



A Small Collection of Brachyuran Crabs (Crustacea: Decapoda) from Lamongan Waters, East Java, Indonesia

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Abstract

The brachyuran crabs are one of the most diverse groups in the crustacean fauna, and their highest diversity has been confirmed to occur at the Western Pacific Region, including Indonesia. Lamongan is located in East Java, Indonesia, and this regency has been acknowledged as the main source of the fisheries catch from East Java. However, information about the diversity of the marine crabs in this location is scarce, due to the main studies on crabs in this region were only focus on commercial crabs, such as *Portunus pelagicus*. Therefore, this study aims to provide preliminary data on the diversity of crabs in Lamongan waters, East Java, Indonesia. A short survey in September 2022, was conducted to observe and explore the crab biodiversity in this area. As a result, a total of six species of brachyuran crabs from four families (Eriphidae, Menippidae, Portunidae dan Vanuridae) were found in the intertidal and reef zone of this water, *Eriphia ferox* (Koh and Ng Raffles Bull Zool 56(2):327?355, 2008); *E. sebana* (Shaw and Nodder Naturalist's Miscellany: 15, 589?612, 1803), *Myomenippe hardwickii* (Gray In: The Zoological Miscellany, 1831), *Thalamita crenata* (Rüppell Br?nner HL, 1830); *T. danae* (Stimpson Proc Acad Nat Sci Philadelphia 10:31?40, 1858) and *Varuna litterata* (Fabricius Proft et Storck, 1798). The result of this study may fill the gap about in information about the diversity of crabs in Lamongan water, East Java, Indonesia, as only 20 species of the marine crabs were previously recorded.

Keywords Eriphidae · Marine crab · Menippidae · Portunidae · Vanuridae

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Introduction

Crustacean fauna is one the major groups of invertebrates found in our environment (Brusca and Brusca 2003). One of the most diverse groups of the crustaceans is the crab (Brusca et al. 2016), which can be found from in both terrestrial and aquatic habitats. A total of 38 superfamilies of brachyuran crabs belonging to 93 families, 1,271 genera and 6,793 species (including subspecies, with more than 1,000 are synonyms) have been reported by Ng et al. (2008). Davie et al. (2015) suggested that a systematics description exceeding 7,250 species, and the current number has increased to 7,773 species (DecaNet eds. 2024a).

Their occurrence in habitats play important roles in the ecosystem. For examples, the increase of sediment-water exchange, oxidation process together with substrate drainage, decomposition from plant debris, and also affecting the growth of microorganisms came from burrowing activities (Lim 2003). Bioturbation and herbivory habits sometimes influence the ecological process in habitats (Alberti et al. 2015), such as feeding habit of the grapsids will produce a

large amount of organic matter in the mangrove forest and other activities also influence the growth of the mangroves (Lee 1998). Furthermore, crabs are used as bioindicator for ecosystem health, such as assessing mangrove health using the fiddler crabs (Pinheiro et al. 2017), harbor health using *Scylla serrata* (Forskål, 1775) (Flint et al. 2021) and tracing the metal content using *Pachygrapsus marmoratus* (Fabricius, 1787) (Álvaro et al. 2016).

Due to their high abundance and important role, investigations into crab diversity have been carried in every region except Antarctica. Ng (1998) explained that the highest diversity of the brachyuran crabs occurs in the Western Central Pacific, including Indonesia. However, valid data about the diversity of crabs in Indonesia are still unknown, although numerous of research efforts in the country. At least 50 species of brachyuran crabs from Java Island have been deposited in the Museum of Zoologicum Bogoriense (MZB), West Java, Indonesia (Murniati et al. 2022). Furthermore, in the last 10 years, more than 40 new species of the brachyuran crabs have also been reported from this country (see Table 1).

Lamongan is located at the Java Island (East Java), Indonesia and this regency also faces the sea water from the Java Sea. A lot of marine ecosystems can be found in here which provide habitat for the fauna. However, studies about the biodiversity of marine fauna in this region, especially the crabs, is still limited. A preliminary investigation about the invertebrate fauna in Kemantren coast, Lamongan water, reported that a total of 100 species belonging to 9 classes occurred in this area. Among them, only 9 species of crabs can be found there (Rahayu et al. 2019). On the other hand, studies on the diversity of bivalvia (Atlanta et al. 2022) and the community structure of gastropods (Laily et al. 2022) have been conducted in Kutang coast, Lamongan water. However, no information about crab diversity from this area was available. Due to the lack of information, this study was conducted to provide preliminary data on the diversity of crabs in Lamongan waters, East Java, Indonesia.

Materials and methods

This study was conducted in the intertidal zone of the Kutang coast (6°53'4.20"S, 112°11'47.94"E), Lamongan, East Java, Indonesia (Fig. 1). This area is well-known as one of the docks for marine fisheries resources in East Java, Indonesia. The bottom of the intertidal zone in this area consists of a sandy and muddy substratum, some area planted with the seagrass *Thalassia hemprichii* (Ehrenberg) Ascheron, 1871, and it is also surrounded by the rocks or dead corals. The water is clear and has weak water current with a depth of ~0.5 m during low tide and could reach more than

1.0 m during the high tide. In general, low tide occurs during the daytime (11.00 or 12.00 AM) until the afternoon or nighttime (05.00 or 06.00 PM) of the local time.

Crabs were collected during low tide at the day time using bait traps and direct-hand collection. For the traps, equipment was installed on the seagrass bed using spoiled or smelly fish. Meanwhile, for hand collecting, the crabs were caught by flipping rocks or dead corals. The collected specimens were then stored in a cool box containing ice for temporary preservation and photographed directly in the field to obtain the living coloration before being preserved in 70% ethanol (see: Ng (2017); for details). All specimens were subsequently brought to the Laboratory of Animal Systematics, Department of Biology, Universitas Negeri Surabaya for further observation.

In the laboratory, all crabs were sorted, and identification was performed following Wee and Ng (1995), Ng (1998) and Koh and Ng (2008). The validity of the species was referenced to the DecaNet (World List of Decapoda) alphabetically as well as the history name (such as junior synonyms or misspelling) of each species, if any, are provided. The carapace dimension (CD) was measured from the maximum carapace length × the carapace width using a vernier caliper. After measurement, all crabs were stored in a collection bottle containing 70% ethanol and deposited in the Museum of Zoologicum Bogoriense (MZB), Cibinong, West Java, Indonesia. Since our finding are common crab species, description of each species is not provided in this paper.

Results

Systematic Account

Superfamily Eriphioidea MacLeay 1838.

Family Eriphiidae MacLeay 1838.

Genus *Eriphia* Latreille 1817.

Eriphia ferox Koh and Ng 2008 (Fig. 2A).

Material examined: Indonesia: Lamongan, Kutang coast, 6°53.064'S 112°11.778'E, 22.09.2022, 1♂ (CD: 44.20 mm × 35.12 mm); MZB Cru 5785, Coll: Rofiza Yolanda and Dimas Ardiansyah Putra Pratama.

Remarks This species was captured under the dead corals by hand. The taxonomy of Eriphian crabs have been thoroughly described by Koh and Ng (2008), and the species *E. ferox* can be recognized from the other Eriphian crab group by the granulose outer surface of the palm, reddish eyes, pubescent carapace and chela with short setae, relatively slender gonophore, and an expanded basal part without

Table 1 The establishment of several new species of the brachyuran crabs in Indonesia since 10 years ago

No	Species	Distribution	References
1	<i>Hyastenus baru</i>	Kei Besar island, Maluku	Windsor and Ahyong (2013)
2	<i>Malayopotamon weh</i>	Weh island, Sumatra	Ng (2014a)
3	<i>Parathelphusa nobilii</i>	Western Kalimantan	Ng (2014b)
4	<i>Geosesarma bintan</i>	Bintan island	Schubart and Ng (2014)
5	<i>Geosesarma raj</i>	Bintan island	Schubart and Ng (2014)
6	<i>Hexapus timika</i>	Timika, Papua	Rahayu and Ng (2014)
7	<i>Hexapinus latus</i>	Kecinan, Lombok	Rahayu and Ng (2014)
8	<i>Hexapinus simplex</i>	Ekas, Lombok	Rahayu and Ng (2014)
9	<i>Mariaplax cyrtophallus</i>	Timika, Papua	Rahayu and Ng (2014)
10	<i>Mariaplax aspera</i>	Lombok	Ng and Rahayu (2015)
11	<i>Aletheiana tenella</i>	Central Sulawesi	Ng and Lukhaup (2015)
12	<i>Geosesarma ambawang</i>	Pontianak	(Ng 2015)
13	<i>Geosesarma pontianak</i>	Pontianak	(Ng 2015)
14	<i>Geosesarma pylaemenes</i>	Pontianak	(Ng 2015)
15	<i>Geosesarma dennerle</i>	Cilacap, central Java	Ng et al. (2015)
16	<i>Geosesarma hagen</i>	Cilacap, central Java	Ng et al. (2015)
17	<i>Parathelphusa pardus</i>	Pekanbaru, Riau	Ng et al. (2016)
18	<i>Sundathelphusa tuerkayi</i>	Lombok island	Ng and Anker (2016)
19	<i>Occulthus halimun</i>	Halimun Salak, West Java	Ng and Wowor (2018)
20	<i>Geosesarma lebak</i>	Lebak, Banten	Ng and Wowor (2019)
21	<i>Geosesarma sukabumi</i>	Sukabumi, West Java	Ng and Wowor (2019)
22	<i>Geosesarma robustum</i>	Bogor, West Java	Ng and Wowor (2019)
23	<i>Geosesarma sekop</i>	Bogor, West Java	Ng and Wowor (2019)
24	<i>Geosesarma cikaniki</i>	Bogor, West Java	Ng and Wowor (2019)
25	<i>Elamenopsis gracilipes</i>	Papua	Rahayu and Ng (2019)
26	<i>Hyastenus tabolongi</i>	North Sulawesi	Lee and Ng (2019)
27	<i>Arges robustus</i>	Timika, Papua	Ng and Rahayu (2020)
28	<i>Arges raouli</i>	Timika, Papua	Ng and Rahayu (2020)
29	<i>Oreotlos octavus</i>	Sunda Strait	Mendoza and Nugroho (2021)
30	<i>Pilumnus swajayai</i>	Sunda Strait	Ng and Rahayu (2021)
31	<i>Tritodynamia nontjii</i>	Papua	Rahayu and Ng (2021)
32	<i>Borneosa serrata</i>	Bulungan, North Kalimantan	Ng and Grinang (2022)
33	<i>Chartocinus rarus</i>	West Papua	Ng and Rahayu (2022)
34	<i>Kingelus kasimi</i>	Maluku	Ng (2022)
35	<i>Geosesarma garutense</i>	Garut, West Java	Ng and Wowor (2022)
36	<i>Indopinnixa latimerus</i>	Flores	Ng and Rahayu (2022)
37	<i>Natunamon indonesicum</i>	Natuna island	Ng et al. (2023)
38	<i>Isolapotamon remotum</i>	Anambas	Ng et al. (2023)
39	<i>Geosesarma hashimi</i>	Natuna island	Ng et al. (2023)
40	<i>Geosesarma anambas</i>	Anambas	Ng et al. (2023)
41	<i>Parasesarma rahayuae</i>	Sulawesi	Shahdadi et al. (2023)
42	<i>Tmethypocoelis simplex</i>	Sulawesi	Murniati et al. (2023)
43	<i>Tmethypocoelis celebensis</i>	Sulawesi	Murniati et al. (2023)

shelf-like structure (Koh and Ng 2008). This crab is also called as red-eyed reef crab.

Eriphia sebana (Shaw and Nodder 1803) (Fig. 2B).

Cancer sebanus Shaw and Nodder 1803.

Cancer tearlachi Curtiss 1938.

Eriphia fordii MacLeay 1838.

Eriphia laevimana Guérin, 1832.

Eriphia sebana hawaiiensis Ward 1939.

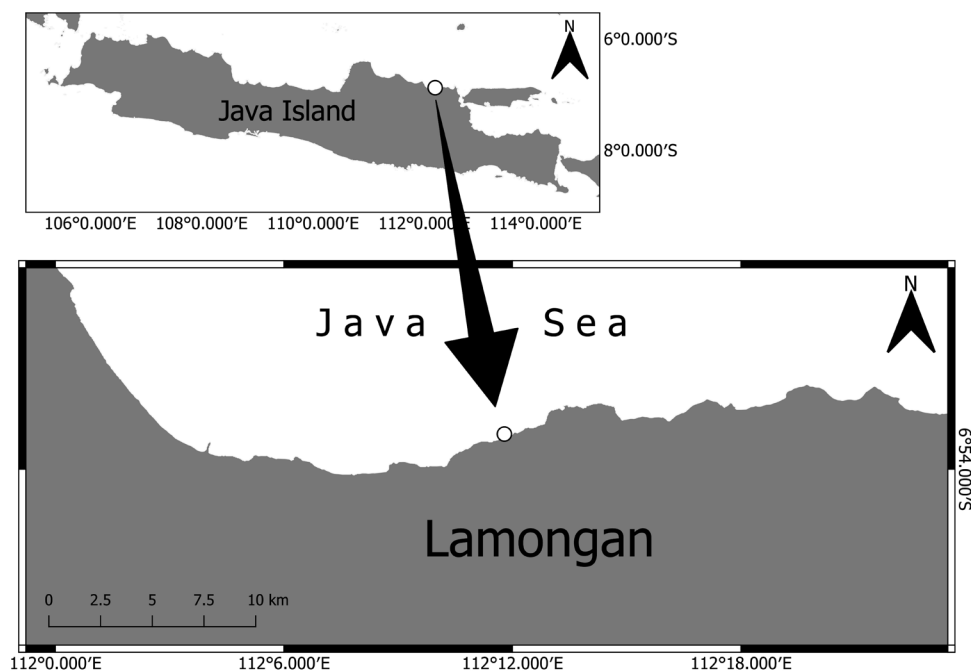
Eriphia trapeziformis Hess 1865.

Gecarcinus anisocheles Latreille 1818.

Material examined: Indonesia: Lamongan, Kutang coast, 6°53.064'S 112°11.778'E, 22.09.2022, 1♂ (CD: 42.56 mm × 35.5 mm), 1♀ (CD: 47.36 × 37.52 mm); MZB Cru 5786, Coll: Rofiza Yolanda and Dimas Ardiansyah Putra Pratama.

Remarks This species was captured under the dead corals by hand. The history of the name from this species was designed as *Cancer sebanus* by Shaw and Nodder (1803) until the name was revised, validated and referred to *E.*

Fig. 1 The map showing the study site of the brachyuran crab (white dot) from Kutang bay, Lamongan, East Java, Indonesia (6°53'4.20"S, 112°11'47.94"E)



sebana for the first time by Rathbun (1906) and used until now. This species is distinguishable from the other species where the frontal lobes tuberculated, with flattened tubercles and not pubescent (Koh and Ng 2008). This crab is well-known with smooth red-eyed crab.

Family Menippidae Ortmann 1893.

Genus *Myomenippe* Hilgendorf 1879.

Myomenippe hardwickii Gray 1831 (Fig. 2C).

Cancer hardwickii Gray 1831.

Menippe (Myomenippe) duplicidens Hilgendorf 1879.

Menippe granulosa Milne-Edwards 1867.

Myomenippe hardwicki (Gray 1831).

Material examined: Indonesia: Lamongan, Kutang coast, 6°53.064'S 112°11.778'E, 22.09.2022, 1♂ (CD: 61.50 mm × 43.8 mm); MZB Cru 5787, Coll: Rofiza Yolanda and Dimas Ardiansyah Putra Pratama.

Remarks This species was captured under the dead corals by hand. The species *M. hardwickii* was discovered and named for the first time after Major-General Thomas Hardwicke and Dr. John Edward Gray described and named it with a misspelling, *Myomenippe hardwicki* (Gray 1831). The major characters of this stone crab are where its eyes with green coloration, gastric region divided into three main regions, four broad teeth present on each anterolateral margin and a large molariform tooth at base of movable finger of larger chela (Ng 1998). This species is commonly known as the stone or thunder crab.

Superfamily Portunoidea Rafinesque 1815.

Family Portunidae Rafinesque 1815.

Genus *Thalamita* Latreille 1829.

Thalamita crenata Rüppell 1830 (Fig. 2D).

Talamita crenata Rüppell 1830.

Thalamita kotoensis Tien 1969.

Thalamita prymna var. *crenata* Rüppell 1830.

Thranita crenata (Rüppell 1830).

Thranita kotoensis (Tien 1969).

Material examined: Indonesia: Lamongan, Kutang coast, 6°53.078'S 112°11.789'E, 22.09.2022, 2♂ (CD: 67.50 mm × 44.8 mm; 71.00 mm × 47.48 mm); MZB Cru 5788, Coll: Rofiza Yolanda and Dimas Ardiansyah Putra Pratama.

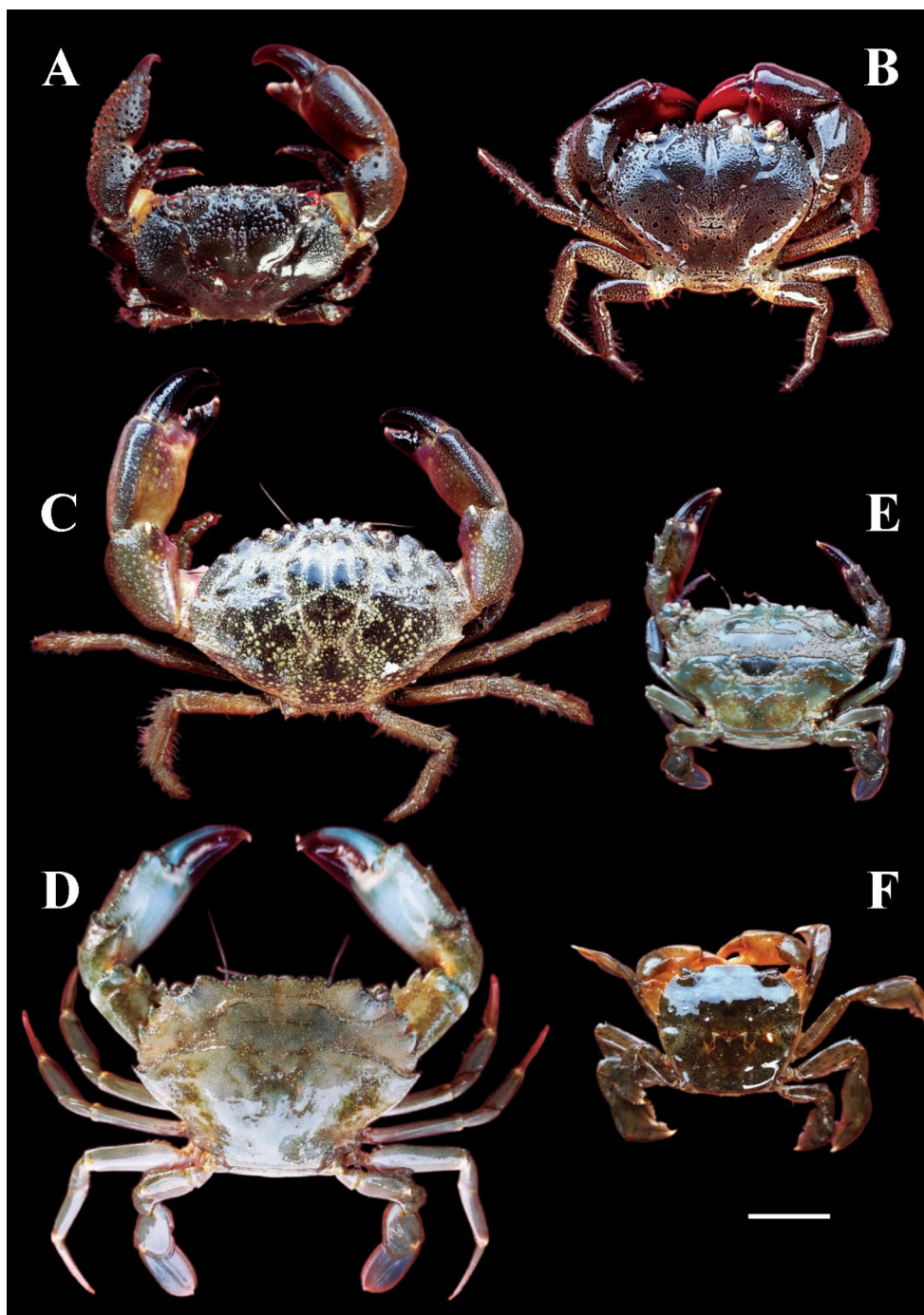
Remarks This species was captured on the seagrass bed (*Thalassia hemprichii*) using bait trap. Previously, Evans (2018) proposed to change the genus back to *Thranita* based on morphological comparison and molecular observation. However, to date, the genus was revised as *Thalamita* (DecaNet eds., 2024b). Among the group of *Thalamita*, the species *T. crenata* can be recognized from the other species where the surface of the carapace is smooth, ridges are low but distinct; front with 6 equal-sized and rounded lobes, five anterolateral tooth are subequal, and size decrease slightly from first to fifth and manus of the cheliped is smooth with single costa running to immovable finger on outer surface (Wee and Ng 1995; Ng 1998). This species is commonly known as powder blue-clawed swimming crab.

Thalamita danae Stimpson 1858 (Fig. 2E).

Thalamita prymna var. *proxima* Montgomery 1931.

Thalamita stimpsoni A. Milne-Edwards, 1830.

Fig. 2 The collected brachyuran crabs from Kutang bay, Lamongan, East Java, Indonesia (live coloration in dorsal view). **A** — *Eriphia ferox* Koh and Ng 2008 (male, MZB Cru 5785); **B** — *Eriphia sebana* (Shaw and Nodder 1803) (female, MZB Cru 5786); **C** — *Myomenippe hardwickii* Gray 1831 (male, MZB Cru 5787); **D** — *Thalamita crenata* Rüppell 1830 (male, MZB Cru 5788); **E** — *Thalamita danae* Stimpson 1858 (female, MZB Cru 5789); **F** — *Varuna litterata* (Fabricius 1798) (male, MZB Cru 5790). Scale bar equal 20 mm for A–F



Thranita danae (Stimpson 1858).

Material examined: Indonesia: Lamongan, Kutang coast, 6°53.064'S 112°11.825'E, 22.09.2022, 1♀ (CD: 49.65 mm × 33.00 mm); MZB Cru 5789, Coll: Rofiza Yolanda and Dimas Ardiansyah Putra Pratama).

Remarks This species was captured on the seagrass bed (*T. hemprichii*) using bait trap. The species *T. danae* can be recognized from the other species where the fourth anterolateral teeth is the smallest among all five anterolateral teeth,

carpus of cheliped armed with four spines, cardiac and mesobranchialridges are absent, gonophore 1 basal lobe is rounded with convex lateral border (Wee and Ng 1995). This species is commonly known as blue swimming crab.

Superfamily Grapsoidea MacLeay 1838.

Family Varunidae Milne Edwards 1853.

Genus *Varuna* H. Milne Edwards in Bory de Saint Vincent (ed.), 1830.

Varuna litterata (Fabricius 1798) (Fig. 2F).

Cancer litterata Fabricius 1798.

Cancer simmonsii Curtiss 1938.

Varuna tomentosa Pfeffer 1889.

Material examined: Indonesia: Lamongan, Kutang coast, 6°53.064'S 112°11.825'E, 22.09.2022, 1♂ (CD: 29.70 mm × 32.40 mm); MZB Cru 5790, Coll: Rofiza Yolanda and Dimas Ardiansyah Putra Pratama.

Remarks This species was captured under the dead corals by hand. *Varuna litterata* is very close to its ally *V. yui*, however, both of them can be differentiated from the carapace, chelipeds, male sixth abdominal somite, gonopore 1 and ambulatory legs (Hwang and Takeda 1986).

Varuna litterata is also known as the river swimming crab or the peregrine crab.

Discussion

A total of six species belonging to four families and four genera were collected from Kutang coast, Lamongan, East Java, Indonesia. Based on scientific literatures, all of these species are common marine crabs in the Asiatic region, as well as in Indonesian water. For examples, *E. ferox* and *E. sebana*, are known from the Indo-Pacific region, ranging from north Japan, China, Taiwan to Pacific Islands such as Hawaii, French Polynesia, and Samoa, Australia to Christmas Island, Cocos-Keeling Islands to India, eastern coasts of Africa, Thailand, Malaysia, Singapore and Indonesia (Koh and Ng 2008). Similarly, the remaining species in our collection (i.e., *M. hardwickii*, *T. crenata*, *T. danae* and *V. litterata*) are also common and very abundant in the Indo-Pacific region (see Wee and Ng 1995; Ng 1998; Lagare et al. 2020; Wong et al. 2021). In Indonesia, especially in Java, their occurrence have also been recorded from Tikus Island, Seribu Islands, West Java (Anggraeni et al. 2015), Karimunjawa National Park, Central Java (Putriningtias et al. 2014), Gresik (Fariedah et al. 2023) and also at Meru Betiri National Park, East Java (Susilo et al. 2020).

So far, information about the biodiversity of the crab from Lamongan water has been very limited. Only 20 species of the brachyuran crabs have been reported from Lamongan water at three locations (Table 2). Since Lamongan is known as the center of the fisheries catch in East Java, studies about crabs in the Lamongan water have primarily focused on the commercial Portunid crab, *Portunus pelagicus*, due to its high market value (Lelono and Wardhani 2017; Rahman et al. 2019, 2021; Amelia et al. 2020; Rohmayani et al. 2020). Therefore, it is no doubt that information about the crab species diversity from Lamongan water is scarce.

Limitations in project support and also field assistant during the crab collecting in this intertidal zones, especially at the reef zone during the low tide, were the main factors that may restrict and influence the present work. Furthermore, during this survey, several threats to the crabs were easily observed in this area that may affect their occurrence and diversity, such as the transformation of this area into a tourism or recreational zone, artisanal fishing, numerous fish/crab traps, and also domestic and industrial wastes. The extent and impacts of such threats shall need to be studied further. The results of the present study highlight the knowledge gaps and the need for greater efforts in studying the

Table 2 Checklist of the brachyuran crabs from Lamongan water, East Java, Indonesia

No	Species	Distribution	References
1	<i>Atergatis integerrimus</i>	Kemantren coast	Rahayu et al. (2019)
2	<i>Chlorodiella nigra</i>	Kemantren coast	Rahayu et al. (2019)
3	<i>Eriphia ferox</i>	Kutang coast	This study
4	<i>Eriphia sebana</i>	Kutang coast	This study
5	<i>Etisus laevimanus</i>	Lorena coast	Khosyi and Andriani (2023)
6	<i>Etisus</i> sp.	Kemantren coast	Rahayu et al. (2019)
7	<i>Grapsus albolineatus</i>	Kemantren coast	Rahayu et al. (2019)
8	<i>Leptodius sanguineus</i>	Kemantren coast	Rahayu et al. (2019)
9	<i>Leptodius</i> sp.	Kemantren coast	Rahayu et al. (2019)
10	<i>Metopograpsus</i> sp.	Lorena coast	Khosyi and Andriani (2023)
11	<i>Myomenippe hardwickii</i>	Lorena coast, Kutang coast	Khosyi and Andriani (2023); This study
12	<i>Pilumnus</i> sp.	Lorena coast	Khosyi and Andriani (2023)
13	<i>Platypodia granulosa</i>	Kemantren coast	Rahayu et al. (2019)
14	<i>Portunus pelagicus</i>	Lorena coast	Khosyi and Andriani (2023)
15	<i>Pseudosesarma edwardsii</i>	Kemantren coast	Rahayu et al. (2019)
16	<i>Thalamita crenata</i>	Lorena coast	Khosyi and Andriani (2023)
17	<i>Thalamita danae</i>	Kutang coast	This study
18	<i>Thalamita</i> sp.	Kemantren coast	Rahayu et al. (2019)
19	<i>Varuna litterata</i>	Kutang coast	This study
20	<i>Xanthias lamarkii</i>	Kemantren coast	Rahayu et al. (2019)

brachyuran fauna of Lamongan water, as well as an increase in crabs' survey. The present effort, covering a wider scope of localities in Kutang beach, is a significant contribution to knowledge on the diversity of brachyuran crabs of the Lamongan water, East Java, Indonesia.

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Data Availability All datasets generated and/or analyzed during this study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent for Publication Not applicable.

Human and Animal Ethics Not applicable.

Competing Interests The authors have no competing interests.

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