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Present Status and Abundance of Brachyuran Crabs from Two Different Locations in the Jaffna District, Sri Lanka

Thilaksika Visayakumaran* and Piratheepa Sivakumar

Department of Zoology, University of Jaffna, Jaffna, Sri Lanka

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ABSTRACT

Crabs are a highly important group of crustaceans, inhabiting various marine and coastal ecosystems. Brachyuran crabs are ecologically and economically significant marine species, particularly edible crabs, which play a vital role as seafood resource. The current study was conducted to document the diversity and abundance of brachyuran crabs at Vadamaradchy and Kakkaithevu fish landing sites in Jaffna, Sri Lanka, from December 2022 to August 2023. The present study revealed 26 crab species belonging to 19 genera of thirteen families. The majority of crab species (92%) were documented at the Vadamaradchy landing sites, compared to the Kakkaithevu. *Portunus pelagicus*, *Portunus sanguinolentus*, *Portunus gladiator*, *Charybdis feriatus*, *Charybdis natator*, *Scylla serrata* and *Thalamita crenata* were identified as edible crabs during the current survey. Fourteen species were recorded for the first time at the Vadamaradchy landing sites. The highest abundance was recorded at Valvettithurai landing site (38.66%) in Vadamaradchy. *Portunus sanguinolentus* was recorded as the dominant species contributing 33.47%, followed by *Portunus pelagicus*, *Charybdis feriatus*, *Charybdis natator* and *Portunus gladiator* representing 23.33%, 16.16%, 12.37% and 7.83%, respectively, at the Vadamaradchy landing sites. *Portunus sanguinolentus* was recorded in greater abundance from December to February and June to July, while *Charybdis feriatus* showed its highest abundance from March to July, at landing sites in Vadamaradchy. Current study's findings could be used to evaluate crab populations and manage crab diversity in these areas.

Keywords: Edible crabs, Fish landing sites, Kakkaithevu, *Portunus*, Vadamaradchy

1. INTRODUCTION

Fish and shellfish could supplement the animal protein needed for the increasing world population. Crabs are the most advanced members of the Sub phylum Crustacea, order Decapoda. Brachyuran crabs represent one of the most diverse groups of crustaceans, encompassing over 7,400 species that inhabit marine, freshwater and terrestrial environments [1]. Crabs play a crucial role in maintaining the health and stability of marine ecosystems, while edible crabs serve as a prestigious seafood source. Crabs constitute approximately 20% of the total marine crustaceans captured, cultivated and utilized globally [2], reaching an annual quantity of 1.5 million tonnes [3].

In recent years, crab exploitation has increased due to global demand and the rise of new fishing vessels [4]. Studying crab diversity supports sustainable management, and continuous research is vital to assess populations. Recent studies on crab diversity in these areas are lacking. Therefore, the current study focused on documenting the diversity and abundance of crabs from selected study areas in Jaffna, Sri Lanka.

* 18thilaksi@gmail.com

2. MATERIALS AND METHODOLOGY

2.1 Study area

The Vadamaradchy area is located in the Northern part of the Sri Lanka and directly connects to the Indian Ocean. Three landing sites were selected in the Vadamaradchy area: Site 1- Munai, Site 2- Sakkotei and Site 3- Valvettithurai (Figure 1; Table 1).

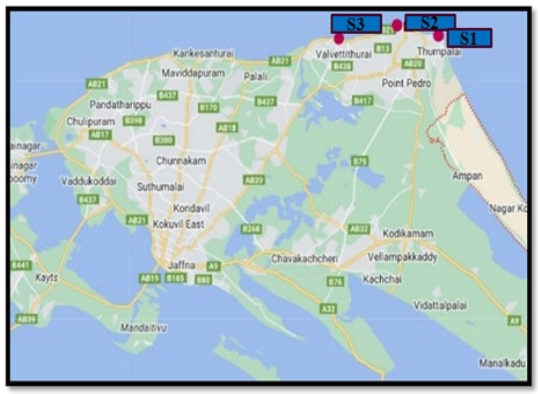

Figure 1. Location of the Vadamaradchy area and three sampling sites

The Jaffna lagoon is a shallow water body located in the Northern part of Sri Lanka, situated approximately between 79^0 52' E to 80^0 38' E longitudes and 9^0 26' N to 9^0 46' N latitudes. It has an area of 12 km^2 [5].

Table 1. GPS location of the sampling sites

Sampling sites	Longitude	Latitude
1.Vadamaradchy		
S1- Munai	9^0 49'36.7"N	$80^0$14'59.54"E
S2- Sakkotei	9^0 50'00.9"N	80^0 12'36.9"E
S3- Valvettithurai	$9^0$49'31.84"N	$80^0$09'35.92"E
2. Kakkaithevu	9^0 41'15"N	79^0 59'51"E

The Kakkaithevu coastal area, which is part of the Jaffna lagoon was selected for this study (Figure 2).

2.2 Sampling

Crabs were observed and collected fortnightly from December 2022 to August 2023 during mornings between 07.00 am and 10.30 am from fishermen's catches at the Kakkaithevu and Vadamaradchy fish landing sites. Non-edible crabs in the rocks were collected with the help of a stick and hand-picking method. Photographs of the collected crabs were taken at the sampling sites.

Figure 2. Location of the Jaffna lagoon and Kakkaithevu sampling site

2.3 Identification of crabs

Different types of crabs collected from the selected landing sites were brought to the laboratory in the Department of Zoology with ice and were properly preserved in a deep freezer for further analysis. Crabs were identified up to species level with the help of morphological features by using standard taxonomical keys [6,7]. Morphological characters such as carapace shape, carapace width and length, number and arrangement of anterolateral spines, shape and size of frontal teeth, cheliped morphology, colour pattern and overall body ornamentation (e.g., granulation or pubescence) were considered for crab diversity identification, following standard FAO taxonomic guidelines.

2.4 Analysis of abundance of edible portunid crabs

After identifying crabs up to species level, each sample was separated into different species and the number of specimens of each species was counted. The number of species observed were counted and recorded monthly.

3. RESULTS AND DISCUSSION

3.1 Diversity of crabs

The present study identified 26 crab species (24 from Vadamaradchy and 3 from Kakkaithevu landing sites) belonging to 19 genera of thirteen families (Table 2). The Portunidae family was the most dominant, with eleven species,

followed by 3 species from Calappidae, 2 species from Grapsidae, 1 species each from the families of Xanthidae, Dorippidae, Majidae, Parthenopiidae, Dromiidae, Carpiliidae, Plagusiidae, Ocypodidae, Epialtidae and Galenidae. *Portunus pelagicus*, *Portunus sanguinolentus*, *Portunus gladiator*, *Charybdis feriatus*, *Charybdis natator*, *Scylla serrata* and *Thalamita crenata* were identified as edible crabs.

1) Family Portunidae

***Portunus pelagicus* (Linnaeus, 1758)**

Common name: Blue swimming crab
It has four pointed triangular teeth on the frontal/ anterior region. Nine teeth on the anterolateral margin and the last tooth enlarged in the form of a long spine. Chelae are elongate in males than in females, with 3 spines on the inner margin of the merus. Males with blue markings and females with dull green bodies (Plate 1A).

***Portunus sanguinolentus* (Herbst, 1783)**

Common name: Blood-spotted swimming Crab
The antero-lateral margin is divided into nine teeth, featuring an enlarged, long lateral spine. The posterior margin of the merus of the chelipeds lacks a spine. The anterior part of the carapace is finely granulated. The carapace is olive to dark green in colour, with three prominent red spots on the posterior one-third (Plate 1B).

***Portunus gladiator* (Fabricius, 1798)**

Common name: Gladiator crab
The antero-lateral border bears nine teeth. The frontal region is divided into four teeth. The posterolateral margin is concave. The carapace and chelipeds are reddish-orange in colour, marked with reddish-brown patches (Plate 1C).

***Charybdis feriatus* (Linnaeus, 1758)**

Common name: Crucifix crab
Carapace is ovate. The antero-lateral border is armed with six teeth. The first tooth of this border is anteriorly truncated and slightly notched. The carapace features maroon and white longitudinal stripes, with a distinct white cross-shaped marking in the middle region (Plate 1D).

***Charybdis natator* (Herbst, 1789)**

Common name: Ridged swimming crab
The antero-lateral margin is cut into six teeth. The body is brown in colour, with reddish-brown tubercles scattered across the surface. The carapace is covered with a soft, woolly texture and marked with several transverse, reddish, granulated ridges. The undersurface of the cheliped's palm is covered with scaly ridges and marked by a longitudinal groove (Plate 1E).

***Charybdis hellerii* (A. Milne-Edwards, 1867)**

Common name: Indo-Pacific swimming crab
The frontal region bears eight well-developed teeth, and the antero-lateral margin has six sharp teeth. Transverse ridges are present on the frontal, protogastric, mesogastric, and branchial regions of the carapace. The carapace is mottled brown in colour, with brown tips on the chelipeds (Plate 1F).

***Charybdis affinis* (Dana, 1852)**

Common name: Smooth shelled swimming crab
The antero-lateral margin bears six sharp teeth, and the frontal region has eight teeth. The body is greenish-grey in colour, with transverse ridges on the carapace. The chelipeds have dark brown tips (Plate 1G).

***Charybdis lucifera* (Fabricius, 1798)**

Common name: Yellowish-brown crab
The frontal region bears eight rounded teeth. The antero-lateral margin has six teeth. The posterior border of the carapace is curved. The carapace is greenish in colour, with two large and two small white spots on each of the branchial regions (Plate 1H).

***Scylla serrata* (Forsskål, 1775)**

Common name: Giant mud crab

The antero-lateral borders of the carapace are cut into nine equal teeth. Polygonal markings are present on the legs and chelipeds. The carapace is grayish-green in colour (Plate 1I).

***Thalamita crenata* (Latreille, 1829)**

Common name: Crenate swimming crab
The frontal region is cut into six nearly equal teeth. The antero-lateral margin of the carapace bears five equal-sized teeth. A single prominent transverse ridge is present between the last pair of antero-lateral spines. The body is dark green in colour (Plate 1J).

***Podophthalmus vigil* (Fabricius, 1798)**

Common name: Sentinel crab / Long-eyed swimming crab
The anterior margin of the carapace is broader than the posterior margin. The antero-lateral margin is cut into two teeth. Orbits are broad, and the eyes are elongated, extending beyond the edge of the carapace. The carapace is green in colour, with violet coloration on the chelipeds and parts of the legs (Plate 1K).

2) Family Calappidae

***Calappa lophos* (Herbst, 1782)**

Common name: Common box crab
The carapace is dome-shaped and smooth. The posterolateral region of the carapace bears strong lateral projections and distinct transverse red stripes. The carapace is yellowish-beige in colour, with minute red spots. The chelipeds display red streaks and spots (Plate 1L).

***Calappa bilineata* (Ng, Lai and Aungtonya, 2002)**

Common name: Box Crab
The carapace is smooth, with two longitudinal lines present on the cardiac and gastric regions. Carapacial teeth are present on the posterior part of the carapace. The carapace is yellowish-brown in colour, covered with minute red spots, while the legs are pale yellow (Plate 1M).

***Matuta planipes* (Fabricius, 1798)**

Common name: Flower moon crab
The carapace is rounded, with unevenly serrated antero-lateral margins and two long lateral spines. A reticulate network of maroon lines is present on the carapace. The legs are yellow in colour, and the walking legs terminate in spade-like tips (Plate 1N).

3) Family Majidae

***Hyas araneus* (Linnaeus, 1758)**

Common name: Great spider crab
The carapace is pear-shaped or sub-triangular and covered with large tubercles. It is reddish-brown dorsally (Plate 1O).

4) Family Carpiliidae

***Carpilius maculatus* (Linnaeus, 1758)**

Common name: Spotted reef crab
The carapace is ovate with a smooth and convex dorsal surface. It is brown in colour with a few large red spots (Plate 2P).

5) Family Grapsidae

***Metopograpsus messor* (Forskal, 1775)**

Common name: Rock crab
The front occupies more than half of the maximum width of the carapace. The merus of the external maxilliped is broader than long. Fine transverse markings are present on the post-frontal region. The carapace and legs are mottled brownish-green, while the claws are brownish-red. The chelipeds are violet in colour (Plate 2Q).

***Grapsus albolineatus* (Lamarck, 1818)**

Common name: Mottled Sally-light-foot
The carapace is rounded, with antero-lateral margins that are also rounded and each bearing one tooth. The lateral regions exhibit numerous oblique striae. The fingertips are strongly spoon-shaped. The carapace displays green and white transverse markings (Plate 2R).

6) Family Plagusiidae

***Plagusia immaculata* (Lamarck, 1818)**

Common name: N/A

The carapace is sub-hexagonal, covered with small bumps, and coated with short plumose hairs. The pincers are short and slender. The carapace is light brown in colour, with blood-red spots on the legs and carapace (Plate 2S).

7) Family Dromiidae

***Dromia dehanni* (Rathbun, 1923)**

Common name: Sponge crab
The antero-lateral margin bears four teeth. The body is brown in colour, and the chelipeds are pink (Plate 2T).

8) Family Dorippidae

***Dorippe frascone* (Herbst, 1785)**

Common name: N/A
The carapace is nodular and wrinkled. The last two pairs of legs have curved dactyli, and the fourth pair of true legs is less than half the length of the second pair. The body is brownish-pink in colour (Plate 2U).

9) Family Parthenopiidae

***Lambrus prensor* (Herbst, 1796)**

Common name: N/A
The carapace is broadly triangular with one median and two lateral carinae (carinated). The chelipeds are much longer and more massive than the other legs. The fingers of the chelipeds are strongly incurved. The body is light green in colour (Plate 2V).

10) Family Epialtidae

***Doclea ovis* (Herbst, 1788)**

Common name: Spider crab
The carapace is rounded and light brown in colour. The chelipeds are whitish, with pinkish tips on each of the walking legs (Plate 2W).

11) Family Xanthidae

***Atergatis ocyroe* (Herbst, 1901)**

Common name: Reef crab
The carapace is oval-shaped and smooth, cream-coloured with dark brown to maroon patches or blotches. The chelipeds and legs are covered with brown spots (Plate 2X).

12) Family Ocypodidae

***Ocypode platytarsus* (H. Milne Edwards, 1852)**

Common name: Stalk eyed ghost crab
The carapace is pale yellow. The stridulating organ on the palm of the cheliped consists of a row of tubercles. Pointed stalks protrude above the eyes of adult specimens. The tips of the chelae are spoon-shaped (Plate 2Y).

13) Family Galenidae

***Galene bispinosa* (Herbst, 1783)**

Common name: Square-shelled crab

The carapace is pentagonal, broader than long, with a convex anterior region. The frontal region is deflexed downward. The antero-lateral margin bears two thorn-shaped teeth. The coloration is a mixture of brown and pinkish Purple (Plate 2Z).

3.2 Abundance of edible portunid crabs

Abundance and percentage of occurrence of edible portunid crabs were calculated. *Portunus pelagicus* was recorded throughout the study period (December 2022-August 2023). *Portunus sanguinolentus* was recorded during December-February and June-July in relatively higher abundance. The highest abundance of *Charybdis feriatus* was recorded during March-July (Figure 5).

The highest percentage of abundance was recorded at Valvettithurai (38.66%), followed by Munai (33.39%) and Sakkotei (21.1%) (Figure 3). *Portunus sanguinolentus* was identified as the dominant species accounting for 33.47%, followed by *Portunus pelagicus, Charybdis feriatus*, *Charybdis natator* and *Portunus gladiator* representing 23.33%, 16.16%, 12.37%, and 7.83%, respectively (Figure 4).

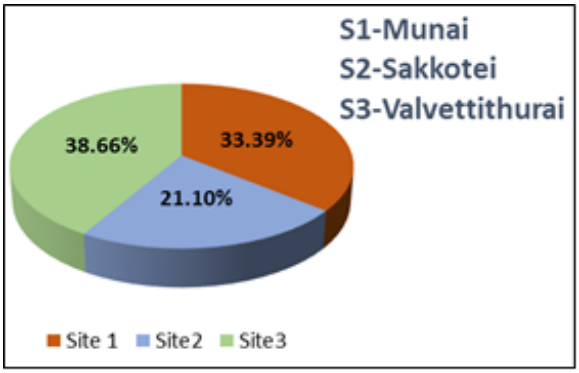

Figure 3. Percentage of occurrence of edible crab species (Portunidae family) in three sampling sites of Vadamaradchy

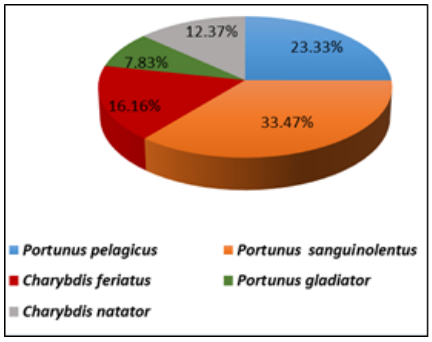

Figure 4. Percentage of occurrence of edible portunid crab species in Vadamaradchy fish landing sites

Out of the 26 species recorded, four species have already been reported during the 1992-1993 period by Chitravadivelu from Jaffna lagoon [8,9]. Eleven species of crabs have also been reported by Chanthirica and Sivashanthini (2006) from Point Pedro [10,11]. *Scylla serrata*, *Portunus pelagicus*, *Thalamita craneta*, *Charybdis natator* and *Portunus sanguinolentus* have also been reported by Tharmine *et al* (2014) from Navanthurai coastal waters [12].

Plate 1. Identified crabs (**A**- *Portunus pelagicus*, **B**- *Portunus sanguinolentus*, **C**- *Portunus gladiator*, **D**- *Charybdis feriatus*, **E**- *Charybdis natator*, **F**-*Charybdis hellerii*, **G**- *Charybdis affinis*, **H**- *Charybdis lucifera*, **I**- *Scylla serrata*, **J**- *Thalamita crenata*, **K**- *Podophthalmus vigil*, **L**- *Calappa lophos*, **M**- *Calappa bilineata*, **N**- *Matuta planipes*, **O**- *Hyas araneus*)

Plate 2. Identified crabs (**P**- *Carpilius maculatus*, **Q**- *Metopograpsus messor* **R**- *Grapsus albolineatus*, **S**- *Plagusia immaculata*, **T**- *Dromia dehanni*, **U**- *Dorippe frascone*, **V**- *Lambrus prensor*, **W**- *Doclea ovis*, **X**- *Atergatis ocyroe*, **Y**- *Ocypode platytarsus*, **Z**- *Galene bispinosa*)

14 species were first time documented in the Vadamaradchy sea waters. These included *Portunus gladiator*, *Matuta planipes*, *Charybdis hellerii*, *Charybdis affinis*, *Charybdis lucifera*, *Podophthalmus vigil*, *Calappa lophos*, *Calappa bilineata*, *Grapsus albolineatus*, *Plagusia immaculata*, *Dorippe frascone*, *Doclea ovis*, *Atergatis ocyroe* and *Galene bispinosa*.

In the present study, *Scylla serrata* and *Thalamita crenata* were only recorded in Kakkaithevu area. *Charybdis hellerii* is considered an invasive alien species in many regions, including the Mediterranean Sea and Western Atlantic [13]. *Metopograpsus messor*, *Grapsus albolineatus* and *Plagusia immaculata*, collected from rocky shores, indicate well-developed intertidal habitats and contribute to ecosystem balance as grazers and prey for higher trophic levels.

Atergatis floridus, a close relative of *Atergatis ocyroe*, is well-documented as poisonous [14], suggesting that *A. ocyroe* may also pose similar risks, although direct studies are lacking. Overall, the findings highlight the diversity and ecological importance of crabs in northern Sri Lanka, and the need to monitor commercially important species.

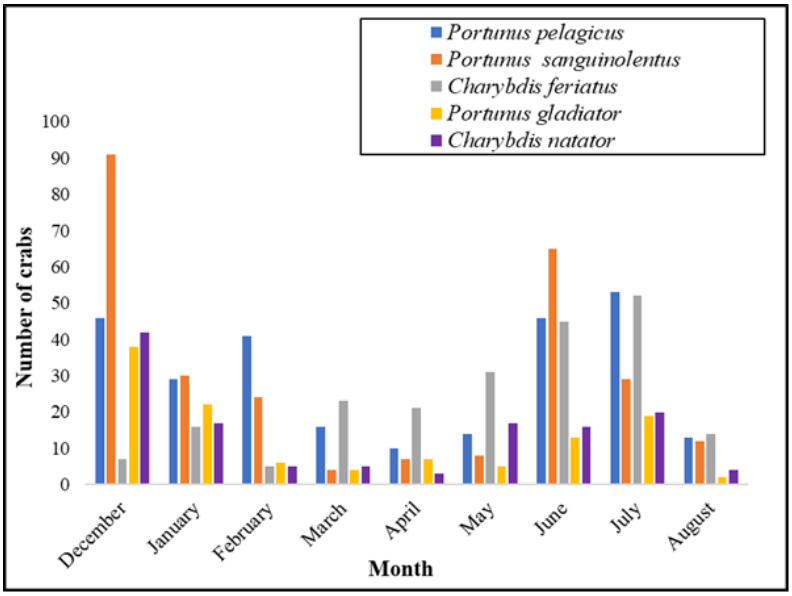

Figure 5. Abundance of edible portunid crabs in Vadamaradchy during December 2022 –August 2023

Table 2. Crab species that recorded from Jaffna area (Vadamaradchy and Kakkaithevu)

Family	Identified species	Locations	
		L1	L2
Portunidae	*Portunus pelagicus*	+	+
	Portunus sanguinolentus	+	-
	Portunus gladiator	+	-
	Charybdis feriatus	+	-
	Charybdis natator	+	-
	Charybdis helleri	+	-
	Charybdis affinis	+	-
	Charybdis lucifera	+	-
	Scylla serrata	-	+
	Thalamita crenata	-	+
	Podophthalmus vigil	+	-
Calappidae	*Calappa lophos*	+	-
	Calappa bilineata	+	-
	Matuta planipes	+	-
Majidae	*Hyas araneus*	+	-
Carpiliidae	*Carpilius maculatus*	+	-
Grapsidae	*Metopograpsus messor*	+	-
	Grapsus albolineatus	+	-
Plagusiidae	*Plagusia immaculata*	+	-
Dromiidae	*Dromia dehanni*	+	-
Dorippidae	*Dorippe frascone*	+	-
Parthenopiidae	*Lambrus prensor*	+	-
Epialtidae	*Doclea ovis*	+	-
Xanthidae	*Atergatis ocyroe*	+	-
Ocypodidae	*Ocypode platytarsus*	+	-
Galenidae	*Galene bispinosa*	+	-

+: Present - : Absent L1- Vadamaradchy L2- Kakkaithevu

4. CONCLUSION

The present study revealed that at least twenty-six species of crabs belonging to 13 families. Fourteen species were first time documented in the Vadamaradchy sea waters. A higher number of crab species were recorded at the

Vadamaradchy landing sites compared to the Kakkaithevu site.

The highest percentage of abundance was recorded in Valvettithurai (38.66%). *Portunus sanguinolentus* was recorded as the most abundant species (33.47%) in Vadamaradchy landing sites. *Portunus pelagicus* was recorded throughout the study period. Further studies are needed to include water quality analysis to provide better insight into biodiversity differences in the two locations.

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