Mar Sci 7: 82. DOI: 10.3389/fmars.2020.00082.

Collette B, Chang SK, Di Natale A, Fox W, Juan JM, Miyabe N, Nelson R. 2011. *Scomberomorus commerson*. The IUCN Red List of Threatened Species 2011: e.T170316A6745396. DOI: 10.2305/IUCN.UK.2011-2.RLTS.T170316A6745396.en.

Desrita, Rambey R, Muhtadi A, Onrizal O, Manurung VR, Hasibuan JS, Tamba IS. 2022. Biodiversity of nekton in the Barumun Watershed, South Labuhanbatu District, North Sumatra, Indonesia. Biodiversitas 23: 2426-2432. DOI: 10.13057/biodiv/d230521.

Dewinta AF, Khairunnisa, Yusni E, Fadhillah A, Siregar RF, Suriani M. 2020. Maximum sustainable potential and utilization rates of Goldstripe *Sardinella* (*Sardinella gibbosa*) in Belawan Oceanic Fishing Port. IOP Conf Ser Earth Environ Sci 454: 012137. DOI: 10.1088/1755-1315/454/1/012137.

El-Azim HA, Mehanna SF, Belal AA. 2017. Impacts of water quality, fishing mortality and food availability on the striped piggy *Pomadassys stridens* production in Bitter Lakes, Egypt. Ann Mar Sci 1: 19-27.

Fabinyi M, Belton B, Dressler WH, Knudsen M, Adhuri DS, Aziz AA, Akber MA, Kittiornkool J, Kongkaew C, Marschke M, Pido M, Stacey N, Steenbergen DJ, Vandergeest P. 2022. Coastal transitions: Small-scale fisheries, livelihoods, and maritime zone developments in Southeast Asia. J Rural Stud 91: 184-194. DOI: 10.1016/j.jrurstud.2022.02.006.

Fierro-Arcos D, Jarrin JM, Aburto-Oropeza O, Harvey ES, Rastoin-Laplane E, Salinas-de-Leon P. 2021. Mangrove fish assemblages reflect the environmental diversity of the Galapagos Islands. Mar Ecol Prog Ser 664: 183-205. DOI: 10.3354/meps 13628.

Garcia AFS, Garcia AM, Vollrath SR, Schneck F, Silva CFM, Marchetti IJ, Vieira JP. 2018. Spatial diet overlap and food resource in two congeneric mullet species revealed by stable isotopes and stomach content analyses. Commun Ecol 19: 116-124. DOI: 10.1556/168.2018.19.2.3.

Hasibuan JS, Wulandari S, Manurung VR. 2022. Growth analysis and exploitation rate of Kawakawa (*Euthynnus affinis*) at TPI Tanjung Beringin Serdang Bedagai Regency, North Sumatera. IOP Conf Ser Earth Environ Sci 977: 012121. DOI: 10.1088/1755-1315/977/1/01212.

Henseler C, Nordström MC, Törnroos A, Snickars M, Pecuchet L, Lindegren M, Bonsdorff E. 2019. Coastal habitats and their importance for the diversity of benthic communities: A species-and trait-based approach. Estuar Coast Shelf Sci 226: 106272. DOI: 10.1016/j.ecss.2019.106272.

Hoese D, Sparks JS. 2017. *Crenimugil crenilabis*. The IUCN Red List of Threatened Species 2017: e.T196421A96230856. DOI: 10.2305/IUCN.UK.2017-3.RLTS.T196421A96230856.en.

Hossain MH, Das NG, Sarker S, Rahaman MZ. 2012. Fish diversity and habitat relationship with environmental variables at Meghna river estuary, Bangladesh. Egypt J Aquat Res 38: 213-226. DOI: 10.1016/j.ejar.2012.12.006.

Jacobsen IP, Bennett MB. 2012. Feeding ecology and dietary comparisons among three sympatric *Neotrygon* (Myliobatoidei: Dasyatidae) species. J Fish Biol 80: 1580-1594. DOI: 10.1111/j.1095-8649.2011.03169.x.

Jacobsen IP, Kyne PM, Last PR. 2015. *Neotrygon annotata*. The IUCN Red List of Threatened Species 2015: e.T60150A68636040. DOI: 10.2305/IUCN.UK.2015-4.RLTS.T60150A68636040.en

Kementerian Kelautan dan Perikanan (KKP). 2017. Status Keanekaragaman Hayati: Biota Perairan Prioritas. Direktorat Konservasi dan Keanekaragaman Laut. Direktorat Jenderal Pengelolaan Ruang Laut. Kementrerian Kelautan dan Perikanan, Jakarta. [Indonesian]

Khoncara AC, Sulistiono, Simanjuntak CPH, Rahardjo MF, Zahid A. 2018. Komposisi makanan dan strategi makan ikan famili Gobiidae di Teluk Pabean, Indramayu. Jurnal Ilmu Pertanian Indonesia 23: 137-147. DOI: 10.18343/jipi.23.2.137. [Indonesian]

Macura B, Byström P, Airondi L, Eriksson BK, Rudstam L, Støttrup JG. 2019. Impact of structural habitat modifications in coastal temperate systems on fish recruitment: A Systematic review. Environ Evid 8: 14. DOI: 10.1186/s13750-019-0157-3.

Mallawa A, Amir F. 2019. Population dynamics of narrow-barred Spanish mackerel *Scomberomorus commerson* (Lacepede, 1800) in Bone Bay waters, South Sulawesi, Indonesia. AACL Bioflux 12: 908-917.

Mohamed ARM, Abood AN. 2019. Food and trophic relationships of four mullet fish (Mugilidae) in the Shatt Al-Arab River, Iraq. Asian J Appl Sci 7: 19-26. DOI: 10.24203/ajas.v7i1.5660.

Motomura H, Matsuura K, Bishop J, Kaymaram F. 2015. *Eleutheronema tetradactylum*. The IUCN Red List of Threatened Species 2015: e.T46087646A57168342.

Muchlisin ZA, Nurfadillah N, Arisa II, Rahmah A, Putra DF, Nazir M, Zulham A. 2017. Short communication: Fish fauna of Lake Lauik Tawar and Lake Laulo, Simeulue Island, Indonesia. Biodiversitas 18: 752-757. DOI: 10.13057/biodiv/d180242.

Munroe TA, Nair R, Weerts SP. 2020. *Cynoglossus quadrilineatus*. The IUCN Red List of Threatened Species 2020: e.T81909538A137767630. DOI: 10.2305/IUCN.UK.2020-2.RLTS.T81909538A137767630.en.

Nikijuluw VPH. 2018. Biodiversity and conservation of coastal fish of Indonesia. Jurnal Iktiologi Indonesia 18: 285-296. DOI: 10.32491/jii.v18i3.382.

Nofrizal N, Afriani A, Efizon D, Jhonnerie R. 2022. Percentage of bycatch and discard composition in artisanal bottom trap fisheries. Depik 11: 139-147. DOI: 10.13170/depik.11.2.26106.

Notowinarto N, Puspita L. 2019. Keanekaragaman, bioekologi ikan di perairan Pantai Barat Pulau Rempang Kecamatan Galang Kota Batam. Simbiosa 8: 188-197. DOI: 10.33373/sim-bio.v8i2.2182. [Indonesian]

Persoon GA, van Weerd M. 2006. Biodiversity and natural resource management in insular Southeast Asia. Isl Stud J 1: 81-108. DOI: 10.24043/isj.189.

Potter IC, Tweedley JR, Elliott M, Whitfield AK. 2015. The ways in which fish use estuaries: A refinement and expansion of the guild approach. Fish Fish 16: 230-239. DOI: 10.1111/faf.12050.

Riofrío-Lazo M, Zetina-Rejón MJ, Vaca-Pita L, Murillo-Posada JC, Páez-Rosas D. 2022. Fish diversity patterns along coastal habitats of the southeastern Galapagos archipelago and their relationship with environmental variables. Sci Rep 12: 3604. DOI: 10.1038/s41598-022-07601-w.

Rizal A, Pratiwi DY, Herawati H. 2022. Biology reproduction and its role in the conservation of goldband goatfish (*Upeneus moluccensis* (Bleeker, 1855)) in Rancabuaya Water, Indonesia. World Sci News 166: 1-14.

Rizwan T, Nasution TK, Dewiyanti I, Elrahimi SA, Putra DF. 2017. Fish diversity in the east coastal waters area of Aceh Besar District, Indonesia. AACL Bioflux 10: 1180-1185.

Sahubawa L, Pertiwiningrum A. 2022. Bioconversion and bioeconomics of thorn stringray skin waste (*Dasyatis* sp.) as a commercial leather products. IOP Conf Ser Earth Environ Sci 1033: 012065. DOI: 10.1088/1755-1315/1033/1/012065.

Santos M, Villarao MC, Tambihasan AM, Villanueva JA, Parido L, Lopez G, Deligero R, Alcantara M, Doyola MC, Gatlabayan LV, Buccat FGA, Lanzuela N, Belga PB, Gapuz AV, Al-Khalaf K, Kaymaram F. 2018. *Sardinella gibbosa*. The IUCN Red List of Threatened Species 2018: e.T46075248A143834681. DOI: 10.2305/IUCN.UK.2018-2.RLTS.T46075248A143834681.en.

Seitz RD, Wennhage H, Bergström U, Lipcius RN, Ysebaert T. 2014. Ecological value of coastal habitats for commercially and ecologically important species. ICES J Mar Sci 71: 648-665. DOI: 10.1093/icesjms/fst152.

Setiawan A, Iqbal M, Setiawan D, Yustian I. 2019. Providing biodiversity information to support sustainable development of Sugihan wetlands, South Sumatra. J Phys Conf Ser 1282: 012108. DOI: 10.1088/1742-6596/1282/1/012108.

Smith-Vaniz WF, Williams I. 2016. *Upeneus moluccensis*. The IUCN Red List of Threatened Species 2016: e.T18177499A115368541. DOI: 10.2305/IUCN.UK.2016-3.RLTS.T18177499A70799447.en.

Souza CD, Batista VS, Fabre NN. 2018. What are the main local drivers determining richness and fishery yields in tropical coastal fish assemblages? Zoologia 35: 1-12. DOI: 10.3897/zoologia.35.e12898.

Stacey N, Gibson E, Loneragan NR, Warren C, Wiryawan B, Adhuri D, Fitriana R. 2019. Enhancing coastal livelihoods in Indonesia: An evaluation of recent initiatives on gender, women and sustainable livelihoods in small-scale fisheries. Marit Stud 18: 359-371. DOI: 10.1007/s40152-019-00142-5.

Sulistiono S, Wildan DM, Ervinia A, Rohim N, Hedianto DA, Baihaqi F, Abdillah D, Parawangsa INY, Wahyudewantoro G, Yokota M. 2022. Diversity, distribution, and species status of the fish in Banten Bay, Indonesia. E3S Web Conf 339: 03003. DOI: 10.1051/e3sconf/20223390300.

Takarina ND, Purwiyanto AIS, Suteja Y. 2021. Cadmium (Cd), Copper (Cu), and Zinc (Zn) levels in commercial and non-commercial fishes in the Blanakan River Estuary, Indonesia: A preliminary study. Mar Pollut Bull 170: 112607. DOI: 10.1016/j.marpolbul.2021.112607.

White WT, Last PR, Dharmadi, Faizah R, Chodrijah U, Prisantoso BI, Pogonoski JJ, Puckridge M, Blaber SJM. 2013. Market Fishes of Indonesia. Australian Centre for International Agricultural Research, Canberra.

Wiyono ES, Yamada S, Tanaka E, Arimoto T, Kitakado T. 2006. Dynamics of fishing gear allocation by fishers in small-scale coastal fisheries of Pelabuhanratu Bay, Indonesia. Fish Manag Ecol 13: 185-195. DOI: 10.1111/j.1365-2400.2006.00493.x.

Zamani NP, Zuhdi MF, Madduppa H. 2022. Environmental DNA biomonitoring reveals seasonal patterns in coral reef fish community structure. Environ Biol Fish 105: 971-991. DOI: 10.1007/s10641-022-01274-0.