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A checklist of Amphipoda (Crustacea) collected from the mudflats of Pulau Ubin, Singapore

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Abstract. A preliminary biodiversity survey of mudflats around Pulau Ubin, Singapore revealed 20 amphipod species in 16 genera from 12 families and two suborders. A checklist of the amphipods of Pulau Ubin mudflats is provided. Distribution of each species in the South China Sea is discussed. This study reports new locality records for 17 species, with only three of the collected species having been previously reported from Singapore. Four species collected during this survey have not been previously reported from the South China Sea.

Key words. Amphipoda, Pulau Ubin, checklist, biodiversity, South China Sea, Singapore

INTRODUCTION

Marine biodiversity studies around Singapore are lacking. Most of what is known of amphipods inhabiting this area is reported in scattered literature from adjacent areas. Lowry (2000) created a checklist of the Amphipoda recorded from the South China Sea (153 spp.), but noted that most reports are from Hong Kong, Vietnam, and the Philippines. Singapore's location in the highly diverse Indo-Pacific region suggests that it should have high diversity, yet few studies have focused on this area. As part of the Biodiversity initiative of the National University of Singapore, amphipods were examined during a preliminary survey of mudflat habitats around Pulau Ubin. Amphipods collected from Pulau Ubin belong to two suborders: Gammaridea Latreille, 1802 and Senticaudata Lowry & Myers, 2013.

MATERIAL AND METHODS

Specimens were collected around Pulau Ubin by hand, mud combing, dredges, seines, otter trawls, and shrimp traps. Stations that yielded amphipods are listed in Table 1 and mapped in Fig. 1. In the laboratory, specimens were sorted, photographed, and preserved in 2% saltwater buffered formalin or in 70% ethanol. Identification of amphipods to family level was done using the Amphipoda Family Key (Lowry, 1999). Identification to genus and species level was done using literature based on adjacent areas in the Indo-Pacific region.

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CHECKLIST

AMPHIPODA FROM PULAU UBIN MUDFLATS

(Listed alphabetically by family. Numbers in parentheses represent number of specimens collected.)

GAMMARIDEA

Ampeliscidae (1 genus, 3 species)

Ampelisca bocki Dahl, 1944
CMBS-M02 (1), CMBS-M24 (4), CMBS-D07 (1)

Ampelisca chinensis Imbach, 1967
CMBS-D06 (1), CMBS-D07 (1)

Ampelisca cyclops iyoensis Imbach, 1967
CMBS-D23 (1)

Leucothoidae (1 genus, 1 species)

Leucothoe cf *furina* Savigny, 1816
CMBS-D07 (1), CMBS-H17 (1)

Lysianassidae (1 genus, 1 species)

Waldeckia nudum (Imbach, 1967)
CMBS-D15 (1)

Stenothoidae (1 genus, 1 species)

Stenothoe gallensis Walker, 1904
CMBS-D07 (1)

SENTICAUDATA

Ampithoidae (1 genus, 1 species)

Cymadusa vadosa Imbach, 1967
CMBS-M13 (1), CMBS-S16 (1), CMBS-H17 (1)

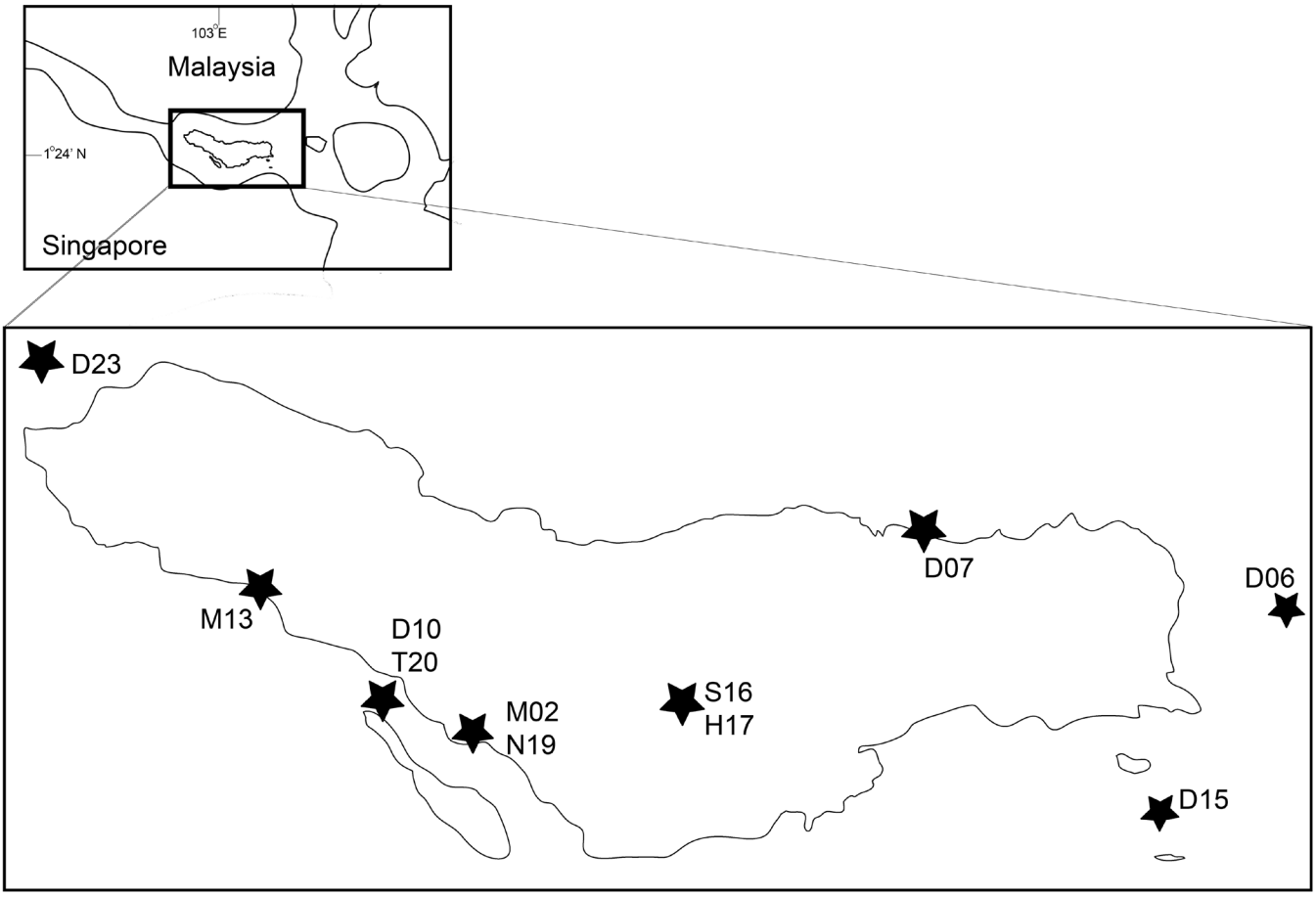

Fig 1. Map showing location of stations discussed here. All stations on the map are preceded by "CMBS-" in Table 1.

Table 1. Samples that yielded amphipods

Station	Date	Location	Sampling Method
CMBS-M02	6 March 2012	Sungei Puaka	Mud Combing
CMBS-D06	6 March 2012	Between Ubin and Tekong Between mouth of Sungei Maman to Kelong	Dredge
CMBS-D07	6 March 2012	FC72E	Hand dredge
CMBS-D10	7 March 2012	Ketam Deep	Dredge
CMBS-M13	7 March 2012	Outward Bound Singapore	Mud Combing
CMBS-D15	7 March 2012	Sekudu/Malang Papan beacon	Dredge
CMBS-S16	7 March 2012	Chek Jawa	Seining
CMBS-H17	7 March 2012	Chek Jawa	Beach combing / hand collection
CMBS-N19	8 March 2012	Sungei Puaka	Shrimp trap, left overnight
CMBS-T20	8 March 2012	Ketam Channel	Otter trawl
CMBS-D23	8 March 2012	North of Outward Bound Singapore	Dredge

Aoridae (2 genera, 2 species)

Bemlos sp.
CMBS-D07 (1)

Lembos sp.
CMBS-D06 (1)

Caprellidae (1 genus, 1 species)

Caprella equilibra Say, 1818
CMBS-D06 (1), CMBS-D07 (2)

Corophiidae (1 genus, 1 species)

Cheiriphotis megacheles (Giles, 1885)
CMBS-D23 (2)

Ischyroceridae (2 genera, 2 species)

Cerapus sp.
CMBS-D10 (~25)

Ericthonius pugnax (Dana, 1853)
CMBS-T20 (6)

Maeridae (2 genera, 3 species)

Ceradocus hawaiiensis Barnard, 1955
CMBS-D07 (1)

Ceradocus laevis Olerod, 1970
CMBS-S16 (1)

Meximaera sp.
CMBS-H17 (12)

Melitidae (2 genera, 2 species)

Melita koreana Stephenson, 1944
CMBS-M02 (1)

Dulichiella pacifica Lowry & Springthorpe, 2005
CMBS-T20 (16)

Podoceridae (1 genus, 2 species)

Podocerus sandroruffoi Ortiz & Lalana, 2003
CMBS-H17 (~30)

Podocerus sp.
CMBS-S16 (11), CMBS-T20 (27), CMBS-N19 (2)

DISCUSSION

The preliminary biodiversity survey at Pulau Ubin revealed 20 amphipod species in 16 genera from 12 families. This survey greatly increased the number of amphipods known from Singapore. Two species of Aoridae, one species of Ischyroceridae, one species of Maeridae, and one species of Podoceridae were only identified to genus level due to the lack of literature available from the area. These may represent new species, but further research is necessary to determine this.

With the exception of four species (*Cerapus* sp., *Meximaera* sp., *Podocerus sandroruffoi*, and *Podocerus* sp.), all species collected during this survey have been previously reported from the South China Sea. *Cerapus* sp. was collected in large numbers with tubes and resembles *Cerapus tubularis* Say, 1817. *Cerapus tubularis* has been previously reported from Japan by Morino (1976) and Hirayama (1995). However, the type locality for this species is Long Island Sound, New York, U.S.A, suggesting that if these specimens represent *C. tubularis*, this species is introduced to Singapore. *Meximaera* sp. is most likely a new species. This genus has typically been reported from the Atlantic and eastern Pacific oceans, although it is not unlikely that the genus is more widespread than is currently known. *Podocerus sandroruffoi* has been previously reported from Indonesia (Ortiz & Lalana, 2003). *Podocerus* sp. closely resembles *Podocerus inconspicuus* (Stebbing, 1888), although Hughes (2012) considered this species to be confined to south-eastern Australia. This suggests that the specimens collected here represent a new closely related species or an introduced species to Singapore.

Waldeckia nudum, *Caprella equilibria*, and *Dulichiella pacifica* are the only species collected here that have been previously reported from Singapore (Arimoto, 1976; Lowry, 2000; Lowry & Springthorpe, 2007). *Leucthoe furina*, *Stenothoe gallensis*, *Cymadusa vadosa*, and *Ericthonius pugnax* have been reported from Malaysia (Azman & Othman, 2013), while the other species have been reported from Vietnam, Hong Kong, and the Philippines (Imbach, 1967; Huang, 1994; Lowry, 2000).

Ampeliscid amphipods are common soft bottom inhabitants worldwide, yet only three species were collected here (*A. bocki*, *A. chinensis*, and *A. cyclops*). *Leucothoe furina* is a circumtropical species that is typically an endocommensal associate of sponges, but is often collected individually in dredge samples. Epimeron 3 in the Pulau Ubin specimens does not match the illustrations in the literature for *L. furina*, but all other characters match well, so for now it is considered *L.* cf. *furina*.

Ampithoid and aorid amphipods are common algal inhabitants. Among these, *Bemlos* sp. and *Lembos* sp. were collected via dredge in this survey. These genera are widespread, but the species have yet to be determined. *Caprella equilibra* is nearly cosmopolitan, reported worldwide. Takeuchi & Sawamoto (1998) reported the Pacific distribution of this species to be limited to temperate regions based on planktonic material. However, according to Arimoto (1976), this species has been reported from Hawaii, Philippine Islands, Malaysia and Singapore (Arimoto, 1976).

All together, this survey has yielded 17 species with new locality records in Singapore and four species newly reported in the South China Sea. Future biodiversity surveys around Singapore will undoubtedly reveal a much higher diversity of Amphipoda than is currently known.

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LITERATURE CITED

Arimoto I (1976) Taxonomic studies of Caprellids (Crustacea, Amphipoda, Caprellidae) found in the Japanese and adjacent waters. Special Publications from the Seto Marine Biological Laboratory, Series 3: iii–229.

Azman BAR & Othman BHR (2013) Shallow water marine gammaridean amphipods of Pulau Tioman, Malaysia, with the description of a new species. Zookeys, 335: 1–31.

Barnard JL (1955) Gammaridean Amphipoda (Crustacea) in the collections of the Bishop Museum. Bernice P. Bishop Museum Bulletin, 215: 1–46.

Dahl E (1944) Amphipods of the family Ampeliscidae from Professor Sixten Bock's expedition to Japan 1914. Arkiv für Zoologi, 36A(1): 1–18.

Dana JD (1853) Crustacea. Part II. United States Exploring Expedition 14: 689–1618.

Giles GM (1885) Natural history notes from H.M.'s Indian Marine Survey Steamer 'Investigator', Commander Alfred Carpenter, R.N., D.S.O., commanding. No. 2. Description of two new species of the amphipod genus *Melita* from Bay of Bengal. Journal of the Asiatic Society of Bengal, 54: 69–71.

Hirayama A (1995) Gammaridea. In: Nishimura S (ed.) Guide to Seashore Animals of Japan with Color Pictures and Keys, Volume II. Hoikusha, Osaka, pp. 173–193 [In Japanese].

Huang Z (1994) Marine species and their distributions in China's seas. China Ocean Press, Beijing, 764 + 144 pp. [In Chinese]

Hughes L (2012) New and little known Podoceridae (Peracarida: Amphipoda) of Southern Australia. Records of the Australian Museum, 64: 71–120.

Imbach MC (1967) Gammaridean Amphipoda of the South China Sea. Naga Report, 4: 39–167.

Latreille PA (1802) Histoire naturelle, generale et particuliere des crustaces et des insects 3. F. Dufart, Paris, xii + 468 pp.

Lowry JK (1999) Crustacea, the Higher Taxa: Description, Identification, and Information Retrieval. Version 2 October 1999. http://crustacea.net/ (Accessed 12 June 2013).

Lowry JK (2000) Taxonomic status of amphipod crustaceans in the South China Sea with a checklist of known species. Raffles Bulletin of Zoology Supplement, 8: 309–341.

Lowry JK & Myers AA (2013) A phylogeny and classification of the Senticaudata subord. nov. (Crustacea: Amphipoda). Zootaxa, 3610: 1–80.

Lowry JK & Springthorpe RT (2005) New and little-known Melitid amphipods from Australian waters (Crustacea: Amphipoda: Melitidae). Records of the Australian Museum, 57: 237–302.

Lowry JK & Springthorpe RT (2007) A revision of the tropical/temperate amphipod genus *Dulichiella* Stout, 1912, and the description of a new Atlantic genus *Verdeia* gen. nov. (Crustacea: Amphipoda: Melitidae). Zootaxa, 1424: 1–62.

Morino H (1976) On two forms of *Cerapus tubularis*, a tube dwelling Amphipoda [sic], from shallow water of Japan. Publications of the Seto Marine Biological Laboratory, 23: 179–189.

Olerod R (1970) Littoral gammaridean Amphipoda from Mindoro, the Philippines. Sonderdruck aus Zoologischer Anzeiger, 184(5/6): 24–396.

Ortiz M & Lalana R (2003) On a new species of *Podocerus* (Amphipoda: Gammaridea: Podoceridae) from the Indonesian Archipelago. Travaux du Musée d´Histoire naturelle "Grigore Antipa", 45: 61–66.

Savigny JC (1816) Observations generals sur la bouche des arachnids, des crustaces et des entomostraces. Second Memorie. Pp. 39–117 of Memories sur les animaux sans Vertebres, primiere partie, Paris: Deterville.

Say T (1817) On a new genus of the Crustacea, and the species on which it was established. Journal of the Academy of Natural Sciences of Philadelphia, 1: 49–52.

Say T (1818) An account of the Crustacea of the United States. Journal of the Academy of Natural Sciences of Philadelphia, 1: 374–401.

Stebbing TRR (1888) Report on the Amphipoda collected by H.M.S. Challenger during the years 1873–1876. Report on the Scientific Results of the Exploring Voyage of H.M.S. Challenger, Zoology 29: XXIV + 1737.

Stephenson K (1944) Some Japanese amphipods. Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening, 108: 25–88.

Takeuchi I & Sawamoto S (1998) Distribution of Caprellid amphipods (Crustacea) in the western North Pacific based on the CSK International Zooplankton Collection. Plankton Biology and Ecology, 45: 225–230.

Walker AO (1904) Report on the Amphipoda collected by Professor Herdman, at Ceylon, in 1902. Ceylon Pearl Oyster Fisheries 1904 Supplementary Reports, 17: 220–300.