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Some Fishing Gears and Target Species in Chaungtha Coast Water, Ayeyarwady Region, Myanmar

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INFORMATION

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ABSTRACT

The fishery status of the marine fishery was investigated in Chaungtha Coastal Area from November 2023 to August 2024. A total of 7 different types of gear such as the bottom set gillnet, purse seine, beach seine, drift gillnet, longline, diving fishing, and trap fishing were recorded with their target species in this study area. Moreover, the net design, parameters, and materials properties of these gears were also recorded. The bottom set gillnet (groupers and false trevally) and diving fishing (groupers, cuttlefishes, octopus, painted spiny lobster, sandfish) were fished from November to August. The purse seine (Indian anchovy, sardine, frigate tuna, Indian mackerel, narrow-barred Spanish mackerel), beach seine (miscellaneous), and longline (yellow pike conger, giant Sea catfish) were targeted from November to April. The trap fishing (maculated ivory whelk) was trapped from November to March. The drift gillnet (sardine) was captured from May to August in Chaungtha Coastal Area. The highest species occurrence was recorded in June 2024. The lowest species occurrence was recorded in November 2023 followed by January and August 2024. Moreover, the highest species composition was noted at 11.61% in June 2024 and the lowest species composition was documented at 8.39% in November 2023 followed by January and August 2024.

1. Introduction

The marine territory of Myanmar extends about 486,000 square kilometers with an Exclusive Economic Zone (EEZ) and provides considerable large fisheries resources. The diverse ecosystems along the coastal areas (i.e., mangroves, coral reefs, seagrass beds, sandy beaches, and mudflats) are important habitats and grounds for spawning and nursing of several aquatic species. Ayeyarwady, a region in southwest Myanmar is rich in natural resources. Fishery assessment is one of the important factors for local food security, foreign exchange earnings, and employment opportunities in the Ayeyarwady Region. The fishery sector in this area is to fulfill the protein requirement of local people and to provide food security.

A total of 7 different types of gear such as the bottom set gillnet, purse seine, beach seine, drift gillnet, longline, diving fishing, and trap fishing are currently utilized in Chaungtha Coastal Area. Fishing gear is the tool with which aquatic resources are captured, while the fishing method is how the gear is used. The suitable shape and size of the gear can be used according to the gears' usage and the water body's environmental condition. Many fishing methods are based on seasonal and spatial conditions and the habitat structure of fish. It is important to understand the methods used by local fishing communities to appreciate the effects of fishing on the marine environment.

Based on the available literature, a review was conducted on the status of fisheries, various fishing gear, and their target species in marine fisheries. Aung (2003; 2015) described the 70 species of commercially important marine fishes of Myanmar under 29 families and the 41 species of exportable marine fishes of Myanmar under 19 families. Furthermore, he also described that over 442 species of fish, prawn, shrimp, and lobster under 153 families were recorded and named systematically in Myanmar (EEZ), including deep-sea areas. Out of 442 species recorded, 80 species are considered commercially important for export, local demand, and catch volume.

Cho (2015) reported the species composition of fish caught by beach seine nets in the Chaungtha Coastal Area. The author described a total of 25 fish species, belonging to 22 families, recorded the highest catch rates and the lowest catch rates, and also analyzed the net's structure in the study period. de Graaf et al. (2015) described international training courses in fisheries statistics and data collection. This course described the socio-economic aspects, better decision-making, and responsible fisheries management. DoF (2021) highlighted the connection between sustainable fisheries management and secure fishery production, income generation, and livelihoods that depend on fisheries. It also emphasized the importance of effective management and conservation of fishery resources for both the present and future.

He et al. (2021) reported the classification and illustrated the definition of fishing gear. The classification is used for commercial, subsistence, and recreational fisheries in marine and freshwater fisheries. This document provides definitions and examples of the various configurations and operational modes of commonly used fishing gear. It is essential for preventing, deterring, and eliminating illegal, unreported, and unregulated (IUU) fishing by supplying monitoring, control, and surveillance personnel with the information needed to recognize different types of fishing gear with licensing and authorization for fishing activities. Furthermore, the document discusses current conservation challenges linked to major fishing gear types, making it a useful resource for students and researchers in fisheries and marine conservation.

In a study conducted in the Ma Gyi coastal area, Lwin (2014) identified that a total of 19 species belonging to 16 genera, 14 families, and 2 orders described the major components of many species being commercial fisheries and others having no market values in the study area. This research conducted the fish catch composition of selected small-scale fishing gear used in the Bonny River, Rivers State, Nigeria by Olopade et al. (2017). The researchers documented a total of 25 fish species belonging to 18 different families throughout their study. They found that the cast net was the most effective fishing gear, whereas the gill net proved to be the least effective.

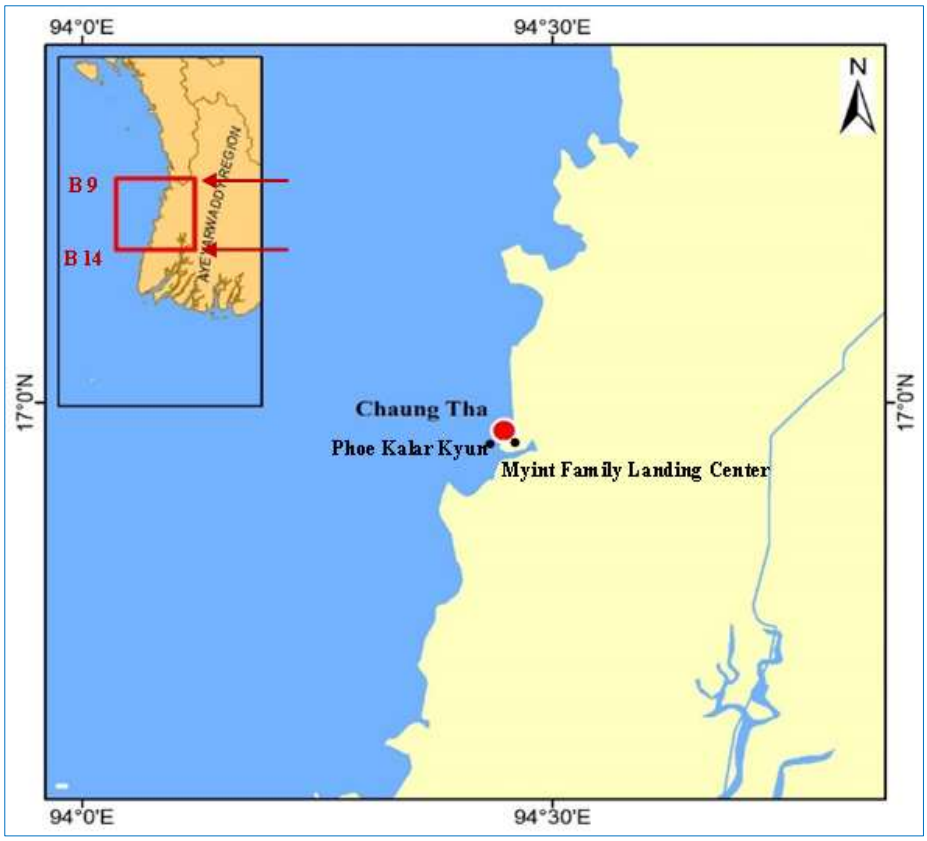


Fig. 1. Map showing the study site of Chaungtha Coastal Area

In Myanmar, Oo (2020) described the population dynamics of the commercially important fishes in the Chaungtha Coastal Area. He observed a total of 83 species belonging to 64 genera, 46 families, and 13 orders were collected from five different fishing gears: beach seine net, net fence, seine net, drift gillnet, and trawl net. Among them, 33 fish species were recorded as commercially importance. He also studied classification, species composition, occurrence, and the highest and lowest catch of these fishing gears.

Psomadakis et al., (2019) presented a field identification guide to the living marine resources of Myanmar. These authors reported that the field guide was the major resource group likely to be encountered in the fisheries of Myanmar.

They also described that the more important species are treated in detail with accounts providing scientific nomenclature, FAO names in English and French (where available), local names used in Myanmar, diagnostic features, one or more illustrations, maximum size, and notes on fisheries and habitat. The guide is fully indexed and a list of further literature is appended.

San (2018) described assessments of anchovy, and sardine fish catches by purse seine net in Kyeintali coastal area, Rakhine State. He studied a total of 13 species of the family Engraulidae and Clupeidae collected from Kyeintali coastal area. During the study period, he also observed the length frequency distribution and the highest and the lowest catch weight for the family Engraulidae and Clupeidae.

Seafish (2005) published basic fishing methods. This report described the classification of fishing gear, gear descriptions, development of fishing gear, gears in the water column, and fish species in the water column.

In 2014, Tun conducted a study on various estuarine and marine prawns and spiny lobsters in the Shwe Thaung Yan coastal region. The research identified a total of four spiny lobster species from the family Palinuridae and eleven prawn species from the families Penaeidae and Palaemonidae. Among the spiny lobsters, *Panulirus versicolor* and *P. ornatus* were commonly observed, while *P. polyphagus* and *P. longipes* were noted as rare species. Additionally, the study found that the prawn species *Penaeus monodon*, *P. merguiensis*, *P. indicus*, *P. canaliculatus*, and *Macrobrachium equidens* were abundant in the Shwe Thaung Yan coastal area, with *M. rude* being identified as a rare species.

WCS Myanmar (2018) published a report detailing the characterization of fisheries and marine wildlife in southern Rakhine State and the western Ayeyarwady Region of Myanmar. This document serves as the final report for the project titled "Identifying and Mapping the Occurrence of Fishing Activity and Marine Wildlife along the Rakhine and Ayeyarwady Coast, Myanmar." The project was carried out from June 26, 2017, to July 31, 2018, by WCS Myanmar in partnership with the Marine Science Department of Pathein University, the Rakhine Coastal Region Conservation Association, the University of Exeter, and other collaborators. The present study mainly emphasized some fishing gear and target species in Chaungtha Coastal Water from November 2023 to August 2024.

2. Materials and Methods

The study was monthly assessed from November 2023 to August 2024 in two different landing sites: Phoe Kalar Kyun, and Myint Family Landing Center (Fig. 1). During this study period, fishing gears and their target species were investigated to assess the efficiency of fishing gears and their performance.

Fish specimens of the common fishing gear used were sampled directly from the local fishermen at monthly intervals. After collecting, scaled photographs were taken to obtain the natural size and colour. The collected species will be identified and labeled with local names before preserving them in 10% formalin. The fishing gears were recorded and photographed. All of the fishing gears were recorded with target species and measured the mesh size of the net and other measurements.

3. Results and Discussion

Observation of some marine fishes were conducted in two landing sites of Chaungtha Coastal Area and the study period lasted for ten months from November 2023 to August 2024. Fishing gear analysis involves studying and evaluating the tools and techniques used in fishing, such as nets, lines, traps, and other equipment. This analysis is critical for several reasons, offering various benefits across ecological, economic, and social domains. In the present study, bottom set gillnet, purse seine, beach seine, drift gillnet, longline, diving fishing, and trap fishing with their design, parameters, and material properties were recorded (Figs. 2-8).

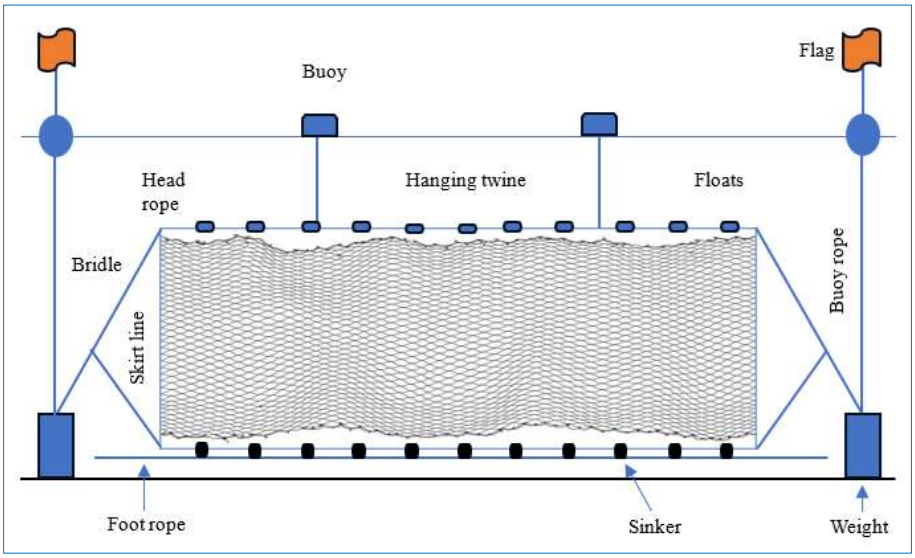


Fig. 2. Diagram of bottom set gillnet in Chaungtha Coastal Area

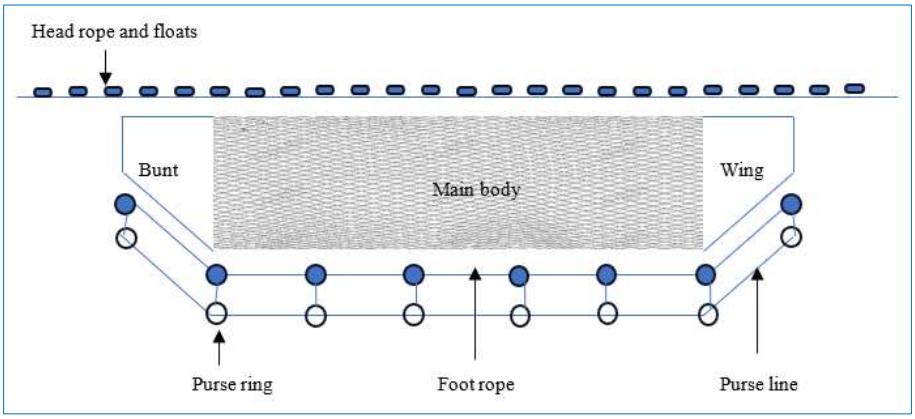


Fig. 3. Diagram of purse seine in Chaungtha Coastal Area

Moreover, the bottom set gillnet (groupers and false trevally) and diving fishing (groupers, cuttlefishes, octopus, painted spiny lobster, sandfish) were fished from November to August. The purse seine (Indian anchovy, sardine, frigate tuna, Indian mackerel, narrow-barred Spanish mackerel), beach seine (miscellaneous), and longline (yellow pike conger, giant Sea catfish) were targeted from November to April. The trap fishing (maculated ivory whelk) was trapped from November to March. The drift gillnet (sardine) was captured from May to August in Chaungtha Coastal Area (Table 1). DoF (2021) suggested fishing gear and their techniques are the most important factors affecting the fish community structure in the marine system. The report of DoF (2021) supported the findings of this present study.

3.1. Bottom Set Gillnet (Kyauk Ngon)

The bottom-set gillnet consisted of the net assembly, skirt lines, and location buoys. The net assembly, made of nylon monofilament, had a length and height of 365 m and 6 m, respectively. In the net assembly, many floats and weights were fixed to head and ground ropes at equal intervals of 0.5 m. Wood bars were positioned at fixed intervals of 50 m along the net assembly length to maximize the stretching performance of the net assembly. The skirt lines were made of polypropylene and secured by strong anchors. They were installed at intervals of 50 m to maintain the location of the net assembly. Each location buoy was connected to the net assembly through a polypropylene rope, and two location buoys were installed at 150 m intervals. The water depth was set as 91.4 m. The net bottom almost touched the seabed.

3.2. Purse Seine (Kyawk Pike)

Purse seine is named from the feature that along the bottom of the net are many rings, a rope passes through the rings, and when pulled the bottom of the seine is closed, like a purse, preventing the fish from escaping. The purse seine is a preferred technique for capturing schooling fish species, close to the surface such as sardines, mackerel, and anchovies. Purse seines are classified as active gears, long nets with bottom edges, and buoyant tops. They can be divided into two general types: the fish are finally contained in a bag or "bunt" at the center of the length, and the bunt is at the end.

The purse-seine is a highly efficient fishing gear with a length and height of 296 m and 29.3 m. According to FAO (1999), the minimum length of a purse seine should be 15 times the length of the seiner and the depth of the seine should be at least 10% of its length. The minimum length of the bunt should be equal to the length of the vessel. These criteria were also taken into account.

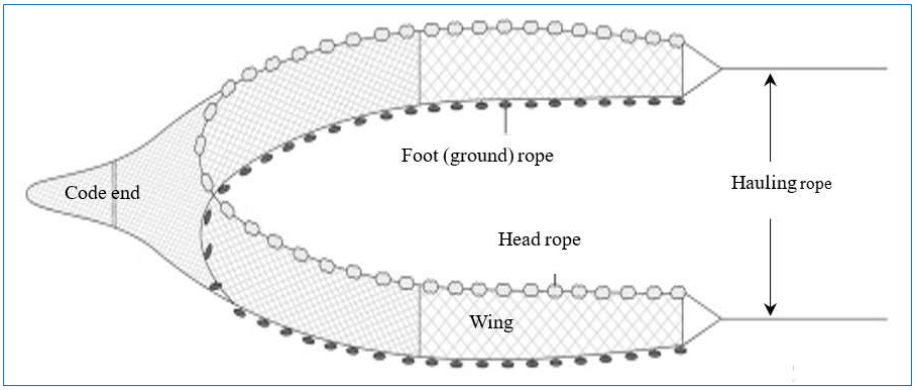


Fig. 4. Diagram of beach seine in Chaungtha Coastal Area

3.3. Beach Seine (Thaung Swel Pike)

Beach seine nets are used primarily in the shallow coastal water of the Ayeyarwady Region. Seines can either be used in the shallows or from a boat. In shallow water, two fishers

will hold one lead end each and slowly encircle schooling. Then, they will pull the weighted end up and over, trapping the fish in the pocket, or purse. This action is called "Thaung Swel" in the study area. Each lead end will be attached to a boat from boats, and one or two fishers will swim behind, pulling up the weighted bottom over the fish. The mesh size for beach seines is generally 2.2 cm while their length and height of 460 m and 1.83 m. Net sizes range from 4.57 m for near-shore fishing and up to around 12.19 feet for fishing from boats. Beach seines cannot be used within half a mile of any city, township, village, settlement, or other inhabited locality in Myanmar.

3.4. Drift Gillnet (Myaw Pike)

The drift gillnets were walls of netting hanging vertically in water by the combined action of the rubber slippers floats attached to the headline and the sinkers (lead) at intervals of 1.35- 2.0 m to the footropes sink the feet of the nets to the bottom while the floats attached at interval of 1.1- 1.95 m to the headlines allow the heads of the nets to float thereby maintaining the vertical opening of the gillnets. The surface driftnet/gillnet had a small number of weights (stones) attached to the footrope; more floats were attached to the headline. The net material is made of monofilament nylon. The mesh size was 6.6 cm and the length and height of the net were 1299 m and 9.6 m, respectively. The drift gill net is used mainly to catch pelagic fish, so gill netters usually are operated at night without moonlight (18" of this lunar month - 12 h of the next lunar one). The net is set at 3 - 5 pm and hauled the next morning.

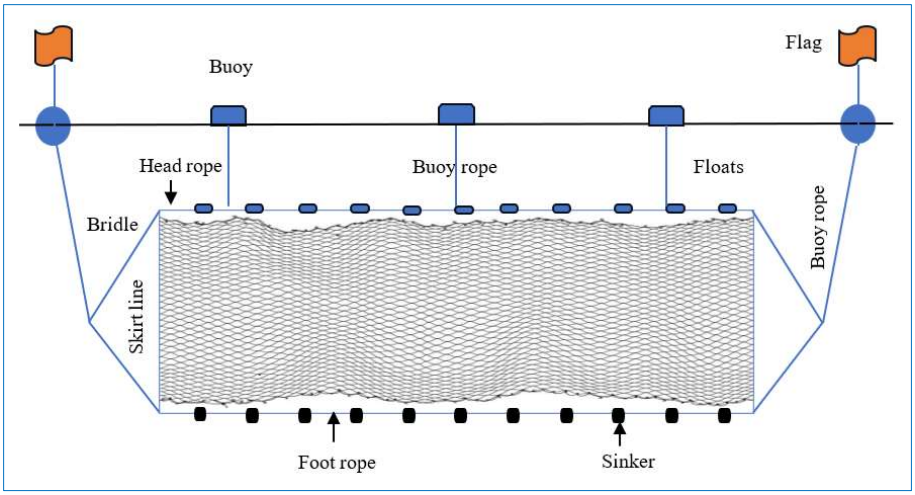


Fig. 5. Diagram of drift gillnet in Chaungtha Coastal Area

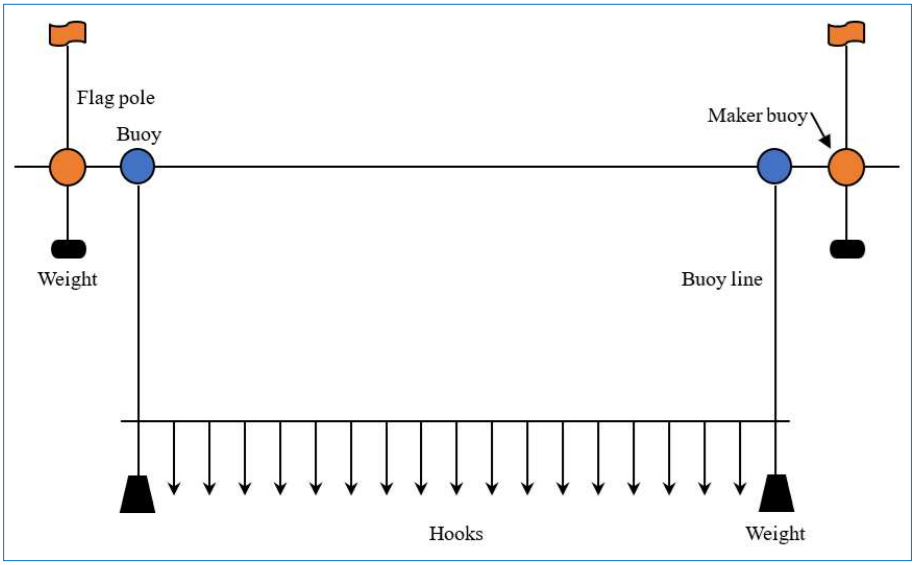


Fig. 6. Diagram of longline in Chaungtha Coastal Area

3.5. Longline (Nga Hmyar Tann)

The bottom longline is the most common type of hook-and-line gear in the study area. The long line consists of a mainline, a good number of branch lines or hook lines, and hooks. The material of the mainline is PE about 2-4 mm in diameter and the branch line is nylon multifilament or monofilament of 0.3 - 0.5 mm. The long line is set at mid-water or bottom of the shallow water depth. A fishing boat of

7.4 m, with 13.6 hp is used for the long line fishing. The length of the long line varies between 50 m to 1000 m. The hook for ordinary bottom longlines are all of nearly the same shape but vary in size. This type of hook has a long shank and a rounded bend. The length of the shank ranges from 2.0 cm to 7.8 cm. All the hooks are barbed. They are long and angular, with a very sharp point but with no barb on them. The number of hooks used for one operation depends on the size of the boat and the construction of gear, but an ordinary bottom longline has between 500 and 650 hooks.

3.6. Diving Fishing (Yay Ngote)

Skin diving, free diving, or diving fishing with a mask and fins is the method used to collect conch and sea cucumber in the study area (Fig. 7). Fishers will collect these target species by hand and bring them back to their boats. A fishing license is needed to catch conch and a special permit is required to catch sea cucumber. Lobster fishers will also skin dive to catch lobster from underneath lobster shades or ledges where lobster congregate. Spear fishers will also skin dive to catch finfish. The fishing operation is carried out by 2-5 men, using one mother boat. The divers breathe through pipes connected to a compressor on board the fishing boat. This method of fishing is suitable for rocky bottom areas around islands, in water depths from 45.7 meters. Fishing can be done outside the monsoon season when the sea is calm. In the Andaman Sea, this happens between November and April. The best fishing time of the month is during neap tide.

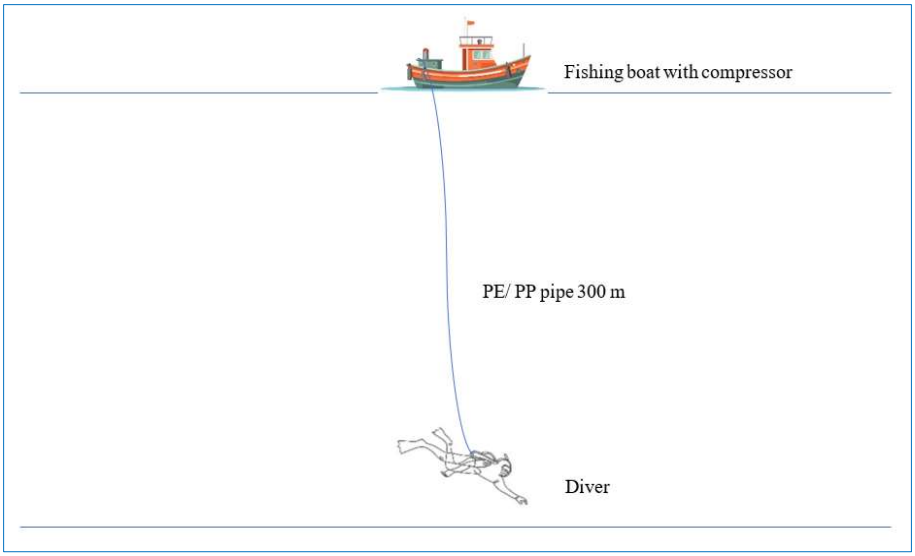


Fig. 7. Diagram of diving fishing in Chaungtha Coastal Area

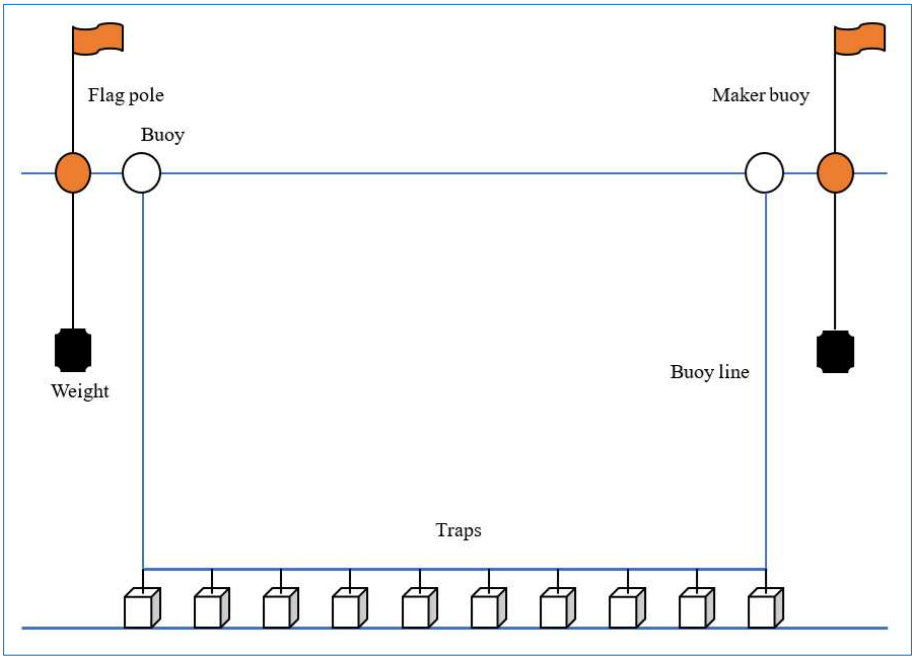


Fig. 8. Diagram of trap fishing in Chaungtha Coastal Area

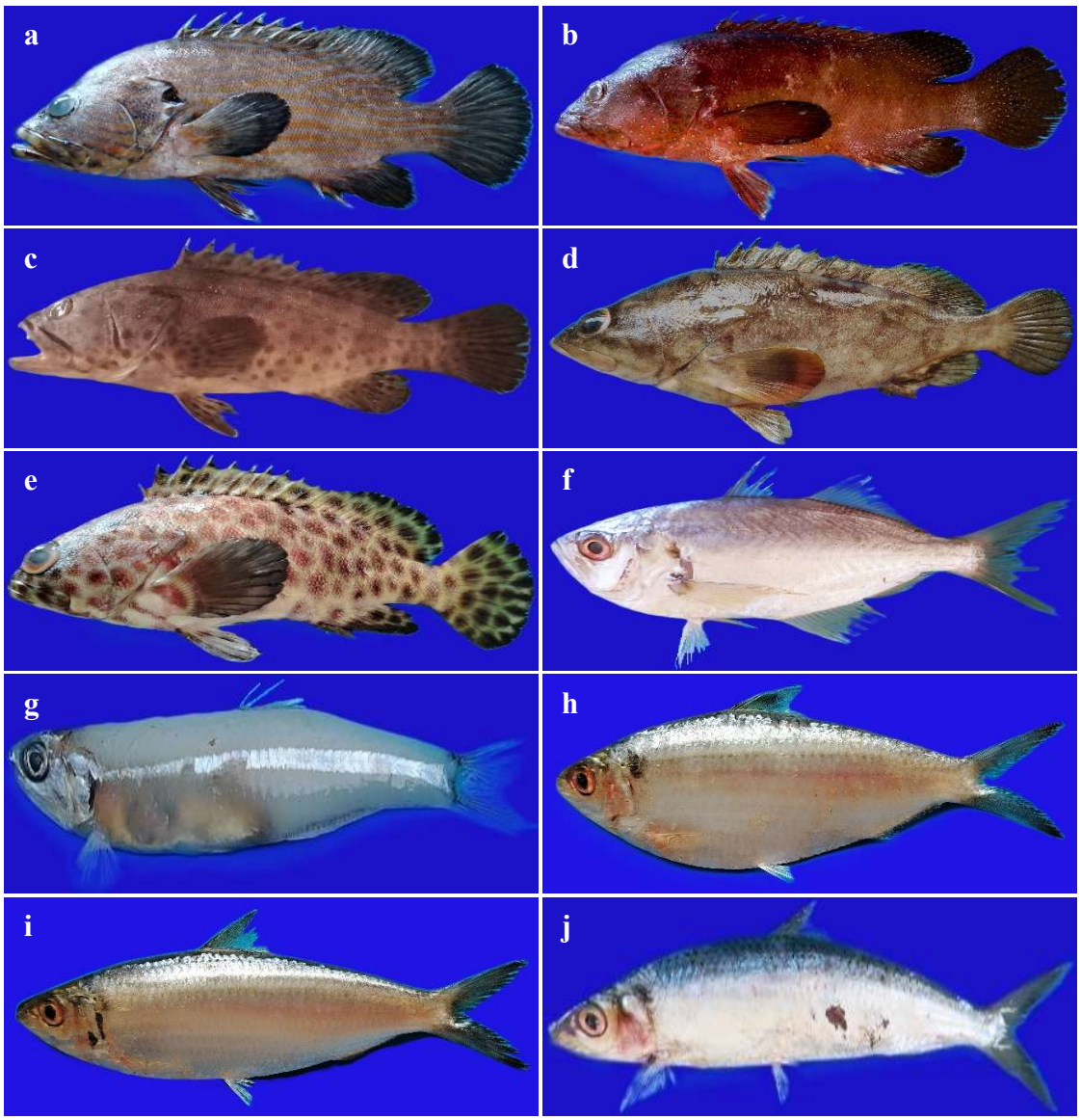
Table 1. Target species of different fishing gear in Chaungtha Coastal Area

No	Fishing gears	Target species	2023		2024							
			Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1	Bottom Set Gillnet	Groupers, False trevally										
2	Purse Seine	Indian anchovy, Sardine, Frigate tuna, Indian and Spanish mackerel										
3	Beach Seine	Miscellaneou										
4	Drift Gillnet	Sardine										
5	Longline	Yellow pike conger, Giant Sea catfish										
6	Diving Fishing	Groupers, Cuttlefishes, Octopus, Painted spiny lobster, Sandfish										
7	Trap Fishing	Maculated ivory whelk										

Symbol: = *Fishing period*

3.7. Trap Fishing (Khayu Hmyone)

The fish trap is locally called "Hmyone". The design of fish traps varies according to the fish to be caught. The entrance is either funnel or wedge-shaped. The traps are about 1 m long 0.5 m wide and 0.3- 0.5 m in height. Rattan and bamboo are the most widely used fish trap materials. A majority of the fish traps have only one entrance. It has a pointed bamboo funnel which prevents the escape of the fish after entering the trap. The fish trap is commonly used in shallow water areas. The fisherman operates these fish traps and one fisher may utilize from 25 to 60 fish pots at a time (Fig. 8). Fish occurrence referring to the presence and distribution of fish species in marine habitats of the Ayeyarwady Region has significant local economic, and social benefits. In the present study, there are 22 species of which 16 species of finfishes, 5 species of shellfishes and 1 species of echinoderm.



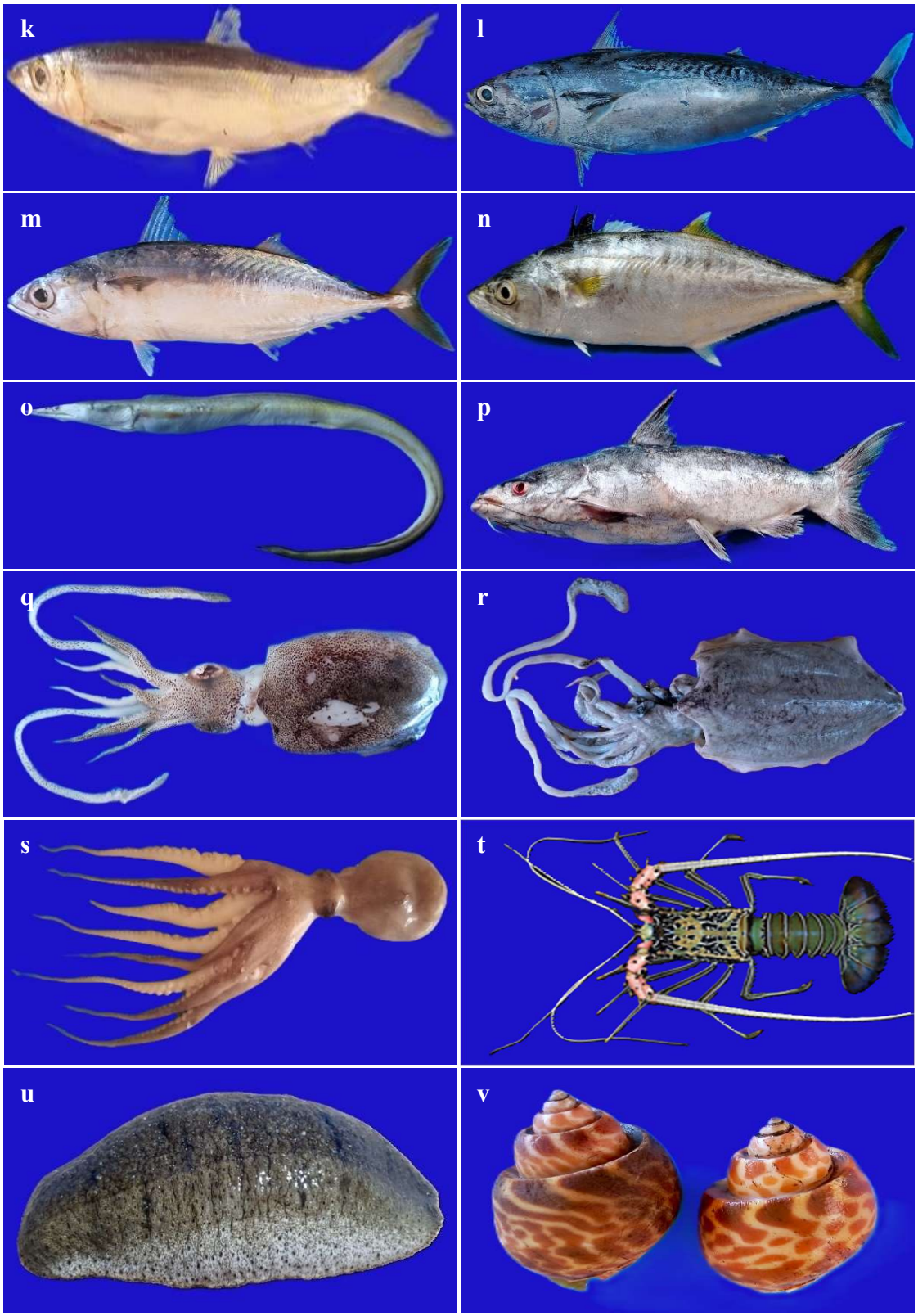


Fig. 9. Target species of Chaungtha Coastal Water: a) *Cephalopholis formosa*; b) *C. miniata*; c) *Epinepheleus coioides*; d) *E. erythrurus*; e) *E. quoyanus*; f) *Lactarius lactarius*; g) *Stolephorus indicus*; h) *Sardinella brachysoma*; i) *S. gibbosa*; j) *S. lemuru*; k) *Dussumieriia acuta*; l) *Auxis thazard*; m) *Rastrelliger kanagurta*; n) *Scomberomorus commerson*; o) *Congresox talabon*; p) *Netuma thalassina*; q) *Sepia aculeata*; r) *S. pharaonis*; s) *Octopus vulgaris*; t*) Panulirus versicolor*; u) *Holothuria scabra*; v) *Babylonia areolata*

Of these 22 species, 1 species of *Lactarius lactarius*, *Stolephorus indicus*, *Congrexsox talabon*, *Netuma thalassina*, *Octopus vulgaris*, *Panulirus versicolor*, *Holothuria scabra*, and *Babylonia areolata*; 2 species of *Sepia aculeata*, and *S. pharaonis*; 3 species of *Auxis thazard*, *Rastrelliger kanagurta*, and *Scomberomorus commerson*; 4 species *Sardinella brachysoma*, *S. gibbosa*, *S. lemuru*, and *Dussumieria acuta*; and 5 species of *Cephalopholis formosa*, *C. miniata*, *Epinephelus coioides*, *E. erythrurus*, and *E. quoyanus*

have observed the finfishes, shellfishes and echinoderm species (Fig. 9).

The occurrence of target fish species in seven types of fishing gear such as groupers (*Cephalopholis Formosa, C. miniata, Epinephelus coioides, E. erythrurus, E. quoyanus*), false trevally (*Lactarius lactarius*), indian anchovy (*Stolephorus indicus*), sardines (*Sardinella brachysoma, S. gibbosa, S. lemuru, Dussumieria acuta)*, tuna and mackerels (*Auxis thazard, Rastrelliger kanagurta, Scomberomorus commerson*), yellow pike conger (*Congrexsox talabon)*, sea catfish, cuttlefishes (*Netuma thalassina*), octopus (*Octopus vulgaris*), painted spiny lobster (*Panulirus versicolor*), sea cucumber (*Holothuria scabra*) and maculated ivory whelk (*Babylonia areolata*) were recorded in the study period (Table 2). The monthly occurrence of target species in Chaungtha Coastal Area is presented in (Table 3).

Table 2. Species occurrence of different fishing gear in Chaungtha Coastal Area

No	Species	Fishing Gears
1	**Groupers** *Cephalopholis formosa* *C. miniata* *Epinephelus coioides* *E. erythrurus* *E. quoyanus*	Bottom Set Gillnet/Diving Fishing
2	**False Trevally** *Lactarius lactarius*	Bottom Set Gillnet
3	**Indian Anchovy** *Stolephorus indicus*	Purse Seine
4	**Sardines** *Sardinella brachysoma* *S. gibbosa* *S. lemuru* *Dussumieria acuta*	Purse Seine/ Drift Gillnet
5	**Tuna and Mackerels** *Auxis thazard* *Rastrelliger kanagurta* *Scomberomorus commerson*	Purse Seine
6	**Miscellaneous**	Beach Seine
7	**Yellow Pike Conger** *Congrexsox talabon*	Longline
8	**Sea Catfish** *Netuma thalassina*	
9	**Cuttlefishes** *Sepia aculeata* *S. pharaonis*	
10	**Octopus** *Octopus vulgaris*	Diving Fishing
11	**Painted Spiny Lobster** *Panulirus versicolor*	
12	**Sea cucumber** *Holothuria scabra*	
13	**Maculated ivory whelk** *Babylonia areolata*	Trap Fishing

The highest species occurrence was recorded in June 2024. The lowest species occurrence was recorded in November 2023 followed by January and August 2024 (Fig. 10). The occurrence of *Stolephorus indicus*, *Scomberomorus commerson, Congrexsox talabon, Netuma thalassina, Sepia aculeata, S. pharaonic and Octopus vulgaris* were recorded throughout the study. Moreover, the highest species composition was noted at 11.61% in June 2024 and the lowest species composition was documented 8.39% in November 2023 followed by January and August 2024 (Fig. 11).

Table 3. Monthly occurrence of some target species in different fishing gears

No	Species	Sampling Months									
		2023		2024							
		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1	*Cephalopholis formosa*	-	-	+	+	-	+	+	+	+	+
2	*C. miniata*	-	-	-	+	+	+	-	+	+	-
3	*Epinephelus coioides*	+	+	+	-	+	-	-	+	+	-
4	*E. erythrurus*	-	-	-	-	+	+	+	+	+	-
5	*E. quoyanus*	-	-	-	-	-	+	+	+	+	-
6	*Lactarius lactarius*	+	+	-	+	+	-	-	+	+	+
7	*Stolephorus indicus*	+	+	+	+	+	+	+	+	+	+
8	*Sardinella brachysoma*	-	-	-	-	-	-	+	+	+	+
9	*S. gibbosa*	-	-	-	-	-	-	+	+	+	+
10	*S. lemuru*	+	+	-	+	+	+	+	-	-	-
11	*Dussumieria acuta*	-	+	+	-	+	-	-	-	-	-
12	*Auxis thazard*	-	-	-	+	-	+	+	-	-	-
13	*Rastrelliger kanagurta*	-	+	-	+	+	+	+	+	+	+
14	*Scomberomorus commerson*	+	+	+	+	+	+	+	+	+	+
15	*Congrexsox talabon*	+	+	+	+	+	+	+	+	+	+
16	*Netuma thalassina*	+	+	+	+	+	+	+	+	+	+
17	*Sepia aculeata*	+	+	+	+	+	+	+	+	+	+
18	*S. pharaonis*	+	+	+	+	+	+	+	+	+	+
19	*Octopus vulgaris*	+	+	+	+	+	+	+	+	+	+
20	*Panulirus versicolor*	+	+	+	+	+	+	+	+	-	+
21	*Holothuria scabra*	+	+	+	+	+	+	+	+	-	-
22	*Babylonia areolata*	+	+	+	+	+	+	-	-	-	-
	Total	13	15	13	16	17	17	17	18	16	13

Symbols: *+ = Present, - = Absent*

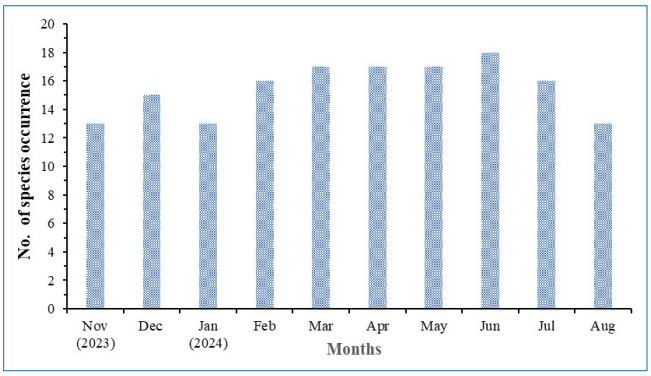


Fig. 10. Monthly occurrence of some target species in Chaungtha Coastal Area

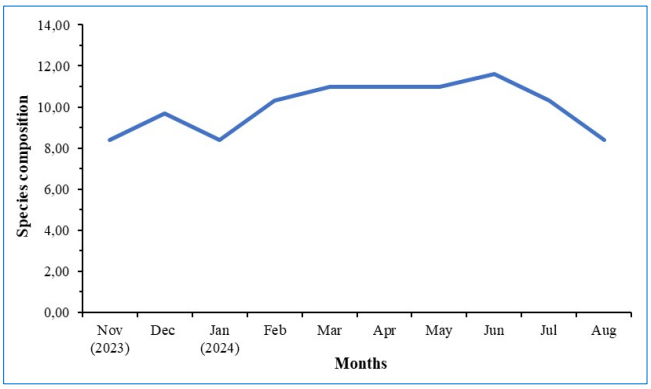


Fig. 11. Species composition of some target species in Chaungtha Coastal Area

Chaungtha Coastal Area is one of the major fishery production areas in the Ayeyarwady Region. The marine fishery in Chaungtha Coastal Areas was a year-round activity with peak periods from November to March. Fishing was carried out both near shore and the sea up to 30 m depth. Marine fish is abundant during the monsoon seasons from June to September. Fishing along Chaungtha Coastal Areas was seasonal because of the weather conditions at different times.

During the period of the northeast monsoon (November to April), the fishing area was quite calm and the entire fishing activity was concentrated along the coast. The conditions were just reversed during the southwest monsoon (May to October) when the sea became rough and choppy and fishing was made difficult.

5. Conclusion

This study provides a comprehensive and detailed description of the fishing methods used in Chaungtha Coastal Area. It is important to understand the methods used by local fishing communities to appreciate the effects of fishing on the marine environment. Informal interviews were conducted in local fishing communities around two different landing sites: Phoe Kalar Kyun, and Myint Family Landing Center with fishers and their family members from November 2023 to August 2024. This study emphasizes providing insights into local fishing methods and the target species associated with each type of gear in the Chaungtha Coastal Area, serving as a valuable reference for discussions on management strategies and alternative fishing practices. Chaungtha Coastal Area is not only a variety of marine fish fauna but also distinctive estuarine fisheries. Fishing activities in this region are significantly influenced by weather conditions.

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