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Two Newly Recorded Species of the Lobster Family Scyllaridae (*Thenus indicus* and *Scyllarides haanii*) From South of Java, Indonesia

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ABSTRACT

Two species of slipper lobster, *Thenus indicus* Leach, 1815, and *Scyllarides haanii* De Haan, 1841, are reported for the first time from the coastal waters of South of Java, part of the Indian Ocean. A total of two specimens, one specimen of *T. indicus* from Palabuhanratu Bay and one specimen of *S. haanii* from Yogyakarta coastal waters, were collected in April and September 2015, respectively. Descriptions and illustrations of the morphological characteristics of the two species and their habitat are presented.

1. Introduction

From a fishery point of view, slipper lobsters of the family Scyllaridae are less popular than palinurid lobsters in Indonesia. Much information on palinurid lobsters [i.e. *Panulirus penicillatus* (Chow *et al.* 2011; Kalih 2012; Abdullah *et al.* 2014), *Panulirus versicolor* (Ongkers *et al.* 2014), *Panulirus homarus*, *Panulirus longipes*, and *Panulirus ornatus* (Kalih 2012)] has been reported, but little information is available on slipper lobsters [e.g. *Parribacus antarticus* (Kalih 2012)]. The family Scyllaridae consists of four subfamilies, 19 genera, 88 species, and two subspecies worldwide (Holthuis 1991; Chan 1998; Chan 2010; Yang *et al.* 2011; Yang & Chan 2012). The four subfamilies are Arctidinae, Ibacinae, Scyllarinae, and Theninae. The subfamily Arctidinae comprises two genera (i.e. *Arctides* and *Scyllarides*) and the subfamily Theninae only one genus (i.e. *Thenus*). All slipper lobster species are bottom-dwelling and found in very shallow water to a depth of more than 484 m (Chan 1998).

Before the recognition of three new species by Burton & Davie (2007), Jones (1993) and Davie & Burton (2000) resurrected one species of the genus *Thenus* Leach, 1815, a monotypic genus with only one species, *Thenus orientalis*. Taxonomic and biodiversity studies on Indonesian lobsters resulted in the collection of two different species of family Scyllaridae from South of Java. The present observation is the 1st record of these two species from South of Java, Indonesia. The morphological characteristics of the two species are illustrated and described.

2. Materials and Methods

A total of two specimens were collected: one specimen of *Thenus indicus* was collected in April 2015 from Palabuhanratu Bay and one specimen of *Scyllarides haanii* in September 2015 from Yogyakarta coastal waters (Figure 1). They were bought from fishermen and preserved in 96% alcohol and transported to the laboratory for analysis. The fishermen caught them with 2- and 3- in nets. The two specimens are lodged in Laboratory of Aquatic Biomolecular, Department of Aquatic Resources Management, Faculty of Fisheries and Marine Science, Bogor Agricultural University. The voucher number is #TIP01 for *T. indicus* and #SHY01 for *S. haanii*.

Identification of the genus *Scyllarides* was based on the morphological characteristics using the taxonomic key book from Food and Agriculture Organization (Holthuis 1991; Chan 1998), i.e. carapace, 4th abdominal segment, posterior margin of the 2nd abdominal, and spots on the 1st abdominal segment. Whereas, the genus *Thenus* was identified based on the

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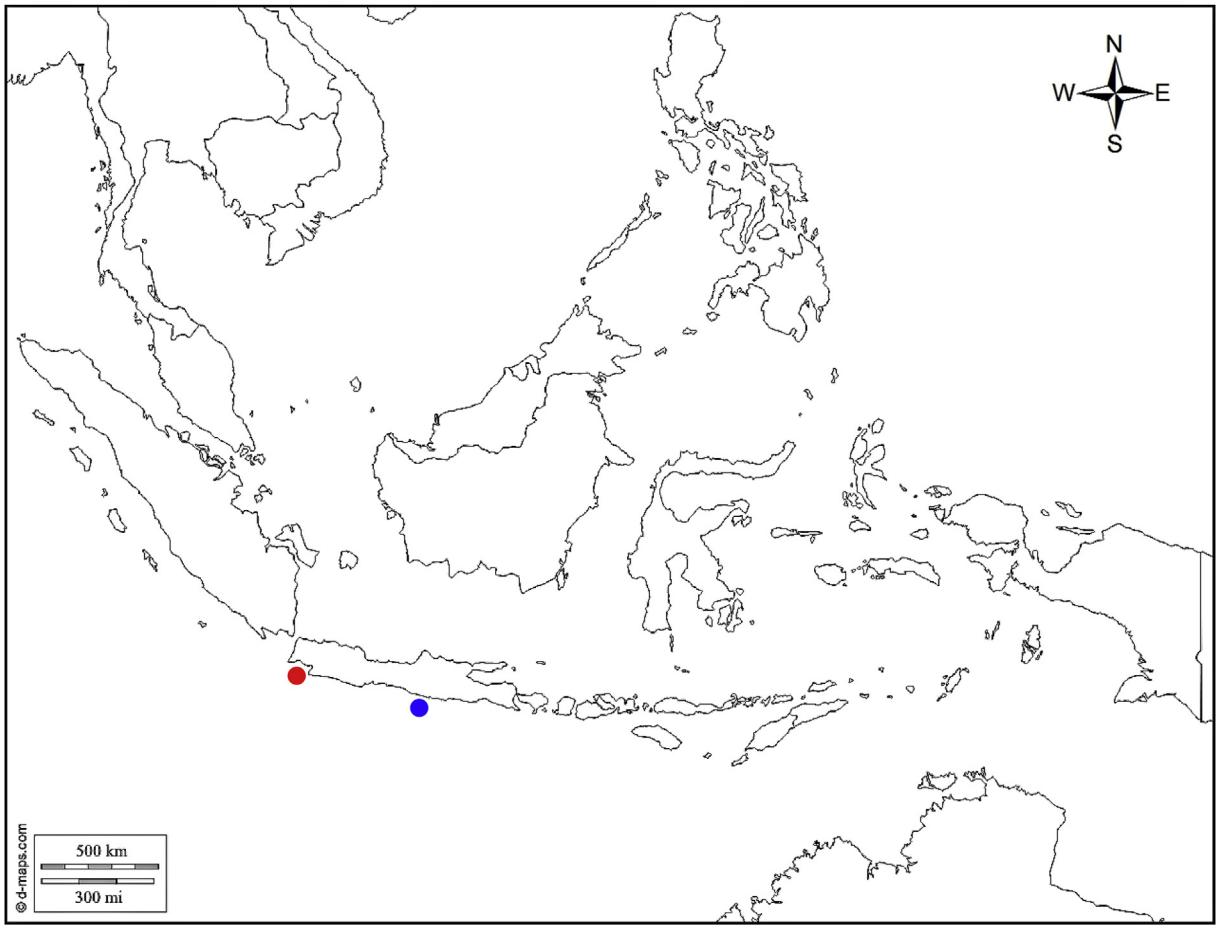

Figure 1. Locations from which *Thenus indicus* and *Scyllarides haanii* were collected. The red circle indicates Palabuhanratu Bay and the blue circle indicates Yogyakarta coastal waters, South of Java, Indonesia.

morphological characteristics using the taxonomic key from FAO (Burton & Davie 2007), i.e. spotting on pereiopods, outer face of the 2nd propodus, merus of the 3rd maxilliped, and several morphometric ratios. Information on habitat of the two species was recorded by interview with the fishermen.

3. Results

The systematics of these two species from the order are as follow:
Order DECAPODA Latreille, 1803
Infraorder ACHELATA Scholts and Richter, 1995
Family SCYLLARIDAE Latreille, 1825
Genus *Thenus* Leach, 1816
Thenus indicus Leach, 1815
(Figures 2A and 3)
Genus *Scyllarides* Gill, 1898
Scyllarides haanii De Haan, 1841
(Figures 2B and 4)
Synonyms: *Scyllarus haanii* De Haan, 1841

3.1. Materials examined

T. indicus. #TIP01. Male: carapace length (CL), 50.29 mm; total length, 84.06 cm; weight, 280 g. April 2015, Palabuhanratu Bay, South of Java, Indonesia.

Figure 2. (A) Species of *Thenus indicus* (male) from Palabuhanratu Bay, South of Java, Indonesia, April 2015. (B) Species of *Scyllarides haanii* (male) from Yogyakarta coastal waters, South of Java, Indonesia, September 2015.

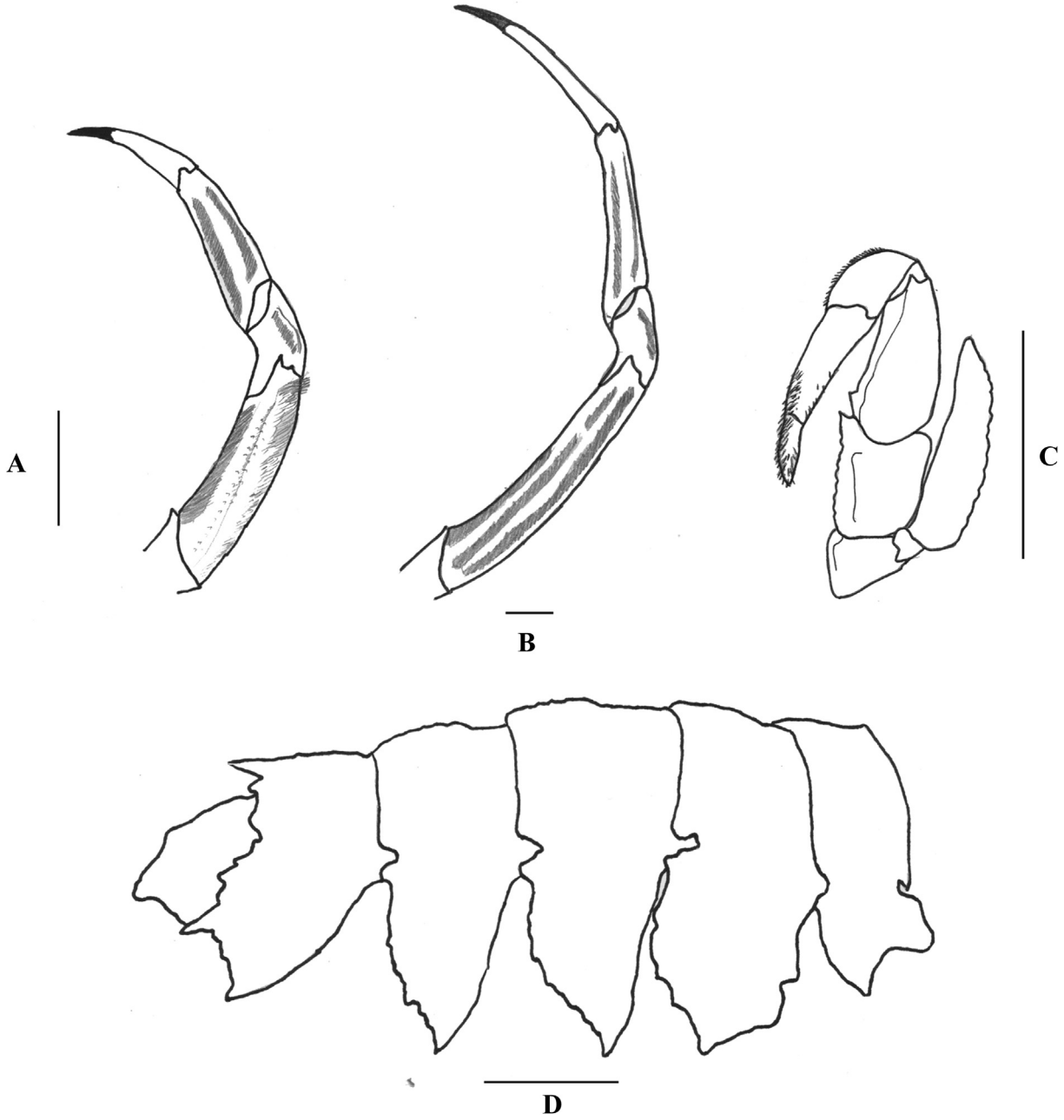

Figure 3. *Thenus indicus* (Lund 1793), Palabuhanratu Bay, South of Java (Indian Ocean), male (carpace length 50.29 mm). (A) First pereiopod; (B) 2nd pereiopod; (C) 3rd maxilliped; (D) abdomen, lateral view. Scale bars, 10 mm.

S. haanii. #SHY01. Male: CL, 68.28 mm; total length, 158.64 mm; weight, 164 g. September 2015, Yogyakarta coastal waters, South of Java, Indonesia.

3.2. Distinctive characteristics

T. indicus. No spotting on the pereiopods (Figure 3A,B); the outer face of the propodus of the 2nd pereiopod had an uppermost longitudinal groove bearing obvious setae over at least the proximal half (Figure 3B). Merus of the 3rd maxilliped with a small spine proximally on the inner ventral margin; the inner margin of the ischium was prominently dentate along the entire length (Figure 3C). Abdominal segments, each with lateral margins expanded downward concealing the pleopods (Figure 3D). No single morphometric ratio that would exclusively identify this species has been identified, but only *T. indicus* can have ratios that fall outside the following maximum and minimum values: 1st pereiopod merus width less than 0.07 CL and 3rd pereiopod merus length more than 0.45 CL.

S. haanii. Body vaulted, pubescent, and covered with rounded tubercles. Eyes small and subspherical. Carapace somewhat rectangular, but the posterior half distinctly wider than the anterior half; cervical groove strong; pregastric, gastric, and cardiac teeth all strongly protruding. Antennae broad, flattened, and plate-like, with distal margin finely crenate (Figure 4A). All legs without pincers and similar in size. Abdomen uniformly granulated and not particularly sculptured; dorsal midline of the 2nd and 3rd segments strongly ridged and that of the 4th segment producing a remarkable hump; pleura directed downward, with the posterior margin of the

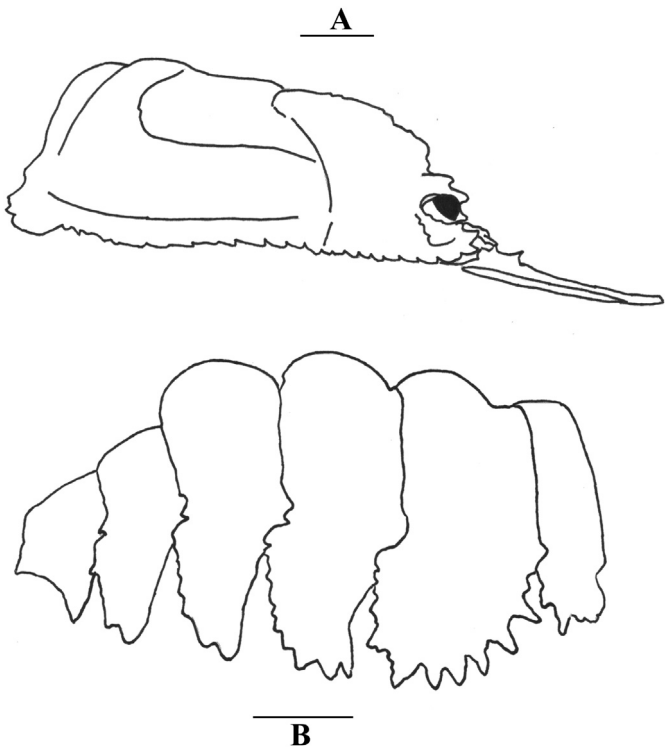

Figure 4. *Scyllarides haanii* (De Haan 1841), Yogyakarta coastal waters, South of Java (Indian Ocean), male (carpace length 68.28 mm). (A) Carapace and eye, lateral view; (B) abdomen, lateral view. Scale bars, 10 mm.

2nd pleuron somewhat concave (Figure 4B). The posterior half of the tail fan is soft and flexible. The 1st abdominal segment was yellowish with three diffuse purplish red spots. The soft part of the tail fan is light brown with numerous purple dots.

3.3. Habitat and distribution

As per the information from the fisherman, the two lobster species are actually present in both Palabuhanratu Bay and Yogyakarta coastal waters. In Palabuhanratu Bay, *T. indicus* was caught from shallow sandy habitat with small portion of silt fraction near rocky coast line with clear waters at 5–15 m depth, whereas habitat of *S. haanii* in Yogyakarta coastal waters is sandy substrate.

According to Burton and Davie (2007), *T. indicus* occurred in Pakistan, India, the Gulf of Thailand, Singapore, Indonesia (west coast of Sumatra Island), and Taiwan. Nevertheless, this study showed that *T. indicus* could be found in Palabuhanratu Bay, South of Java, as a new distribution record. Meanwhile, Holthuis (1991) and Chan (1998) demonstrated the presence of *S. haanii* in Indo-West Pacific from Mauritius to the Red Sea, Japan, Indonesia, Australia, and Hawaii. In the works by Holthuis (1991) and Chan (1998), the distribution map of *S. haanii* in Indonesia showed its presence in west coast of Sumatra Island, Banten coastal waters to the Sunda Strait, and Aru archipelago. The occurrence of this species in Yogyakarta coastal waters, South of Java is a new distribution record.

4. Discussion

As targets in marine fishery, the economic value of slipper lobsters has increased since the 1990s, and its consumption as seafood has become more popular in some parts of the world (Spanier and Lavalli 2006). *Thenus* is the most economically important genus of the family Scyllaridae (Jones 1993), despite the fact that in some countries, the slipper lobster is a bycatch product, such as in southern and southeastern Brazil (Oliveira *et al.* 2008, Duartea *et al.*, 2010) and Australia (Courtney *et al.* 2001; Brewer *et al.* 2006). In Indonesia, the slipper lobster species *P. antarticus* was one of six economically valuable lobsters in the coastal waters of Lombok Island (Kalih 2012).

Slipper lobster fisheries on the east coast of Queensland, Australia, face a problem in that *T. orientalis* and *T. indicus* could not be differentiated in logbook records and the market place as their taxonomy and distribution differ only slightly (Courtney *et al.* 2001). Before Jones (1993), *T. indicus* was named *T. orientalis. Thenus* is a complex of five species, and the species called *T. indicus* by Jones (1993) is in fact the new species *Thenus parindicus* (Burton and Davie 2007). *S. haanii* is closely related to *Scyllarides squammosus* and has similarly shaped, blunt dactyls (Hwang & Yu 1983; Lau 1988). However, it can be distinguished by its larger body and distinct protuberances on the 2nd to 4th terga (Hwang and Yu 1983).

According to the distribution maps (Holthuis 1991; Chan 1998; Burton and Davie 2007), *T. indicus* and *S. haanii* occurred in the west coast of Sumatra Island and Banten coastal waters to the Sunda Strait. It is interesting that the two species were found in coastal waters of South Java. The water mass circulation of south east Asian waters was clearly demonstrated by Wyrtki (1961). With the circulation pattern, the coastal waters of west Sumatra and the Sunda Strait have a connectivity with the coastal waters of South Java. Becasue phyllosoma larvae period of the scyllarid lobsters is long (3 until 6 months; Sekiguchi *et al.* 2007), the larvae may be taken away with long distances by currents. As a result, the settlement may be taking place far away from their original spawning grounds (Lewis 1951). So, it is not impossible for the two species to exist in south of Java waters with the assumption that west coast of Sumatra, Banten coastal waters, and Sunda Strait was the breeding grounds.

In terms of habitat, the habitat characteristics of *T. indicus* and *S. hanii* as informed by the fisherman are similar to the explanation of Jones (2007) and Chan (1998). Jones (2007) found *T. indicus* on fine mud or "silty inshore substrates" between 10 and 30 m. Whereas, Chan (1998) informed the habitat of *S. hanii* in coral or rocky reefs at depths from 10 to 135 m, usually less than 50 m.

The number of Indonesian crustaceans reported as 1st records has increased [e.g. *Albunea symmista* (Mashar *et al.* 2015), *Hippa marmorata* (Wardiatno *et al.* 2015), *Hippa adactyla* (Ardika *et al.* 2015), *Puerulus mesodontus* (Wardiatno *et al.* 2016)]. Studies on lobsters in Indonesia mostly focused on highly economically valuable species, such as *P. penicillatus* (Chow *et al.* 2011; Kalih 2012; Abdullah *et al.* 2014), *Linuparus somniosus* (Wowor 1999), *P. versicolor* (Ongkers *et al.* 2014), *P. homarus, P. longipes, P. ornatus* (Kalih 2012), and *P. mesodontus* (Wardiatno *et al.* 2016). A study on the occurrence of the slipper lobster, *P. antarticus*, in the coastal waters of Lombok Island, Indonesia, was reported by Kalih (2012). The presence of these two species in two coastal areas of the southern part of Java Island complements the extant crustacean biodiversity in Indonesian waters. Moreover, this strengthens the notion that Indonesia is a hotspot of marine biodiversity. Information on the biological aspects of these two species is needed to facilitate their sustainable management; therefore, studies of the biology of these slipper lobsters are warranted.

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Conflict of Interest

None.

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