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Emerita pangandaranensis sp. nov., a new sand crab (Anomura: Hippidae) from South Coast of Java, Indonesia

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Abstract

Background

The report of genus *Emerita* from Indonesia has only contained one species, namely *Emerita emeritus*. They were found on the west coast of Sumatera and the south coast of Java. Although Indonesia is the number two country in the world that has long beaches and is dominated by sandy beaches, as the preferred habitat for sand crabs, reports regarding these biotas in Indonesia are still limited. The previous studies have expected about the occurrence of the other species which was related to *Emerita emeritus* in Southern Java.

New information

We reported the new species of *Emerita* which was found in Pangandaran beach, West Java. We found it in an intertidal area, near Citonjong Estuary. Here, we described and illustrated the species.

Keywords

intertidal, new *Emerita*, sand crab, Southern Java

Introduction

Emerita belongs to family Hippidae, infraorder Anomura. In Indo-Pacific, five species of *Emerita* have been well studied, namely *Emerita emeritus*, *E. austroafricana*, *E. holthuisi*, *E. karachiensis*, and *E. taiwanensis*. The five species have similarities with each other. *Emerita austroafricana* has a close resemblance to *E. emeritus*, while *E. karachiensis* has

close resemblance to E. holthuisi (Niazi and Haqub 1970). In Indonesia, only one species of the genus *Emerita* has been reported (*Emerita emeritus*). It was reported from the west coast of Sumatera (Padang, Bengkulu) and south coast of Java (Cilacap, Kebumen, Bantul, Purworejo) (Wardiatno and Mashar 2013, Wardiatno Y et al. 2015, Nugaraha et al. 2018).

Anomura inhabits the sandy beach, predominantly in the tropical area (Boyko and Harvey 1999). Indonesia is one of the suitable habitats for them that belongs to the second-longest coastline in the world and has a tropical climate. The high activity in coastal areas of Indonesia makes these zones rich in nutrients (Hanim et al. 2021). This situation may influence the occurrence of the sand crab (Anomura). Like the other two genera in the family Hippidae (*Hippa* and *Mastigochirus*), *Emerita* also spends most of their time burrowing into the sand, especially in the swash zone. One of the beaches with high activity is Pangandaran beach, which is located in Pangandaran Regency, West Java.

In this study, we report a new *Emerita* from Indonesia that was a very close resemblance to *E. emeritus*. They were distinguished from the species by the spines on the inner margin of the first pereiopod that is sturdy in the new *Emerita*, but with shallow bases (weak spine) in *E. emeritus* (Niazi and Haqub 1970, Sankolli 1962). Another difference is in the outer anterolateral angle of the merus of the third maxilliped which is rectangular and not produced in the new type of *Emerita*, but with tooth-like produced with a horny tip in *E. emeritus* (Sankolli 1962). There are at least two previous studies that have suspected the existence of other species besides *Emerita emeritus* in southern Java (Butet et al. 2019, Nuryanto et al. 2020). This research aims to describe new species of the genus *Emerita* in Indonesian waters with a morphological and molecular approach.

Materials and methods

Four specimens were captured by hand in the intertidal zone on the South Coast of Java. The specimens were preserved in 70% alcohol for a day, then substituted in 96% alcohol for storage and deposited at the Museum Zoologicum Bogoriense (MZB), Research Center for Biology, Indonesian Institute of Sciences (LIPI), Cibinong, West Java, Indonesia. Specimens were photographed using a Canon camera (PowerShot SX430 IS) and the smaller parts were photographed using Optilab Olympus SZ61, and then illustrated using a Huion tablet (canvas Pro 13).

Taxon treatment

Emerita pangandaranensis Hanim, Farajallah, Putri 2021, sp. n.

Materials

Holotype:

a. kingdom: Animalia; phylum: Arthropoda; class: Malacostraca; order: Decapoda; family: Hippidae; genus: *Emerita*; country: Indonesia; countryCode: IDN; stateProvince: West

Java; county: Pangandaran Regency; locality: Pangandaran Beach; verbatimElevation: 0 m a.s.l; verbatimLatitude: 7°42'11.1"S; verbatimLongitude: 108°39'22.5"E; eventDate: 2020-10-07; individualCount: 1; sex: male; catalogNumber: MZB Cru 5338; recordedBy: Nisfa Hanim; disposition: in collection; associatedSequences: MZ571198; identifiedBy: Nisfa Hanim; Achmad Farajallah; dateIdentified: 2021-0; type: PhysicalObject; institutionCode: MZB; collectionCode: MZB Cru; basisOfRecord: PreservedSpecimen

Paratypes:

a. kingdom: Animalia; phylum: Arthropoda; class: Malacostraca; order: Decapoda; family: Hippidae; genus: *Emerita*; country: Indonesia; countryCode: IDN; stateProvince: West Java; county: Pangandaran Regency; locality: Pangandaran Beach; verbatimElevation: 0 m a.s.; verbatimLatitude: 7°42'11.1"S; verbatimLongitude: 108°39'22.5"E; eventDate: 2019-08-22; individualCount: 1; sex: Female; catalogNumber: MZB Cru 5339; recordedBy: Achmad Farajallah; Nisfa Hanim; disposition: in collection; identifiedBy: Nisfa Hanim; dateIdentified: 2021-05; type: PhysicalObject; institutionCode: MZB; collectionCode: MZB Cru; basisOfRecord: PreservedSpecimen

b. kingdom: Animalia; phylum: Arthropoda; class: Malacostraca; order: Decapoda; family: Hippidae; genus: *Emerita*; country: Indonesia; countryCode: IDN; stateProvince: Central Java; county: Cilacap Regency; locality: Sodong Beach; verbatimElevation: 0 m a.s.l; verbatimLatitude: 7°41'38.8356"S; verbatimLongitude: 109°11'18.1572"E; eventDate: 2020-10-04; individualCount: 2; sex: Female; catalogNumber: MZB Cru 5340; recordedBy: Achmad Farajallah; disposition: in collection; identifiedBy: Nisfa Hanim; dateIdentified: 2021-05; type: PhysicalObject; institutionCode: MZB; collectionCode: MZB Cru; basisOfRecord: PreservedSpecimen

Description

Body is almost cylindrical; the frontal margin of the carapace is tridentate (with three lobes). All three lobes sharply triangular (horny tips), the median lobe is shorter than the lateral lobes, separated by the U-shaped sinus (Fig. 1a). The U-shaped sinus on each side is greater in width than the breath of the median lobe at the base. The dorsal surface of the carapace is covered with quite prominent transverse rugae, in the area between the cardiac region and the frontal lobes. The lateral border of the carapace is serrulate in its anterior half. The serrulate appearance formed by the minutely setose pit. Posterolateral carapace margin rounded.

Eyes with slender, elongated peduncles, length (including cornea) exceeding the tip of the longest horny spine on the second antennal segment (Fig. 1a). Antennular flagellum with 27 articles. The second antennal segment with three large spines distally, all with horny tips, median spine is the longest (Fig. 1b).

Merus of the third maxilliped rectangular, the length approximately 1.63 times as long as greatest width. The outer anterolateral angle of the merus of the third maxilliped is rectangular, not produced. The antero-internal lobe is blunt, distally rounded, but prominent (high) (Fig. 1c).

Dactylus of the first pereiopod elongated, 1.85 times as long as greatest width, distally with one spine, lower margin with five distinct horny spines, no spine on the upper margin (Fig. 1d).

Diagnosis

The spines in dactyls of the first pereiopod contain five distinct spines on the inner margin. The spine on the terminal or apical spine and the last spine is relatively shorter than the three others, with no one on the upper margin.

Etymology

The name of the new species has been taken from the name of the area where the holotype was found.

Distribution

Pangandaran and Cilacap (South Coast of Java, Indonesia)

Discussion

For several characters such as the spines in dactyls of the first legs, this species is most similar to *E. karachiensis* and *E. holthuisi* that have spines about four until six on the inner margin of dactyls of the first pereiopod and have no spine on the outer margin. For merus of the third maxilliped, this species has a close resemblance to *E. holthuisi* which both of them have the outer anterolateral angle of the external margin of the merus of the third maxilliped is rectangular and not produced (Table 1). *Emerita holthuisi* was from India and *E. karachiensis* was from Pakistan.

These *Emerita* were found in Pangandaran beach and the same kinds were also found in Cilacap. These two locations were one coastline (south coast of Java), and face directly to the Indian Ocean. According to the previous studies as was mentioned in the preface, where *E. emeritus* was also found in Cilacap, it means both species were sympatric.

In the course of our research on sand crabs, we usually find the presence of this group on beaches close to river mouths. Like this study, we found it on Pangandaran beach which is close to the mouth of the Citunjong river. Perhaps the link between the existence of this species and the river mouth is about the availability of abundant food because the presence of the river indicates the existence of human settlements which indirectly contribute to the improvement of the food chain. In this case, the remnants of human food distributed to the estuary can be utilized by sand crabs, one of which acts as a detritivore.

References

- Boyko C, Harvey A (1999) Crustacea Decapoda: Albuneidae and Hippoidae of the tropical Indo-West Pacific region. In: Crosnier A (Ed.) Resultats des campagnes MUSORTOM, volume 20. Memoires du Museum National d'Histoire Naturelle 180: 379-406.

- Butet, Dewi I, Zairion, Halim A (2019) Validasi species undur-undur berdasarkan penanda molekuler 16s rRNA dari perairan Bantul dan Purworejo. Jurnal Pengelolaan Perikanan Tropis 3 (2): 28-35.
- Hanim N, Wardiatno Y, Perwitasari D, Suman A, Parlindungan D, Farajallah A (2021) Distribution of *Matuta purnama* J.C.Y. Lai & Galil, 2007 (Brachyura: Matutidae) outside type locality. 744. IOP Conference Series: Earth and Environmental Science. https://doi.org/10.1088/1755-1315/744/1/012023
- Hsueh P (2015) A new species of *Emerita* (Decapoda, Anomura, Hippidae) from Taiwan, with a key to species of the genus. Crustaceana 88 (3): 247-258. https://doi.org/10.1163/15685403-00003413
- Niazi M, Haqub M (1970) On new species of mole-crab (*Emerita karachiensis* sp. nov.) with a key to common Indo-Pacific Species). Marine Biological Research Laboratory1-5.
- Nugaraha O, Suryanti, Rudyanti S (2018) Karakterisasi habitat dan kelimpahan undur-undur laut (Hippoidea) di pantai Purworejo. Journal of Fisheries and Marine Sciences 2 (2): 56-57.
- Nuryanto A, Bhagawati D, Rukayah S, Rahayu D, Wibowo D (2020) Molecular barcoding reveals possible existence of sympatric species of *Emerita emeritus* in South Coast of Cilacap Central Java. 593. IOP Conference Series: Earth and Environmental Science. https://doi.org/10.1088/1755-1315/593/1/012014
- Sankolli K (1962) On a new species of *Emerita* (Decapoda, Anomura) from India, with a note on *Emerita emeritus* (L.). Crustaceana 8: 48-54. https://doi.org/10.1163/156854065X00541
- Schmitt W (1937) A new species of *Emerita* (Crustacea) from South Africa. Annals of the South African Museum 6: 25-29.
- Wardiatno Y, Mashar A (2013) Aspek pertumbuhan undur-undur laut, *Emerita emeritus* dari pantai berpasir kabupaten Kebumen. Jurnal Biologi Tropis 13 (1): 29-38.
- Wardiatno Y, Ardika P, Farajallah A, Butet N, Mashar A, Kamal M, Renjaan E, Sarong M (2015) Biodiversity of Indonesian sand crabs (Crustacea, Anomura, Hippidae) and assessment of their phylogenetic relationships. Aquaculture, Aquarium, Conservation & Legislation - International Journal of the Bioflux Society 8 (2): 224-235. URL: http://www.bioflux.com.ro/aacl.

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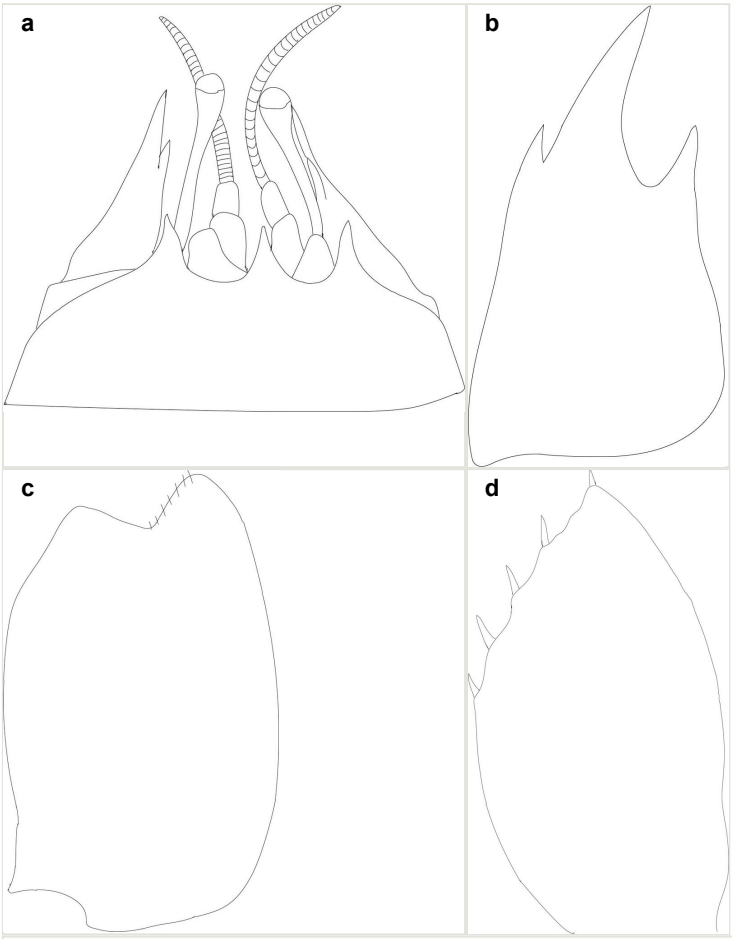

Figure 1.

Emerita pangandaranensis.

a: Frontal lobes
b: Second antennal segment
c: Merus of the third maxilliped
d: Lower margin of the first pereiopod

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Table 1.

Morphological differences between *Emerita* spp.

	E. austroafricana	*E. taiwanensis*	*E. karachiensis*	*E. holthuisi*	*E. emeritus*	*E. pangandaranensis* sp. nov.
Reference	Schmitt 1937	Hsueh 2015	Niazi and Haqub 1970	Sankolli 1962	Sankolli 1962	This sutudy
Spines in dactyls of first legs	Two spines on the upper or outer margin and four on the inner or lower margin The spines occupy more than one-half to less than two-thirds of the distal of the lower margin (Sankolli 1962, Niazi and Haqub 1970)	One to three spines on the inner margin No spine on the upper margin	Five to nine but usually 6 distinct spines on the lower margin	Generally four distinct spines on the inner or lower margin (Niazi and Haqub 1970) No spine on the upper margin	Four or five horny, movable spines in the distal third of the lower margin; one to three, generally two, spines are placed on the upper margin, near the tip. The spines are comparatively short and have shallow bases (Sankolli 1965; Niazi and Haqub 1970)	Five distinct spines on the inner margin Spine on the terminal or apical spine and the last spine is relatively shorter than three others No spine on the upper margin
Dactyls of first legs	Being armed with conspicuous marginal teeth tipped with tiny, movable, clear, corneous spines. The dactylus of the first leg is broadly ovate, less than twice its greatest width and, not counting the terminal or apical tooth or spine	A narrow and elongate dactylus of the first leg, The dactylus of the first leg elongated, 2.78 times as long as greatest width, distally subacute with one spine, ovate at the base, with a corneous tip	The dactylus of the first leg, in length, is either double or more than double of its breadth and usually terminates in a distal spine but sometimes in two or even three distal spines	The dactylus of the first leg, in length, is more than twice its width and terminates in a spine distally.	The dactylus of the first leg is broadly ovate, less than twice its greatest width. It terminates in a spine	It terminates in a spine distally The dactylus is more length than width,1.85 times as long as the greatest width

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Shape of carapace	The carapace is more or less cylindrical	The body subcylindrical	The body is oblong-oval and comparatively narrow	The body is more or less cylindrical	The body is almost cylindrical	The body is almost cylindrical
Dorsal carapace	Dorsally conspicuously and transversely striate from behind the groove or impressed line, setting off the frontal region from the anterior portion of the carapace before the cervical groove to the posterior margin of the carapace	A peculiar color pattern on the dorsum of the carapace. Dorsum of carapace distinctly convex, covered with numerous straight or sinuous, uneven transverse ridges (except near posterior and posterolateral margins), Post-frontal furrow absent, post-gastric furrow clearly present	The lateral border of the carapace is decidedly serrulate. There are well-marked post-rostral and post-gastric furrows, in between them, two small but distinct crescentic pits are present. The surface of the carapace is covered with transverse rugae which are well clear on the frontal area	The lateral border of the is minutely serrulate in its anterior half. The transverse rugae on the dorsal surface of the carapace are quite prominent in the area between the cardiac region and the frontal lobes. The carapace shows well-marked post-frontal and post-gastric furrows	The transverse dorsal rugae of the Carapace are crowded and less frequently interrupted. The post-frontal and post-gastric furrows of the carapace are well marked and also the hepatic region is well-grooved	The lateral border of the carapace is serrulate in its anterior half. The dorsal surface of the carapace is covered with quite prominent transverse rugae, in the area between the cardiac region and the frontal lobes

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Frontal lobes	In shape, acuteness, and relative length the three projections of the front are much like those of E. emeritus (L.)	Anterior carapace with 3 lobes, separated on either side by a U-shaped sinus, median lobe sharply triangular, distally acute, lateral lobes subacute, all 3 lobes approximately equal in length, curved slightly downward distally	The frontal margin is tridentate. The middle one, the rostrum proper, is shorter than the lateral ones. The rostrum or the median lobe is less acute, blunt, and triangulate separated on either side by a U-shaped sinus from the submedian pair of teeth. The U-shaped sinus on each side is greater in width than the breadth of the rostrum at the base	The three frontal lobes are relatively short and wide. The median lobe is triangular and sub-acute and is separated from the lateral lobes by a distance greater than its own breadth at the base	The three frontal lobes are relatively longer, more slender, and provided with distinct horny tips. The median lobe is triangular, acute and from the lateral lobes by a distance much greater than its own breadth separated at the base (Sankolli 1965)	All three lobes sharply triangular (horny tips), the median lobe is shorter than the lateral lobes, separated on either side by a U-shaped sinus
Merus of the third maxilliped	The lobe at the Antero-inner angle of the large and operculiform joint of the third or outer maxilliped is low-triangular, broad at the base, and distally rounded	Merus of third maxilliped subrectangular, approximately 1.8 times as long as greatest width Anterolateral angle of outer margin rectangular, not produced, antero-internal lobe high, triangular, distally rounded	The outer anterolateral angle of the merus of the third maxilliped possesses a produced tooth-like horny tip, which is sometimes broken or missing. The antero-internal lobe is blunt, rounded distally, having developed and raised triangle	The outer anterolateral angle of the external margin of the merus of the third maxilliped is rectangular and not produced; the antero-internal lobe is low triangular, distally rounded, and little prominent	The outer anterolateral angle of the merus of the third maxilliped is tooth-like produced with a horny tip, which is sometimes broken or missing; the antero-internal lobe is low triangular but prominent	Merus of the third maxilliped maximum length to maximum width ratio about 1.63. The outer anterolateral angle of the merus of the third maxilliped is rectangular, not produced. The antero-internal lobe is blunt, distally rounded, and prominent