

## Notes on the taxonomy and ecology of *Labuanium politum* (De Man, 1887) (Crustacea: Decapoda: Sesarmidae), an obligate arboreal crab on the nipah palm, *Nypa fruticans* (Arecales: Arecaceae)

Peter K. L. Ng<sup>1, 2\*</sup>, Bee Yan, Lee<sup>2, 3</sup> & H. H. Tan<sup>1</sup>

**Abstract.** The taxonomy of the rarely reported and poorly known arboreal sesarmid crab *Labuanium politum* (De Man, 1887), which is the type species of *Labuanium* Serène & Soh, 1970, is clarified. The species is an obligate associate of the mangrove nipah palm (Arecaceae: *Nypa fruticans*), hiding at the frond base during the day and feeding on the leaves at night. The species is recorded from Singapore for the first time.

**Key words.** Sesarmidae, *Labuanium politum*, taxonomy, new records, nipah palm

### INTRODUCTION

*Labuanium* Serène & Soh, 1970 (type species *Sesarma polita* De Man, 1887) is a genus of climbing crab found in the Indo-West Pacific, comprising 13 species (Ng, Guinot & Davie, 2008; Ng & Davie, 2011; Ng, 2012). Of these, the ecology of four species, *L. cruciatum* (Bürger, 1893), *L. demani* (Bürger, 1893), *L. finni* (Alcock, 1900) and *L. schuetteii* (Hess, 1865), are poorly known, being reported only from their type specimens. One species, *L. trapezoideum* (H. Milne Edwards, 1837) is found on cliffs and walls adjacent to waterfalls and fast flowing streams (Jeng et al., 2003). The remaining species of *Labuanium* are arboreal; living on palms and trees, usually near the sea, but sometimes several kilometres inland as well (Ng, 2012). Best known perhaps are *L. navus* Ng, 2012, *L. rotundatum* (Hess, 1865), *L. scandens* Ng & Liu, 2003, and *L. vitatum* Ng & Davie, 2011 (see Ng & Liu, 2003; Ng & Davie, 2011; Ng, 2012). These primarily nocturnal species live many metres above the ground in phytotelms, and feeding on a variety of plant and animal matter (see also Ho, 2003; Lee, 2008; Li & Chiu, 2013).

The ecology of the type species, *L. politum*, which had hitherto being represented by only few specimens in museum collections, is not well documented. Over the last decade, the

first author had several opportunities to observe the habits of this species in Philippine mangroves, and more recently during the first Comprehensive Marine Biodiversity Survey (CMBS) expedition held in Pulau Ubin in 2012. Detailed ecological and population studies have been conducted by H-C Liu (ex Academia Sinica, Nankang) from Taiwan, and these results will, hopefully, be published at a later date.

The present study documents the specimens deposited in the Zoological Reference Collection (ZRC) of the Lee Kong Chian Natural History Museum (ex Raffles Museum of Biodiversity Research) of the National University of Singapore, as well as observations of their habitat and behaviour in the field. Comparative material is from the Naturalis (ex Rijksmuseum van natuurlijke Historie, RMNH), Leiden, The Netherlands; and The Natural History Museum (NHM), London, United Kingdom. Measurements provided are of the maximum carapace width by length, in millimetres, were made using a pair of dial callipers.

### TAXONOMY

#### FAMILY SESARMIDAE DANA, 1851

##### *Labuanium* Serène & Soh, 1970

**Remarks.** Ng, Guinot & Davie (2008: 224) suggested that the genus was heterogeneous, and at least one species, *L. trapezoideum*, needs to be transferred out. Ng (2012: 266) subsequently noted that four species groups can be distinguished in what is now *Labuanium*, with *L. politum* by itself. Interestingly, only *L. politum* is known to be associated with mangrove nipah palms. The taxonomy of the genus is now being revised by Tohru Naruse (University of the Ryukyus, Japan) and the first author.

<sup>1</sup>Lee Kong Chian Natural History Museum, National University of Singapore, 6 Science Drive 2, Singapore 117546, Republic of Singapore; Email: dbsngkl@nus.edu.sg (\*corresponding author)

<sup>2</sup>Systematics and Ecology Laboratory, Department of Biological Sciences, National University of Singapore, S3 level 2, 14 Science Drive 4, Singapore 117543, Republic of Singapore.

<sup>3</sup>Tropical Marine Science Institute, National University of Singapore, Kent Ridge, Singapore 119260, Republic of Singapore.

***Labuanium politum* (De Man, 1887)**

(Figs. 1–4)

*Sesarma polita* De Man, 1887: 654; De Man, 1888: 189, pl. 13 figs. 7–9; Alcock, 1900: 422; Tweedie, 1940: 93; Tweedie, 1950: 346.

*Sesarma* (*Sesarma*) *polita* – Tesch, 1917: 190.

*Labuanium politum* – Serène & Soh, 1970: 401–402; Yang, 1979: 48 (part); Tan & Ng, 1994: 82; Wee & Ng, 1994: 82 (part); Ng, Guinot & Davie, 2008: 221, 225; Ng, Wang & Lim, 2008: 74; Rahayu & Setyadi, 2009: 66.

*Labuanium polita* – Fransen et al., 1997: 124.

**Material examined. Syntypes:** 1 male (18.7 × 17.1 mm) (NHM 1886.52), 1 male (RMNH D18), Sullivan Island, Mergui Archipelago, Andaman Sea, Burma (= present day Myanmar), coll. J Anderson, 25 November 1881–13 April 1882. **Philippines:** 1 gravid female (28.8 × 25.9 mm) (ZRC 2003.0382), Loboc River, Bohol, coll. PKL Ng, 28 July 2003; 1 gravid female (31.2 × 28.2 mm) (ZRC 2003.0383), Loboc River, Bohol, coll. PKL Ng, 28 July 2003; 6 males (32.5 × 28.4 mm, 38.3 × 35.5 mm), 3 females (30.5 × 28.5 mm, 37.3 × 33.5 mm) (ZRC 2003.0381), Loboc River, Bohol, coll. PKL Ng et al., 28–29 July 2003; 4 males (35.4 × 31.2 mm, 37.5 × 33.7 mm), 2 gravid females, 8 females (26.1 × 24.1 mm, 37.5 × 33.9 mm) (ZRC 2004.0470), Loboc River, Bohol, Visayas, coll. PKL Ng et al., 2 March 2004; 13 males (31.6 × 28.2 mm, 39.7 × 35.7 mm), 6 gravid females, 17 females (28.7 × 25.6 mm, 37.1 × 32.7 mm) (ZRC 2003.0380), Loboc River, Bohol, coll. PKL Ng et al., 28–29 July 2003; 2 males (26.9 × 24.1 mm, 34.1 × 30.0 mm) (ZRC 2013.0383), station M57, Sungcolan Inlet, Panglao Island, coll. Panglao 2004 Expedition, 4 July 2004; 1 female (35.7 × 31.7 mm) (ZRC 2013.0241), Cebu, coll. PKL Ng et al., 25–30 July 2003; 2 males (33.1 × 29.3 mm, 39.2 × 33.7 mm) (ZRC 2013.0382), station M51, Mayacabas, Panglao Island, coll. Panglao 2004 Expedition, 30 June 2004. **Malaysia:** 1 male (39.6 × 36.0 mm) (ZRC 1965.7.29.58), Labuan, Borneo, coll. G Nunong, 1938; 3 females (34.9 × 32.5 mm, 31.9 × 29.7 mm, 29.1 × 26.7 mm) (ZRC 1965.7.29.59–61), Labuan, Borneo, coll. G Nunong, 1938; 1 young male (12.4 × 12.4 mm) (ZRC 1965.7.29.63), Sedili River, Johore, coll. MWF Tweedie, March 1938. **Singapore:** 1 female (34.2 × 36.9 mm) (ZRC 2014.0860), station SW14, in patch of *Nypa fruticans* along stream, on path to Chek Jawa Wetlands, just before road junction to entrance, 01°24.637'N, 103°58.729'E, Pulau Ubin, coll. PKL Ng et al., 16 October 2012; 1 male (36.6 × 32.7 mm), 1 female (34.7 × 32.0 mm) (ZRC 2014.0861), station SW34, in patch of *Nypa fruticans* along stream, on path to Chek Jawa Wetlands, just before road junction to entrance, 1°24.637'N, 103°58.729'E, Pulau Ubin, coll. PKL Ng et al., 18 October 2012; 3 males (21.9 × 20.2 mm, 33.9 × 30.6 mm), 4 females (21.0 × 19.5 mm, 34.5 × 31.1 mm) (ZRC 2014.0862), station SW34, in nipah patch along stream, on path to Chek Jawa Wetlands, just before road junction to entrance, 1°24.637'N, 103°58.729'E, Pulau Ubin, coll. PKL Ng et al., 18 October 2012; 1 male (34.5 × 31.8 mm), 1 female (33.5 × 30.6 mm) (ZRC 2013.1791), in patch of *Nypa fruticans*, Pulau Ubin, coll. PKL Ng, 01 October 2012.

**Remarks.** The name *Sesarma polita* was first used by De Man (1887: 654–655) in his overview of the genus, which was published in 15 September 1887. Although he credited the name to “De Man 1886” (p. 654), the actual paper describing this species was only published the following year by De Man (1888). This large work by De Man of the Crustacea of the Mergui Archipelago was published in five parts, between 24 November 1887 and 31 July 1888. *Sesarma polita* was published in Part IV and was issued on 10 April 1888 (De Man, 1888: 189, pl. 13 figs. 7–9). However, since De Man (1887) had remarked that the species was from the Mergui islands in the eastern Indian Ocean and noted it had a characteristic carapace shape and diagnostic ambulatory legs, the name *Sesarma polita* is available and should be dated from 1887, even though no material was mentioned. All six specimens listed by De Man (1888) from Sullivan Island in the Mergui Archipelago, are therefore syntypes.

Alcock (1900) listed the species from India, while Tesch (1917) and Fransen et al. (1997) recorded a male syntype in RMNH. Tweedie (1940: 93) was the first to hint at its preferred habitat when he noted he obtained “A single male from among nipah palms beside the river Sedili, Johore.” (see material examined). He (Tweedie, 1950: 346) subsequently collected three pairs of this species from mangroves in Labuan in Borneo but did not state the precise habitat it was collected from. Tan & Ng (1994) listed it from Peninsular Malaysia but were unsure if it was an obligate mangrove species. The species was listed to be present in Singapore by Wee & Ng (1994) based on specimens collected from Pulau Pawai by Michael Tweedie in 1933 from an unpublished catalogue of brachyuran crabs in the ZRC by Yang (1979). Ng, Wang & Lim (2008: 74), however, noted that the species was not in Singapore (and also not listed from Singapore by Tan & Ng, 1994; see further below). Rahayu & Setyadi (2009: 66) subsequently recorded this species from Timika in Indonesian Papua. Ng, Guinot & Davie (2008: 225) provided a colour photograph of a specimen from the Philippines.

The old Singapore record requires comment. Yang (1979) listed several specimens as “*Labuanium polita*” from Malaysia, Borneo, and Pulau Pawai in the collections of the ZRC. Interestingly, although they were collected in 1933 by Michael Tweedie, he never included this record in his papers on the species (Tweedie, 1940, 1950). The Pulau Pawai specimens (a male [7.9 × 7.4 mm] and a female [8.8 × 7.6 mm], ZRC 1965.7.29.55–56, coll. MWF Tweedie, November 1933) were re-examined, and they proved to be young *Pseudosesarma edwardsi* (De Man, 1888) instead. Interestingly, on the original label in the bottle, Tweedie had correctly identified them as “*Sesarma edwardsi*”, in his own handwriting. Another hand-written label (likely by Raoul Serène) noted the name as belonging to a new species, “*Sesarma* (*Sesarma*) *pawai*”. This name has never been published. Who identified the specimens as “*Labuanium polita*” is not known but the labels date back to the 1960s in the time when Serène was in the museum. Interestingly as well, in an unpublished thesis treating *Sesarma* species (as most sesarmid genera were referred to at that time) from Singapore by Soh (1969), he made no mention of these



Fig. 1. Habitats associated with *Labuanium politum* in the Loboc River, Bohol, Philippines. A, B, lower reach of the river showing nipah forest; C, base of nipah palms; D, E, *Labuanium politum* emerging from between the stems of the nipah palm; F, G, *L. politum* foraging on nipah leaves; H, *L. politum* male (35.5 × 32.1 mm) (ZRC 2003.0381) feeding on leaflet.

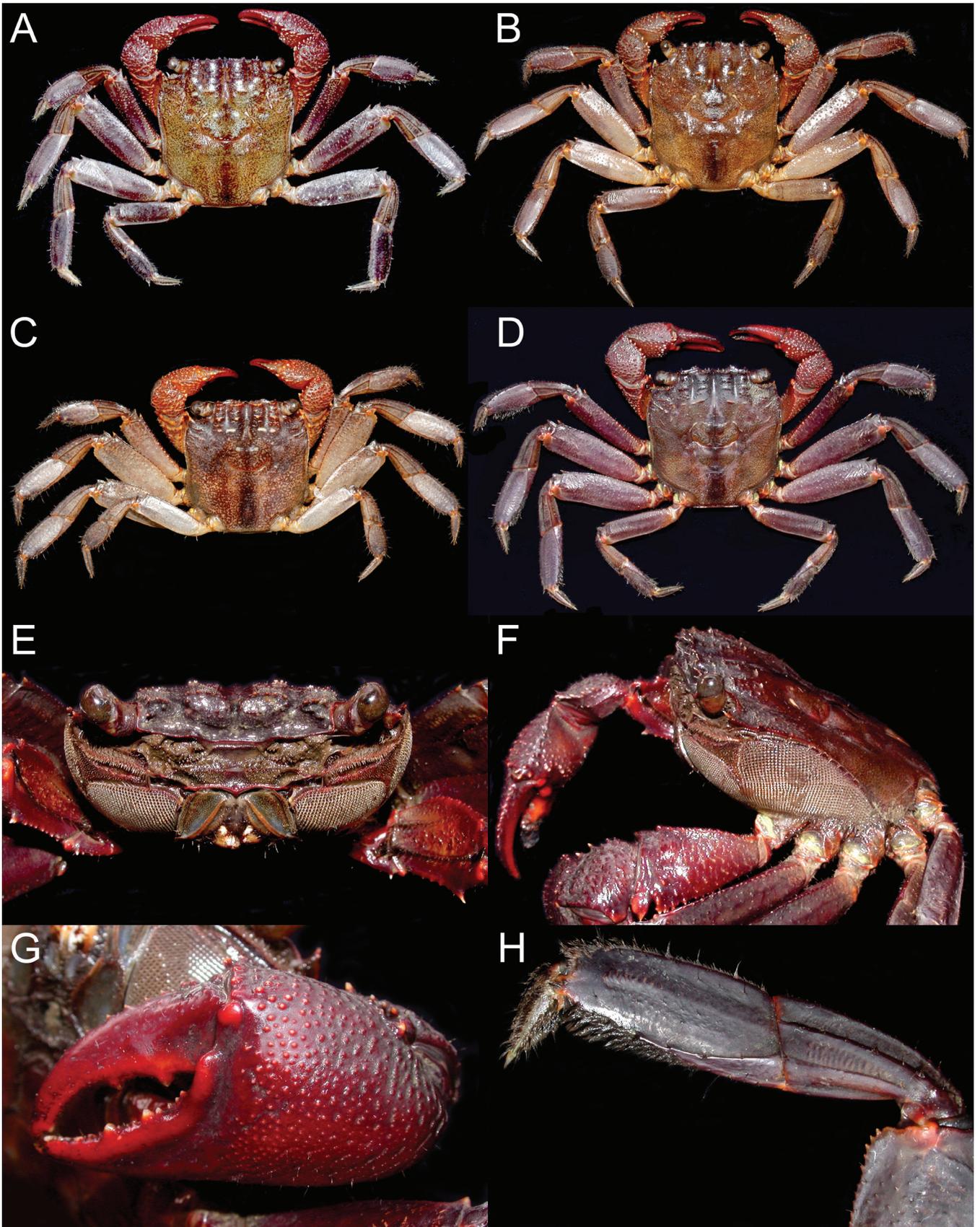


Fig. 2. *Labuanium politum* from Loboc River, Bohol, Philippines. A, female (37.3 × 33.5 mm) (ZRC 2003.0381); B, female (35.9 × 32.0 mm) (ZRC 2003.0380); C, male (30.5 × 28.5 mm) (ZRC 2003.0381); D, male (37.3 × 33.7 mm) (ZRC 2004.0470); E–H, male (38.3 × 35.5 mm) (ZRC 2003.0381); A–D, dorsal overall views; E, frontal view; F, lateral view showing flat carapace; G, outer view of left chela; H, left second ambulatory leg.



Fig. 3. *Labuanium politum* from Pulau Ubin, Singapore. A–H, specimens climbing and foraging on nipah leaves, ca. 2–5 m above ground.

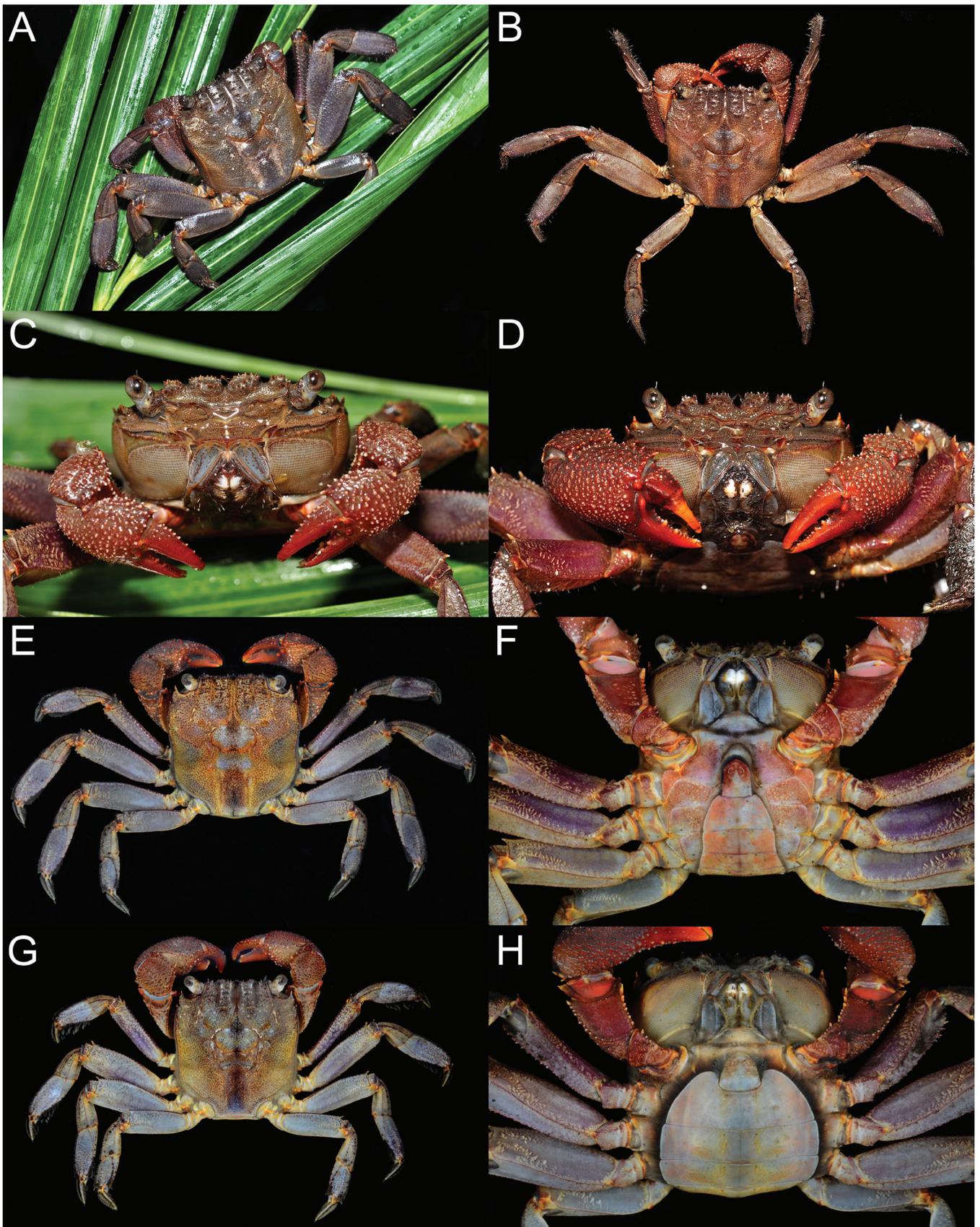


Fig. 4. *Labuanium politum* from Pulau Ubin, Singapore. A, C, male (36.6 × 32.7 mm) (ZRC 2014.0861); B, D, female (34.2 × 33.5 mm) (ZRC 2013.1791); E, F, male (36.6 × 32.7 mm) (ZRC 2014.0861); G, H, female (34.7 × 32.0 mm) (ZRC 2014.0861). A, in situ on nipah palm leaf; B–D, live specimens as photographed in the laboratory; A, B, E, G, dorsal overall views; C, D, frontal view of carapaces; F, G, ventral views of cephalothorax.

specimens or “*Sesarma polita*” in his list of taxa. Tan & Ng (1994: 82) also did not list *Labuanium politum* from Singapore, while Ng, Wang & Lim (2008: 74) noted that it was not found in Singapore. Previous records of the species from Singapore are therefore mistaken, and the first valid record of this species from the country is from the 2012 survey carried out during the CMBS workshop on Pulau Ubin.

De Man (1888) provided a detailed description with excellent figures of the species but had no information about its ecology or habitat. The present specimens agree with his description (and syntypes) very well and we are confident they are conspecific. Smaller specimens tend to have lighter coloured carapaces and ambulatory legs (Figs. 2C, 4E, G), with larger individuals being red to purplish-red or dark brown (Figs. 2A, B, D, 4A, B). The chelae are less inflated and relatively weaker in smaller specimens, with the surface red and granules on the outer surface white (Fig. 4C, D). Large specimens have much stouter chelae, and the granules may be white or pale red (Fig. 2G). Large specimens also tend to have the lateral carapace margins relatively more convex, and the ambulatory legs also are proportionately longer and more slender (Fig. 2D versus Fig. 2A–C).

### ECOLOGY

Arboreal crabs are well known, and a large number of species have this habit. In the Indo-West Pacific, most members of the sesarmid genera *Labuanium* sensu lato, *Selatium* Serène & Soh, 1970, and *Scandarma* Schubart, Liu & Cuesta, 2003, as well as some species of *Parasesarma* De Man, 1895, and *Geosesarma* De Man, 1895, occur regularly on trees (see Cumberlidge et al., 2005; Fratini et al., 2005; Godsall & Smallegange, 2011; Naruse & Ng, 2007; Ng, 1988; Schubart et al., 2003, 2009; Sivasothi, 2000; Sivasothi et al., 1993; Vannini & Ruwa, 1994; Vannini et al., 1997). These should be regarded as obligate tree-dwelling crabs. Various species of Grapsidae also have arboreal habits to varying degrees (see Fratini et al., 2005; Sivasothi, 2000; Sivasothi et al., 1993; Vannini et al., 1997). Some true freshwater crabs in Africa, South and Southeast Asia (Gecarcinucoidea) are also primarily arboreal (see Cumberlidge & Sachs, 1991; Cumberlidge et al., 2005; Ng, 1991, 1995).

The comments by Ng, Wang & Lim (2008) are the only indication that *Labuanium politum* is an obligate inhabitant of the mangrove nipah palm (*Nypa fruticans*) (Arecales: Areaceae: Nypoideae), confirming a collection record by Tweedie (1940: 93). Ng, Wang & Lim (2008: 74) noted that “This interesting tree climber, the Labuan Crab (*Labuanium politum*) has never been reported from Singapore but it is very likely it was here in the past. This species lives among the fronds of the nipah palm (*Nypa fruticans*), hiding deep in the bases during the day and coming out only late at night to feed on the leaves. In fact, it was long regarded as one of the rarest crabs in Southeast Asia until this habit was discovered. Because most of the Nipah Palms in Singapore have been cut down, the crab has probably also disappeared.” Rahayu & Setyadi (2009: 66) stated that in Indonesian Papua, they found it from among mangrove tree roots during the day.

The authors however, commented that the species was not common and there were no *Nypa fruticans* patches in the immediate vicinity that they were aware of (DL Rahayu, pers. comm.). This is unusual as they have otherwise only been found on nipah at night; suggesting that the specimens from Indonesian Papua may be stragglers. There are stretches of nipah on Indonesia Papua but no night collections were made there (DL Rahayu, pers. comm.).

In the Philippines, *Labuanium politum* was found in large numbers along the lower stretches of the Loboc River in the island of Bohol in the Visayas, central Philippines (PKL Ng, unpublished data). These lower stretches have dense growths of nipah palm on both banks (Fig. 1A, B). The relatively level and navigable part of the river is about 10 km, from the river mouth at the port at Loay to the Busay Falls. They were not seen during the day. The first author was first informed of their nocturnal presence by several locals who told him that they observed many tree-climbing crabs on the nipah forest at night when they were fishing in the river. He followed them out by boat on several evenings, starting out at around 2000 hours from the town of Loboc, and travelled downstream towards the port of Loay. The stretch between Loboc and Loay (ca. 7 km) had many dense patches of nipah palm, especially in the lower half closer to the sea. Numerous specimens of *L. politum* were observed emerging from in between the bases of the stem of the leaves that are near the water’s edge at high tide (Fig. 1D, E). The nipah palm is unusual among palms in that the rhizome/stem is actually below the mud, and what emerges from the ground are the stalks of the leaves (Fig. 1C), which can extend almost nine metres high (Whitmore, 1970).

It was therefore noteworthy that in October 2012, during the Johor Strait biodiversity workshop, *Labuanium politum* was found in a patch of nipah forest in Pulau Ubin during a night survey. There are only a few significant patches of nipah palms remaining in Singapore and this palm is at present classified as ‘Vulnerable’ in Singapore (Chong et al., 2009; Teo et al., 2010). Currently, *L. politum* is only known from a single nipah palm patch on Pulau Ubin, Singapore. However, it is likely the crab can be found in other nipah palm patches once the necessary night surveys can be conducted.

The behaviours of the crabs in both Philippines and Singapore were similar. They hide deep between the narrow spaces between the stalks of the leaves during the day, which are often filled also with debris, mud and water; and they cannot be seen from the surface. Their very flat carapaces (Fig. 2E, F) are perfectly adapted for this. When it is completely dark (after 2000–2100 hours), they start foraging. The crabs climb all the way up the slender leaf stalks to the slender leaflets (pinnae) relatively quickly. The short, pubescent ambulatory dactyli, pubescent ventral margin of the propodus, and serrated ventrodiscal margins of the first two ambulatory meri (Fig. 2H) are well adapted for gripping the edges of the stalk and leaflets (Figs. 1F–H, 3). The first and second ambulatory legs are particularly important as at least one pair is usually gripping onto the stalk or leaflet, even as

the crab manoeuvres or feeds (e.g., see Fig. 1F, H, 3A, B). The last pair of ambulatory legs is used for gripping and/or balancing, especially when the crab is positioned on a narrow structure, being articulated far backwards (Figs. 1F, 3C, H). In addition, the crabs were observed to use their chelae to grip as they moved or adjusted their position (Fig. 3E). They are often seen balanced precariously on the narrow leaflets, sometimes as high as nine metres (in the Philippines). The crabs were observed to use their stout chelae to tear off small pieces of the leaflets for food (Figs. 1G, 3F). The tips of the fingers are partially excavated on the inner side to form a spoon-like structure that is very effective at “pinching” off small pieces of leaflets. This action leaves a distinctive saw-like edge on the leaflets (Fig. 1G, H). In many cases, we noted they were feeding from the centre of the leaflets near the main vein (Fig. 1G, H). Only on one occasion (in the Philippines) was a large specimen seen feeding on a small grasshopper that it probably caught by chance. *Labuanium politum* is primarily a herbivore, as is the case for many sesarmids (see discussion in Sivasothi, 2000; Sivasothi et al., 1993).

The crabs were never seen during the day. At night, they were observed foraging even on nights with a full moon and without rain, although more specimens were observed after rains in the evening or afternoon. When disturbed (e.g., the main compound leaf it is foraging on is shaken, if a strong light is directed at the crab from close range or when physically prodded); it leaped away from the leaf; landing in the water or mud. When it landed in the water, they scurried along the bottom to the stream and made their way to the water's edge, where they stayed for a few minutes. If undisturbed, they then emerged from the water and took cover in the nearest site possible. We have observed a few individuals moving along mangrove tree roots and mud lobster mounds as they made their way back to the nipah palms. This may explain why some specimens have been collected in non-nipah habitats. They moved relatively slowly on flat ground, their ambulatory legs clearly not designed for locomotion on flat surfaces.

In the Philippines and Singapore where we observed and collected specimens, there were always other coastal trees and large scrubs nearby or growing with the nipah. We have never observed *Labuanium politum* on them. They were only seen on the nipah palm. On the other trees and scrubs, we have found other species of *Perisesarma*, *Selatium*, and *Episesarma* De Man, 1895, as well as various species of *Metopograpsus* H. Milne Edwards, 1853. In the Philippines, *Labuanium politum* is found in the same area as two other arboreal sesarmids, *Selatium elongatum* (A. Milne-Edwards, 1869) and *S. brockii* (De Man, 1887) (Schubart et al., 2009). However, both *Selatium* species were more common closer to the port and open sea; nearer Loboc, they were absent. *Selatium brockii* is most common on the tree trunks of non-nipah plants, and even sometimes on rock faces. A few specimens were observed on nipah, but they were only at the base of the palm with the very broad stem. They were never seen further up the stem or the leaves. *Selatium elongatum*,

on the other hand, was only found on the trunks of large mangrove plants (e.g., *Sonneratia* sp.) near the port.

In the Philippines, specimens were collected from the boat. As the palm leaves often curved towards the river, the crabs would relatively easy to pluck off while on the boat by hand at high tide. On land, as in Singapore, they were much more difficult to collect unless they are on leaves on the lower part of the palm. Most of the Singapore specimens were caught with a long handled scoop net – the crabs were prodded with the front of the net and the opening facing them. The crabs would then usually leap, away from the leaf and into the open net.

#### ACKNOWLEDGEMENTS

The Johor Straits marine biodiversity workshop on Pulau Ubin, Singapore was organised by the National Parks Board and National University of Singapore and held from 15 October to 2 November 2012 at Outward Bound School. The workshop, as part of the Comprehensive Marine Biodiversity Survey (CMBS) was supported by generous contributions from Asia Pacific Breweries Singapore, Care-for-Nature Trust Fund, Shell Companies in Singapore and The Air Liquide Group. We also wish to thank the management and staff of the Outward Bound School for kindly accommodating our special needs for a successful workshop. We are grateful to the CMBS team led by Tan Koh Siang; the museum team (notably Tan Siong Kiat and Jose Mendoza) as well as Koh Kwan Siong and Linda Goh (NParks), for their invaluable help in many ways. The Philippines studies were conducted out of a grant to the first author from NUS, together with colleagues (notably Lawrence Liao and Danny Largo) from the University of San Carlos in Cebu, Philippines. Permits from the National Museum of the Philippines (courtesy of Marivene Manuel-Santos) and Philippines Bureau of Fisheries & Aquatic Resources (courtesy of Malcolm Sarmiento and Labe Luduvina) enabled this study to be carried out in Bohol and Cebu. In the Philippines, we were helped by Lawrence Liao, as well as Liu Hung-Chang and Wang Chia-Hsiang from Taiwan. Dwi Listyo Rahayu kindly shared her observations of the species with the authors. Tohru Naruse kindly checked the type material and compared Philippine material with the first author. We thank Paul Clark (NHM) and Charles Fransen (RMNH) for help in examining specimens under their charge. Photographs of specimens from Singapore by Jose Mendoza and Paul Ng are much appreciated.

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