



Consultancy Service Contract
Between Ba Ria - Vung Tau Fish Oil and Fishmeal Processing Association
and South Research Sub-Institute for Marine Fisheries
(August 05, 2025)

REPORT
UPDATE OF DOCUMENTS AND DATA AND
DEVELOPMENT OF THE REPORT ON MARINE
FISHERY RESOURCES IN THE COASTAL WATERS
OF BA RIA - VUNG TAU PROVINCE

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1. INTRODUCTION

1.1. Background

Ba Ria - Vung Tau province is located in the Southern key economic region, with a natural area of 1,982.56 km², a coastline of about 130.7 km (excluding Con Dao islands) together with a continental shelf of nearly 100,000 km², creating one of the country's key fishing grounds, associated with an exclusive economic zone of about 297,000 km². This is a great advantage for the development of the marine economy, especially the province's fisheries exploitation sector.

In the province's fisheries structure, the trawl fishery significantly contributes to both output and fishermen's livelihoods, while also imposing considerable pressure on marine resources and the environment. In recent years, marine resource stocks have declined and the species composition has changed, especially for high-value economic groups, posing an urgent requirement for fisheries management in accordance with international market demands for sustainable exploitation.

Globally, seafood importing markets increasingly demand products with transparent origin, legal exploitation, and compliance with sustainability standards. This is both a challenge and a driving force for Vietnamese fisheries, especially the Ba Ria - Vung Tau trawl fishery, to participate in the Fishery Improvement Project (FIP), aiming to enhance fishing practices, minimize ecological impact, conserve resources, and meet international standards. Specifically, the trawl fishery, also known as 'giã cào,' currently uses small-mesh nets and sweeps close to the seabed, causing severe damage to the benthic ecosystem and catching juveniles, non-commercial species, or trash fish (sometimes accounting for up to 50% of the catch), leading to the depletion of fishery resources. The vessel structure is unreasonable, with the number of fishing vessels engaged in trawling accounting for a high proportion of the province's total fishing fleet (at times exceeding 30%), far surpassing the national planning goal (reducing to below 15% of the total fishing fleet by 2020). Furthermore, unsustainable exploitation and the lack of clear traceability are putting Vietnamese fisheries, including the trawl fishery, at risk of losing important export markets (EU, US) due to the IUU yellow card (Illegal, Unreported, and Unregulated fishing).

In this context, the report on the status of species composition, distribution, density, and stock assessment of marine fishery resources in Ba Ria - Vung Tau waters was conducted to provide a scientific basis for fisheries management and planning. The survey results not only reflect the local resource status but also serve as important input data for the Vungtau trawl FIP action plan, contributing to guiding management solutions, rational exploitation, and sustainable fisheries development. Moreover, the Vungtau FIP program was launched to improve the trawl fishery's practices towards responsible and sustainable exploitation, aiming to achieve international standards such as MarineTrust IP (Improver Programme) and move towards MSC (Marine Stewardship Council) certification or other standards.

1.2. Objectives

To update documents and data and develop a report on marine fishery resources in the coastal waters of Ba Ria - Vung Tau province (as per the consultancy service contract, dated August 05, 2025, between the Ba Ria - Vung Tau Fish Oil and Fishmeal Processing Association and the Sub-Institute for Southern Marine Fisheries Research),

to ensure that aquatic raw materials are legally and sustainably exploited, with clear traceability to meet the requirements of international markets, opening up export opportunities for businesses. Specifically:

- To update documents and data on marine fishery resources in the coastal waters of Ba Ria - Vung Tau province from past resource surveys conducted by the Sub-Institute for Southern Marine Fisheries Research.
- To develop a report on the current status of species composition, distribution, density, and stock assessment of marine fishery resources in the coastal waters of Ba Ria - Vung Tau province.
- To conclude and propose solutions for responsible and sustainable fisheries development.

2. OVERVIEW OF BA RIA - VUNG TAU MARINE WATERS

2.1. Natural conditions and marine ecology

Ba Ria - Vung Tau province is located in the Southeast region, characterized by diverse topography, including a system of peninsulas, islands, and coastal plains. Vung Tau peninsula has a low average elevation, ranging from 3–4 meters above sea level, while large islands like Con Dao islands and Long Son create distinctive topographical features. Offshore, the continental shelf spans over 100,000 km² with a gentle slope, favorable for fishery exploitation, maritime development, and oil and gas exploration [1]. The combination of mainland and island geography has formed a rich natural environment, playing a crucial role in the economy and biological resource conservation of the area.

Regarding meteorology and hydrology, Ba Ria - Vung Tau province has a tropical monsoon climate, clearly divided into two seasons: the rainy season from May to October, influenced by the Southwest monsoon, and the dry season from November to April of the following year, dominated by the Northeast monsoon. The average annual temperature remains stable at approximately 27°C, with a narrow fluctuation range (26.8–28.6°C), suitable for the development of marine and island ecosystems. The average rainfall is about 1,500 mm/year, concentrated mainly in the rainy season, while the high number of sunshine hours (2,400 hours/year) creates favorable conditions for photosynthesis in coastal and near-shore vegetation. Furthermore, the sea area is influenced by complex near-shore currents and tidal regimes, contributing to the regulation of temperature, salinity, and nutrient distribution in the ecosystem [2].

In addition to its geographical and climatic characteristics, the marine ecosystem of Ba Ria - Vung Tau is highly diverse and rich in biological value. Typical ecosystems include mangrove forests distributed along river mouths and tidal zones, along with coral reefs and seagrass beds in the Con Dao area. Con Dao National Park is considered an important center of biodiversity, home to various species of corals, seagrasses, and rare aquatic species such as sea turtles, dugongs, and many commercially valuable fish species. The combination of coral reefs, seagrass beds, and muddy/sandy bottoms creates rich habitats that serve as living, spawning, and nursery grounds for numerous marine species, helping to maintain ecological balance and fishery resources in the area [3] [4].

2.2. Current status of fishery exploitation

As of June 2025, Ba Ria - Vung Tau province has a total of 4,913 fishing vessels. Of these, the offshore fishing fleet (vessels with a length of 15 meters or more) accounts for 2,411 vessels ; the near-shore fishing fleet (vessels from 12 to under 15 meters) has 653 vessels ; and the remaining 1,849 vessels are coastal fishing vessels with lengths from 6 to under 12 meters [5].

Statistical data for Ba Ria - Vung Tau province shows that during the 2021-2024 period, the total number of fishing vessels continuously decreased, from 5,770 vessels in 2021 down to 4,403 vessels in 2024. By 2025, the number of vessels increased again, reaching 4,913 vessels. However, this increase primarily comes from the coastal fishing vessel group (Figure 1) [6].

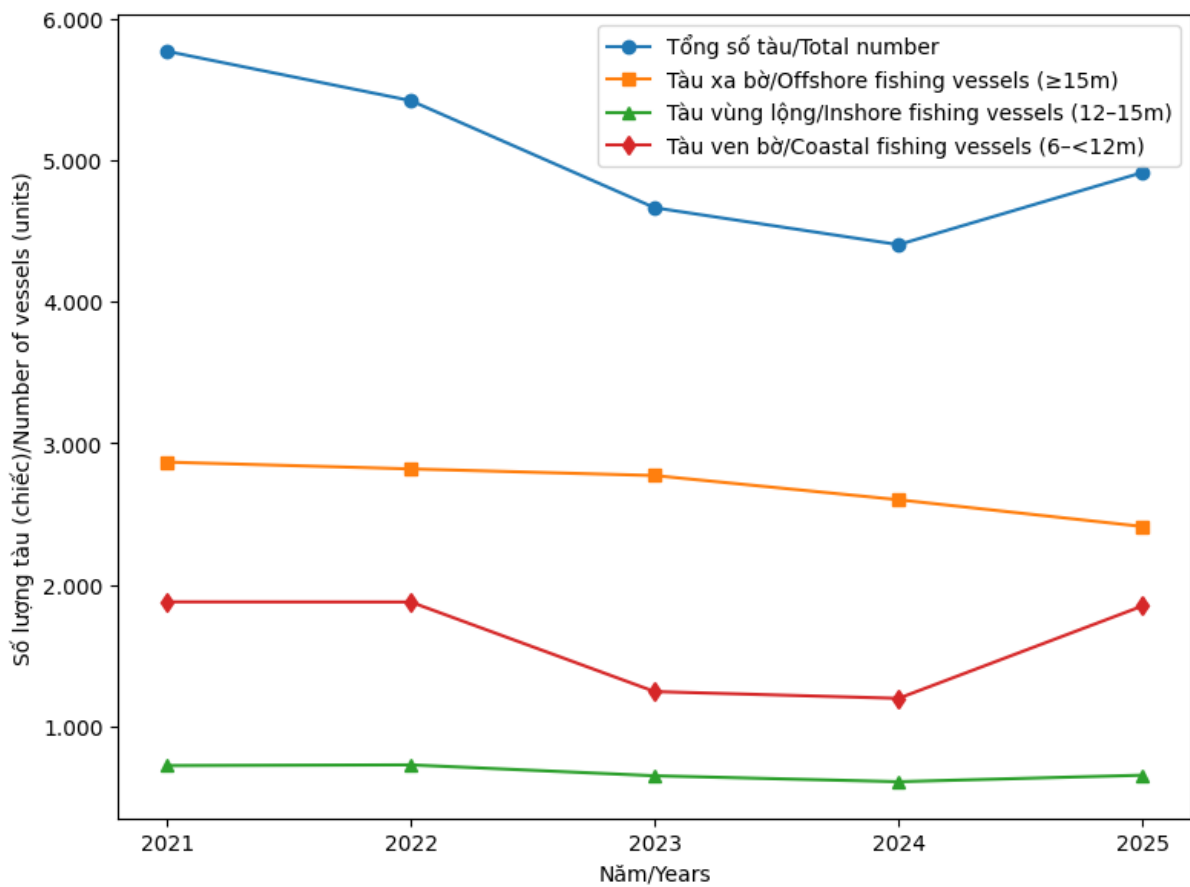


Figure 1. Number of fishing vessels in Ba Ria-Vung Tau province in the period 2021-2025

Source: Ba Ria-Vung Tau provincial statistics office (2025) [6]

In the structure of fishing gears, trawling accounts for the largest proportion, at about 30.6% of the total vessels ; followed by gillnetting at 26%, lining/hooking at 13.6%, while surrounding net, trap, and logistics vessels for fisheries account for approximately 5% each. Purse seining accounts for about 2% [7]. This structure indicates an imbalance, as selective and encouraged gears (lining/hooking, surrounding net, light fishing, traps) have low numbers, while trawling and some restricted gears still hold a large proportion. Notably, the coastal fleet (vessels <12 m) increased again by 2025, continuing to exert pressure on marine resources.

In response to this situation, the province has recently implemented sustainable fishery management, gradually reducing and converting coastal vessels and resource-destructive fishing gears. As of January 2025, the number of environmentally friendly vessels, such as surrounding net, gillnet, and lining/hooking vessels, significantly increased compared to 2024 ; specifically, gillnetting saw the strongest increase, tripling (1,740 vessels), while surrounding net and lining/hooking increased by 16.5% and 12% (275 and 250 vessels), respectively. Conversely, vessels using banned gears continued to decrease, with trawling alone reducing by 121 vessels, down to 1,268 vessels [8].

2.3. Current status of marine fishery resources

Studies across various periods consistently confirm that the marine waters of Ba Ria - Vung Tau have a high level of species diversity, abundant fishery resources, and many commercially valuable aquatic species. The recorded number of species has increased significantly over time, from 142 fish species in 2013 to 388 species during the 2020-2021 period. Of these, 282 species belong to the fish group (72.7%); 69 species belong to the crustacean group (17.8%), and 37 species belong to the mollusk group (9.5%) [9], [10], [11]. The estimated marine stock is approximately 66,573 tonnes, of which small pelagic fish account for the largest share at 93.4% of the total stock, indicating a high exploitation potential for this group [12].

Commercially valuable species in the marine waters include 58 species belonging to 46 genera and 26 families, comprising: 37 fish species, 15 crustacean species, and 6 mollusk species. Single bottom trawling is the gear that catches the most commercial species (23 species), followed by gears such as set net/trap and bottom net (Table 1) [11].

Table 1. List of commercial species in Ba Ria - Vung Tau marine waters

**Note: (1) Fixed net; (2) Single bottom trawl; (3) Trap marking; (4) Bottom gillnet; (5) Pelagic gillnet; và (6) Coastal purse seine fishing.*

Scientific name	English name	Fishing group					
		(1)	(2)	(3)	(4)	(5)	(6)
A. Fish group							
1. <i>Ablennes hians</i> (Valenciennes 1846)	Flat needlefish					+	
2. <i>Alepes kleinii</i> (Bloch 1793)	Razorbelly scad	+			+		+
3. <i>Ariosoma anago</i> (Temminck & Sch. 1846)	Silvery conger		+				
4. <i>Chirocentrus dorab</i> (Forsskål, 1775)	Dorab wolf					+	
5. <i>Cynoglossus lingua</i> (Hamilton, 1822)	Long tongue sole	+					
6. <i>Dendrophysa russelii</i> (Cuvier 1829)	Goatee croaker			+	+		
7. <i>Eleutheronema tetradactylum</i> (Shaw)	Four threadfin			+			
8. <i>Elops hawaiiensis</i> Regan 1909	Ladyfish					+	
9. <i>Encrasicholina heteroloba</i> (Rüpp. 1837)	Shortheadanchovy						+
10. <i>Encrasicholina punctifer</i> Fowler, 1938	Buccaneeranchovy						+
11. <i>Escualosa thoracata</i> (Valen. 1847)	White sardine	+					
12. <i>Harpadon nehereus</i> (Hamilton 1822)	Bombay-duck				+		
13. <i>Hilsa kelee</i> (Cuvier 1829)	Kelee shad					+	
14. <i>Ilisha melastoma</i> (Bloch & Schneider 1801)	Indian ilisha				+	+	

15. <i>Johnius belangerii</i> (Cuvier 1830)	Belanger's croaker	+	+	+	+
16. <i>Johnius borneensis</i> (Bleeker 1851)	Hammer croaker		+	+	+
17. <i>Johnius carouna</i> (Cuvier 1830)	Caroun croaker			+	
18. <i>Johnius plagiostoma</i> (Bleeker 1849)	Large-eye croaker	+	+	+	+
19. <i>Johnius</i> sp.	Croaker			+	
20. <i>Megalaspis cordyla</i> (Linnaeus 1758)	Torpedo scad				+ +
21. <i>Mugil cephalus</i> Linnaeus, 1758	Flathead mullet				+
22. <i>Nibea soldado</i> (Lacepède 1802)	Soldier croaker			+	
23. <i>Osteomugil perusii</i> (Valenc. 1836)	Longfinned mullet				+
24. <i>Pennahia anea</i> (Bloch 1793)	Donkey croaker	+			
25. <i>Pomadasy maculatus</i> (Bloch 1793)	Saddle grunt				+
26. <i>Rastrelliger kanagurta</i> (Cuvier 1816)	Indian mackerel				+ +
27. <i>Sardinella fimbriata</i> (Valencien. 1847)	Fringescale sardine				+ +
28. <i>Sardinella gibbosa</i> (Bleeker 1849)	Goldstripe sardine				+ +
29. <i>Scatophagus argus</i> (Linnaeus 1766)	Spotted scat			+	
30. <i>Scomberomorus commerson</i> (Lacepè 1800)	Spanish mackerel				+
31. <i>Selaroides leptolepis</i> (Cuvier 1833)	Yellowstripe scad				+ +
32. <i>Setipinna taty</i> (Valenciennes 1848)	Scaly hairfin				+
33. <i>Sillago sihama</i> (Forsskål 1775)	Silver sillago		+	+	
34. <i>Stolephorus dubiosus</i> (Wongratan 1983)	Thai anchovy	+			
35. <i>Thryssa dussumieri</i> (Valencienes 1848)	Dussumier thryssa				+
36. <i>Trachinocephalus myops</i> (Forster 1801)	Snakefish		+		
37. <i>Trichiurus lepturus</i> Linnaeus 1758	Largehead hairtail				+ +
B. Crustacean group					
38. <i>Acetes</i> sp.	Baby shrimp	+			
39. <i>Charybdis feriatus</i> (Linnaeus, 1758)	Crucifix crab		+	+	
40. <i>Charybdis japonica</i> (MilneEdwards, 1861)	Japanese crab			+	
41. <i>Kishinouyepenaeopsis cornuta</i> (Kishin)	Greasybock shrimp	+	+		
42. <i>Megokris sedili</i> (Hall, 1961)	Malayan shrimp		+		
43. <i>Metapenaeopsis barbata</i> (DeHaan,1844)	Whiskered shrimp	+	+		
44. <i>Mierspenaeopsis sculptilis</i> (Heller,1862)	Rainbow shrimp			+	
45. <i>Oratosquilla oratoria</i> (De Haan, 1844)	Squillid shrimp	+	+		
46. <i>Oratosquillina gravieri</i> (Manning1978)	Squillid shrimp	+	+	+	
47. <i>Parapenaeopsis hardwickii</i> (Miers,1878)	Spear shrimp	+	+	+	
48. <i>Penaeus merguensis</i> De Man, 1888	White prawn	+			
49. <i>Portunus haanii</i> (Schmitt, 1858)	Red-spot crab		+		
50. <i>Portunus pelagicus</i> (Linnaeus, 1758)	Blue crab		+	+	
51. <i>Portunus sanguinolentus</i> (Herbst, 1783)	Threespot crab		+	+	
52. <i>Trachypenaeus</i> sp.	Atlantic shrimp		+		
C. Molluscs group					
53. <i>Amphioctopus aegina</i> (Gray, 1849)	Sandbird octopus		+		

54. <i>Amphioctopus marginatus</i> (Taki, 1964)	Coconut octopus	+					
55. <i>Sepiella inermis</i> (Van Hasselt, 1835)	Spineless cuttlefish	+	+	+	+		
56. <i>Uroteuthis duvaucelii</i> (D'Orbigny, 1835)	Indian squid	+					
57. <i>Uroteuthis chinensis</i> (Gray, 1849)	Mitre Squid	+					
58. <i>Amusium pleuronectes</i> (Linnaeus, 1758)	Asian moon scallop	+					
Total:		15	23	18	14	12	8

Source: Nguyen Phuoc Trieu & Pham Quoc Huy (2022) [11]

Additionally, many studies also emphasize the presence of species requiring protection in the coastal and near-shore waters of Ba Ria - Vung Tau province. Some species are listed in the Vietnam red book, such as the *Megalops cyprinoides*, the *Anodontostoma chacunda*, and the *Otolithoides biauritus* [9]. Recent research recorded 16 endangered marine species at various levels according to IUCN, CITES, and the Vietnam red book (Table 2), and also proposed adding 71 species in need of protection, many of which are distributed in the bottom trawl fishing grounds [13]. Notably, 57 species of cartilaginous fish (sharks, rays) were recorded in this sea area [14]. This highlights the need to balance exploitation and conservation to ensure the sustainability of resources.

Table 2. List of endangered species found in Ba Ria - Vung Tau marine waters

ID	Scientific name	English name	Levels		
			(1)	(2)	(3)
1	<i>Maculabatis gerrardi</i> (Gray, 1851)	Sharpnose stingray	EN	–	–
2	<i>Brevitrygon imbricata</i> (Bloch & Sch., 1801)	Coromandel whipray	VU	–	–
3	<i>Gymnura poecilura</i> (Shaw, 1804)	Long-tailed butterfly ray	VU	–	–
4	<i>Narcine timlei</i> (Bloch & Schneider, 1801)	Spotted numbfish	VU	–	–
5	<i>Pampus argenteus</i> (Euphrasen, 1788)	Silver pomfret	VU	–	–
6	<i>Pateobatis jenkinsii</i> (Annandale, 1909)	Jenkins whipray	VU	–	–
7	<i>Telatrygon zugei</i> (Müller & Henle, 1841)	Pale-edged stingray	NT	–	–
8	<i>Brevitrygon walga</i> (Müller & Henle, 1841)	Bengal whipray	NT	–	–
9	<i>Scomberomorus commerson</i> (Lac. 1800)	Narrow-barred Spanish mackerel	NT	–	–
10	<i>Harpadon nehereus</i> (Hamilton, 1822)	Bombay-duck	NT	–	–
11	<i>Hemitrygon akajei</i> (Müller & Henle, 1841)	Whip stingray	NT	–	–
12	<i>Anodontostoma chacunda</i> (Ham. 1822)	Chacunda gizzard shad	–	Group II	VU

13	<i>Charibdis feriatus</i> (Linnaeus, 1758)	Crucifix crab	–	–	VU
14	<i>Megalops cyprinoides</i> (Broussonet, 1782)	IndoPacific tarpon	–	Group II	VU
15	<i>Sepia pharaonis</i> (Ehrenberg, 1831)	Pharaoh cuttlefish	–	–	VU
16	<i>Uroteuthis chinensis</i> (Gray, 1849)	Mitre Squid	–	–	VU

Notes: (1) IUCN (2021); (2) Decree No. 26/2019/ND-CP; (3) Vietnam Red Book (2007)

Source: Pham Quoc Huy et al., (2022) [13]

Furthermore, biological analysis of commercially valuable aquatic species in the Ba Ria - Vung Tau marine waters indicates that the spawning season for these species occurs year-round, but with two peak periods: February - April and October - November. Areas such as Ganh Rai bay, the near-shore area of Xuyen Moc district, and the border area with Ho Chi Minh City are identified as key nursery grounds, requiring priority management and conservation [15].

3. MATERIALS AND METHODS

3.1. Scope and source of research materials

3.3.1. Research scope:

The survey scope covers the coastal and near-shore waters of Ba Ria - Vung Tau province, defined by straight lines connecting adjacent points, which have been agreed upon in determining the boundary and zoning management of exploitation with neighboring localities (Ho Chi Minh City and Binh Thuan) and based on Decree 26/2019/ND-CP (amended and supplemented by Decree 37/2024/ND-CP) (Figure 2).

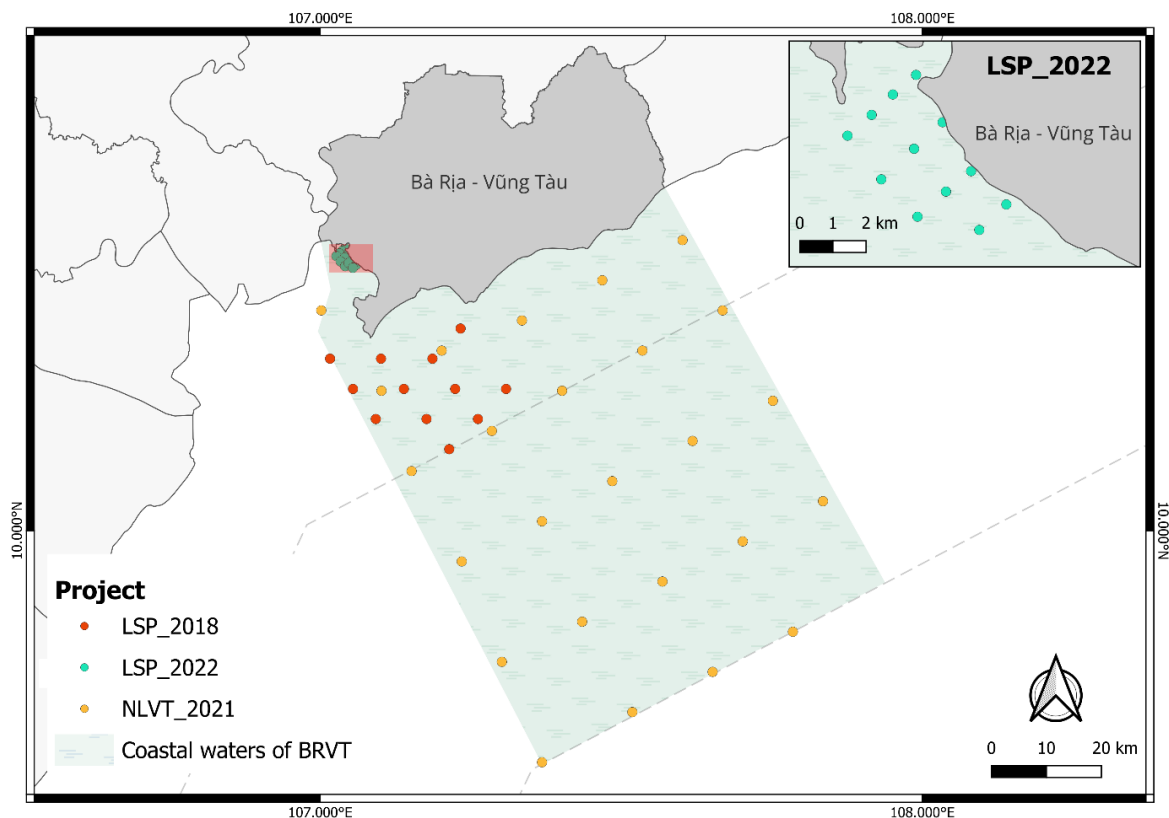


Figure 2. Map of Survey Stations in Ba Ria - Vung Tau Marine Waters (from 2018 to 2022 period)

3.3.2. Source of materials:

The data sources in this report were collected from marine fishery resource surveys in Ba Ria - Vung Tau waters and adjacent areas over a 5-year period (from 2018 to 2022), belonging to research projects and programs conducted by the South Research Sub-Institute for Marine Fisheries.

During this time, the South Research Sub-Institute for Marine Fisheries conducted 03 surveys with a total of 74 survey stations for each type of fishing gear (single bottom trawl for fish and single bottom trawl for shrimp). Specifically: The survey on the status of marine fishery resources in the proposed area for dredged material disposal and adjacent areas had 12 survey stations ; the survey assessing aquatic resources in the coastal and near-shore waters of Ba Ria - Vung Tau province had 25 stations/trip × 2 trips = 50 stations ; and the survey on marine resources in the area implementing the Long Son Petrochemical Complex Port Project and adjacent areas in Long Son commune, Vung Tau City, had 12 survey stations (Table 3).

Table 3. Summary of survey trips in Ba Ria-Vung Tau marine waters (2018-2022)

Trip code	Program	Time	Sea area	No. of station
LSP_2018	Investigation of the current status of marine resources in the area where to be dumped and the surrounding area	November, 2018	Coastal in Baria - Vungtau	12
NLVT_2021	Investigation and assessment of aquatic resources in coastal and offshore waters of Baria - Vungtau province	November, 2020 & June, 2021	coastal and offshore waters of BRVT	25 x 2 = 50
LSP_2022	Survey of marine resources in the area implementing the Long Son petrochemical complex seaport project and neighboring areas in Long Son commune, Vung Tau city.	June, 2022	Coastal area of Long Son commune, Vungtau city	12
Total:	04 survey trips	2018-2022	BR-VT	74

3.2. Research Methods

Investigation of marine resources by single fish trawl and single shrimp trawl (carried out continuously): After completing the investigation of marine resources by single fish trawl, investigation of marine resources by single shrimp trawl will be carried out or vice versa. Detailed technical specifications and net material used are shown in the net drawing (Figure 3).

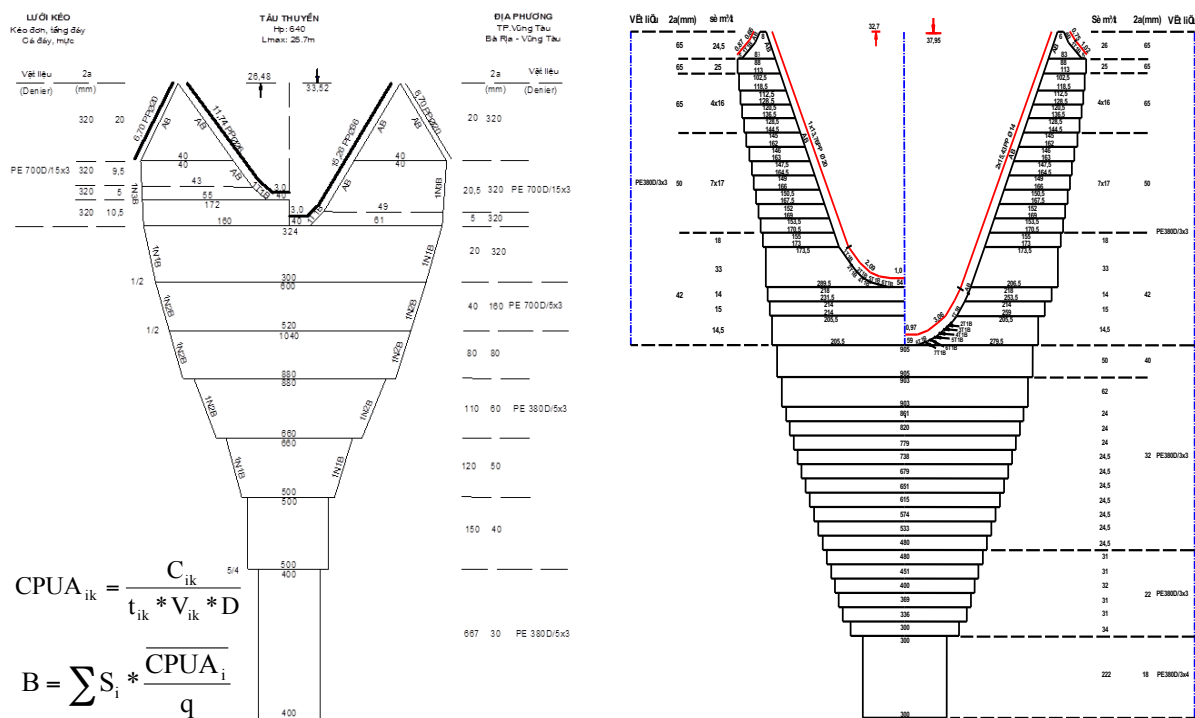


Figure 3. Type of net used in the marine resource survey in Ba Ria - Vung Tau waters (Fish bottom trawl on the left, shrimp trawl on the right)

- The research vessels used in the surveys were boats chartered from local trawling fishermen, ensuring safety and workspace at sea.

- The tools used in the surveys were single bottom trawl nets, including fish single bottom trawl nets (cod-end mesh size 2a=30 mm) and shrimp single bottom trawl nets (cod-end mesh size 2a=18 mm).

- The trawling time at each station was approximately 1 hour. When the catch was brought onto the deck, if the catch weight was less than 5 kg, the entire catch was analyzed; if the catch weight was more than 5 kg, high-value commercial species such as sardines, mackerels, lizardfish, threadfin brems, ponyfish, shrimp, squid, etc., were separated, and low-value species were sampled for analysis. The specimens were classified to the species level, weighed, measured for length (total length or fork length), and counted for the number of individuals. Information regarding fishing gear, time, fishing ground, species composition, weight, number of individuals, and sub-sampling factor (if any) were recorded on pre-designed data sheets.

- Species composition of seafood species was determined to species or species groups by morphological comparison method mainly based on the documents: “FAO species identification guide for fisheries purpose: The living marine resources of the Western Central Pacific” (vol 1-6) [16] and “Fishes of Japan with pictorial keys to the species” (Nakabo, 2002) [17]. Scientific names and ecological groups of seafood species were updated based on the websites: FishBase.org and SeaLifeBase.org. The list of fish species was arranged according to the classification system of Eschmeyer (2024) [18].

- Exploitation productivity and average density were calculated for different depth ranges, coastal areas, and near-shore areas.

- The stock biomass (B) was calculated for each depth range, coastal area, and near-shore area, using the area method described in Sparre & Venema (1995).

$$B = \sum S_i * \frac{\overline{CPUA}_i}{q}$$

Where: B is the stock biomass (tonnes); S_i is the area of the i-th depth range; \overline{D}_i is the average density of marine species per unit area in the i-th depth range (kg/km²); q is the catchability coefficient (q=0.5 was applied for single trawl nets - Pauly, 1980).

- The distribution density of marine species was estimated using the formula:

$$\overline{CPUA}_i = \frac{\sum CPUA_{ik}}{n_i}$$

and:

$$CPUA_{ik} = \frac{C_{ik}}{t_{ik} * V_{ik} * D}$$

Where: D_{ik} is the distribution density (kg/km²) of marine species at the k-th station in the i-th depth range; C_{ik} , t_{ik} , V_{ik} are the catch amount (kg), trawling time (hour), and trawling speed (km/hour) of the net haul at the k-th station in the i-th depth range, respectively; D is the average horizontal opening of the trawl net mouth (m) (King, 1995).

- Data were entered and analyzed using conventional descriptive statistics methods. QGIS software (version 3.40.10) was used to construct maps of research stations and distribution of marine species. All data on marine resources were represented as areas of high or low value through the contour method. Specifically, the Natural Neighbor Interpolation method was used to estimate values at locations without data, based on the relationship between surrounding data points. This is a common technique in GIS applications, based on the Voronoi diagram, a special form of spatial analysis determined by the distance between discrete objects in space.

4. RESULTS FROM DATA SYNTHESIS

4.1. Species diversity and composition structure

The survey results for marine resources in the Ba Ria - Vung Tau waters during the 2018-2024 period recorded 367 species, belonging to 217 genera, 98 families, and 34 orders. In that:

- Bony fish (Teleostei) dominated with 240 species (65.4%), indicating their primary role in the community structure.

- Crustaceans (Malacostraca) were second with 82 species (22.3%).

- Followed by Cephalopods (Cephalopoda) with 21 species (5.7%).

- Gastropods (Gastropoda) with 11 species (3.0%).

- The remaining groups were less diverse, including Cartilaginous fish (Elasmobranchii) with 8 species (2.2%), Bivalves (Bivalvia) with 4 species (1.1%), and Horseshoe crab (Merostomata) with only 1 species (0.3%) (Figure 4).

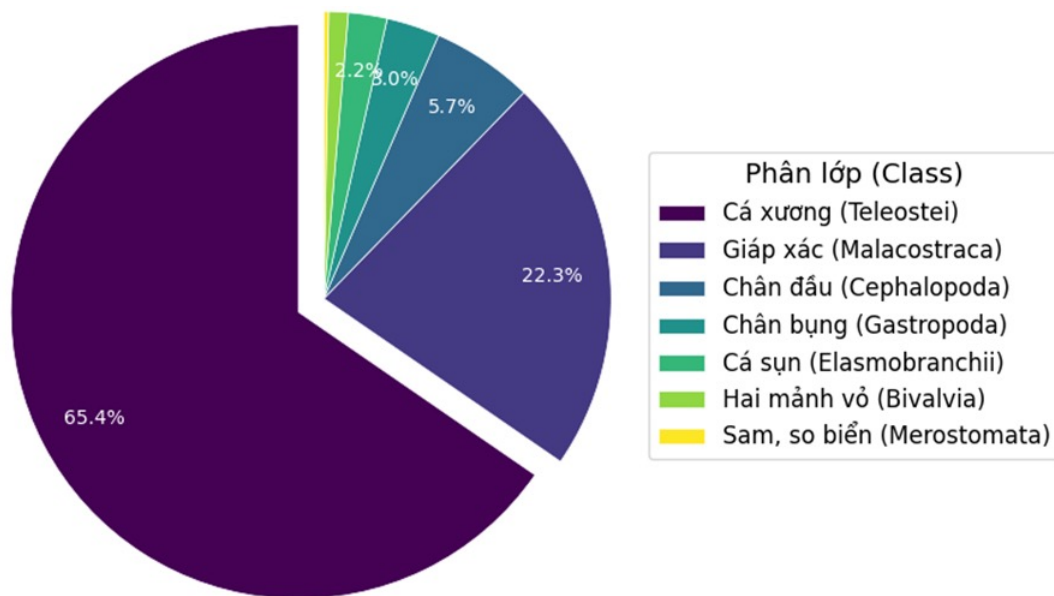


Figure 4. Species composition structure of marine organisms caught in Baria - Vungtau marine waters, 2018-2024 period

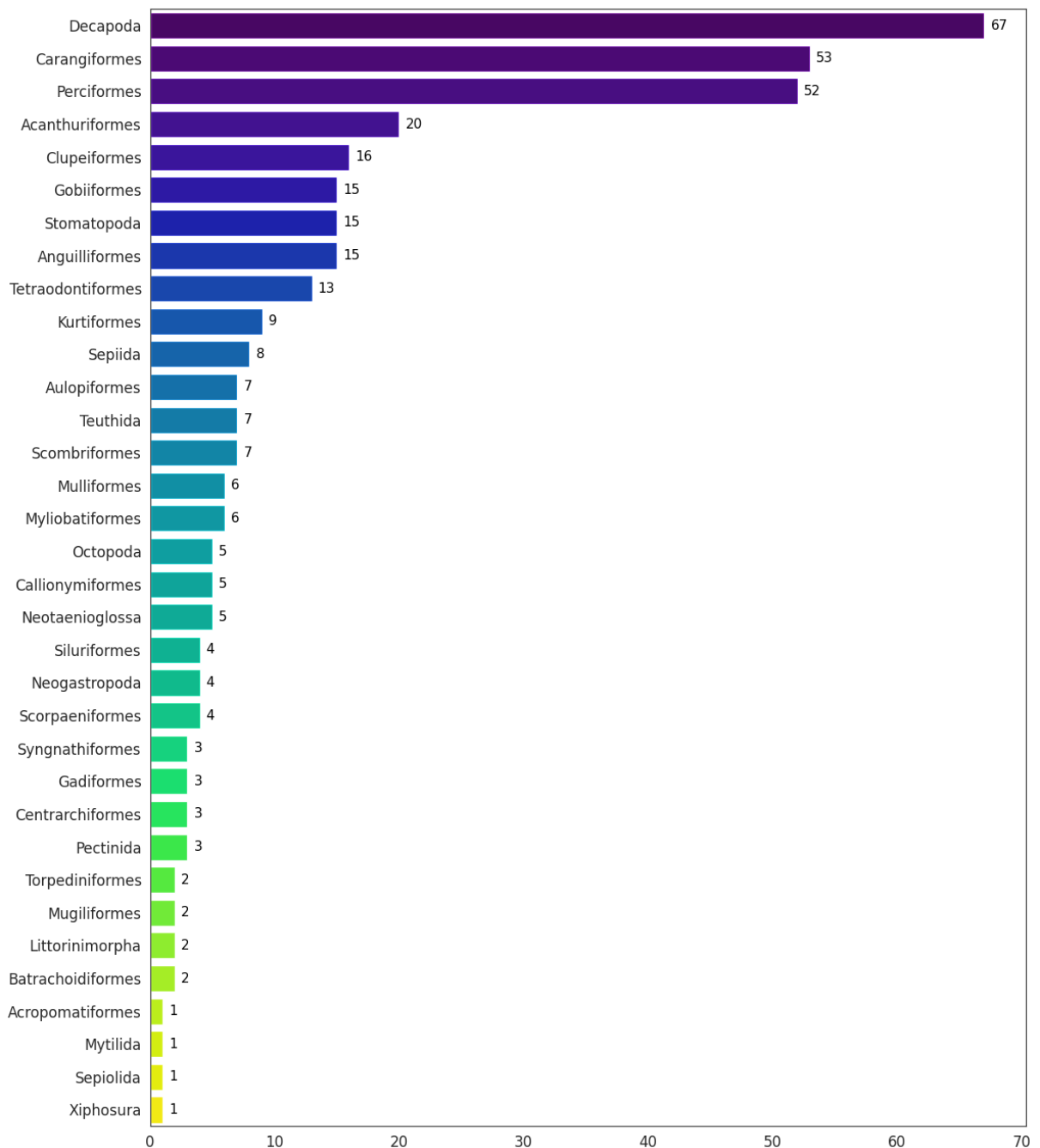
At the order level, the three most species-diverse groups were the order Decapoda (Decapod crustaceans), the order Carangiformes, and the order Perciformes, accounting for 46.9% of the total species.

- Decapoda was the most diverse with 67 species (18.3% of the total species), indicating its significant role in demersal marine resources and fishery exploitation.

- Carangiformes had 53 species (14.4% of the total species).

- Perciformes had 52 species (14.2% of the total species). Both Carangiformes and Perciformes are key economic fish groups and account for a large proportion of species in the fish community in the study area. In addition, several orders had medium diversity, with species counts ranging from 10–20, notably Acanthuriformes (20 species, 5.4%), Clupeiformes (16 species, 4.4%), Gobiiformes (15 species, 4.1%), Stomatopoda (15 species, 4.1%), Anguilliformes (15 species, 4.1%), and Tetraodontiformes (13 species, 3.5%). The remaining orders recorded only 1–9 species, a small percentage of the overall composition

Regarding the class of cartilaginous fish (Chondrichthyes), only the order Myliobatiformes (Eagle Rays, 6 species) and the order Torpediniformes (Electric Rays, 2 species) were recorded. Although the number of species is small, the presence of rays and electric rays still indicates a certain level of diversity in the community (Figure 5).



* Fish orders are classified systematically of Eschmeyer (2024) [16]

Figure 5. Percentage of species by order found in Ba Ria-Vung Tau marine waters

At the family level, the Penaeidae (Penaeid shrimp) family was the most diverse with 26 species (7.1%), followed by the Portunidae (Swimming crab) family with 21 species (5.7%) and the Carangidae (Jack/Trevally) family with 20 species (5.4%). These are groups of species with high economic value and play a key role in coastal marine resources. In addition, some other families are also quite diverse, including the Sciaenidae family with 17 species (4.6%), the Leiognathidae family with 16 species (4.4%), the Gobiidae family with 13 species (3.5%) and the Squillidae family with 13 species (3.5%).

The families with medium diversity, with 5–11 species, represent a wide range of ecological groups, such as Cynoglossidae (11 species), anchovies (Engraulidae, 11 species), puffers (Tetraodontidae, 8 species), squids (Loliginidae, 7 species), barracudas

(Platycephalidae, 7 species), sardines (Synodontidae, 7 species), smelts (Mullidae, 6 species), eels (Congridae, 6 species) and rays (Dasyatidae, 5 species). This group reflects ecological diversity, from pelagic, demersal fish to molluscs and rays. The remaining families have only 1–4 species (Table 4).

Table 4. Percentage of species by family found in Baria - Vungtau marine waters

ID	Family name	English name	No. of species	Rate (%)
1	Penaeidae	Prawn	26	7,1
2	Portunidae	Swimming crab	21	5,7
3	Carangidae	Jack	20	5,4
4	Sciaenidae	Croaker	17	4,6
5	Leiognathidae	Ponyfish	16	4,4
6	Gobiidae	Goby	13	3,5
7	Squillidae	Mantis shrimp	13	3,5
8	Cynoglossidae	Tongue sole	11	3,0
9	Engraulidae	Anchovy	11	3,0
10	Apogonidae	Cardinalfish	9	2,5
11	Tetraodontidae	Puffer fish	8	2,2
12	Loliginidae	Squid	7	1,9
13	Platycephalidae	Flathead	7	1,9
14	Sepiidae	Cuttlefish	7	1,9
15	Synodontidae	Lizardfish	7	1,9
16	Congridae	Eel	6	1,6
17	Mullidae	Goatfish	6	1,6
18	Callionymidae	Dragonet	5	1,4
19	Dasyatidae	Stingray	5	1,4
20	Nemipteridae	Threadfin bream	5	1,4
21	Octopodidae	Octopus	5	1,4
22	Soleidae	Sole fish	5	1,4
Total (22 families)			230	62,7
Other families (76 families):			137	37,3

Compared with previous studies, the number of species found in the Ba Ria - Vung Tau sea area is significantly higher than in many other coastal areas. Specifically, a survey of the coastal area from Tien Giang to Soc Trang recorded only 199 species [17]; in the mangrove ecosystem - coastal Tra Vinh identified 211 fish species [18]; in the Ben Tre sea area identified 276 species [19]; in the Soc Trang - Bac Lieu coastal area recorded 239 fish species [20] and in Phan Thiet city - Binh Thuan province included 179 species [21].

For the fish group, previous studies have shown that the Perciformes order is the dominant order [17], [18], [19], [20]. However, the research results in Ba Ria - Vung Tau show a difference when both the Carangiformes and Perciformes hold a dominant position with a similar number of species. For the crustacean group, this trend is similar to previous studies, when the Decapoda order is still the diverse and dominant group [17], [19], [22]. It can be seen that the level of species diversity and the difference in species composition structure are directly influenced by habitat characteristics, ecosystem diversity, and environmental conditions in each studied sea area.

Table 5. Species composition of marine resources caught by bottom trawl in Baria - Vungtau waters during the 2018-2024

Class/Order name	Family name	Scientific name	Level (IUCN)
Cartilaginous fish class (Elasmobranchii)			
Myliobatiformes	Dasyatidae	1. <i>Brevitrygon imbricata</i> (Bloch & Schneider 1801)	VU
		2. <i>Brevitrygon walga</i> (Müller & Henle 1841)	NT
		3. <i>Dasyatis</i> sp.	NE
		4. <i>Hemitrygon akajei</i> (Müller & Henle, 1841)	NT
		5. <i>Neotrygon kuhlii</i> (Müller & Henle, 1841)	DD
	Gymnuridae	6. <i>Gymnura poecilura</i> (Shaw, 1804)	VU
Torpediniformes	Narkidae	7. <i>Narke dipterygia</i> (Bloch & Schneider, 1801)	VU
		8. <i>Narke</i> sp.	NE
Bony fish class (Teleostei)			
Acanthuriformes	Drepaneidae	9. <i>Drepane punctata</i> (Linnaeus 1758)	LC
	Ephippidae	10. <i>Proteracanthus sarissophorus</i> (Cantor, 1849)	NE
	Leiognathidae	11. <i>Deveximentum hanedai</i> (Mochizuki & Hayashi, 1989)	NE
		12. <i>Equulites elongatus</i> (Günther, 1874)	NE
		13. <i>Equulites lineolatus</i> (Valenciennes, 1835)	NE
		14. <i>Equulites rivulatus</i> (Temminck & Schlegel, 1845)	NE

Class/Order name	Family name	Scientific name	Level (IUCN)
		15. <i>Eubleekeria splendens</i> (Cuvier, 1829)	LC
		16. <i>Gazza minuta</i> (Bloch 1795)	LC
		17. <i>Karalla daura</i> (Cuvier, 1829)	NE
		18. <i>Leiognathus berbis</i> (Valenciennes, 1835)	NE
		19. <i>Leiognathus equula</i> (Forsskål 1775)	LC
		20. <i>Leiognathus</i> sp.	NE
		21. <i>Nucchequula blochii</i> (Valenciennes, 1835)	NE
		22. <i>Nucchequula gerreoides</i> (Bleeker 1851)	NE
		23. <i>Photopectoralis bindus</i> (Valenciennes, 1835)	DD
		24. <i>Secutor insidiator</i> (Bloch, 1787)	NE
		25. <i>Secutor ruconius</i> (Hamilton, 1822)	LC
		26. <i>Secutor</i> sp.	NE
	Scatophagidae	27. <i>Scatophagus argus</i> (Linnaeus 1766)	LC
	Siganidae	28. <i>Siganus canaliculatus</i> (Park 1797)	LC
Acropomatiformes	Champsodontidae	29. <i>Champsodon</i> sp.	NE
Anguilliformes	Congridae	30. <i>Ariosoma anago</i> (Temminck & Schlegel, 1846)	DD
		31. <i>Ariosoma</i> sp.	NE
		32. <i>Conger</i> sp.	NE
		33. <i>Gnathophis nystromi</i> (Jordan & Snyder, 1901)	NE
		34. <i>Uroconger lepturus</i> (Richardson, 1845)	NE
		35. <i>Uroconger</i> sp.	NE

Class/Order name	Family name	Scientific name	Level (IUCN)
	Muraenesocidae	36. <i>Muraenesox cinereus</i> (Forsskål, 1775)	NE
		37. <i>Muraenesox</i> sp.	NE
	Muraenidae	38. <i>Gymnothorax minor</i> (Temminck & Schlegel, 1846)	LC
		39. <i>Gymnothorax reevesii</i> (Richardson 1845)	NE
		40. <i>Gymnothorax reticularis</i> Bloch, 1795	NE
		41. <i>Gymnothorax</i> sp.	NE
	Ophichthidae	42. <i>Neenchelys microtretus</i> (Bamber, 1915)	NE
		43. <i>Ophichthus</i> sp.	NE
		44. <i>Pisodonophis boro</i> (Hamilton 1822)	LC
Aulopiformes	Synodontidae	45. <i>Saurida elongata</i> (Temminck & Schlegel 1846)	LC
		46. <i>Saurida tumbil</i> (Bloch, 1795)	LC
		47. <i>Saurida undosquamis</i> (Richardson, 1848)	LC
		48. <i>Synodus hoshinonis</i> Tanaka, 1917	LC
		49. <i>Synodus variegatus</i> (Lacepède, 1803)	LC
		50. <i>Trachinocephalus myops</i> (Forster, 1801)	LC
		51. <i>Harpadon nehereus</i> (Hamilton, 1822)	NT
Batrachoidiformes	Batrachoididae	52. <i>Allenbatrachus grunniens</i> (Linnaeus, 1758)	LC
		53. <i>Batrachomoeus trispinosus</i> (Günther 1861)	NE
Callionymiformes	Callionymidae	54. <i>Callionymus curvicornis</i> (Valenciennes, 1837)	NE
		55. <i>Callionymus izuensis</i> (Fricke & Zaiser Brownell, 1993)	NE

Class/Order name	Family name	Scientific name	Level (IUCN)
		56. <i>Callionymus sagitta</i> Pallas 1770	NE
		57. <i>Callionymus</i> sp.	NE
		58. <i>Dactylopus dactylopus</i> (Valenciennes, 1837)	NE
Carangiformes	Bothidae	59. <i>Crossorhombus kanekonis</i> (Tanaka, 1918)	NE
		60. <i>Crossorhombus kobensis</i> (Jordan & Starks, 1906)	LC
		61. <i>Crossorhombus</i> sp.	NE
		62. <i>Engyprosopon grandisquama</i> (Temminck & Schlegel, 1846)	LC
	Carangidae	63. <i>Alectis ciliaris</i> (Bloch, 1787)	LC
		64. <i>Alectis indica</i> (Rüppell, 1830)	LC
		65. <i>Alepes djedaba</i> (Forsskål, 1775)	LC
		66. <i>Alepes kleinii</i> (Bloch 1793)	LC
		67. <i>Alepes melanoptera</i> (Swainson, 1839)	LC
		68. <i>Alepes vari</i> (Cuvier, 1833)	LC
		69. <i>Atropus atropos</i> (Bloch & Schneider, 1801)	LC
		70. <i>Atule mate</i> (Cuvier, 1833)	LC
		71. <i>Carangoides malabaricus</i> (Bloch & Schneider, 1801)	LC
		72. <i>Carangoides praeustus</i> (Anonymous [Bennett] 1830)	LC
		73. <i>Carangoides</i> sp.	NE
74. <i>Caranx sexfasciatus</i> Quoy & Gaimard, 1825	LC		
75. <i>Decapterus maruadsi</i> (Temminck & Schlegel, 1843)	LC		

Class/Order name	Family name	Scientific name	Level (IUCN)
		76. <i>Megalaspis cordyla</i> (Linnaeus, 1758)	LC
		77. <i>Parastromateus niger</i> (Bloch, 1795)	LC
		78. <i>Scomberoides tol</i> (Cuvier 1832)	LC
		79. <i>Selar boops</i> (Cuvier, 1833)	LC
		80. <i>Selaroides leptolepis</i> (Cuvier, 1833)	LC
		81. <i>Uraspis helvola</i> (Forster, 1801)	LC
		82. <i>Uraspis uraspis</i> (Günther, 1860)	NE
	Cynoglossidae	83. <i>Cynoglossus arel</i> (Bloch & Schneider 1801)	DD
		84. <i>Cynoglossus bilineatus</i> (Lacepède, 1802)	LC
		85. <i>Cynoglossus cynoglossus</i> (Hamilton, 1822)	LC
		86. <i>Cynoglossus interruptus</i> Günther, 1880	NE
		87. <i>Cynoglossus kopsii</i> (Bleeker, 1851)	DD
		88. <i>Cynoglossus lingua</i> (Hamilton, 1822)	LC
		89. <i>Cynoglossus nanhaiensis</i> (Wang, Munroe & Kong, 2016)	DD
		90. <i>Cynoglossus puncticeps</i> (Richardson 1846)	LC
		91. <i>Cynoglossus</i> sp.	NE
		92. <i>Cynoglossus trulla</i> (Cantor, 1849)	NE
		93. <i>Paraplagusia bilineata</i> (Bloch, 1787)	LC
	Lactariidae	94. <i>Lactarius lactarius</i> (Bloch & Schneider, 1801)	NE

Class/Order name	Family name	Scientific name	Level (IUCN)
	Menidae	95. <i>Mene maculata</i> (Bloch & Schneider, 1801)	NE
	Paralichthyidae	96. <i>Pseudorhombus arsius</i> (Hamilton 1822)	NE
		97. <i>Pseudorhombus oligodon</i> (Bleeker, 1854)	LC
		98. <i>Pseudorhombus</i> sp.	NE
	Polynemidae	99. <i>Eleutheronema tetradactylum</i> (Shaw 1804)	NE
		100. <i>Polydactylus sextarius</i> (Bloch & Schneider, 1801)	NE
		101. <i>Polynemus melanochir</i> (Valenciennes, 1831)	LC
	Rachycentridae	102. <i>Rachycentron canadum</i> (Linnaeus, 1766)	LC
	Soleidae	103. <i>Aseraggodes lateralis</i> Randall, 2005	DD
		104. <i>Brachirus orientalis</i> (Bloch & Schneider, 1801)	LC
		105. <i>Pardachirus pavoninus</i> (Lacepède, 1802)	LC
		106. <i>Synaptura commersonnii</i> (Lacepède 1802)	LC
		107. <i>Zebrias zebra</i> (Bloch, 1787)	NE
	Sphyraenidae	108. <i>Sphyraena forsteri</i> Cuvier, 1829	NE
		109. <i>Sphyraena obtusata</i> (Cuvier, 1829)	LC
		110. <i>Sphyraena putnamae</i> Jordan & Seale, 1905	NE
		111. <i>Sphyraena</i> sp.	NE
Centrarchiformes	Terapontidae	112. <i>Pelates quadrilineatus</i> (Bloch, 1790)	NE
		113. <i>Terapon jarbua</i> (Forsskål, 1775)	LC
		114. <i>Terapon theraps</i> Cuvier, 1829	LC

Class/Order name	Family name	Scientific name	Level (IUCN)
Clupeiformes	Clupeidae	115. <i>Escualosa thoracata</i> (Valenciennes, 1847)	LC
		116. <i>Hilsa kelee</i> (Cuvier 1829)	LC
		117. <i>Sardinella fimbriata</i> (Valenciennes 1847)	LC
		118. <i>Sardinella gibbosa</i> (Bleeker 1849)	LC
	Engraulidae	119. <i>Coilia dussumieri</i> (Valenciennes, 1848)	LC
		120. <i>Coilia rebentischii</i> (Bleeker, 1858)	DD
		121. <i>Encrasicholina heteroloba</i> (Rüppell, 1837)	LC
		122. <i>Encrasicholina punctifer</i> Fowler, 1938	LC
		123. <i>Setipinna taty</i> (Valenciennes 1848)	LC
		124. <i>Stolephorus commersonnii</i> (Lacepède, 1803)	LC
		125. <i>Stolephorus dubiosus</i> (Wongratana, 1983)	LC
		126. <i>Stolephorus indicus</i> (van Hasselt 1823)	LC
		127. <i>Thryssa dussumieri</i> (Valenciennes 1848)	LC
		128. <i>Thryssa mystax</i> (Bloch & Schneider, 1801)	LC
129. <i>Thryssa</i> sp.	NE		
Gadiformes	Pristigasteridae	130. <i>Ilisha melastoma</i> (Bloch & Schneider 1801)	LC
	Bregmacerotidae	131. <i>Bregmaceros japonicus</i> Tanaka, 1908	NE
		132. <i>Bregmaceros mclellandi</i> Thompson, 1840	NE
		133. <i>Bregmaceros</i> sp.	NE

Class/Order name	Family name	Scientific name	Level (IUCN)
Gobiiformes	Butidae	134. <i>Butis koilomatodon</i> (Bleeker, 1849)	LC
	Gobiidae	135. <i>Acentrogobius caninus</i> (Valenciennes 1837)	LC
		136. <i>Acentrogobius</i> sp.	NE
		137. <i>Aulopareia janetae</i> (Smith, 1945)	NE
		138. <i>Brachygobius sabanus</i> (Inger, 1958)	LC
		139. <i>Cryptocentrus</i> sp.	NE
		140. <i>Myersina filifer</i> (Valenciennes, 1837)	LC
		141. <i>Oxyurichthys auchenolepis</i> (Bleeker, 1876)	NE
		142. <i>Oxyurichthys</i> sp.	NE
		143. <i>Parachaeturichthys polynema</i> (Bleeker, 1853)	LC
		144. <i>Taenioides gracilis</i> (Valenciennes, 1837)	LC
		145. <i>Taenioides nigrimarginatus</i> Hora, 1924	NE
		146. <i>Tomiyamichthys russus</i> (Cantor, 1849)	NE
		147. <i>Trypauchen vagina</i> (Bloch & Schneider 1801)	LC
Kurtiformes	Trichonotidae	148. <i>Trichonotus setiger</i> Bloch & Schneider, 1801	LC
	Apogonidae	149. <i>Apogon</i> sp.	NE
150. <i>Apogonichthyoides niger</i> (Döderlein, 1883)		NE	
151. <i>Jaydia poeciloptera</i> (Cuvier, 1828)		LC	
152. <i>Jaydia striata</i> (Smith & Radcliffe, 1912)		NE	
153. <i>Jaydia carinatus</i> (Cuvier, 1828)		NE	

Class/Order name	Family name	Scientific name	Level (IUCN)
		154. <i>Jaydia ellioti</i> (Day, 1875)	NE
		155. <i>Ostorhinchus fasciatus</i> (White, 1790)	NE
		156. <i>Ostorhinchus kiensis</i> (Jordan & Snyder, 1901)	NE
		157. <i>Ostorhinchus notatus</i> (Houttuyn, 1782)	NE
Mugiliformes	Mugilidae	158. <i>Osteomugil perusii</i> (Valenciennes 1836)	LC
		159. <i>Planiliza subviridis</i> (Valenciennes, 1836)	LC
Mulliformes	Mullidae	160. <i>Mulloidichthys vanicolensis</i> (Valenciennes, 1831)	LC
		161. <i>Parupeneus heptacanthus</i> (Lacepède, 1802)	LC
		162. <i>Upeneus japonicus</i> (Houttuyn, 1782)	NE
		163. <i>Upeneus subvittatus</i> (Temminck & Schlegel, 1843)	NE
		164. <i>Upeneus tragula</i> (Richardson, 1846)	LC
		165. <i>Upeneus vittatus</i> (Forsskål, 1775)	LC
Perciformes	Ambassidae	166. <i>Ambassis</i> sp.	NE
	Apistidae	167. <i>Apistus carinatus</i> (Bloch & Schneider, 1801)	LC
	Aploactinidae	168. <i>Erisphex pottii</i> (Steindachner, 1896)	NE
	Gerreidae	169. <i>Gerres erythrourus</i> (Bloch 1791)	LC
		170. <i>Gerres limbatus</i> (Cuvier, 1830)	LC
	Haemulidae	171. <i>Diagramma pictum</i> (Thunberg, 1792)	NT

Class/Order name	Family name	Scientific name	Level (IUCN)
		172. <i>Plectorhinchus cinctus</i> (Temminck & Schlegel, 1843)	NE
		173. <i>Pomadasys maculatus</i> (Bloch, 1793)	LC
Labridae		174. <i>Iniistius trivittatus</i> (Randall & Cornish, 2000)	DD
Lutjaninae		175. <i>Lutjanus lutjanus</i> Bloch, 1790	LC
		176. <i>Lutjanus russellii</i> (Bleeker, 1849)	LC
		177. <i>Lutjanus vitta</i> (Quoy & Gaimard, 1824)	LC
Nemipteridae		178. <i>Nemipterus furcosus</i> (Valenciennes, 1830)	LC
		179. <i>Nemipterus japonicus</i> (Bloch, 1791)	LC
		180. <i>Nemipterus nemurus</i> (Bleeker, 1857)	LC
		181. <i>Scolopsis affinis</i> Peters, 1877	LC
		182. <i>Scolopsis taenioptera</i> (Cuvier, 1830)	LC
Pinguipedidae		183. <i>Parapercis filamentosa</i> (Steindachner 1878)	NE
Platycephalidae		184. <i>Cociella crocodilus</i> (Cuvier 1829)	LC
		185. <i>Grammoplites knappi</i> (Imamura & Amaoka, 1994)	NE
		186. <i>Inegocia japonica</i> (Cuvier, 1829)	LC
		187. <i>Platycephalus indicus</i> (Linnaeus 1758)	DD
		188. <i>Rogadius asper</i> (Cuvier, 1829)	LC
		189. <i>Rogadius patriciae</i> Knapp, 1987	LC
		190. <i>Rogadius</i> sp.	NE
Pomacentridae		191. <i>Pristotis</i> sp.	NE

Class/Order name	Family name	Scientific name	Level (IUCN)
	Priacanthidae	192. <i>Priacanthus macracanthus</i> Cuvier, 1829	LC
		193. <i>Priacanthus tayenus</i> Richardson, 1846	LC
	Sciaenidae	194. <i>Chrysochir aureus</i> (Richardson, 1846)	LC
		195. <i>Dendrophysa russelii</i> (Cuvier 1829)	LC
		196. <i>Johnius belangerii</i> (Cuvier 1830)	LC
		197. <i>Johnius borneensis</i> (Bleeker 1851)	LC
		198. <i>Johnius carouna</i> (Cuvier 1830)	LC
		199. <i>Johnius novaehollandiae</i> (Steindachner 1866)	NE
		200. <i>Johnius plagiostoma</i> (Bleeker, 1849)	LC
		201. <i>Johnius</i> sp.	NE
		202. <i>Johnius trachycephalus</i> (Bleeker, 1851)	LC
		203. <i>Nibea soldado</i> (Lacepède 1802)	LC
		204. <i>Otolithes ruber</i> (Bloch & Schneider, 1801)	LC
		205. <i>Panna microdon</i> (Bleeker, 1849)	LC
		206. <i>Pennahia anea</i> (Bloch 1793)	LC
		207. <i>Pennahia argentata</i> (Houttuyn, 1782)	LC
		208. <i>Pennahia macrocephalus</i> (Tang, 1937)	NE
		209. <i>Pennahia pawak</i> (Lin, 1940)	LC
		210. <i>Pennahia</i> sp.	NE
	Scorpaenidae	211. <i>Scorpaenopsis diabolus</i> (Cuvier, 1829)	NE

Class/Order name	Family name	Scientific name	Level (IUCN)
	Serranidae	212. <i>Epinephelus areolatus</i> (Forsskål, 1775)	LC
		213. <i>Epinephelus coioides</i> (Hamilton, 1822)	LC
		214. <i>Epinephelus</i> sp.	NE
	Sillaginidae	215. <i>Sillago ingenuua</i> (McKay, 1985)	NE
		216. <i>Sillago sihama</i> (Forsskål 1775)	LC
		217. <i>Sillago</i> sp.	NE
Scombriformes	Centrolophidae	218. <i>Psenopsis anomala</i> (Temminck & Schlegel, 1844)	NE
	Scombridae	219. <i>Rastrelliger kanagurta</i> (Cuvier, 1816)	DD
		220. <i>Scomberomorus commerson</i> (Lacepède 1800)	NT
		221. <i>Scomberomorus guttatus</i> (Bloch & Schneider, 1801)	DD
	Stromateidae	222. <i>Pampus argenteus</i> (Euphrasen, 1788)	VU
	Trichiuridae	223. <i>Trichiurus cristatus</i> Klunzinger, 1884	NE
224. <i>Trichiurus lepturus</i> Linnaeus 1758		LC	
Scorpaeniformes	Synanceiidae	225. <i>Leptosynanceia asteroblepa</i> (Richardson, 1844)	NE
		226. <i>Minous inermis</i> (Alcock, 1889)	NE
		227. <i>Minous monodactylus</i> (Bloch & Schneider, 1801)	NE
		228. <i>Minous</i> sp.	NE
Siluriformes	Ariidae	229. <i>Arius maculatus</i> (Thunberg, 1792)	NE
		230. <i>Osteogeneiosus militaris</i> (Linnaeus, 1758)	LC

Class/Order name	Family name	Scientific name	Level (IUCN)
	Plotosidae	231. <i>Plotosus canius</i> Hamilton 1822	NE
		232. <i>Plotosus lineatus</i> (Thunberg, 1787)	LC
Syngnathiformes	Centriscidae	233. <i>Centriscus cristatus</i> (De Vis, 1885)	DD
	Syngnathidae	234. <i>Hippocampus</i> sp.	NE
		235. <i>Hippocampus trimaculatus</i> Leach, 1814	VU
Tetraodontiformes	Diodontidae	236. <i>Chilomycterus reticulatus</i> (Linnaeus, 1758)	LC
		237. <i>Diodon hystrix</i> Linnaeus, 1758	LC
	Monacanthidae	238. <i>Aluterus monoceros</i> (Linnaeus, 1758)	LC
		239. <i>Anacanthus barbatus</i> Gray, 1830	LC
		240. <i>Paramonacanthus japonicus</i> (Tilesius, 1809)	LC
	Tetraodontidae	241. <i>Arothron immaculatus</i> (Bloch & Schneider, 1801)	LC
		242. <i>Dichotomyctere nigroviridis</i> (Marion de Procé 1822)	NE
		243. <i>Lagocephalus inermis</i> (Temminck & Schlegel, 1850)	LC
		244. <i>Lagocephalus lunaris</i> (Bloch & Schneider 1801)	LC
		245. <i>Lagocephalus spadiceus</i> (Richardson, 1845)	NE
246. <i>Lagocephalus wheeleri</i> Abe, Tabeta & Kitahama, 1984		NE	
247. <i>Takifugu niphobles</i> (Jordan & Snyder, 1901)		LC	
248. <i>Takifugu oblongus</i> (Bloch, 1786)		LC	
Gastropod class (Gastropoda)			

Class/Order name	Family name	Scientific name	Level (IUCN)
Littorinimorpha	Naticidae	249. <i>Natica vitellus</i> (Linnaeus, 1758)	NE
		250. <i>Polinices didyma</i> (Röding, 1798)	NE
Neogastropoda	Buccinidae	251. <i>Babylonia areolata</i> (Link, 1807)	NE
	Muricidae	252. <i>Indothais lacera</i> (Born, 1778)	NE
		253. <i>Murex trapa</i> Röding, 1798	NE
	Volutidae	254. <i>Cymbiola nobilis</i> ([Lightfoot], 1786)	NE
Neotaenioglossa	Cassidae	255. <i>Phalium glaucum</i> (Linnaeus, 1758)	NE
		256. <i>Phalium</i> sp.	NE
	Ficidae	257. <i>Ficus subintermedia</i> (Orbigny, 1852)	NE
	Tonnidae	258. <i>Tonna dolium</i> (Linnaeus, 1758)	NE
		259. <i>Tonna</i> sp.	NE
Cephalopoda class (Cephalopoda)			
Octopoda	Octopodidae	260. <i>Amphioctopus aegina</i> (Gray, 1849)	LC
		261. <i>Amphioctopus fangsiao</i> (D'Orbigny, 1839-1841)	NE
		262. <i>Amphioctopus ovulum</i> (Sasaki, 1917)	LC
		263. <i>Amphioctopus marginatus</i> (Taki, 1964)	LC
		264. <i>Amphioctopus</i> sp.	NE
Sepiida	Sepiadariidae	265. <i>Sepiadarium kochi</i> Steenstrup, 1881	LC
	Sepiidae	266. <i>Sepia aculeata</i> Van Hasselt, 1835	DD
		267. <i>Sepia brevimana</i> Steenstrup, 1875	DD

Class/Order name	Family name	Scientific name	Level (IUCN)
		268. <i>Sepia esculenta</i> Hoyle, 1885	DD
		269. <i>Sepia lycidas</i> Gray, 1849	DD
		270. <i>Sepia pharaonis</i> Ehrenberg, 1831	DD
		271. <i>Sepia recurvirostra</i> Steenstrup, 1875	DD
		272. <i>Sepiella inermis</i> (Van Hasselt, 1835)	DD
Sepiolida	Sepiolidae	273. <i>Euprymna morsei</i> (Verrill, 1881)	DD
Teuthida	Loliginidae	274. <i>Aestuariolus noctiluca</i> (Lu, Roper & Tait, 1985)	DD
		275. <i>Loligo</i> sp.	NE
		276. <i>Loliolus beka</i> (Sasaki, 1929)	DD
		277. <i>Sepioteuthis lessoniana</i> Férussac, 1831	DD
		278. <i>Uroteuthis chinensis</i> (Gray, 1849)	DD
		279. <i>Uroteuthis duvaucelii</i> (D'Orbigny, 1835)	DD
		280. <i>Uroteuthis edulis</i> (Hoyle, 1885)	DD
Crustacean class (Malacostraca)			
Decapoda	Alpheidae	281. <i>Alpheus</i> sp.	NE
	Calappidae	282. <i>Calappa calappa</i> (Linnaeus, 1758)	NE
		283. <i>Calappa philargius</i> (Linnaeus, 1758)	NE
		284. <i>Cycloes granulosa</i> De Haan, 1837	NE
		285. <i>Matuta planipes</i> Fabricius, 1798	NE
	Dorippidae	286. <i>Dorippe</i> sp.	NE
	Epialtidae	287. <i>Doclea canalifera</i> Stimpson, 1857	NE

Class/Order name	Family name	Scientific name	Level (IUCN)
		288. <i>Doclea</i> sp.	NE
	Euryplacidae	289. <i>Eucrate alcocki</i> Serène & Lohavanijaya, 1973	NE
	Galenidae	290. <i>Galene bispinosa</i> (Herbst, 1783)	NE
		291. <i>Halimede ochtodes</i> (Herbst, 1783)	NE
	Majidae	292. <i>Hyastenus</i> sp.	NE
	Palaemonidae	293. <i>Palaemon</i> sp.	NE
	Pandalidae	294. <i>Heterocarpus sibogae</i> (De Man, 1917)	NE
	Parthenopidae	295. <i>Parthenope longimanus</i> (Linnaeus, 1758)	NE
	Penaeidae	296. <i>Alcockpenaeopsis hungerfordii</i> (Alcock, 1905)	NE
		297. <i>Kishinouyepenaeopsis cornuta</i> (Kishinouye, 1900)	NE
		298. <i>Marsupenaeus japonicus</i> (Bate, 1888)	NE
		299. <i>Marsupenaeus japonicus</i> (Bate, 1888)	NE
		300. <i>Megokris sedili</i> (Hall, 1961)	NE
		301. <i>Metapenaeopsis barbata</i> (De Haan, 1844)	NE
		302. <i>Metapenaeopsis lamellata</i> (De Haan, 1844)	NE
		303. <i>Metapenaeopsis mogiensis</i> Rathbun, 1902	NE
		304. <i>Metapenaeopsis</i> sp.	NE
		305. <i>Metapenaeopsis stridulans</i> (Alcock, 1905)	NE
		306. <i>Metapenaeus affinis</i> (Milne-Edwards, 1837)	NE
		307. <i>Metapenaeus brevicornis</i> (Milne-Edwards, 1837)	NE

Class/Order name	Family name	Scientific name	Level (IUCN)
		308. <i>Metapenaeus ensis</i> (De Haan, 1844)	NE
		309. <i>Metapenaeus lysianassa</i> (De Man, 1888)	NE
		310. <i>Metapenaeus</i> sp.	NE
		311. <i>Metapenaeus tenuipes</i> (Kubo, 1949)	NE
		312. <i>Mierspenaeopsis sculptilis</i> (Heller, 1862)	NE
		313. <i>Parapenaeopsis cornuta</i> (Kishinouye, 1900)	NE
		314. <i>Parapenaeopsis gracillima</i> (Nobili, 1903)	NE
		315. <i>Parapenaeopsis hardwickii</i> (Miers, 1878)	NE
		316. <i>Parapenaeopsis tenella</i> (Bate, 1888)	NE
		317. <i>Penaeus indicus</i> Milne-Edwards, 1837	NE
		318. <i>Penaeus merguiensis</i> (De Man, 1888)	NE
		319. <i>Penaeus monodon</i> Fabricius, 1798	NE
		320. <i>Trachypenaeus</i> sp.	NE
		321. <i>Trachysalambria curvirostris</i> (Stimpson, 1860)	NE
	Portunidae	322. <i>Charybdis affinis</i> Dana, 1852	NE
		323. <i>Charybdis anisodon</i> (De Haan, 1850)	NE
		324. <i>Charybdis feriatus</i> (Linnaeus, 1758)	NE
		325. <i>Charybdis hellerii</i> (A. Milne-Edwards, 1867)	NE
		326. <i>Charybdis japonica</i> (A. Milne-Edwards, 1861)	NE
		327. <i>Charybdis lucifera</i> (Fabricius, 1798)	NE

Class/Order name	Family name	Scientific name	Level (IUCN)
		328. <i>Charybdis natator</i> (Herbst, 1794)	NE
		329. <i>Charybdis</i> sp.	NE
		330. <i>Charybdis truncata</i> (Fabricius, 1798)	NE
		331. <i>Charybdis variegata</i> (Fabricius, 1798)	NE
		332. <i>Lupocyclus rotundatus</i> Adams & White, 1849	NE
		333. <i>Monomia argentatus</i> (A. Milne-Edwards, 1861)	NE
		334. <i>Podophthalmus vigil</i> (Fabricius, 1798)	NE
		335. <i>Portunus gladiator</i> Fabricius, 1798	NE
		336. <i>Portunus gracilimanus</i> (Stimpson, 1858)	NE
		337. <i>Portunus haanii</i> (Schmitt, 1858)	NE
		338. <i>Portunus pelagicus</i> (Linnaeus, 1758)	NE
		339. <i>Portunus sanguinolentus</i> (Herbst, 1783)	NE
		340. <i>Portunus</i> sp.	NE
		341. <i>Thalamita crenata</i> (Milne-Edwards, 1834)	NE
		342. <i>Xiphonectes hastatoides</i> (Fabricius, 1798)	NE
	Scyllaridae	343. <i>Scyllarus rugosus</i> H. Milne Edwards, 1837	LC
		344. <i>Scyllarus</i> sp.	NE
		345. <i>Thenus orientalis</i> (Lund, 1793)	LC
	Sergestidae	346. <i>Acetes</i> sp.	NE
	Solenoceridae	347. <i>Solenocera crassicornis</i> (Milne-Edwards, 1837)	NE

Class/Order name	Family name	Scientific name	Level (IUCN)
Stomatopoda	Lysiosquillidae	348. <i>Lysiosquillina maculata</i> (Fabricius, 1793)	NE
	Odontodactylidae	349. <i>Odontodactylus scyllarus</i> (Linnaeus, 1758)	NE
	Squillidae	350. <i>Anchisquilla fasciata</i> (de Haan, 1844)	NE
		351. <i>Carinosquilla multicarinata</i> (White, 1848)	NE
		352. <i>Clorida decorata</i> Wood-Mason, 1875	NE
		353. <i>Dictyosquilla foveolata</i> (Wood-Mason, 1895)	NE
		354. <i>Erugosquilla woodmasoni</i> (Kemp, 1911)	NE
		355. <i>Harpiosquilla harpax</i> (de Haan, 1844)	NE
		356. <i>Harpiosquilla japonica</i> Manning, 1969	NE
		357. <i>Harpiosquilla raphidea</i> (Fabricius, 1798)	NE
		358. <i>Harpiosquilla</i> sp.	NE
		359. <i>Miyakea nepa</i> (Latreille, 1828)	NE
	360. <i>Oratosquilla oratoria</i> (De Haan, 1844)	NE	
361. <i>Oratosquilla</i> sp.	NE		
362. <i>Oratosquillina gravieri</i> (Manning, 1978)	NE		
Bivalvia class (Bivalvia)			
Mytilida	Mytilidae	363. <i>Perna viridis</i> (Linnaeus, 1758)	LC
Pectinida	Pectinidae	364. <i>Amusium pleuronectes</i> (Linnaeus, 1758)	NE
		365. <i>Mimachlamys sanguinea</i> (Linnaeus, 1758)	NE
		366. <i>Mimachlamys</i> sp.	NE
Sea cucumber class (Merostomata)			

Class/Order name	Family name	Scientific name	Level (IUCN)
Xiphosura	Limulidae	367. <i>Carcinoscorpius rotundicauda</i> (Latreille, 1802)	DD

* Fish orders are classified systematically of Eschmeyer (2024) [16]

4.2. Distribution density of demersal fishery resources

The analysis results showed that the total average distribution density (CPUA) of demersal fishery resources in Ba Ria - Vung Tau marine waters reached $251.4 \pm 201.2 \text{ kg/km}^2$.

- The crab and swimming crab group dominated with the highest average density ($65.5 \pm 68.1 \text{ kg/km}^2$, corresponding to 25.2%).

- Followed by the demersal fish group ($55.6 \pm 142.7 \text{ kg/km}^2$, 21.4%).

- Marine shrimp group ($49.2 \pm 87.2 \text{ kg/km}^2$, 19.0%).

- Squid and octopus group ($35.8 \pm 37.6 \text{ kg/km}^2$, 13.8%).

- Small pelagic fish group ($21.4 \pm 49.7 \text{ kg/km}^2$, 8.2%).

- Reef fish group ($17.3 \pm 19.7 \text{ kg/km}^2$, 6.7%).

- The other resources group (sea cucumbers, snails, etc.) had the lowest density, reaching only $14.7 \pm 18.0 \text{ kg/km}^2$ (5.7%) (Figure 6).

Figure 6 shows the density (CPUA) of 7 main demersal fishery resource groups. In that:

- The demersal fish group had the widest distribution density and the highest maximum value, reaching nearly 1000 kg/km^2 . The elongated and sharp violin shape suggests the existence of very high-yield catches, although most data (the swollen belly area) are concentrated at a low CPUA level (from 0 - 200 kg/km^2). This suggests high instability in demersal fish density, with low average performance but the potential for very high performance when encountering good fishing grounds or large schools of fish, making it a group with high contribution potential but also high yield risk.

- The marine shrimp group also had some high-density catches, reaching a maximum of over 600 kg/km^2 , indicating high localized concentration in some areas or at certain times. The density tends to be relatively stable and frequent in medium-yield catches, but can concentrate suddenly at spawning grounds, leading to higher yields.

- The crab and swimming crab group had a wide distribution and dense data in the region from 0 to 200 kg/km^2 , with a maximum value of about 350 kg/km^2 . This group shows a relatively uniform distribution and is regularly exploited with significant yields. Most high-density concentration areas are in coastal waters and around islands or coral reefs. The density distribution of this resource group is relatively stable and is frequently exploited with medium yields.

- The groups with medium and narrow density distribution are small pelagic fish and squid/octopus. Their common yield is low, rarely reaching high levels, reflecting the dispersed nature of the resource or difficulty in mass exploitation.

- The reef fish and other resources groups had the narrowest and lowest density distribution. Specifically, reef fish were mainly concentrated below 100 kg/km², reflecting a consistently low density or non-uniform distribution (concentrated in coral reefs, submerged rocks) (Fig. 6).

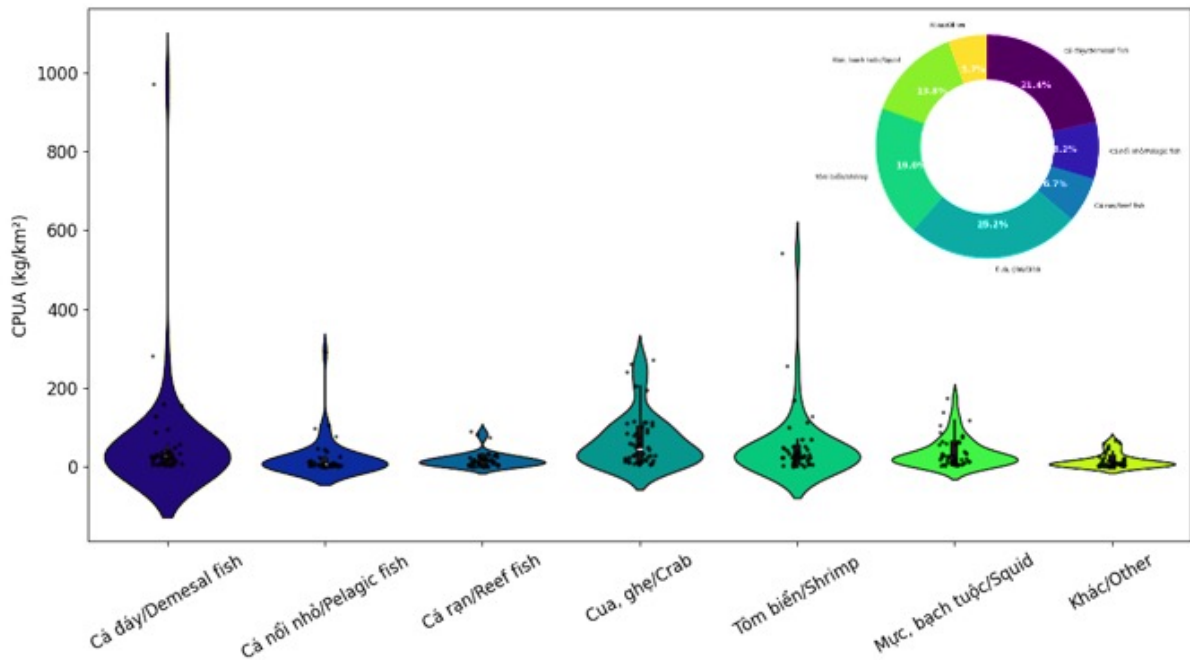


Figure 6. Distribution density by group of benthic marine resources in the sea

If we evaluate in depth the distribution of data on density of marine resources by resource group in the sea area of Ba Ria Vung Tau, Table 6 provides information on the probability density of exploitation times as follows:

Table 6. Concentrated density areas of exploited marine resource groups in Ba Ria - Vung Tau sea area, period 2018-2024

Resource group	Area of concentrated density	Comments
Bottom fish	From 0 to below ~100 kg/km ²	Groundfish densities show high volatility. Most catches are low yielding, but have the potential to reach very high yields (outliers/maximums) when encountering good fishing grounds or large flows. This is a group with high potential contribution but also very high yielding risk.
Crabs	From ~50–150 kg/km ²	The density of this resource group has a relatively stable distribution and is regularly exploited with average productivity. There are few maximum values, showing that exploitation is less dependent on sudden concentration flows.

Small pelagic fish	From 0 to below ~50 kg/km ²	Most of the exploitation of small pelagic resources has low productivity, although there are times when high productivity is achieved. In accordance with the schooling and migratory nature of small pelagic fish, they are only concentrated locally and difficult to exploit regularly with high density.
Sea shrimp	From ~50–150 kg/km ²	Similar to Crab but with higher peak values. Indicates that marine shrimp are regularly present at medium densities, but can suddenly concentrate at spawning grounds/areas, leading to higher productivity.
Squid, octopus	From 0 - 50 kg/km ²	Productivity is generally low, rarely reaching high levels. Reflecting the nature of resources being scattered or difficult to exploit en masse.

The density distribution of demersal fishery resources showed similarity between the coastal and near-shore areas. In the coastal waters, the average distribution density reached 248.9 ± 225.1 kg/km², with high concentrations in the Vung Tau area and Ganh Rai Bay. Meanwhile, in the near-shore area, the average distribution density reached 257.7 ± 30.1 kg/km², with high concentrations in the border area with the coast (latitude 10.28; longitude 107.54) and the offshore area (latitude 9.74; longitude 107.66) (Figure 7).

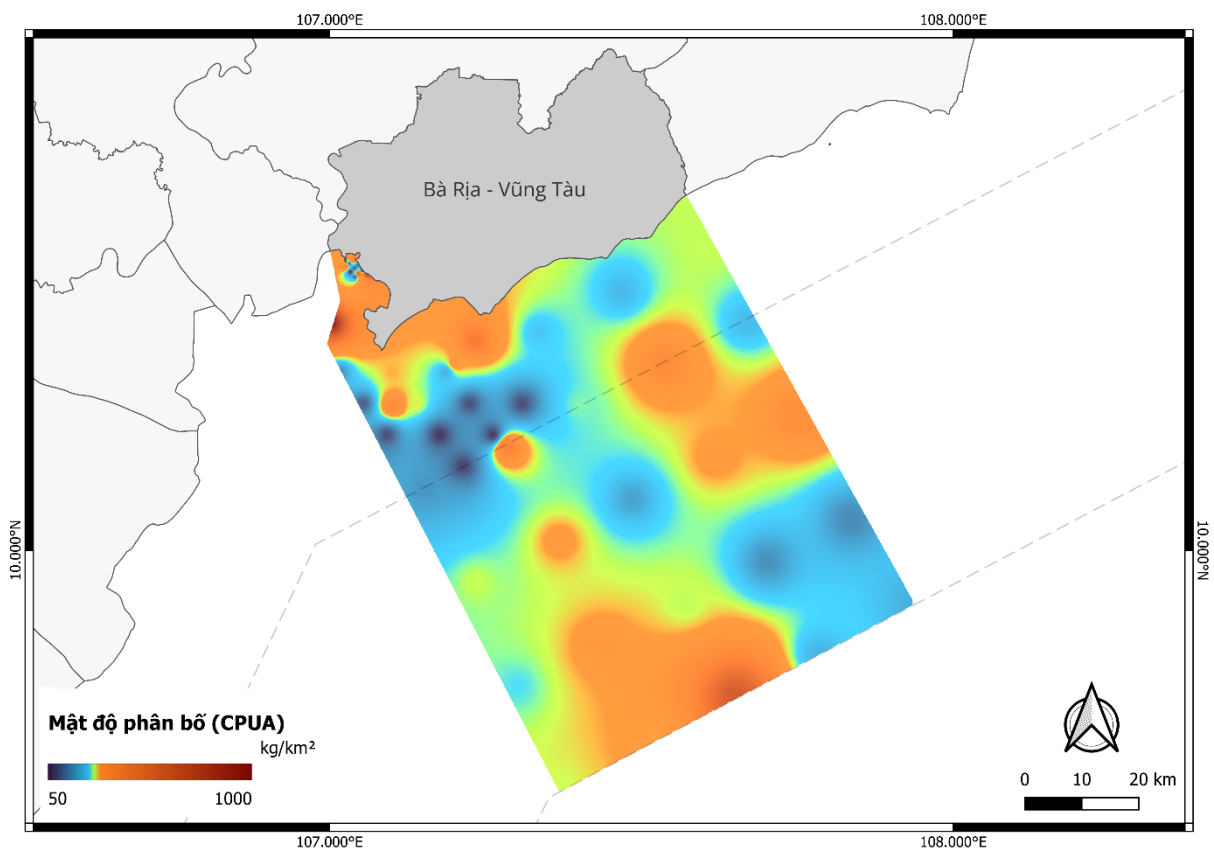


Figure 7. Distribution map of demersal fishery resources in Ba Ria - Vung Tau marine waters

The average density of benthic marine resources in the Ba Ria - Vung Tau sea area is lower than that in the Ben Tre sea area, with the average density of the whole sea area reaching 714 kg/km², in which the coastal area is higher than the open sea area (1,072 compared to 535 kg/km²), with crustaceans dominating in both areas [19]. Compared to the Ninh Thuan sea area, the average density of the Ba Ria - Vung Tau sea area is also lower (340.6 kg/km²), with the coastal area 172.4 kg/km², significantly lower than the open sea area 424.7 kg/km² [31]. These results are consistent with previous studies, emphasizing that the biomass density of benthic marine groups is an important indicator reflecting the community structure and exploitation level of marine ecosystems [32], [33].

4.3. Stock assessment of demersal fishery resources

The demersal fishery resource stock in Ba Ria - Vung Tau marine waters (2018-2024) was estimated from trawl survey data, applying the tropical fish stock assessment method based on the log-distribution of Pauly (1984) [34]. The results show that the total stock biomass reached approximately 3,139 tonnes, of which the coastal area accounted for 945 tonnes (30.1%) and the near-shore area for 3,443.6 tonnes (69.9%). The coefficient of variation (CV) was 60.9%, indicating an uneven distribution density of resources in the sea area (Table 7).

Table 7. Instantaneous stock assessment of demersal fishery resources (tonnes) in Ba Ria - Vung Tau marine waters

(Unit: tons)

TT No.	Nhóm nguồn lợi/Groups	Vùng bờ/Coastal (1.930 km ²)	Vùng lộng/Inshore (4.250 km ²)	Toàn vùng/Entire (6.180 km ²)
1	Cá đáy (Demersal fish)	230	189	420
2	Cá nổi nhỏ (Small Pelagic fish)	82	27	109
3	Cá rạn (Reef fish)	62	175	236
4	Tôm biển (Shrimp)	178	483	661
5	Cua, ghẹ (Crab)	207	808	1.015
6	Mực, bạch tuộc (Squid)	139	344	483
7	Khác (Other)	47	167	214
Tổng cộng (Total)		945	2.193	3.139
Hệ số biến thiên/ Coefficient of variation (CV%)		60,9	60,9	60,9

In the structure of the fishery resource stock, the crustacean group accounted for >50% of the total stock, with the crab and swimming crab group having the highest proportion at 1,015 tonnes (32.3%) , followed by marine shrimp (661 tonnes; 21.1%). The squid and octopus groups (483 tonnes; 15.4%) and demersal fish (420 tonnes; 14.3%) had significant stock, while reef fish (236 tonnes; 7.5%), small pelagic fish (109 tonnes; 3.5%), and other resources (214 tonnes; 6.8%) accounted for a smaller proportion. The coastal waters were characterized by the demersal fish group (24.4%), whereas the near-shore area was dominated by the crab and swimming crab group (36.8%). This structure clearly reflects the distribution according to the specific habitat and environmental conditions of each resource group.

Comparison with neighboring sea areas shows that the reserves of benthic aquatic resources in Ba Ria - Vung Tau sea area are higher than those in Tra Vinh sea area (1,539 tons) and Ben Tre sea area (2,144 tons) [35], [36], but much lower than those in Ninh Thuan sea area, with an average reserve of about 6,088 tons [31].

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The updated data on marine fishery resources in Ba Ria - Vung Tau province during the 2018-2024 period show the following:

- A total of 367 marine species belonging to 34 orders and 98 families were recorded, with bony fish dominating (240 species, 65.4%), followed by crustaceans (82 species, 22.3%) and mollusks (32 species, 8.7%).

- The average distribution density of demersal fishery resources reached 251.4 ± 201.2 kg/km², with the crab and swimming crab group dominating with the highest average density (25.2%).

- The total stock biomass of demersal fishery resources across the entire area is estimated at approximately 3,139 tonnes, with the crustacean group accounting for the highest proportion (53.4%).

5.2. Recommendations

The demersal fish group is the resource with the largest fluctuation range in exploitation density and the highest absolute maximum value. This suggests that exploitation pressure on this resource needs special attention to avoid overexploitation during periods when they are concentrated. The crab and swimming crab and marine shrimp groups are two groups with relatively stable distribution density and consistently bring significant average yields, playing an important role in the stable exploitation output of Ba Ria - Vung Tau marine waters.

Meanwhile, the small pelagic fish group has a low density, indicating that successful exploitation often requires searching and monitoring specialized fish flows; the reef fish group and other groups have low density, consistent with the dispersed nature, which is considered a secondary resource.

These research results have provided an important scientific basis for fisheries management in the Ba Ria - Vung Tau sea area in general, and at the same time have direct significance for the province's Fisheries Improvement Project. Therefore, it is necessary to integrate the results into the process of building and implementing the Fisheries Improvement Plan (FIP) in Ba Ria - Vung Tau, to ensure a solid scientific basis, contributing to the development of responsible and sustainable fisheries according to international standards. At the same time, continue to focus on further research to develop effective spatial and temporal management measures, protecting their spawning or concentration areas.

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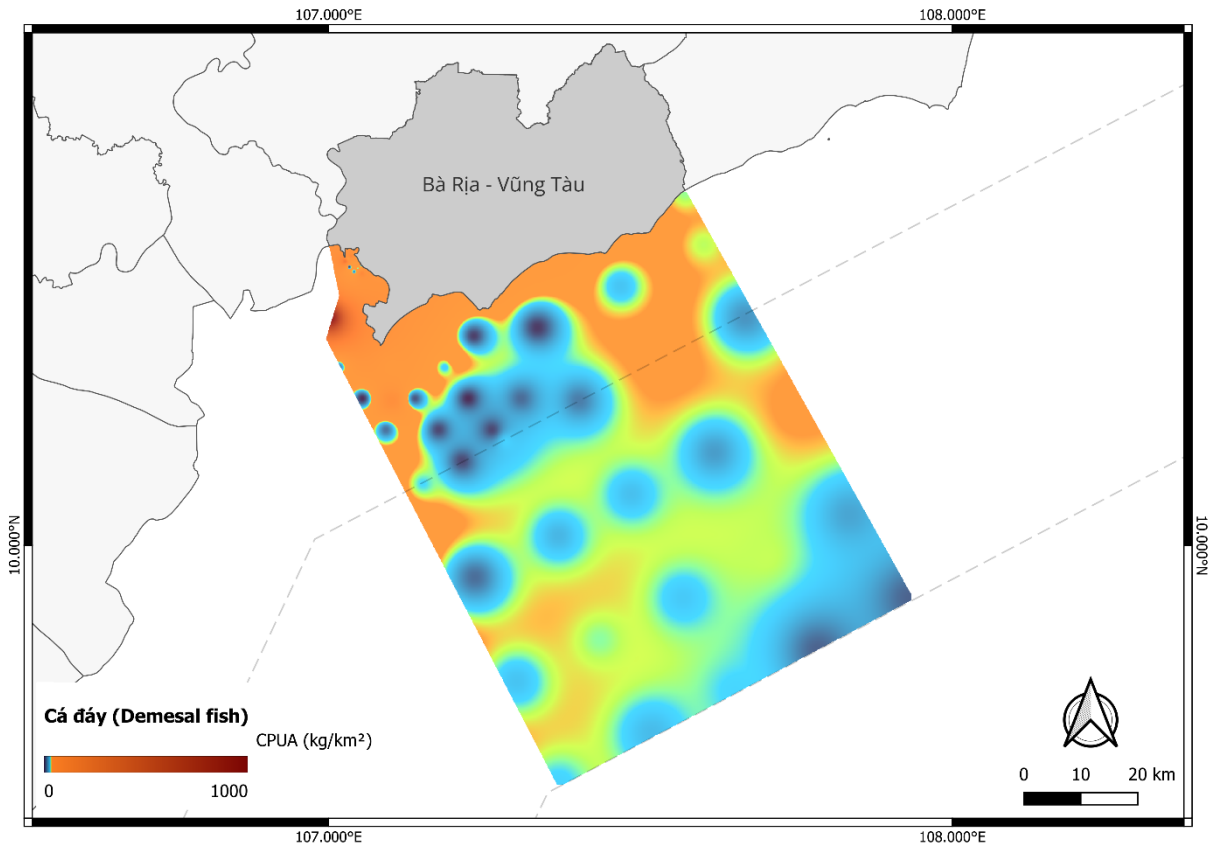
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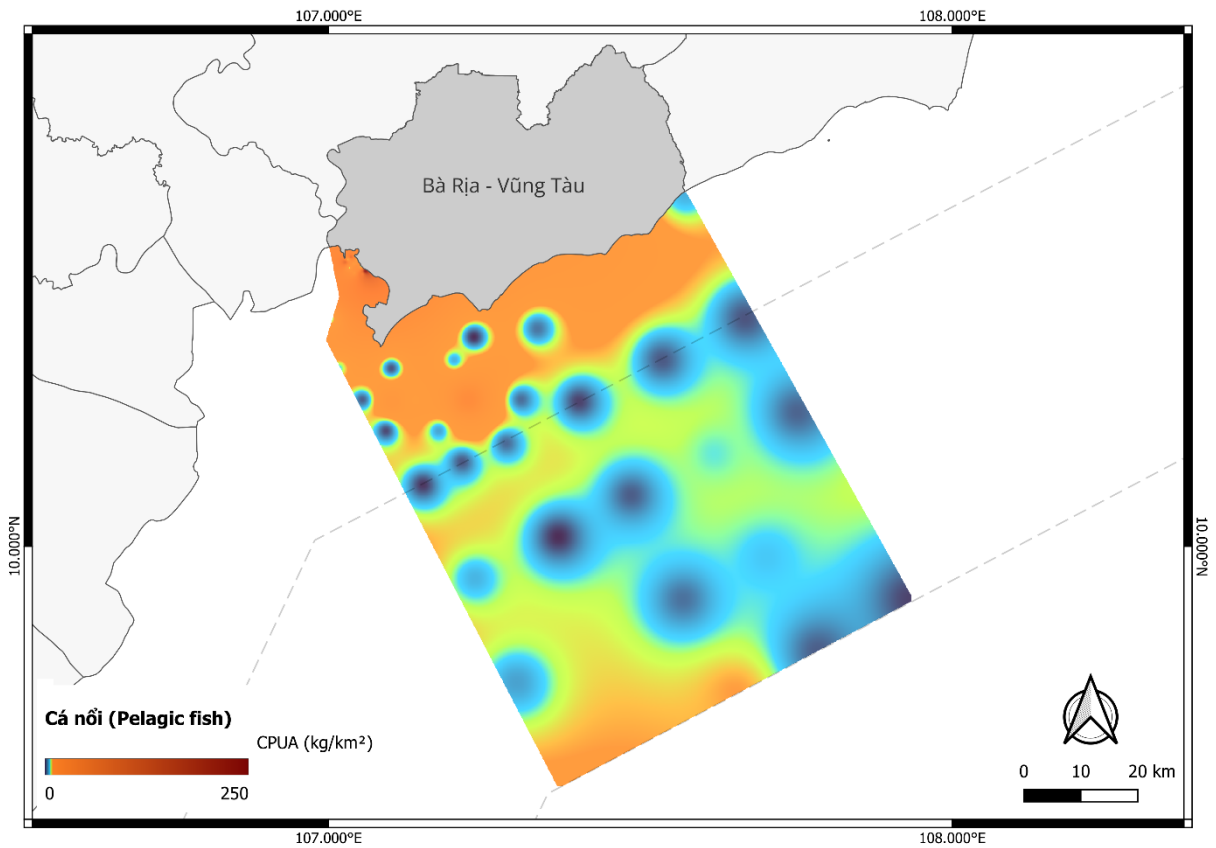
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APPENDIX

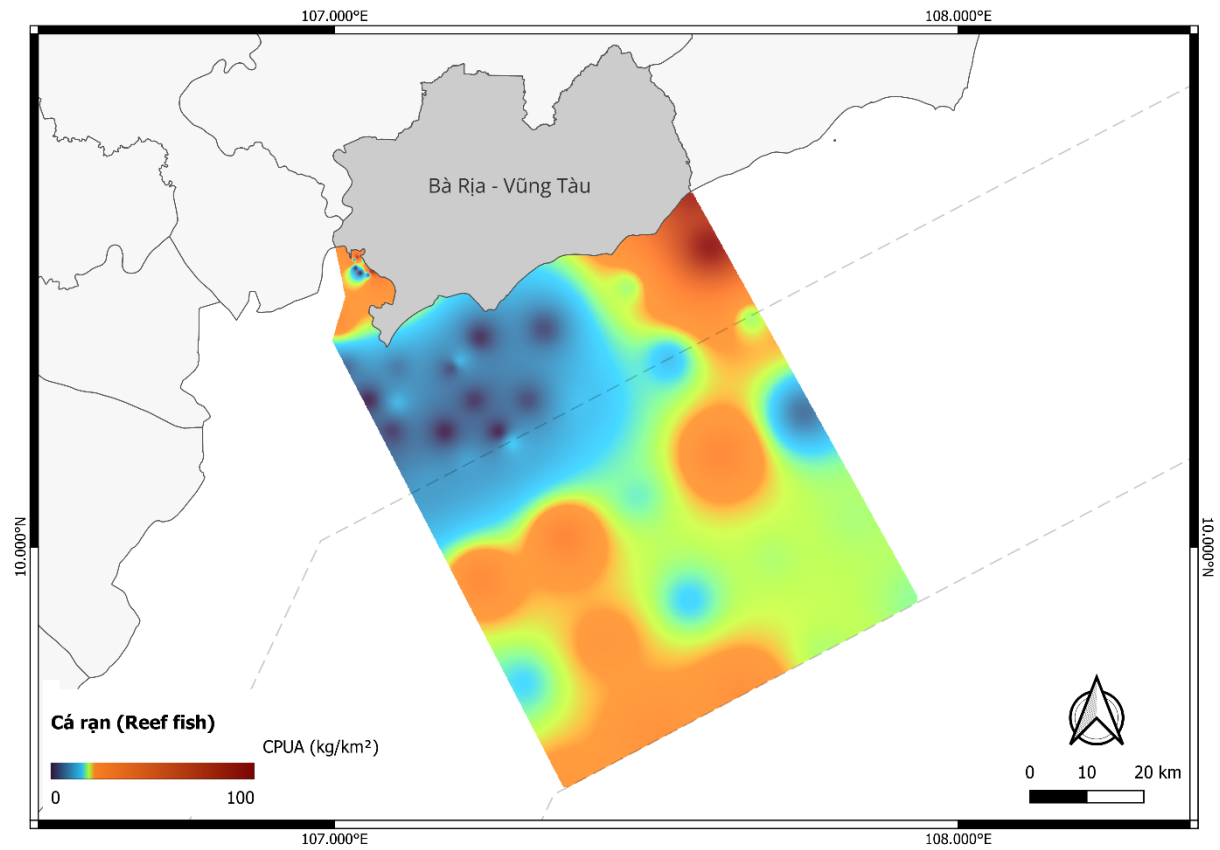
Appendix 1. Map of distribution of bottom fish resources in the Baria - Vungtau sea



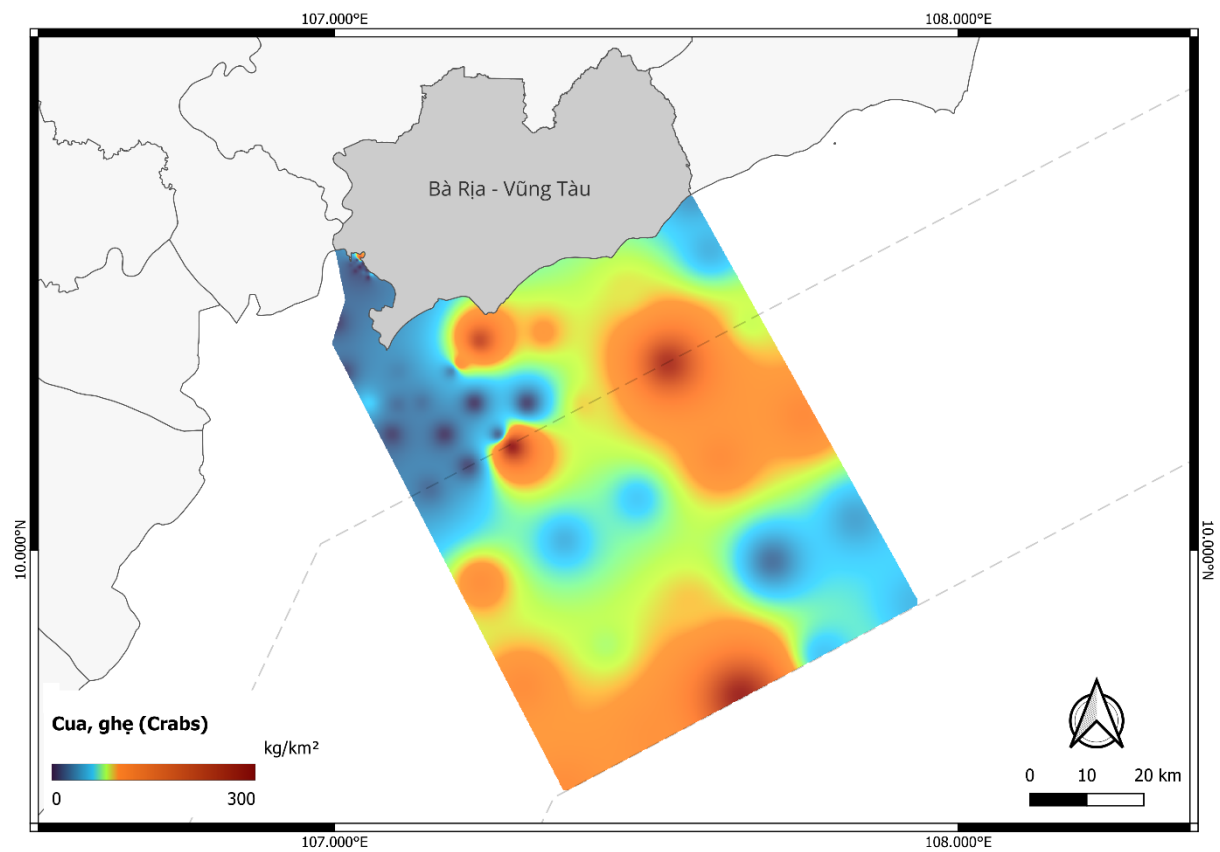
Appendix 2. Map of distribution of pelagic fish resources in the sea of Baria-Vungtau



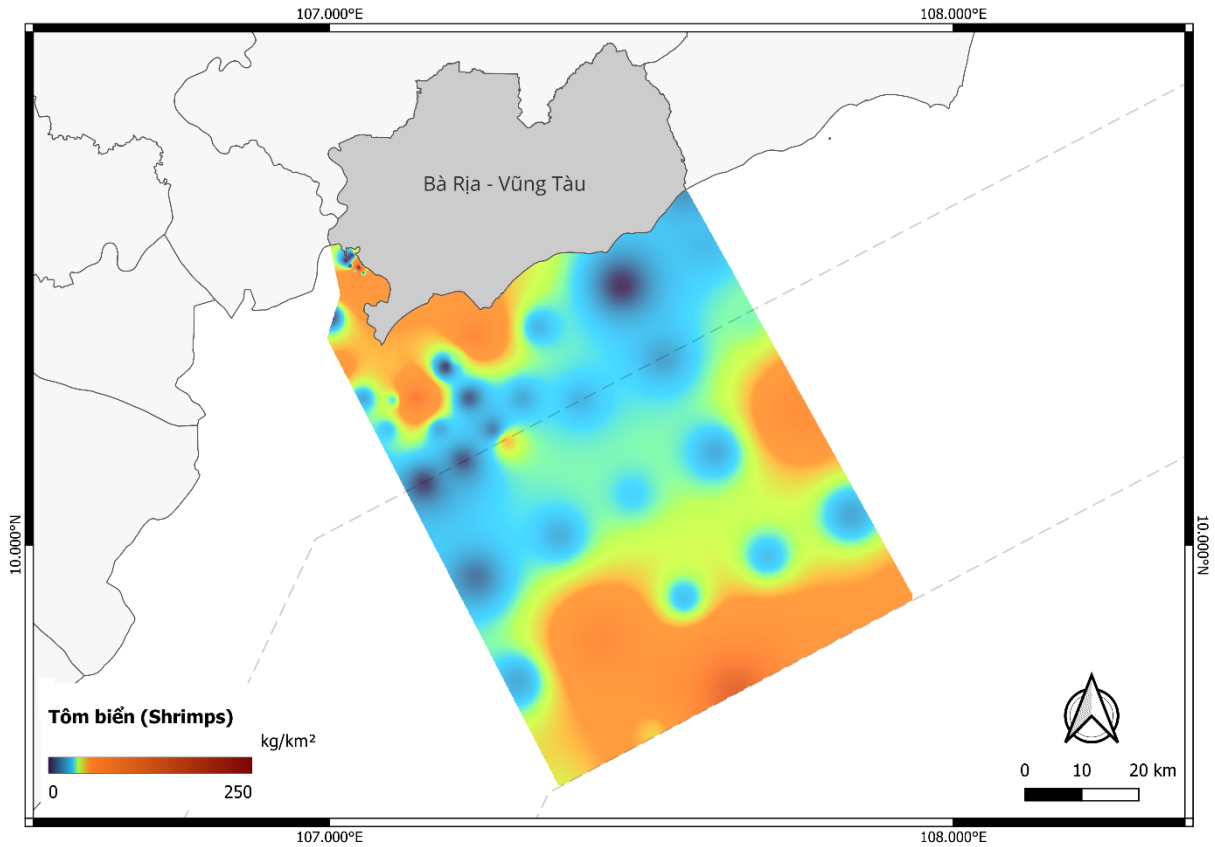
Appendix 3. Map of distribution of reef fish resources in the Ba Ria-Vung Tau sea area



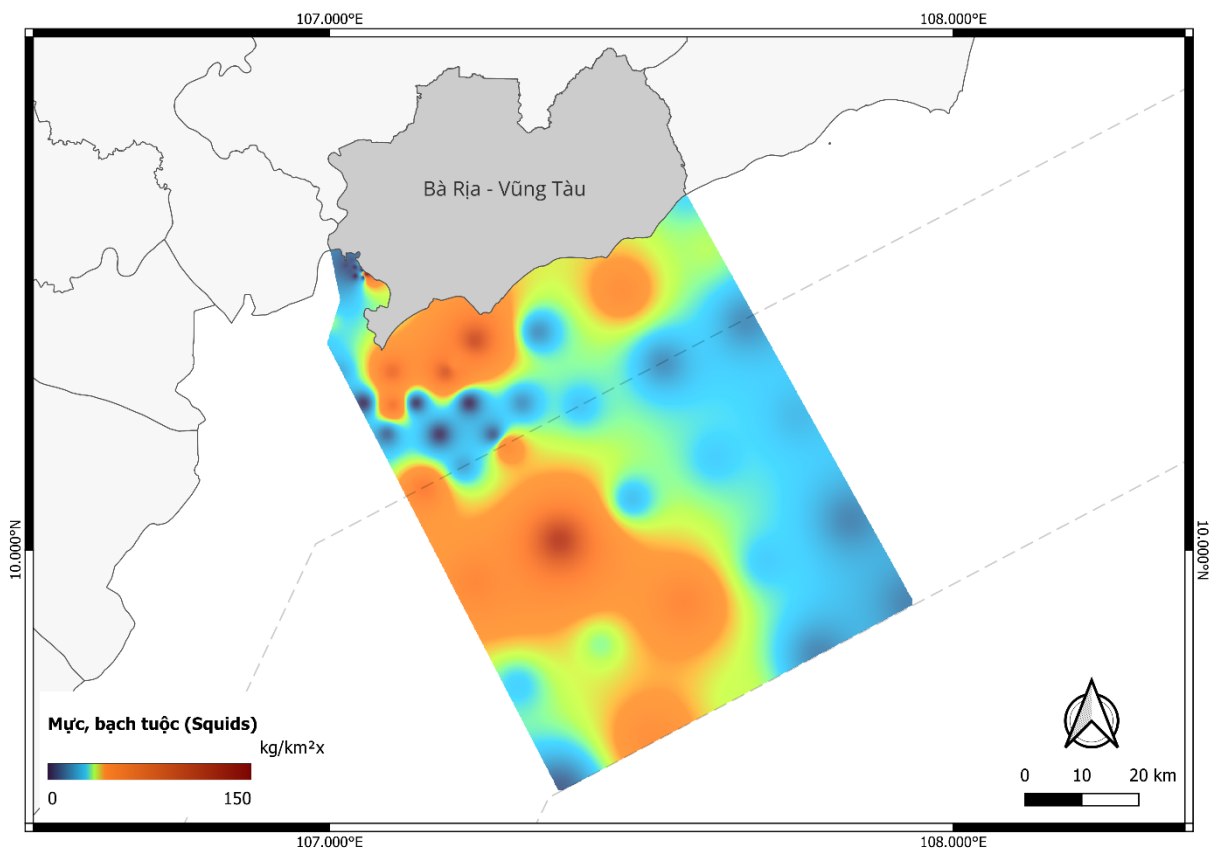
Appendix 4. Map of crab and swimming resources distribution in the sea area of Ba Ria-Vung Tau



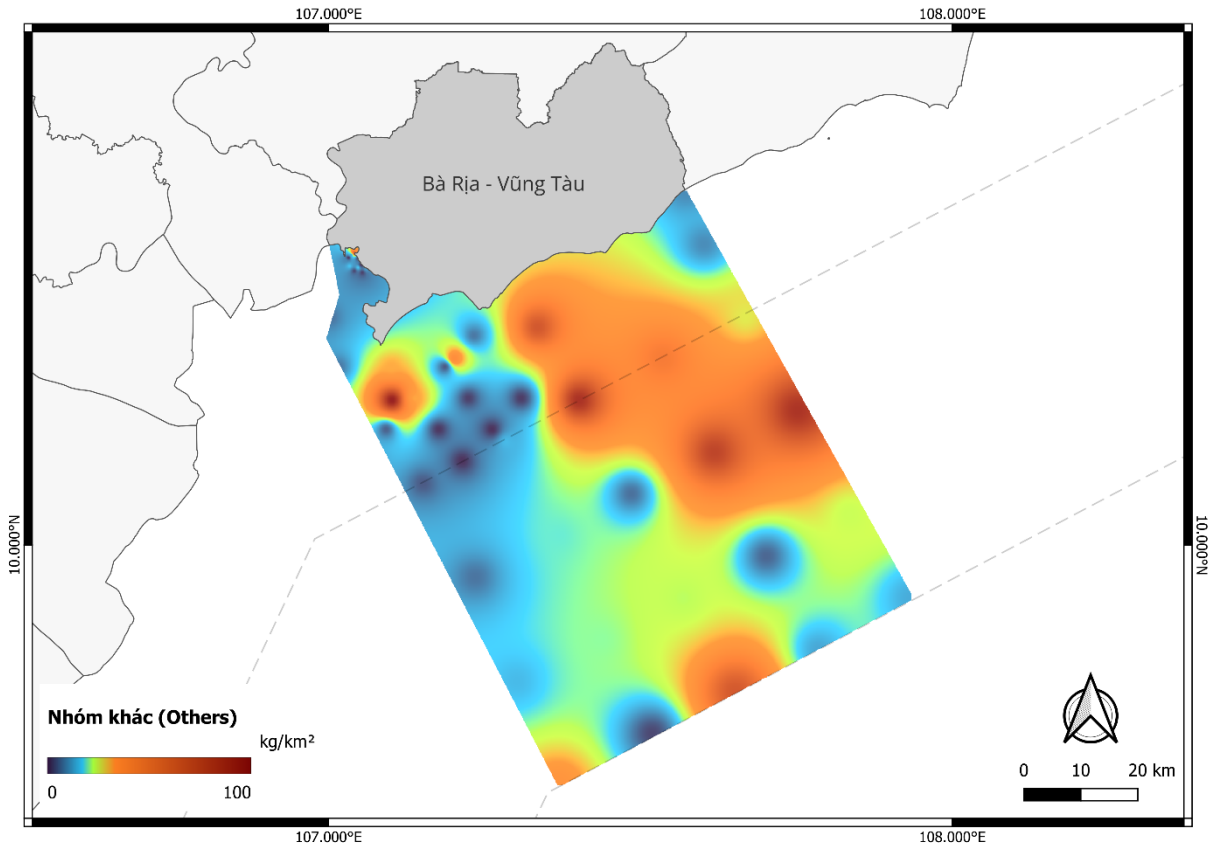
Appendix 5. Map of distribution of marine shrimp resources in Ba Ria-Vung Tau sea



Appendix 6. Map of distribution of squid and octopus resources in the sea of Ba Ria-Vung Tau



Appendix 7. Map of distribution of other resources (clams, snails...) in the sea area of Ba Ria-Vung Tau



Appendix 8. Summary data of Long Son resource survey trip 2018 (LSP_2018)

Kind of net	Season	Station	Total of species	No. of ind.	Total weigh (kg)	CPUE (kg/h)	CPUA (kg/km ²)
Fish trawl	South west	2	34	872	6,3	12,2	198,8
		4	30	151	2,4	5,0	82,3
		5	48	2.730	22,3	25,7	421,0
		6	46	1.022	18,0	18,0	294,0
		9	12	103	0,7	0,7	11,1
		10	12	5.675	11,1	11,5	187,6
		11	19	113	2,8	3,4	55,7
		12	17	130	2,0	2,1	35,6
		14	24	537	2,5	2,5	40,1
		15	20	202	0,9	1,0	15,6
		16	17	238	1,1	1,1	17,9
		19	22	384	2,7	2,7	44,3
Shrimp trawl	South west	2	59	2.148	7,7	8,4	151,1
		4	46	2.667	8,4	9,2	163,4
		5	40	1.926	15,8	24,4	435,1
		6	42	1.343	5,7	7,4	132,3
		9	28	978	3,7	4,0	71,7
		10	42	7.414	12,3	14,1	253,1
		11	16	1.065	4,5	6,6	117,5
		12	19	3.665	5,2	5,2	93,3
		14	15	755	2,8	3,1	55,1
		15	30	902	4,9	5,2	92,5
		16	21	3.570	7,7	7,5	133,8
		19	17	1.743	3,0	3,1	54,1

Appendix 9. Summary data of Long Son resource survey trip 2022 (LSP_2022)

Kind of net	Season	Station	Total of species	No. of ind.	Total weigh (kg)	CPUE (kg/h)	CPUA (kg/km ²)
Fish trawl	North east	1	24	921	4,6	11,6	178,4
		2	32	7.769	14,5	19,3	348,6
		3	26	292	1,7	5,0	69,3
		4	28	5.801	13,3	26,5	440,4
		5	32	592	3,8	7,7	118,1
		6	28	256	2,7	8,2	121,9
		7	13	186	0,8	1,4	22,8
		8	23	130	1,7	2,6	48,8
		9	16	135	1,0	1,9	39,7
		10	7	357	4,1	4,7	63,0
		11	17	8.472	34,9	45,5	674,9
		12	29	3.044	13,2	17,6	243,1
Shrimp trawl	North east	1	40	1.994	22,9	54,9	991,1
		2	31	2.077	7,9	15,2	225,8
		3	29	114	1,9	3,3	59,7
		4	17	1.223	7,2	12,3	213,5
		5	21	418	4,1	7,0	93,9
		6	9	23	0,9	1,6	30,1
		7	40	1.110	9,0	17,9	371,5
		8	54	1.310	13,6	21,5	330,6
		10	29	727	4,6	5,5	71,6

Appendix 10. Summary data of the marine resources survey trip in Ba Ria-Vung Tau

Kind of net	Season	Station	Total of species	No. of ind.	Total weigh (kg)	CPUE (kg/h)	CPUA (kg/km ²)	
Fish trawl	North east	1	25	630	5,8	6,4	120,0	
		2	18	129	3,5	3,5	58,1	
		3	15	101	3,5	3,9	76,5	
		4	7	33	1,7	1,8	29,1	
		5	12	798	22,1	33,2	827,2	
		6	16	1.019	3,9	4,1	71,8	
		7	20	83	5,3	6,6	149,5	
		8	26	128	3,2	4,2	95,3	
		9	15	73	2,4	2,9	55,9	
		10	20	280	1,6	2,1	49,2	
		11	13	93	1,3	1,4	26,1	
		12	23	143	3,9	4,2	76,3	
		13	38	283	7,6	9,9	205,4	
		14	36	291	7,2	9,7	242,9	
		15	28	230	4,9	6,1	157,6	
		16	35	224	5,7	7,5	167,1	
		17	19	75	3,3	4,2	90,3	
		18	18	89	2,8	3,5	72,9	
		19	25	351	10,3	12,2	237,4	
		20	13	346	2,3	2,9	59,3	
		21	32	316	7,9	11,5	280,2	
		22	40	375	5,4	7,2	165,7	
		23	28	267	9,6	12,0	249,1	
		24	23	131	5,8	7,8	153,7	
		25	23	307	6,3	8,0	176,5	
		South west	1	21	437	12,1	13,2	248,9
			2	22	262	4,7	5,1	96,3
			3	14	670	3,6	3,8	74,4
	4		26	555	4,0	4,4	86,8	
	5		10	85	1,5	6,0	412,4	
	6		21	403	8,5	9,3	174,8	
	7		15	180	2,8	3,3	72,5	

Kind of net	Season	Station	Total of species	No. of ind.	Total weigh (kg)	CPUE (kg/h)	CPUA (kg/km ²)		
		8	19	456	4,6	4,6	80,3		
		9	21	376	3,9	3,9	66,9		
		10	14	482	3,0	3,0	54,3		
		11	20	295	5,2	5,2	89,1		
		12	13	157	2,9	3,2	59,5		
		13	24	130	4,5	4,5	81,4		
		14	10	161	2,9	3,2	62,3		
		15	25	631	7,8	7,4	121,6		
		16	20	1.236	5,5	5,5	95,8		
		17	20	628	16,2	17,7	348,2		
		18	16	494	6,6	7,9	170,8		
		19	18	694	9,1	9,1	163,7		
		20	9	252	30,2	60,3	2.003,2		
		21	24	553	3,3	7,2	265,3		
		22	25	1.405	9,2	8,2	127,6		
		23	20	338	5,7	5,7	102,0		
		24	25	278	5,6	5,8	103,5		
		25	17	479	6,8	6,3	96,4		
		Shrimp trawl	North east	1	33	1.044	5,7	6,4	143,6
				2	27	2.901	10,9	12,1	242,2
				3	30	2.685	18,4	24,4	539,0
				4	38	464	5,1	9,5	297,1
				5	22	451	11,9	13,0	255,4
				6	39	1.244	10,3	26,8	1.262,7
				7	37	2.208	15,9	17,3	356,6
8	29			404	7,0	7,6	172,9		
9	26			755	7,1	7,4	143,8		
10	33			5.090	20,1	21,9	368,1		
11	32			389	14,0	15,2	344,8		
12	41			211	5,8	6,6	163,0		
13	39			1.683	18,9	19,9	435,4		
14	39			6.425	70,3	70,3	1.327,1		
15	40			7.228	27,7	27,7	574,7		
16	24			2.254	16,5	15,7	258,6		

Kind of net	Season	Station	Total of species	No. of ind.	Total weigh (kg)	CPUE (kg/h)	CPUA (kg/km ²)
		17	31	1.224	16,6	16,6	275,3
		18	24	2.496	16,0	16,0	266,0
		19	13	777	18,0	19,0	377,0
		20	17	133	1,1	1,7	41,1
		21	49	2.653	16,6	17,5	382,5
		22	34	1.024	26,7	9,3	61,3
		23	31	596	19,2	20,6	366,0
		24	32	205	7,5	11,2	388,1
		25	51	2.370	32,3	35,2	569,0
	South west	2	26	697	7,3	5,8	83,9
		3	23	2.005	14,1	13,0	217,0
		4	27	2.018	13,9	13,9	250,5
		5	14	334	11,3	16,9	421,8
		6	32	621	11,5	12,1	230,4
		7	28	543	17,2	17,2	310,1
		8	30	1.584	21,0	14,0	168,5
		9	37	2.142	16,6	18,1	357,2
		10	32	994	15,3	16,7	314,5
		11	23	1.233	21,6	20,0	332,8
		12	32	1.874	21,5	20,5	352,0
		13	33	682	13,6	13,6	255,7
		14	26	3.235	25,2	43,3	1.283,0
		15	32	186	4,9	4,7	72,7
		16	34	11.397	37,6	41,0	807,2
		17	31	1.197	14,7	26,0	826,8
18	24	50.879	37,7	37,7	679,9		
19	18	860	4,5	4,3	74,3		
20	30	890	22,4	20,7	330,7		
21	15	292	2,2	2,3	43,0		
22	30	449	5,7	5,9	105,5		
23	14	595	7,7	7,6	129,0		
24	29	528	8,4	11,0	248,1		
25	24	1.742	12,1	11,3	183,5		