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Bycatch Composition and Marine Mammal Interactions in Blue Swimming Crab Gillnet Fisheries in Indonesia



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Indonesian Blue Swimming Crab Association

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Executive Summary

Gillnet-based blue swimming crab (*Portunus pelagicus*) fisheries face challenges related to the potential bycatch of Endangered, Threatened, and Protected (ETP) species. The implementation of US Marine Mammal Protection Act underscores the need for scientific evidence and improved data availability on bycatch in this fishery. This study documents blue swimming crab fishing activities, bycatch composition, conservation status, and potential interactions with marine mammals in several major crab-producing area in Indonesia. National production data indicate that the largest proportion of Indonesia's blue swimming crab landings originates from Fisheries Management Area (FMA) 712 (64%), followed by FMA 571 (12.9%), FMA 713 (6.5%), and FMA 711 (6.2%). Other FMAs, namely FMA 572, 714, 715, and 717 each contributed less than 5% of annual production. Therefore, this study focuses on bycatch monitoring in Fisheries Management Areas (FMAs) 712 and 571, which contribute substantially to national blue swimming crab production.

Sampling was conducted in six major crab-producing area, namely Cirebon (West Java Province, FMA 712), Rembang (Central Java Province, FMA 712), Gresik (East Java Province, FMA 712), Pamekasan (East Java Province, FMA 712), East Lampung (Lampung Province, FMA 712), and Batubara (North Sumatera Province, FMA 571). Data collection was conducted from January to December 2025 through landing site observations, onboard monitoring, and structured interviews with fishers who use gillnet as fishing gear.

Blue swimming crab gillnet fisheries in the study areas are predominantly small-scale, operated by vessels under 5 GT. Fishing grounds are located in nearshore waters at distances ranging from 2 to 10 miles from the coastline, characterized by shallow depths (<10 m). Fishing activities generally follow a one-day fishing system, with deployment and retrieval of fishing gear conducted on the same day. Bycatch species recorded during the monitoring period consisted mainly of fish, crustaceans, molluscs, and other benthic organisms. No species from the Order Cetacea were recorded as bycatch. Most bycatch species were classified under the IUCN Red List categories of Least Concern (LC) and Not Evaluated (NE), with a very small proportion categorized as Near Threatened (NT), from Elasmobranch group. The majority of bycatch was retained for sale or household seafood consumption, while a small portion was discarded due to poor condition or low freshness.

Marine mammal interaction monitoring indicated a very low level of interaction between blue swimming crab fishing activities and marine mammals. Based on weekly interviews with fishers and multiple onboard observations, no incidents of marine mammal entanglement or bycatch were reported. Monitoring results indicate no operational interactions between blue swimming crab fisheries and marine mammals.

Socialization and awareness-raising activities on marine mammal protection were conducted through banner installations at landing sites, direct communication during catch weighing, and fisher group meetings. These efforts aimed to enhance fishers' understanding of marine mammal conservation and legal protection. Overall, the findings suggest that blue swimming crab fisheries in the study areas pose a low risk to marine mammals.

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1. Cirebon, West Java (FMA 712)

1.1. Overview of blue swimming crab fisheries in Cirebon

Blue swimming crab fishing activities in Cirebon Regency, West Java was mainly located in Gunung Jati Subdistrict water areas. Landing sites for blue swimming crab take place at a local crab weighing station (read *bakul*), where blue swimming crabs are landed together with other catches such as squid, shrimp, fish, and crabs. One of landing sites is located in Mertasinga Village, Gunung Jati Subdistrict, Cirebon Regency (Figure 1.A).



Figure 1.A. Blue swimming crab landing sites in Cirebon Regency, West Java (FMA 712)

The fishing grounds are located within Fisheries Management Area (FMA) 712 along the northern coast of Java, approximately 5–10 km to the east from the Bondet River estuary. The area is characterized by shallow waters, with a maximum depth of approximately 10 m, and is therefore classified as coastal waters rather than offshore environments. BSC fishing in Cirebon are predominantly conducted using bottom-set gillnets with a mesh size of 3.5 inches, operated in sets of 3–5 net panels per fishing trip. The fishing vessels employed are small-scale boats with a capacity of approximately 2 GT, each operated by one skipper and two crew members., are predominantly

conducted using bottom-set gillnets with a mesh size of 3.5 inches, operated in sets of 3–5 net panels per fishing trip, in combination with crab traps. The fishing vessels employed are small-scale boats with a capacity of approximately 2 GT, each operated by one skipper and two crew members. The gillnets used have a net height of approximately 1.5 m and are constructed from plastic monofilament material. Each fishing trip typically involves five net panels operated by the skipper and three net panels operated by crew members. Fishing operations generally follow a single-setting pattern per trip. The total duration of a fishing trip is approximately 8 hours, with vessels departing at around 01:00. Travel time to the fishing grounds takes approximately 2 hours, followed by net setting and soaking for about 3 hours. Hauling activities take place over approximately 1 hour, after which vessels return to the landing site over a 2-hour journey (07:00–09:00 am) (Figure 1.B).



Figure 1.B. Fishing grounds and gear used to catch blue swimming crab in Cirebon Regency

1.2. Composition and diversity of bycatch species

Figure 1.C shows that the target catch (blue swimming crab) accounted for 76% of the total catch weight, while non-target species contributed 24%. In 2025, the total sampled landings of blue swimming crab was about 73.6 kg, while the non-target species (bycatch) was approximately 23.5 kg.

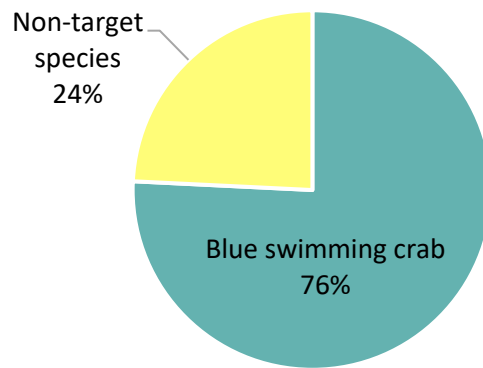


Figure 1.C. Catch composition in blue swimming crab gillnet fishery in Cirebon Regency

Table 1.A. presents the diversity of bycatch species in the blue swimming crab fishery in Cirebon in 2025. The bycatch assemblage comprised 15 species belonging to 9 orders and 13 families. Bycatch was dominated by three orders, namely Decapoda (42.3%), Neogastropoda (39.5%), and Pennatulacea (8.5%). The most dominant family and species were Muricidae (*Murex trapa*), Epialtidae (*Libinia* sp.), and Pennatulidae (*Pennatula* sp.). This finding indicates that these species occupy habitats that overlap with those of the blue swimming crab (*Portunus pelagicus*). No species from the Order Cetacea were recorded as bycatch. Table 1.A showed most bycatch (83%) was discarded due to its low economic value and low freshness, while approximately 17% was retained for household consumption, including fish and crabs.

Table 1.A. List of bycatch species caught by the blue swimming crab gillnet fishery in Cirebon Regency, in 2025

No	Non-Target Species	Order	Family	Weight (kg)		
				Retained	Discarded	Total
1	<i>Johnius belangeri</i>	Perciformes	Sciaenidae		0.06	0.06
2	<i>Hexanemathys sagor</i>	Siluriformes	Ariidae	0.9		0.9
3	<i>Podophthalmus vigil</i>	Decapoda	Portunidae	2.4	0.2	2.6
4	<i>Charybdis feriata</i>	Decapoda	Portunidae	0.7		0.7
5	<i>Charybdis anisodon</i>	Decapoda	Portunidae		1.9	1.9
6	<i>Libinia</i> sp.	Decapoda	Epialtidae		4	4
7	<i>Homoioplax haswellii</i>	Decapoda	Dotillidae		0.41	0.41
8	<i>Episesarma</i> sp.	Decapoda	Sesarmidae		0.2	0.2
9	<i>Calappa philargius</i>	Decapoda	Calappidae		0.12	0.12
10	<i>Harpiosquilla harpax</i>	Stomatopoda	Squillidae		0.42	0.42
11	<i>Octopus vulgaris</i>	Octopoda	Octopodidae		0.05	0.05
12	<i>Murex trapa</i>	Neogastropoda	Muricidae		46.5	46.5
13	<i>Strombus ureus</i>	Littorinimorpha	Strombidae		9.3	9.3
14	<i>Thais</i> sp.	Neogastropoda	Muricidae		0.24	0.24
15	<i>Pennatula</i> sp.	Pennatulacea	Pennatulidae		2	2
Total (kg)				4	19.5	23.5

Table 1.B shows that the occurrence of bycatch species varied temporally throughout the year. Several species exhibited the highest frequency of occurrence and were consistently recorded in every month, while some species were recorded only sporadically during the study period. The gastropod *Murex trapa* was the most abundant species across all months, indicating a high spatial and temporal overlap with the fishing grounds. Other frequently encountered species included *Charybdis anisodon*, *Harpiosquilla harpax*, and *Pennatula sp.*, which were recorded consistently with relatively high abundances. Several crustacean species, such as *Homoioplx haswellii*, *Libinia sp.*, and *Podophthalmus vigil*, showed intermittent but recurrent occurrences, suggesting seasonal availability or habitat-specific interactions. In contrast, fish species including *Johnius belangerii* and *Hexanematichthys sagor* were rarely recorded, reflecting incidental capture rather than persistent bycatch. The dominance of benthic and sessile or low-mobility taxa, such as gastropods and sea pens (*Pennatula sp.*), indicates that the fishing operations primarily interact with benthic communities rather than pelagic fauna.

Table 1.B. Monthly occurrence frequency of bycatch species in the blue swimming crab gillnet fishery in Cirebon Regency, in 2025

No	Non Target Species	Number of Bycatch (ind)											
		J	F	M	A	M	JN	JL	AG	S	O	N	D
1	<i>Johnius belangerii</i>					1	1						
2	<i>Hexanematichthys sagor</i>								1				
3	<i>Podophthalmus vigil</i>				3		1	2		2		3	6
4	<i>Charybdis feriata</i>				1					4			
5	<i>Charybdis anisodon</i>	21	20	4	24	9	1	14	7	10	15	7	25
6	<i>Libinia sp.</i>			9	1								2
7	<i>Homoioplx haswellii</i>	4	5	3		1		3	1	1			15
8	<i>Episesarma sp.</i>	1							2	25		1	1
9	<i>Calappa philargius</i>					2							
10	<i>Harpiosquilla harpax</i>	5	8	9	2	13	3	2		3		2	9
11	<i>Octopus vulgaris</i>			1									
12	<i>Murex trapa</i>	38	28	252	145	74	23	203	39	286	51	119	46
13	<i>Strombus ureus</i>			1	4	3	1	1	2	3	1	2	6
14	<i>Thais sp.</i>			1	4	3	1	1	2	3	1	2	6
15	<i>Pennatula sp</i>	5	1	43	3	6	10	10	15	10	11	2	4

1.3. Conservation status of bycatch

The bycatch species recorded in Cirebon were classified into two IUCN Red List categories: Not Evaluated (NE) (94%) and Least Concern (LC) (6%) (Figure 1.D). Species categorized as Least Concern was *Hexanematichthys sagor*, *Johnius belangerii*, *Harpiosquilla harpax*, and *Octopus vulgaris*. The remaining 11 bycatch species were classified as Not Evaluated under the IUCN Red List.

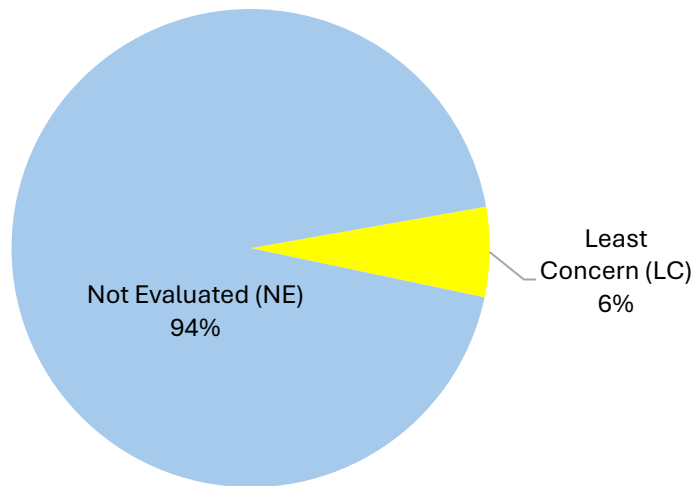


Figure 1.D. Conservation status of bycatch species in the blue swimming crab gillnet fishery in Cirebon Regency, based on the IUCN Red List

1.4. Socialization and data collection of marine mammal

Awareness-raising activities on marine mammal interactions, as protected wildlife, were conducted with blue swimming crab fishers as an effort to enhance their understanding and awareness of the importance of marine resource conservation (Figure 1.E). The socialization emphasized that marine mammals, such as dolphins, are integral components of marine ecosystems and play essential ecological roles that are closely linked to the sustainability of fisheries resources. During these activities, fishers were provided with information on marine mammal species commonly encountered in local waters, their legal protection status under prevailing regulations, and the potential types of interactions that may occur during fishing operations.



Figure 1.E. Socialization and data collection activities on marine mammals conducted with blue swimming crab fishers in Cirebon Regency

Based on monitoring conducted from January to December 2025 involving interviews with 10–15 blue swimming crab fishers and onboard observations, no sightings of marine mammals, including dolphins or whales, were reported during fishing activities in Cirebon waters. No incidents of marine mammals becoming entangled in or captured by fishing gear were reported (Table 1.C).

Table 1.C. Records of marine mammal interactions within fishing grounds as reported by blue swimming crab gillnet fishers in Cirebon Regency, in 2025

Month	Number of Fishers (ind.)		Additional Information
	Sightings	Bycatch	
January	0	0	No marine mammals were observed
February	0	0	No marine mammals were observed
March	0	0	No marine mammals were observed
April	0	0	No marine mammals were observed
May	0	0	No marine mammals were observed
June	0	0	No marine mammals were observed
July	0	0	No marine mammals were observed
August	0	0	No marine mammals were observed
September	0	0	No marine mammals were observed
October	0	0	No marine mammals were observed
November	0	0	No marine mammals were observed
December	0	0	No marine mammals were observed

This indicates that interactions between blue swimming crab fishing operations and marine mammals in Cirebon are absent. The absence of reported encounters is likely related to the relatively nearshore fishing grounds and shallow water depths where crab fishing is conducted, which may not overlap with the primary habitat or movement routes of marine mammals. Overall, no operational interactions or bycatch of marine mammals were recorded during the monitoring period.

2. Rembang, Central Java (FMA 712)

2.1. Overview of blue swimming crab fisheries in Rembang

Rembang Regency is a major blue swimming crab-producing area located in the eastern part of the northern coast of Central Java. Two villages with a high concentration of blue swimming crab fishers in Rembang Regency are Dasun Village and Gedongmulyo Village. Approximately 15 fishers from Dasun Village harvest blue swimming crab using trap gear (bubu), supported by a single collector and miniplant named Basid, which is located along the riverbank of Dasun Village. In addition, approximately 150 fishers from Gedongmulyo Village operate gillnets to target blue swimming crab (Figure 2.A).



Figure 2.A. Blue swimming crab landing sites in Rembang, Central Java (FMA 712)

Fishing activities are conducted in the waters off Rembang at distances ranging from 2 to 10 miles from the landing sites, or approximately 5 miles north of Sluke Subdistrict, Rembang Regency. Gillnet fishers from Gedongmulyo Village typically operate between 40 and 120 net panels per vessel. Each net panel has a stretched length of approximately 30 m. Gillnet operations involve net deployment between 06:00 and 07:00, followed by retrieval between 11:00 and 14:00, resulting in a fishing duration of approximately 4–5 hours per trip (Figure 2.B)



Figure 2.B. Fishing grounds and gears used to catch blue swimming crab in Rembang Regency

2.2. Composition and diversity of bycatch species

Figure 2.C shows that the target catch (blue swimming crab) accounted for 90% of the total catch weight, while non-target species contributed 10%. In 2025, the total sampled landings of blue swimming crab was about 217 kg, while the non-target species (bycatch) was approximately 23.7 kg.

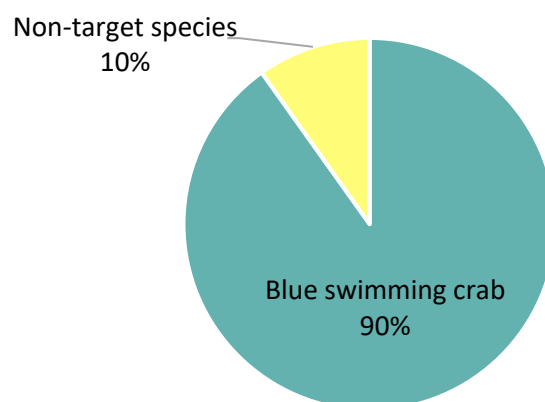


Figure 2.C. Catch composition in blue swimming crab gillnet fishery in Rembang Regency

Table 2.A presents the diversity of bycatch species in the blue swimming crab fishery in Rembang in 2025. The bycatch assemblage comprised 20 species belonging to 9 orders and 15 families. Bycatch was dominated by three orders, namely Decapoda (33.5%), Sepiida (23.2%), and Neogastropoda (23.2%). The most dominant family and species were Sepiidae (*Sepia recurvirostra*), Babyloniidae (*Babylonia spirata*), Portunidae (*Scylla serrata* and *Charybdis feriata*). This finding indicates that these species occupy habitats that overlap with those of the blue swimming crab (*Portunus pelagicus*). Table 2.A showed that no species from the Order Cetacea were recorded as bycatch. Most bycatch (94.3%) was retained for sale or consumption, while 5.7% of bycatch was discarded due to low economic value or physical damage.

Table 2.A. List of bycatch species caught by the blue swimming crab gillnet fishery in Rembang Regency, in 2025

No	Non-Target Species	Order	Family	Weight (kg)		
				Retained	Discarded	Total
1	<i>Terapon theraps</i>	Perciformes	Terapontidae	0,15		0,15
2	<i>Pelates quadilineatus</i>	Perciformes	Terapontidae	0,06		0,06
3	<i>Pomadasys kaakan</i>	Perciformes	Haemulidae	0,9		0,9
4	<i>Scatophagus argus</i>	Perciformes	Scatophagidae	0,19		0,19
5	<i>Johnius belangerii</i>	Perciformes	Sciaenidae	0,66		0,66
6	<i>Brevitrygon walga</i>	Myliobatiformes	Dasyatidae	1,55		1,55
7	<i>Arius</i> sp.	Siluriformes	Ariidae	0,45		0,45
8	<i>Pseudorhombus arsius</i>	Pleuronectiformes	Paralichthyidae	0,22		0,22
9	<i>Psettodes erumei</i>	Pleuronectiformes	Psettodidae	0,06		0,06
10	<i>Libinia</i> sp.	Decapoda	Epialtidae		0,33	0,33
11	<i>Homoioplax haswelli</i>	Decapoda	Goneplacidae		0,12	0,12
12	<i>Scylla serrata</i>	Decapoda	Portunidae	3,37		3,37
13	<i>Charybdis affinis</i>	Decapoda	Portunidae		0,16	0,16
14	<i>Charybdis lucifera</i>	Decapoda	Portunidae		0,15	0,15
15	<i>Podophthalmus vigil</i>	Decapoda	Portunidae		0,57	0,57
16	<i>Charybdis feriata</i>	Decapoda	Portunidae	3,22		3,22
17	<i>Harpisquilla harpax</i>	Stomatopoda	Squillidae	0,25	0,02	0,27
18	<i>Babylonia spirata</i>	Neogastropoda	Babyloniidae	5,24		5,24
19	<i>Sepia recurvirostra</i>	Sepiida	Sepiidae	5,48		5,48
20	<i>Octopus vulgaris</i>	Octopoda	Octopodidae	0,51		0,51
Total				22.31	1.35	23.66

Table 2.B shows that the occurrence of bycatch species varied temporally throughout the year. A total of 20 bycatch species were recorded, with several taxa showing sporadic appearances, while others were consistently present across multiple months. Among the recorded species, crustaceans and mollusks dominated the bycatch composition. *Babylonia spirata* exhibited the highest abundance, particularly during June and July, indicating seasonal dominance in the fishing grounds. Other frequently encountered species included *Podophthalmus vigil*, *Charybdis feriata*, and *Scylla serrata*, which were recorded across several months with relatively high individual counts. In contrast, elasmobranch bycatch such as *Brevitrygon walga* occurred infrequently and in low numbers, suggesting limited interaction with vulnerable taxa. Several fish species, including *Terapon theraps*,

Pomadasys kaakan, and *Johnius belangerii*, were recorded intermittently with low abundance, reflecting incidental capture rather than consistent overlap with the blue swimming crab fishery.

Table 2.B. Monthly occurrence frequency of bycatch species in the blue swimming crab gillnet fishery in Rembang Regency, in 2025

No	Non target species	Number of Bycatch (ind)											
		J	F	M	A	M	JN	JL	AG	S	O	N	D
1	<i>Terapon theraps</i>				2								
2	<i>Pomadasys kaakan</i>		1	1	2					1			
3	<i>Scatophagus argus</i>						2						
4	<i>Pelates quadilineatus</i>							2					
5	<i>Johnius belangerii</i>						4		2				
6	<i>Brevitrygon walga</i>		1	2		2		1	1	1			
7	<i>Arius sp.</i>			1									
8	<i>Pseudorhombus arsius</i>					2							
9	<i>Psettodes erumei</i>			1									
10	<i>Scylla serrata</i>	2	1					2	2	10	4		1
11	<i>Libinia sp.</i>				1	2						1	
12	<i>Homoioplax haswelli</i>		3										
13	<i>Charybdis affinis</i>	1										3	1
14	<i>Charybdis lucifera</i>	2				6				1	3		
15	<i>Podophthalmus vigil</i>	4	2				3	4	2			2	7
16	<i>Charybdis feriata</i>		2	2	4					3	5	5	7
17	<i>Harpiosquilla harpax</i>							1	1				
18	<i>Babylonia spirata</i>				52		95	190			125		
19	<i>Sepia recurvirostra</i>		1	1	2	3		3	9	2			
20	<i>Octopus vulgaris</i>												1

2.3. Conservation status of bycatch

The bycatch species recorded in Rembang were classified into three IUCN Red List categories: Not Evaluated (NE) (54%) and Least Concern (LC) (40%), and Near Threatened (NT) (6%) (Figure 2.D). The only species categorized as Near Threatened was *Brevitrygon walga*. Ten species were categorized as least concern, including *Terapon theraps*, *Pomadasys kaakan*, *Scatophagus argus*, *Pelates quadilineatus*, *Johnius belangerii*, *Psettodes erumei*, *Scylla serrata*, *Charybdis feriata*, *Harpiosquilla harpax*, and *Octopus vulgaris*. Nine species were categorized as Not Evaluated, namely *Arius sp.*, *Pseudorhombus arsius*, *Libinia sp.*, *Homoioplax haswelli*, *Charybdis affinis*, *Charybdis lucifera*, *Podophthalmus vigil*, *Babylonia spirata*, and *Sepia recurvirostra*.

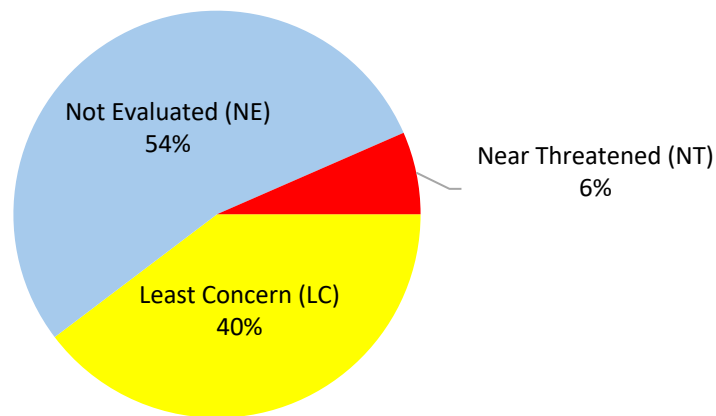


Figure 2.D. Conservation status of bycatch species in the blue swimming crab gillnet fishery in Rembang, Regency, based on the IUCN Red List

2.4. Socialization and data collection of marine mammal

Socialization activities were conducted through interviews with 30 fishers during fish landing activities as well as during fisher group meetings. In addition, direct monitoring was carried out to independently verify the information by accompanying fishers during fishing trips at varying distances from the coast, ranging from 4 to 10 miles (Figure 2.E).



Figure 2.E. Socialization and data collection activities on marine mammals conducted with blue swimming crab fishers in Rembang Regency

Based on monitoring conducted from January to December 2025, most fishers reported no sightings of marine mammals, including dolphins or whales, during fishing activities in Rembang waters. On 10 June 2025, a fisher named Khairul Hadi reported seeing dolphins far from fishing ground at a distance of more than 10 miles from the coastline. Onboard observations were conducted at two different fishing areas, 4 and 10 miles from the coastline, no marine mammals were observed passing through the fishing area, nor were any incidents of entanglement recorded, similar with fishers report. This suggests that interactions between blue swimming crab fishing operations and marine mammals in the study area are absent or occur at a very low frequency. The limited occurrence of sightings is likely associated with the predominantly nearshore fishing grounds and shallow water depths where crab fishing is conducted, which may not overlap with the primary habitats or movement routes of marine mammals. Overall, no operational interactions or bycatch of marine mammals were recorded during the monitoring period.

Table 2.C. Records of marine mammal interactions within fishing grounds as reported by blue swimming crab gillnet fishers in Rembang Regency, in 2025

Month	Number of Fishers (ind.)		Additional Information
	Sightings	Bycatch	
January	0	0	No marine mammals were observed
February	0	0	No marine mammals were observed
March	0	0	No marine mammals were observed
April	0	0	No marine mammals were observed
May	0	0	No marine mammals were observed
June	0	0	No marine mammals were observed
July	0	0	No marine mammals were observed
August	0	0	No marine mammals were observed
September	0	0	No marine mammals were observed
October	0	0	No marine mammals were observed
November	0	0	No marine mammals were observed
December	0	0	No marine mammals were observed

3. Gresik, East Java (FMA 712)

3.1. Overview of blue swimming crab fisheries in Gresik

Gresik Regency is one of the important centers of the blue swimming crab (*Portunus pelagicus*) fishery in East Java Province, particularly along the northern coastal zone. The coastal waters of Ujung Pangkah and Mengare provide favorable environmental conditions for blue swimming crabs, characterized by shallow depths, sandy substrates, and the availability of natural food resources. These features make the area a suitable habitat for spawning and growth. Consequently, blue swimming crab resources have long constituted a key capture fisheries commodity in Gresik, supporting coastal livelihoods and contributing significant economic value. The continued and intergenerational exploitation of this resource by local fishers reflects its relatively high abundance and the substantial potential of the fishery in the region. Blue swimming crab data collection was primarily recorded at landing station located in Kramat Village, Mengare, Bungah Subdistrict, Gresik Regency, East Java. Additional observations were conducted onboard fishing vessel to document fishing activities, catch, and interaction with marine mammal (Figure 3.A).

The fishing grounds of Mengare fishers are generally located in the Gresik–Madura waters, approximately 4–5 miles from the coastline, depending on seasonal conditions. During periods of low crab availability, fishing activities tend to shift farther offshore, reaching areas as distant as Karang Jamuwang Island. The fishery predominantly employs gillnets as the main fishing gear. Fishers typically operate between 70 and 100 net panels (*tinting*), each with an approximate length of 12 m. The gillnets use ropes of about 800 m in length, commonly red and/or blue, with a mesh size of 3.5 inches and constructed from white monofilament material. Fishing trips are conducted as short daily operations, generally starting in the early morning at around 04:00 am and ending at approximately 08:00 am. Travel time to the fishing grounds within a distance of up to 4 miles is about one hour, followed by net deployment and a soaking period of 1–2 hours (Figure 3.B)



Figure 3.A. Blue swimming crab landing sites in Gresik Regency, East Java (FMA 712)



Figure 3.B. Fishing grounds and gear used to catch blue swimming crab in Gresik Regency

3.2. Composition and diversity of bycatch species

Figure 3.C shows that the target catch (blue swimming crab) accounted for 62% of the total catch weight, while non-target species contributed 38%. In 2025, the total sampled landings of blue swimming crab was about 429.3 kg, while the non-target species was approximately 268.2 kg.

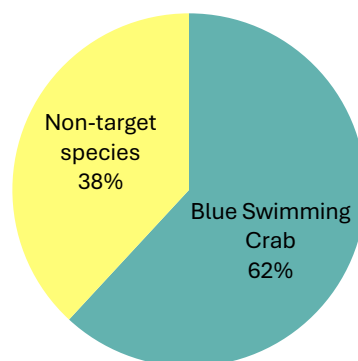


Figure 3.C. Catch composition in blue swimming crab gillnet fishery in Gresik Regency

Table 3.A presents the diversity of bycatch species in the blue swimming crab fishery in Gresik in 2025. The bycatch assemblage comprised 19 species belonging to 8 orders and 17 families. Bycatch was dominated by four orders, namely Siluriformes (44.7%), Perciformes (20.6%), Decapoda (16%), and Pleuronectiformes (14.7%). The most dominant family and species were Ariidae (*Plicofollis argyropleuron*), Sciaenidae (*Johnius belangeri*), Portunidae (*Scylla serrata*), dan Cynoglossidae (*Cynoglossus lingua*). This finding indicates that these species occupy habitats that overlap with those of the blue swimming crab (*Portunus pelagicus*). Table 3.A showed that no species from the Order Cetacea were recorded as bycatch. The majority of bycatch retained (98%), while only 2% was discarded. Discarded catches generally consisted of specimens that were damaged or incomplete and therefore had no market value, or occurred in very small quantities.

Table 3.A. List of bycatch species caught by the blue swimming crab gillnet fishery in Gresik Regency, in 2025

No	Non-Target Species	Order	Family	Weight (kg)		
				Retained	Discarded	Total
1	<i>Epinephelus sexfasciatus</i>	Perciformes	Serranidae	0.5	-	0.5
2	<i>Epinephelus coioides</i>	Perciformes	Serranidae	0.4	-	0.4
3	<i>Lutjanus monostigma</i>	Perciformes	Lutjanidae	0.1	-	0.1
4	<i>Scatophagus argus</i>	Perciformes	Scatophagidae	0.4	-	0.4
5	<i>Deprane punctata</i>	Perciformes	Drepaneidae	0.3	-	0.3
6	<i>Leiognathus sp.</i>	Perciformes	Leiognathidae	0.4	-	0.4
7	<i>Pampus argenteus</i>	Perciformes	Stromateidae	1.2	-	1.2
8	<i>Johnius belangeri</i>	Perciformes	Sciaenidae	50	0.81	50.81
9	<i>Eleutheronema tetradactylum</i>	Perciformes	Polynemidae	1	-	1
10	<i>Cynoglossus lingua</i>	Pleuronectiformes	Cynoglossidae	39.5	-	39.5
11	<i>Brevitrygon walga</i>	Myliobatiformes	Dasyatidae	1.3	-	1.3
12	<i>Taeniura lymma</i>	Myliobatiformes	Dasyatidae	1.1	-	1.1
13	<i>Hexanematichthys sagor</i>	Siluriformes	Ariidae	48	-	-
14	<i>Plicofollis argyropleuron</i>	Siluriformes	Ariidae	71.75	0.1	71.76
15	<i>Scylla serrata</i>	Decapoda	Portunidae	37.4	1.73	39.13
16	<i>Panulirus versicolor</i>	Decapoda	Palinuridae	3.8	-	3.8
17	<i>Metapenaeus sp.</i>	Decapoda	Penaeidae	-	0.02	0.02
18	<i>Harpisquilla harpax</i>	Stomatopoda	Squillidae	5.85	1.73	7.58
19	<i>Babylonia spirata</i>	Neogastropoda	Babyloniidae	-	0.78	0.78
Total (kg)				263	5.2	268.2

Table 3.B shows that the occurrence of bycatch species varied across months. Several species exhibited the highest frequency of occurrence and were consistently recorded in every month. In contrast, several other fish species were recorded only sporadically during the study period. The bycatch assemblage was dominated by demersal fish species, particularly *Johnius belangeri*, *Cynoglossus lingua*, *Hexanematichthys sagor*, and *Plicofollis argyropleuron*, which were consistently recorded across most months and accounted for the highest monthly abundances.

Crustaceans such as *Scylla serrata* and *Harpiosquilla harpax* were also frequently encountered throughout the monitoring period, indicating substantial habitat overlap with blue swimming crab fishing grounds. Elasmobranch bycatch was limited and sporadic, with *Brevitrygon walga* and *Taeniura lymma* recorded only in specific months and at low frequencies. Molluscan bycatch, including *Babylonia spirata*, occurred intermittently with notable peaks in certain months. Overall, the results suggest that bycatch composition is dominated by common demersal and benthic-associated species, with limited occurrence of species of higher conservation concern.

Table 3.B. Monthly occurrence frequency of bycatch species in the blue swimming crab gillnet fishery in Gresik Regency, in 2025

No	Non-Target Species	Hasil Tangkapan per Bulan (ind)											
		J	F	M	A	M	JN	JL	AG	S	O	N	D
1	<i>Epinephelus sexfasciatus</i>		2										
2	<i>Epinephelus coioides</i>							2					
3	<i>Lutjanus monostigma</i>							1					
4	<i>Scatophagus argus</i>		2										
5	<i>Deprane punctata</i>									2			
6	<i>Leiognathus sp.</i>							3					
7	<i>Pampus argenteus</i>									3			
8	<i>Johnius belangeri</i>	36	48	15	23	25	19	37	28	14	10	8	11
9	<i>Eleutheronema tetradactylum</i>				4			2					
10	<i>Cynoglossus lingua</i>	9	23	8	6	16	12	8	17	17	11	22	15
11	<i>Brevitrygon walga</i>		6										
12	<i>Taeniura lymma</i>							2					
13	<i>Hexanematichthys sagor</i>	15		6	9	10	19	16	11	6	11	13	2
14	<i>Plicofollis argyroleuron</i>	26	16	22	25	27	19	15	15	13	8	24	13
15	<i>Scylla serrata</i>	28	1	27	29	17	18	21	22	25	8	5	22
16	<i>Panulirus versicolor</i>		4		2	1	2	2		4	4		
17	<i>Metapenaeus sp.</i>									2			
18	<i>Harpiosquilla harpax</i>	10	9	7	5	14	12	1	7	7	1	6	4
19	<i>Babylonia spirata</i>	5				16	14						

3.3. Conservation status of bycatch

The bycatch species recorded in Gresik waters were classified into three IUCN Red List categories: Not Evaluated (NE)(95%), Least Concern (LC) (4%), and Near Threatened (NT) (1%) (Figure 3.D). Two elasmobranch species were categorized as Near Threatened, namely *Brevitrygon walga* and *Taeniura lymma*. The two species were incidentally captured only once, occurring in February and July (Table xx), and were not recorded consistently across months. Species categorized as Least Concern were *Harpiosquilla harpax*, *Panulirus versicolor*, and *Scatophagus argus*. The remaining 14 bycatch species were classified as Not Evaluated under the IUCN Red List.

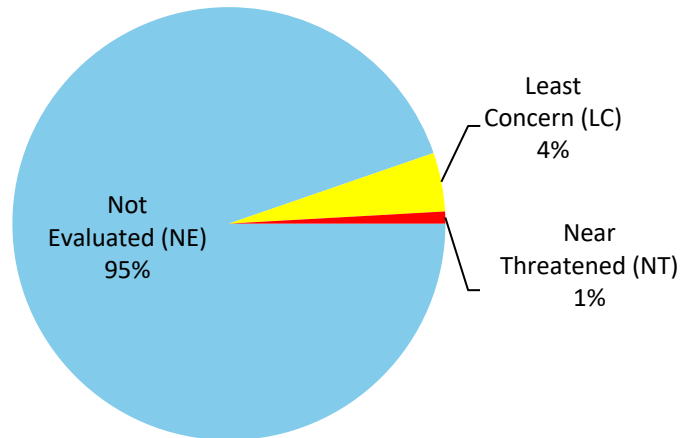


Figure 3.D. Conservation status of bycatch species in the blue swimming crab gillnet fishery in Gresik Regency, based on the IUCN Red List

3.4. Socialization and data collection of marine mammal

Activities to raise awareness of protected marine mammal species were conducted through the placement of informational posters at the main blue swimming crab landing sites and discussion with fisher groups. Data collection was carried out on a weekly basis. Records of marine mammal bycatch events were obtained through interviews with fishers after they returned from fishing trips and sold their catches to collectors and onboard observations. Interviews with fishers were conducted to assess their experiences during blue swimming crab fishing activities, particularly regarding any encounters with marine mammals in their fishing grounds, as well as to explore their level of understanding of regulations related to marine mammals (Figure 3.E).



Figure 3.E. Socialization and data collection activities on marine mammals conducted with blue swimming crab fishers in Gresik Regency

Based on monitoring conducted from January to December 2025 involving interviews with 15 blue swimming crab fishers and onboard observations, no sightings of marine mammals, including

dolphins or whales, were reported during fishing activities in Gresik waters. No incidents of marine mammals becoming entangled in or captured by fishing gear were reported (Table 3.C). This indicates that interactions between blue swimming crab fishing operations and marine mammals in the study area are absent. The absence of reported encounters is likely related to the relatively nearshore fishing grounds and shallow water depths where crab fishing is conducted, which may not overlap with the primary habitat or movement routes of marine mammals. Overall, no operational interactions or bycatch of marine mammals were recorded during the monitoring period.

Table 3.C. Records of marine mammal interactions reported by blue swimming crab gillnet fishers in Gresik Regency, in 2025

Month	Number of Fishers (ind)		Additional Information
	Sightings	Bycatch	
January	0	0	No marine mammals were observed
February	0	0	No marine mammals were observed
March	0	0	No marine mammals were observed
April	0	0	No marine mammals were observed
May	0	0	No marine mammals were observed
June	0	0	No marine mammals were observed
July	0	0	No marine mammals were observed
August	0	0	No marine mammals were observed
September	0	0	No marine mammals were observed
October	0	0	No marine mammals were observed
November	0	0	No marine mammals were observed
December	0	0	No marine mammals were observed

4. Pamekasan, East Java (FMA 712)

4.1. Overview of blue swimming crab fisheries in Pamekasan

Blue swimming crab data collection activities in Pamekasan Regency were conducted in Pagagan Village and Candi Hamlet, Polagan Village, Pademawu Subdistrict (Figure xx). In Pagagan Village, data collection was carried out at the collector's facility owned by Mr. Misrawi and focused on blue swimming crabs caught using trap gear. In Candi Hamlet, Polagan Village, data collection targeted blue swimming crabs caught using gillnets and was conducted at the residence of the head of the fisher group, Mr. Sarkawi (Figure 4.A).



Figure 4.A. Data collection of blue swimming crabs and bycatch conducted at the landing sites in Pamekasan, East Java (FMA 712)

The fishing grounds used by fishers from Pagagan and Polagan Villages are located within Fisheries Management Area (FMA) 712, at distances of approximately 4–10 miles from the coastline. Fishing locations vary daily depending on individual fishers' preferences and information shared among fishers regarding areas with higher catch yields. Fishing activities are conducted under a one-day fishing system, in which operations are completed within a single day (round trip) (Figure 4.B).

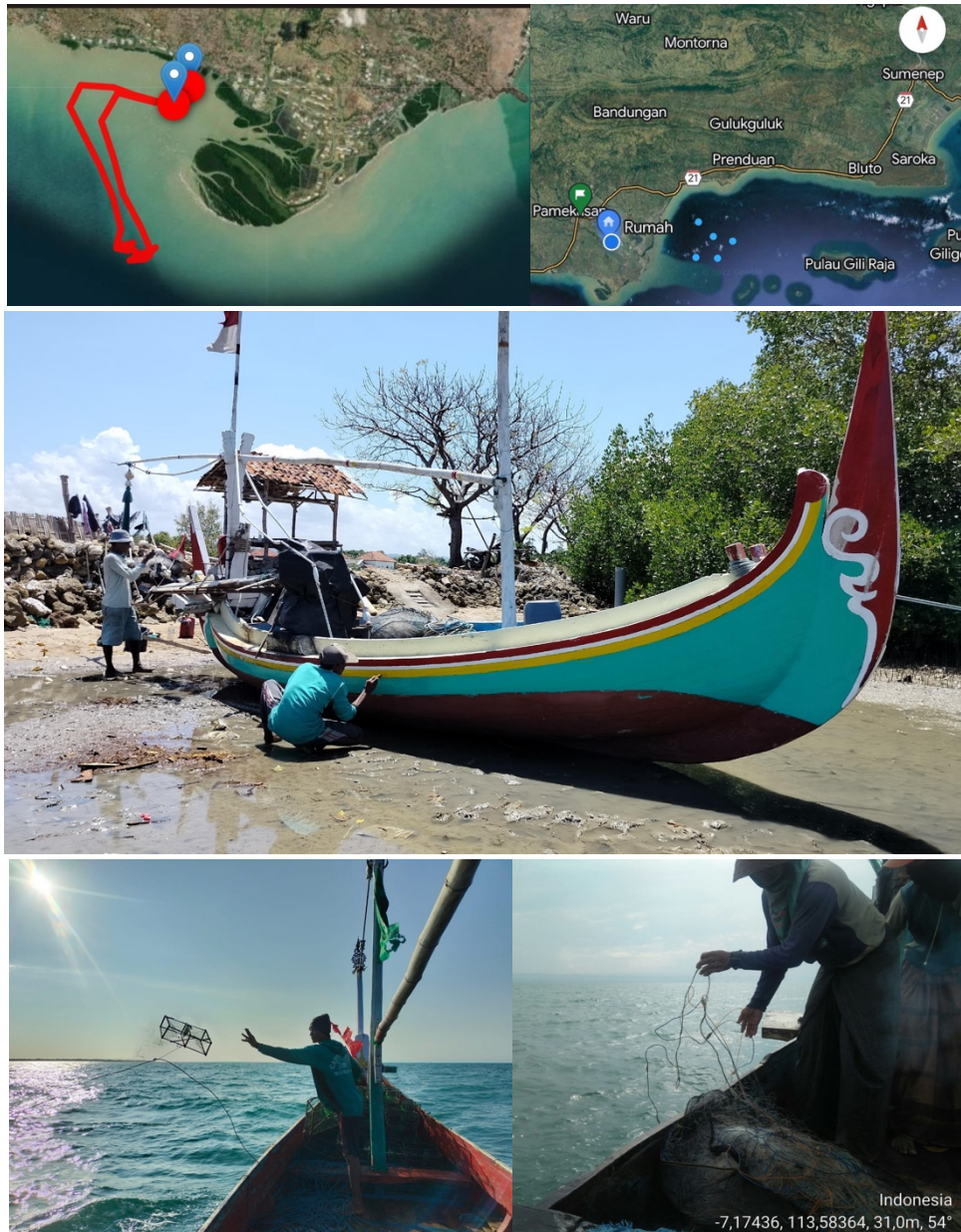


Figure 4.B. Fishing grounds and gears used to catch blue swimming crab in Pamekasan Regency

Fishers typically depart after dawn and complete fishing activities between 04:00 and 10:00 a.m. local time. In Polagan Village, fishing operations are also conducted using a one-day fishing system, with fishers departing after dawn and spending approximately 7–8 hours at sea. The fishing gear used in Pagagan Village consists of bamboo crab traps measuring approximately 40 cm in length, 32 cm in width, and 12 cm in height (Figure 2). In contrast, the fishing gear used in Polagan Village consists of gillnets with mesh sizes ranging from 3.5 to 4.5 inches. Fishing operations for trap and gillnet were conducted using small-scale fishing vessels with a capacity of less than 5 GT.

4.2. Composition and diversity of bycatch species

Figure 4.C shows that the target catch (blue swimming crab) accounted for 90% of the total catch weight, while non-target species contributed 10%. In 2025, the total sampled landings of blue swimming crab was about 73.6 kg, while the non-target species (bycatch) was approximately 23.5 kg.

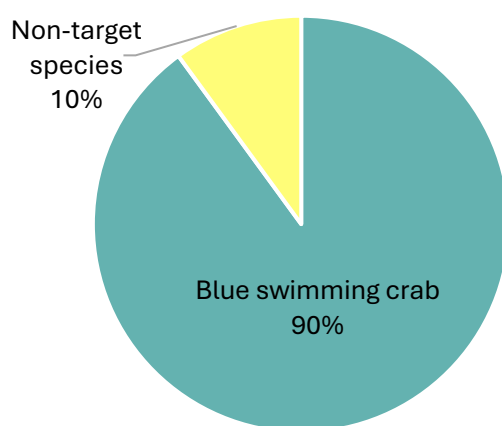


Figure 4.C. Catch composition in blue swimming crab gillnet fishery in Pamekasan Regency

Tabel 4.A presents the diversity of bycatch species in the blue swimming crab fishery in Pamekasan in 2025. The bycatch assemblage comprised 22 species belonging to 10 orders and 17 families. Bycatch was dominated by three orders, namely Decapoda (47.2%), Perciformes (17.6%), and Neogastropoda (14.1%). The most dominant family and species were Portunidae (*Scylla serrata*, *Podophthalmus vigil*), Sciaenidae (*Johnius amblycephalus*), and Volutidae (*Melo melo*). This finding indicates that these species occupy habitats that overlap with those of the blue swimming crab (*Portunus pelagicus*). Table 4.A showed that no species from the Order Cetacea were recorded as bycatch. Most bycatch (84.9%) was retained for sale or consumption, while 15.1% of bycatch was discarded due to low economic value or physical damage.

Table 4.A. List of bycatch species caught by the blue swimming crab gillnet fishery in Pamekasan Regency, in 2025

No	Non-Target Species	Order	Family	Weight (kg)		
				Retained	Discarded	Total
1	<i>Johnius amblycephalus</i>	Acanthuriformes	Sciaenidae	1,23		1,23
2	<i>Scatophagus argus</i>	Acanthuriformes	Scatophagidae	2,13		2,13
3	<i>Leiognathus</i> sp.	Acanthuriformes	Leiognathidae	0,14		0,14
4	<i>Gerres filamentosus</i>	Acanthuriformes	Gerreidae	0,42		0,42
5	<i>Selaroides leptolepis</i>	Carangiformes	Carangidae	0,69		0,69
6	<i>Scomberoides tala</i>	Carangiformes	Carangidae	0,1		0,1
7	<i>Lutjanus monostigma</i>	Lutjaniformes	Lutjanidae	2,15		2,15
8	<i>Brevitrygon walga</i>	Myliobatiformes	Dasyatidae	1,47		1,47
9	<i>Psettodes erumei</i>	Pleuronectiformes	Psettodidae	0,16		0,16
10	<i>Plotosus canius</i>	Siluriformes	Plotosidae	0,09		0,09
11	<i>Nemipterus hexodon</i>	Spariformes	Nemipteridae	2,39		2,39
12	<i>Acanthopagrus spinifer</i>	Spariformes	Sparidae	0,98		0,98
13	<i>Scylla serrata</i>	Decapoda	Portunidae	8,52		8,52
14	<i>Penaeus monodon</i>	Decapoda	Penaeidae	0,05		0,05
15	<i>Podophthalmus vigil</i>	Decapoda	Portunidae	4,34		4,34
16	<i>Charybdis feriata</i>	Decapoda	Portunidae	2,24		2,24
17	<i>Charybdis affinis</i>	Decapoda	Portunidae		1,33	1,33

No	Non-Target Species	Order	Family	Weight (kg)		
				Retained	Discarded	Total
18	<i>Charybdis natator</i>	Decapoda	Portunidae		1,89	1,89
19	<i>Melo melo</i>	Neogastropoda	Volutidae	2,83		2,83
20	<i>Babylonia spirata</i>	Neogastropoda	Babyloniidae		0,74	0,74
21	<i>Murex trapa</i>	Neogastropoda	Muricidae		1,91	1,91
22	<i>Sepia recurvirostra</i>	Sepiida	Sepiidae	3,08		3,08
Total				33.01	5.87	38.88

Table 4.B shows that the occurrence of bycatch species varied temporally throughout the year. A total of 22 non-target species were recorded as bycatch throughout the sampling period, consisting of teleost fishes, elasmobranchs, crustaceans, mollusks, and cephalopods. Bycatch occurred in almost every month, with variation in species composition and abundance. Crustaceans were the dominant bycatch group, particularly swimming crabs (*Podophthalmus vigil*, *Charybdis feriata*, *C. affinis*, and *C. natator*) and mud crab (*Scylla serrata*), which were consistently recorded throughout the year.

Table 4.B. Monthly occurrence frequency of bycatch species in the blue swimming crab gillnet fishery in Pamekasan Regency, in 2025

No	Non target species	Number of bycatch (ind)											
		J	F	M	A	M	JN	JL	AG	S	O	N	D
1	<i>Johnius amblycephalus</i>									1	1		3
2	<i>Scatophagus argus</i>		2	2	2	1		1	1	1			
3	<i>Leiognathus sp.</i>		1		1								
4	<i>Gerres filamentosus</i>		1		1			1	1		1		
5	<i>Selaroides leptolepis</i>					1		1	2	3		1	1
6	<i>Scomberoides tala</i>		1										
7	<i>Lutjanus monostigma</i>	1	1	3	1	3		2	1		2	4	
8	<i>Brevitrygon walga</i>	1		1	3			1	1	2	1	1	1
9	<i>Psettodes erumei</i>					1							
10	<i>Plotosus canius</i>					1							
11	<i>Nemipterus hexodon</i>	1		1	2		2	1		2	4		
12	<i>Acanthopagrus spinifer</i>			1		2					2		1
13	<i>Scylla serrata</i>	3	5	3	3	1		2	1	1	2	3	1
14	<i>Penaeus monodon</i>												1
15	<i>Podophthalmus vigil</i>	6	6	4	6	7		3	6	3	3	6	7
16	<i>Charybdis feriata</i>	2	1	4	1			1	1	3	1		1
17	<i>Charybdis affinis</i>	1	2	4	2	4		1	2	2	1		
18	<i>Charybdis natator</i>	1	2	1	1	1					1	1	
19	<i>Melo melo</i>				1	1		2	2	1	5	2	
20	<i>Babylonia spirata</i>		4			6		2	1	1	1	2	
21	<i>Murex trapa</i>	5	8	11	3	2		1	1			2	5
22	<i>Sepia recurvirostra</i>	1	2	2				6		3	3	3	

Podophthalmus vigil showed the highest and most consistent abundance, indicating strong spatial and habitat overlap with blue swimming crab fishing grounds. Teleost fishes formed a moderate proportion of bycatch, dominated by members of the order Perciformes, including *Lutjanus monostigma*, *Nemipterus hexodon*, *Scatophagus argus*, and *Gerres filamentosus*. These species were recorded intermittently and generally in low numbers, suggesting incidental

capture rather than targeted exploitation. Elasmobranch bycatch was limited to *Brevitrygon walga*, which occurred in low abundance across several months. Molluscs such as *Babylonia spirata*, *Murex trapa*, and *Melo melo*, as well as cephalopods (*Sepia recurvirostra*), were also recorded sporadically, likely due to their benthic association with trap fishing gear. Overall, the bycatch composition reflects demersal and benthic-associated species, consistent with the characteristics of blue swimming crab fishing operations conducted in shallow coastal waters.

4.3. Conservation status of bycatch

The bycatch species recorded in Pamekasan were classified into three IUCN Red List categories: Not Evaluated (NE) (37.1%) and Least Concern (LC) (59.1%), and Near Threatened (NT) (3.8%) (Figure 4.D). The only species categorized as Near Threatened was *Brevitrygon walga*. Ten species were categorized as least concern, including *Johnius amblycephalus*, *Scatophagus argus*, *Gerres filamentosus*, *Selaroides leptolepis*, *Scomberoides tala*, *Lutjanus monostigma*, *Psettodes erumei*, *Plotosus canius*, *Nemipterus hexodon*, *Acanthopagrus spinifer*, *Scylla serrata*, *Charybdis feriata*, and *Charybdis natator*. Eight species were categorized as Not Evaluated, namely *Leiognathus sp.*, *Penaeus monodon*, *Podophthalmus vigil*, *Charybdis affinis*, *Melo melo*, *Babylonia spirata*, *Murex trapa*, and *Sepia recurvirostra*.

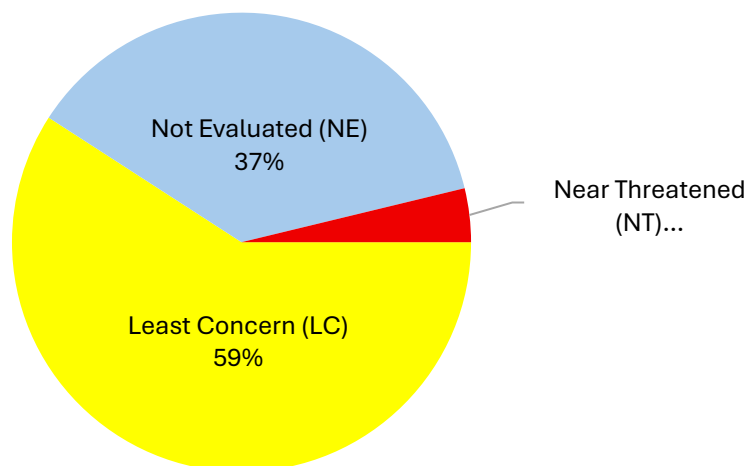


Figure 4.D. Conservation status of bycatch species in the blue swimming crab gillnet fishery in Pamekasan Regency, based on the IUCN Red List

4.4. Socialization and data collection of marine mammal

Marine mammal awareness activities conducted by field support were implemented through the installation of informational banners at several strategic locations, highlighting the protection of marine mammals and reminding fishers of conservation regulations during blue swimming crab weighing activities at landing sites. Socialization activities were also carried out during fisher meetings, both at data collection sites and in other areas with potential blue swimming crab fisheries (Figure 4.E).

Monitoring and data collection on interactions between blue swimming crab fishers and marine mammals were conducted using a combination of weekly structured interviews with selected fishers on a rotational basis and onboard observation. Onboard monitoring was carried out by accompanying fishers during crab fishing operations to directly observe fishing activities and any potential interactions with marine mammals.



Figure 4.E. Socialization and data collection activities on marine mammals conducted with blue swimming crab fishers in Pamekasan Regency

Based on monitoring conducted from January to December 2025 involving interviews with 10–15 blue swimming crab fishers and onboard observations, it can be concluded that all fishers reported no encounters with marine mammals within the blue swimming crab fishing ground. Results from onboard observations further support fishers' statements, as field support staff did not observe any marine mammals during monitoring activities conducted at sea. One fisher, Mr. Misraji, reported a sighting during the second week of July (11 July 2025), when he saw dolphins surfacing and leaping above the water, far from fishing ground. The species could not be identified due to the considerable distance from the fishing vessel. Fishers community in Pamekasan also have local beliefs that accidentally harming a marine mammal would negatively affect future fishing success.

This result indicates that interactions between blue swimming crab fishing operations and marine mammals in Pamekasan are absent. The absence of reported encounters is likely related to the relatively nearshore fishing grounds and shallow water depths where crab fishing is conducted, which may not overlap with the primary habitat or movement routes of marine mammals. Overall, no operational interactions or bycatch of marine mammals were recorded during the monitoring period.

Table 4.C. Records of marine mammal interactions within fishing ground reported by blue swimming crab gillnet fishers in Pamekasan Regency, in 2025

Month	Number of Fishers (ind.)		Additional Information
	Sightings	Bycatch	
January	0	0	No marine mammals were observed
February	0	0	No marine mammals were observed
March	0	0	No marine mammals were observed
April	0	0	No marine mammals were observed
May	0	0	No marine mammals were observed
June	0	0	No marine mammals were observed
July	0	0	No marine mammals were observed
August	0	0	No marine mammals were observed
September	0	0	No marine mammals were observed
October	0	0	No marine mammals were observed
November	0	0	No marine mammals were observed
December	0	0	No marine mammals were observed

5. East Lampung, Lampung (FMA 712)

5.1. Overview of blue swimming crab fisheries in East Lampung

Blue swimming crab data collection activities in East Lampung Regency were conducted in Margasari Village, Labuhan Maringgai Subdistrict. Data collection in Margasari Village took place at the collector facility owned by Mr. Eko and included biological data, landing data, socio-economic data, and bycatch information (Figure 5.A).



Figure 5.A. Blue swimming crab landing sites in East Lampung Regency, Lampung (FMA 712)

The fishing grounds used by fishers from Margasari Village are located within Fisheries Management Area (FMA) 712 at distances of approximately 4–10 miles from the coastline (Figure 1). Fishing locations vary on a daily basis depending on individual fishers' preferences as well as information shared among fishers regarding areas with higher catch yields. Fishing activities are conducted using gillnets with mesh sizes ranging from 3.5 to 4.5 inches. The fishery operates under a one-day fishing system, in which fishers typically depart after dawn and spend approximately 7–8 hours at sea (Figure 5.B)



Figure 5.B. Fishing grounds and gear used to catch blue swimming crab in East Lampung Regency

5.2. Composition and diversity of bycatch species

Figure 5.C shows that the target catch (blue swimming crab) accounted for 93% of the total catch weight, while non-target species contributed 7%. In 2025, the total sampled landings of blue swimming crab was about 2243.8 kg, while the non-target species was approximately 159.1 kg.

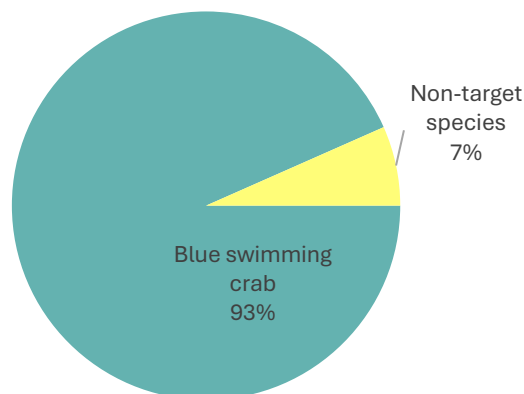


Figure 5.C. Catch composition in blue swimming crab gillnet fishery in East Lampung Regency

Table 5.A presents the diversity of bycatch species in the blue swimming crab fishery in East Lampung in 2025. The bycatch assemblage comprised 24 species belonging to 12 orders and 19 families. Bycatch was dominated by one order, namely Decapoda (89.8%), while other orders account for less than 5% of total bycatch. The most dominant family and species were Scyllaridae (*Thenus orientalis*, *Charybdis feriata*, and *Charybdis natator*). This finding indicates that these species occupy habitats that overlap with those of the blue swimming crab (*Portunus pelagicus*). Table 5.A showed that no species from the Order Cetacea were recorded as bycatch. Most bycatch (94.9%) was retained for sale or consumption, while 5.1% of bycatch were discarded due to its low economic value or low freshness.

Table 5.A. List of bycatch species caught by the blue swimming crab gillnet fishery in East Lampung Regency, in 2025

No	Non-Target Species	Order	Family	Weight (kg)		
				Retained	Discarded	Total
1	<i>Drepane punctata</i>	Acanthuriformes	Drepaneidae	0,71		0,71
2	<i>Eleutheronema tetradactylum</i>	Carangiformes	Polynemidae	0,48		0,48
3	<i>Brevitrygon walga</i>	Myliobatiformes	Dasyatidae	1,53		1,53
4	<i>Taeniura lymma</i>	Myliobatiformes	Dasyatidae	0,16		0,16
5	<i>Neotrygon kuhlii</i>	Myliobatiformes	Dasyatidae	0,2		0,2
6	<i>Hemiscyllium griseum</i>	Orectolobiformes	Hemiscylliidae	4,8		4,8
7	<i>Platycephalus indicus</i>	Perciformes	Platycephalidae	0,69		0,69
8	<i>Epinephelus coioides</i>	Perciformes	Serranidae	0,94		0,94
9	<i>Cynoglossus lingua</i>	Pleuronectiformes	Cynoglossidae	1,1		1,1
10	<i>Psettodes erumei</i>	Pleuronectiformes	Psettodidae	0,54		0,54
11	<i>Libinia</i> sp.	Decapoda	Epialtidae		0,28	0,28
12	<i>Metapenaeus ensis</i>	Decapoda	Penaeidae		0,01	0,01
13	<i>Scylla serrata</i>	Decapoda	Portunidae	1,44		1,44
14	<i>Charybdis natator</i>	Decapoda	Portunidae	20,13	7,33	27,5
15	<i>Charybdis feriata</i>	Decapoda	Portunidae	34,97		34,97
16	<i>Scylla olivacea</i>	Decapoda	Portunidae		0,21	0,21
17	<i>Thenus orientalis</i>	Decapoda	Scyllaridae	78,46		78,46
18	<i>Harpiosquilla harpax</i>	Stomatopoda	Squillidae	0,25	0,14	0,39
19	<i>Babylonia spirata</i>	Neogastropoda	Babyloniidae	0,11		0,11
20	<i>Natica tigrina</i>	Littorinimorpha	Naticidae	0,41		0,41
21	<i>Octopus vulgaris</i>	Octopoda	Octopodidae	0,49		0,49
22	<i>Strombus urceus</i>	Littorinimorpha	Strombidae		0,05	0,05
23	<i>Melo melo</i>	Neogastropoda	Volutidae	3,6		3,6
24	<i>Archaster typicus</i>	Paxillosida	Archasteridae		0,09	0,09
Total (kg)				151,01	8,11	159,16

Table 5.B shows that the occurrence of non-target species recorded during the monitoring period showed clear temporal variation across months. A total of 24 non-target species were identified, comprising elasmobranchs, bony fishes, crustaceans, mollusks, and echinoderms. The bycatch

assemblage was strongly dominated by crustaceans, particularly *Thenus orientalis*, *Charybdis natator*, and *Charybdis feriata*, which contributed the highest abundances and were recorded consistently across multiple months. Fish bycatch occurred at relatively lower frequencies, with species such as *Cynoglossus lingua*, *Eleutheronema tetradactylum*, and *Epinephelus coioides* recorded sporadically. Elasmobranch bycatch was limited and infrequent, represented by *Brevitrygon walga*, *Taeniura lymma*, *Neotrygon kuhlii*, and *Hemiscyllium griseum*, each occurring only in specific months and at low abundances. Mollusks and other benthic invertebrates, including *Babylonia spirata*, *Natica tigrina*, *Octopus vulgaris*, *Strombus urceus*, *Melo melo*, and *Archaster typicus*, were recorded occasionally, indicating incidental capture associated with benthic fishing operations. Overall, the bycatch composition reflects strong habitat overlap between blue swimming crab fishing grounds and demersal–benthic species, with limited occurrence of species of higher conservation concern.

Table 5.B. Monthly occurrence frequency of bycatch species in the blue swimming crab gillnet fishery in Cirebon Regency, in 2025

No	Non target species	Number of Bycatch (ind)											
		S	O	N	D	J	F	M	A	M	JN	JL	AG
1	<i>Drepane punctata</i>							3					
2	<i>Eleutheronema tetradactylum</i>				2	1							
3	<i>Brevitrygon walga</i>				7	2		1					
4	<i>Taeniura lymma</i>							1					
5	<i>Neotrygon kuhlii</i>			1									
6	<i>Hemiscyllium griseum</i>				3								
7	<i>Platycephalus indicus</i>							1					
8	<i>Epinephelus coioides</i>	1						2					
9	<i>Cynoglossus lingua</i>			1	2	1		2				2	
10	<i>Psettodes erumei</i>					1		1				1	
11	<i>Libinia</i> sp.		2					1					
12	<i>Metapenaeus ensis</i>											1	
13	<i>Scylla serrata</i>			1	1		1	2		1			
14	<i>Charybdis natator</i>	22	12	17	47	32	15	42		11		5	14
15	<i>Charybdis feriata</i>	20	33	5	6	20	12	15	7	23	5	4	12
16	<i>Scylla olivacea</i>											3	
17	<i>Thenus orientalis</i>	244	313	58	1			2	28		48	4	
18	<i>Harpiosquilla harpax</i>		8										
19	<i>Babylonia spirata</i>				3								
20	<i>Natica tigrina</i>		1		3								
21	<i>Octopus vulgaris</i>				15								
22	<i>Strombus urceus</i>							1					
23	<i>Melo melo</i>											1	
24	<i>Archaster typicus</i>					6							

5.3. Conservation status of bycatch

The bycatch species recorded in Cirebon were classified into five IUCN Red List categories: Not Evaluated (NE) (20.3%), Data Deficient (DD) (0.1%), Least Concern (LC) (75.5%), Near Threatened (NT) (1.1%), and Vulnerable (3%) (Figure 5.D). Elasmobranch bycatch included species categorized as Vulnerable and Near Threatened, namely *Chiloscyllium griseum*, *Brevitrygon walga*, and *Taeniura lymma*, while *Neotrygon kuhlii* was classified as Data Deficient.

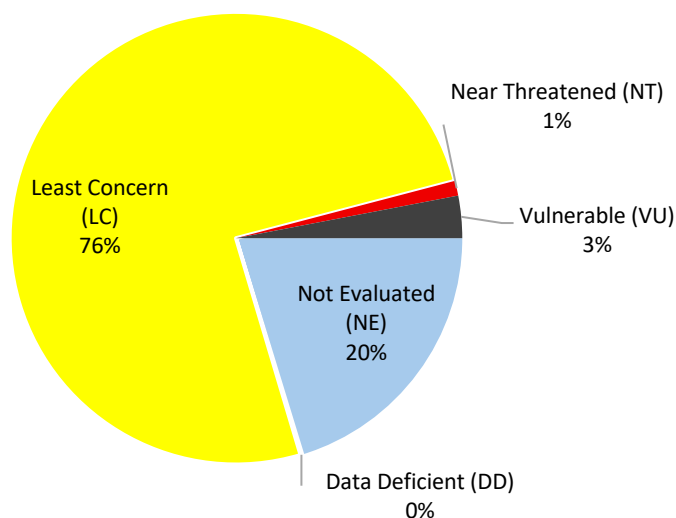


Figure 5.D. Conservation status of bycatch species in the blue swimming crab gillnet fishery in East Lampung Regency, based on the IUCN Red List

Ten species were categorized as Least Concern, including *Drepane punctata*, *Eleutheronema tetradactylum*, *Platycephalus indicus*, *Epinephelus coioides*, *Cynoglossus lingua*, *Psettodes erumei*, *Scylla serrata*, *Charybdis feriata*, *Thenus orientalis*, *Harpisquilla harpax*, and *Octopus vulgaris*. Nine species were categorized as Not Evaluated, including *Libinia* sp., *Metapenaeus ensis*, *Charybdis natator*, *Scylla olivacea*, *Babylonia spirata*, *Natica tigrina*, *Strombus urceus*, *Melo melo*, and *Archaster typicus*.

5.4. Socialization and data collection of marine mammal

Marine mammal outreach activities conducted by field support included the installation of informational banners on marine mammal protection at several strategic locations and direct reminders to fishers during blue swimming crab weighing activities at landing sites (Figure 5). Outreach was also carried out during fisher meetings, both at data collection sites and at other locations with potential blue swimming crab fisheries. Monitoring of interactions between blue swimming crab fishers and marine mammals was conducted through weekly interviews with selected fishers on a rotational basis. In addition, field support conducted onboard observations by accompanying fishers during blue swimming crab fishing operations (Figure 5.E).



Figure 5.E. Socialization and data collection activities on marine mammals conducted with blue swimming crab fishers in East Lampung Regency

Based on monitoring conducted from January to December 2025 involving interviews with 10–15 blue swimming crab fishers and onboard observations, it can be concluded that fishers reported having never encountered marine mammals in the fishing ground (Table 2.C). Some fishers also shared local beliefs that unintentionally harming marine mammals may bring misfortune, potentially affecting fishing catches. Onboard observations conducted by field support personnel did not record any encounters with marine mammals, which is consistent with the information provided by the interviewed fishers. This indicates that interactions between blue swimming crab fishing operations and marine mammals in East Lampung are absent. The absence of reported encounters is likely related to the relatively nearshore fishing grounds and shallow water depths where crab fishing is conducted, which may not overlap with the primary habitat or movement routes of marine mammals. Overall, no operational interactions or bycatch of marine mammals were recorded during the monitoring period.

Table 5.C. Records of marine mammal interactions within fishing grounds as reported by blue swimming crab gillnet fishers in East Lampung Regency, in 2025

Month	Number of Fishers (ind.)		Additional Information
	Sightings	Bycatch	
January	0	0	No marine mammals were observed
February	0	0	No marine mammals were observed
March	0	0	No marine mammals were observed
April	0	0	No marine mammals were observed
May	0	0	No marine mammals were observed
June	0	0	No marine mammals were observed
July	0	0	No marine mammals were observed
August	0	0	No marine mammals were observed
September	0	0	No marine mammals were observed
October	0	0	No marine mammals were observed
November	0	0	No marine mammals were observed
December	0	0	No marine mammals were observed

6. Batubara, North Sumatra (FMA 571)

6.1. Overview of blue swimming crab fisheries in Batubara

Blue swimming crab data collection was conducted at two landing stations in Batubara Regency, North Sumatra. The first site was at Dahari Selebar Village, Talawi Subdistrict, where crab landings occur in the estuarine area of the Dahari Selebar River. The second site was at Perupuk Village, Lima Puluh Pesisir Subdistrict, with crab landings taking place in the estuarine area of the Perupuk River (Figure 6.A). Approximately 13 blue swimming crab fishers sell their catches at Dahari Selebar, operating vessels of less than 1 GT equipped with engines of 24 HP. Meanwhile, five crab fishers sell their catches to Perupuk Village, using vessels of less than 1 GT powered by 6 and 8 HP engines.



Figure 6.A. Blue swimming crab landing sites in Batu Bara Regency, North Sumatra

The fishing grounds of blue swimming crab fishers in Batu Bara Regency are situated approximately 2–4 miles from the coastline and fall within Fisheries Management Area (FMA) 571, which encompasses coastal waters adjacent to several subdistricts. The hydrodynamic conditions of this area are spatially and temporally variable. Under certain conditions the waters are relatively calm and gently sloping, whereas at other times they are characterized by increased wave activity and more turbulent sea states. Blue swimming crab fishers operating in Dahari Selebar Village (Talawi Subdistrict) and Perupuk Village (Lima Puluh Pesisir Subdistrict) employ crab gillnets as their primary

fishing gear. These gillnets have a net height ranging from 0.5 to 1.5 m and a total length of approximately 1,000 m, with a mesh size of 3.5–4 inches. Gillnets are made of white monofilament material. Fishing operations are generally conducted once per day, with a fishing duration of approximately 7–10 hours. The gear is operated at water depths of approximately 5–7 m, with a soak time of 2–4 hours (Figure 6.B).

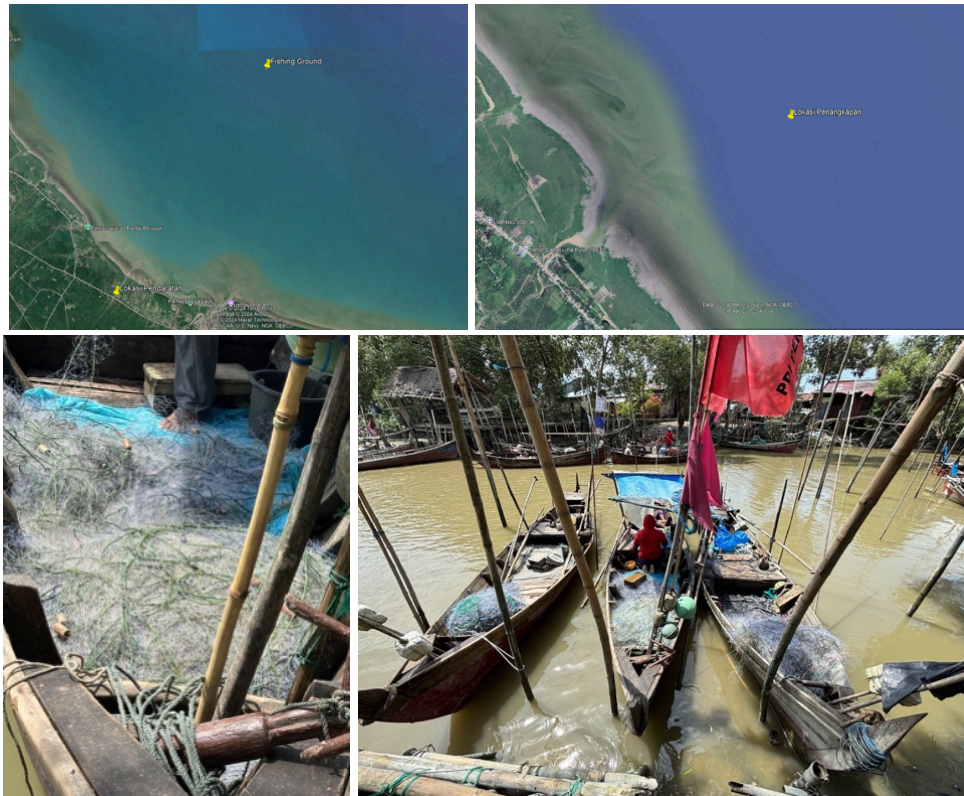


Figure 6.B. Fishing grounds and gear used to catch blue swimming crab in Batu Bara Regency

6.2. Composition and diversity of bycatch species

Figure 6.C shows that the target catch (blue swimming crab) accounted for 93% of the total catch weight, while non-target species contributed 7%. In 2025, the total sampled landings of blue swimming crab was about 2045 kg, while the non-target species (bycatch) was approximately 148 kg.

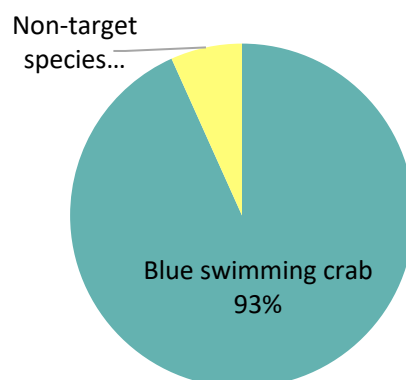


Figure 6.C. Catch composition in blue swimming crab gillnet fishery in Batubara Regency

Tabel 6.A presents the diversity of bycatch species in the blue swimming crab fishery in Gresik in 2025. The bycatch assemblage comprised 19 species belonging to 10 orders and 17 families. Bycatch was dominated by three orders, namely Siluriformes (34.4%), Pleuronectiformes (25.8%), and Perciformes (20.6%), Decapoda (7.7%), and Aulopiformes (7.5%). The most dominant family and species were Ariidae (*Hexanematichtys sundaicus*), Cynoglossidae (*Cynoglossus lingua*), Sciaenidae (*Johnius belangeri*), Portunidae (*Charybdis feriata*), Synodontidae (*Harpadon nehereus*). This finding indicates that these species occupy habitats that overlap with those of the blue swimming crab (*Portunus pelagicus*). No species from the Order Cetacea were recorded as bycatch. All bycatch were retained (100%), either for sale or for consumption by fishers.

Table 6.A. List of bycatch species caught by the blue swimming crab gillnet fishery in Batubara Regency, in 2025

No	Non-Target Species	Order	Family	Weight (kg)		
				Retained	Discarded	Total
1	<i>Upeneus sundaicus</i>	Perciformes	Mullidae	0.41		0.41
2	<i>Upeneus vittatus</i>	Perciformes	Mullidae	3.88		3.88
3	<i>Johnius belangeri</i>	Perciformes	Sciaenidae	20.16		20.16
4	<i>Eleutheronema tetradactylum</i>	Perciformes	Polynemidae	1.73		1.73
5	<i>Ephippus orbis</i>	Perciformes	Ephippidae	0.11		0.11
6	<i>Megalaspis cordyla</i>	Perciformes	Carangidae	6.22		6.22
7	<i>Trachinotus blochii</i>	Perciformes	Carangidae	0.09		0.09
8	<i>Pomadasys maculatus</i>	Perciformes	Haemulidae	0.04		0.04
9	<i>Lutjanus sp.</i>	Perciformes	Lutjanidae	0.08		0.08
10	<i>Drepane punctata</i>	Perciformes	Drepaneidae	0.08		0.08
11	<i>Hexanematichtys sundaicus</i>	Siluriformes	Ariidae	54.76		54.76
12	<i>Cynoglossus lingua</i>	Pleuronectiformes	Cynoglossidae	41.05		41.05
13	<i>Platycephalus indicus</i>	Scorpaeniformes	Platycephalidae	4.39		4.39
14	<i>Chiloscyllium hasseltii</i>	Orectolobiformes	Hemiscylliidae	0.60		0.60
15	<i>Harpadon nehereus</i>	Aulopiformes	Synodontidae	11.99		11.99
16	<i>Dasyatis laosensis</i>	Myliobatiformes	Dasyatidae	0.17		0.17
17	<i>Harpiosquilla harpax</i>	Stomatopoda	Squillidae	1.09		1.09
18	<i>Charybdis feriata</i>	Decapoda	Portunidae	12.33		12.33
19	<i>Sepia recurvirostra</i>	Sepiida	Sepiidae	0.06		0.06
Total (kg)				159.24		0.06

Table 6.B shows that the occurrence of bycatch species varied across months. Several species exhibited the highest frequency of occurrence and were consistently recorded in every month, namely *Johnius belangeri*, *Cynoglossus lingua*, *Harpadon nehereus*, *Charybdis feriata*, dan *Harpiosquilla harpax*. In contrast, several other fish species were recorded only sporadically during the study period.

Table 6.B. Monthly occurrence frequency of bycatch species in the blue swimming crab gillnet fishery in Batubara Regency, in 2025

No	Non Target Species	Number of Bycatch (ind)											
		J	F	M	A	M	JN	JL	AG	S	O	N	D
1	<i>Upeneus sundaicus</i>	1	8										
2	<i>Upeneus vittatus</i>	13	25	32					3			4	
3	<i>Johnius belangeri</i>	13	25	37	51	54	52	33	42	22	17	30	9
4	<i>Eleutheronema tetradactylum</i>					2	2						
5	<i>Ephippus orbis</i>		1										
6	<i>Megalaspis cordyla</i>		7	19	2				2			1	
7	<i>Trachinotus blochii</i>					1							
8	<i>Pomadasyd maculatus</i>			1									
9	<i>Lutjanus synagris</i>	1											
10	<i>Drepane punctata</i>		1										
11	<i>Hexanematichthys sundaicus</i>				2	5	5	5	8	3	5	6	2
12	<i>Cynoglossus lingua</i>	12	14	33	27	40	29	26	21	14	16	24	9
13	<i>Platycephalus indicus</i>			9									
14	<i>Chilosyllium punctatus</i>	1											
15	<i>Harpadon nehereus</i>	9		24	25	24	15	26	17	14	22	20	6
16	<i>Dasyatis laosensis</i>		2										
17	<i>Harpiosquilla harpax</i>	1	1	1		1	3	4	11		9		3
18	<i>Charybdis feriata</i>	1	1	1	18	22	6	4	9	11	11	19	6
19	<i>Sepia recurvirostra</i>					1							

6.3. Conservation status of bycatch

The bycatch species recorded in Batubara were classified into four IUCN Red List categories: Not Evaluated (NE) (74%), Least Concern (LC) (26%), Near Threatened (NT) (0.4%), and Endangered (EN) (0.1%) (Figure 6.D). Two elasmobranch species were categorized as Near Threatened and Endangered, namely *Chilosyllium punctatum* and *Dasyatis laosensis*. The two species were incidentally captured only once, occurring in January and February (Table xx), and were not recorded consistently across months. Species categorized as Least Concern was *Cynoglossus lingua*. The remaining 16 bycatch species were classified as Not Evaluated under the IUCN Red List.

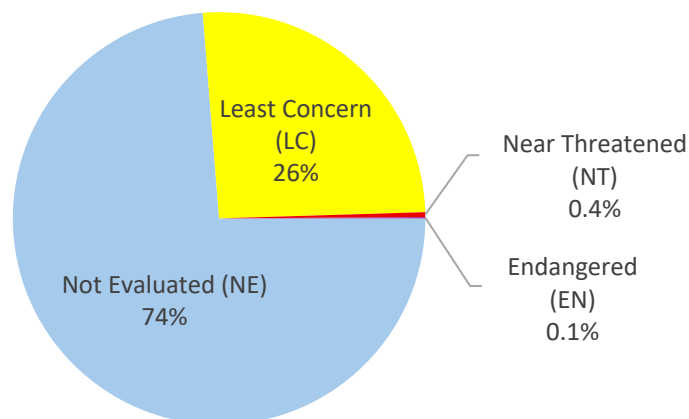


Figure 6.D. Conservation status of bycatch species in the blue swimming crab gillnet fishery in Batubara Regency, based on the IUCN Red List

6.4. Socialization and data collection of marine mammal

Awareness-raising activities on marine mammal interactions, as protected wildlife, were conducted with blue swimming crab fishers as an effort to enhance their understanding and awareness of the importance of marine resource conservation (Figure 6.E). The socialization emphasized that marine mammals, such as dolphins, are integral components of marine ecosystems and play essential ecological roles that are closely linked to the sustainability of fisheries resources. During these activities, fishers were provided with information on marine mammal species commonly encountered in local waters, their legal protection status under prevailing regulations, and the potential types of interactions that may occur during fishing operations.



Figure 6.E. Socialization and data collection activities on marine mammals conducted with blue swimming crab fishers in Batubara, North Sumatra (FMA 571)

Based on the monitoring activities conducted from January to December 2025 involving interviews with 15–20 blue swimming crab fishers and onboard observations, fishers in Batubara reported no marine mammal observations within the blue swimming crab fishing grounds (Table 6.C). Some fishers noted occasional dolphin sightings outside the fishing grounds, specifically around Salah

Nama Island, which is located at a considerable distance from the blue swimming crab fishing areas. No incidents of marine mammals becoming entangled in or captured by fishing gear were reported. Overall, no operational interactions or bycatch of marine mammals were recorded during the monitoring period.

Table 6.C. Records of marine mammal interactions within fishing grounds as reported by blue swimming crab gillnet fishers in Batubara, Regency, in 2025

Month	Number of Fishers (ind.)		Additional Information
	Sightings	Bycatch	
January	0	0	No marine mammals were observed
February	0	0	No marine mammals were observed
March	0	0	No marine mammals were observed
April	0	0	No marine mammals were observed
May	0	0	No marine mammals were observed
June	0	0	No marine mammals were observed
July	0	0	No marine mammals were observed
August	0	0	No marine mammals were observed
September	0	0	No marine mammals were observed
October	0	0	No marine mammals were observed
November	0	0	No marine mammals were observed
December	0	0	No marine mammals were observed



INDONESIAN BLUE SWIMMING CRAB ASSOCIATION

Jl. Dukuh Kupang Timur XI No. 33, Surabaya, East Java, Indonesia

 : rajunganindonesia@gmail.com     | [@rajunganindonesia](https://www.instagram.com/rajunganindonesia) |  www.apri.or.id