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CURRENT STATUS OF MYSID TAXONOMY IN SOUTHEAST ASIA

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ABSTRACT

This paper reviews the current status of mysid taxonomy in Southeast Asia, encompassing the South China Sea as far north as Hong Kong, the Andaman Sea, the Philippines, and the Indonesian seas as far south as the northern Australian waters. According to the 188 scientific papers published before 2013, 23 species in five genera of the Order Lophogastrida and 207 species in 63 genera of the Order Mysida have been recorded from these waters. This amounts to about 20 % of the recent species of these orders so far reported in the world. The occurrence records of these species were summarized in a table and a figure. On the basis of this body of information, it is suggested that there is an urgent need for research to improve our understanding of the biodiversity of mysids in this region.

Keywords: mysid species, taxonomy, geographical distribution, Southeast Asia

INTRODUCTION

Mysids are important animals in coastal and estuarine ecosystems and are used as food for humans, as are *Acetes* shrimps, in Southeast Asia (Mantiri et al, 2012), India (Tattersall and Tattersall, 1951), China (Liu and Wang, 2000), China and Korea (Omori, 1978) and Japan (Tattersall and Tattersall, 1951; Murano, 1963). Therefore, species identification and ecological studies of mysids are important for increasing the use of the mysid resources in Southeast Asia.

Mysid is an animal group, formerly placed in the Suborder Lophogastrida and Suborder Mysida of the Order Mysidacea, which has recently been reclassified as two orders, Order Lophogastrida and Order Mysida (Mees and Meland, 2012). In Southeast Asia, many research cruises, including several expeditions, have been conducted and mysid species have also been described. These studies were mainly carried out by European (e.g., G. O. Sars, 1883; 1885; Hansen, 1910) and Asian scientists (e.g., Ii, 1964; Pillai, 1973; Murano, 1970- 2010, Liu and Wang, 2000). Gordan (1957), Mauchline and Murano (1977), Mauchline (1980), Müller (1993) and Mees and Meland (2012) dealt with world mysids and their geographical distribution, also providing information on accepted names of mysid species as well as synonyms (Mees and Meland, 2012). There are several problematic species in *Siriella* because its description is made based on male specimens, so females are difficult to distinguish (Murano and Fukuoka, 2008). Mauchline (1980) devised, as a first attempt, a key to 120 genera. However, research on the biodiversity of mysids in the Southeast Asian waters and their geographical distribution has been limited.

As a basis for future research, this paper reviews the current status of taxonomy of mysids in Southeast Asian waters and documents their geographic patterns on the basis of records of their occurrence records, with a discussion on future research.

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MATERIAL AND METHODS

Regional coverage

The Southeast Asian waters in the present study are defined as the sea areas encompassing the South China Sea as far north as Hong Kong, the Andaman Sea, the Philippine seas, and the Indonesian seas as far south as the northern Australian waters. This region is mostly included in geographical region 7 of Mauchline and Murano (1977) and Mauchline (1980).

History and references of mysid taxonomy

As of 2004, 24 species from Southeast Asia in the Order Lophogastrida and 167 species in the Order Mysida have been described in 110 taxonomic papers (Sawamoto and Fukuoka, 2005). Among them *Paralophogaster macrops* of the Order Lophogastrida and *Parastilomysis paradoxa* of the Order Mysida should be excluded from the list. After that, genus *Siriella* (Murano and Fukuoka, 2008) and genus *Rhopalophthalmus* (Hanamura *et al*, 2011) were revised and several new species were described, and a description of four new species (Hanamura *et al*., 2008; Fukuoka, 2011; Bamber and Morton, 2012; Hanamura and Tsutsui, 2012) and the new occurrence of two species (Hanamura et al., 2008; Hanamura et al., 2012) were reported.

Recently, higher taxonomic ranks was modified; five tribes in the subfamily Mysinae were placed at a higher position, subfamily, and the former subfamily Mysinae was cancelled (Mees and Meland, 2012). Those tribes are Erythropini, Leptomysini, Mancomysini, Mysini and Heteromysini. Mees and Meland (2012) also modified *Neognathophausia* to *Gnathophausia* of the Order Lophogastrida, *Anisomysis* (*Pseudanisomysis*) to *Carnegiomysis* and *Anisomysis* (*Javanisomysis*) *gutzuii* to *Javanisomysis gutzuii* of the Order Mysida. The last species *Anisomysis* (*Javanisomysis*) *gutzuii* was discussed in Murano and Fukuoka (2003) who proposed changing its name to *Javanisomysis gutzuii*, but they could not examine the type series of the species. As there were few descriptions for the other two revisions in Mees and Meland (2012), the former system was applied in the present study.

Supplementary collection

To supplement the literature records, mysids were collected with a sledge net and a hand net during the training courses of programs of the Japan Society for the Promotion of Science (JSPS). The sledge net had a rectangular mouth frame (20 cm high and 60 cm wide) and pyramidal in net shape (180 cm long with 0.1 mm mesh opening). The hand net had a round mouth frame (30 cm in diameter) and conical net shape (40 cm long with 0.1 mm mesh opening) with a handle. The specimens were collected in Malaysia (2006, 2008 and 2012) and Thailand (2009).

RESULTS

Mysid species reported in Southeast Asian waters

According to the present literature survey, at least 188 papers had been published on mysid taxonomy as of December 2012. *Promysis orientalis* was described as a new species by Dana (1852) from the specimen collected in 1842 in the South China Sea, 450 miles northeast of Singapore, during the US Exploring Expedition when the first mysid species from this region was described. Sars (1883) described the second species *Promysis* (?) *pusilla* (synonym of *Pseudanchialina pusilla*) based on the specimens collected from the Celebes Sea during the Challenger Expedition. After that many taxonomic studies have been carried out by European scientists such as Hansen (1910), Illig (1930), W. M. Tattersall (1922 - 1951), O. S. Tattersall (1957 - 1967) and Băcescu (1973 - 1993), and Asian scientists such as Ii (1964), Murano (1970 - 2010), Pillai (1973), Takahashi and Murano (1986), Liu and Wang (1980, 1983, 2000), Fukuoka (2011), Fukuoka and Murano (2002, 2005), Hanamura (1997, 1998), Panampunnayil (2002) and Pinkeaw *et al*. (2001).

Figure 1 summarizes the sampling stations of mysids from the literature, including those from expeditions and research cruises as well as shore samplings, including those in mangrove swamps and coral reefs. Sampling stations are scattered over most Southeast Asian waters, including some areas of extensive sampling, such as those around the Hainan Island extending to Hong Kong

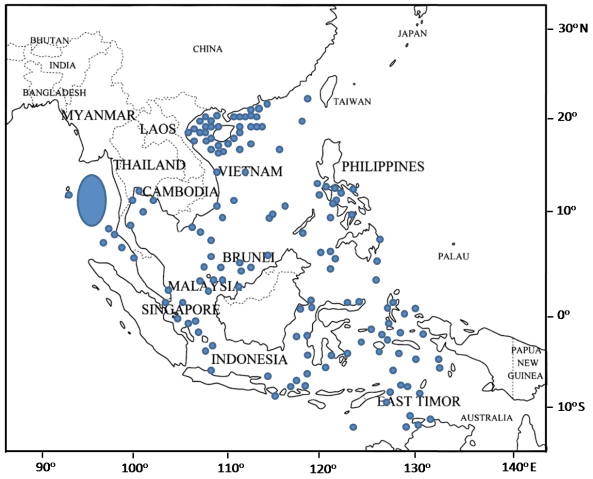

Figure 1. Map of stations where mysid specimens were reported. The map was arranged on the sampling records of expeditions and research cruises and those of coastal and shore samplings. Circles indicate approximate positions, and an ellipse indicates research area in the Andaman Sea.

and to the Gulf of Tonkin and the Andaman Sea. Research in these areas was carried out around 1960 and 1984 – 1990 by Liu and Wang (2000) and during 2002 – 2006 by Biju and Panampunnayil (2011), respectively. Shallow to deep waters close to the Philippines and Indonesia were sampled by Murano (1988 – 2010) in 1972, and deep waters there were sampled by European scientists around 1980 to 1992. Most of the other oceanic stations were surveyed by European expeditions and Japanese research cruises before 1935. However there are few stations around the island of Borneo, especially the north-eastern and the south-western areas.

At these stations samples were mainly collected by vertical or horizontal towing of plankton nets, while dredges were also employed in other cases, such as those in the Philippine and Indonesian waters around 1912 (Tattersall, 1951). Recently, sledge nets were employed to sample mysids at shallow coastal waters to about 500 metres depth (Murano, 2010), and hand nets were also used in shallow coastal waters (Bamber and Morton, 2012).

According to Mees and Meland (2012), the Order Lophogastrida consisted of 55 recent species of 9 genera in 4 families and the Order Mysida of 1129 recent species of 167 genera in 2 families. In their list, however, a valid species *Hypererythrops suluensis* (Murano, 2010) was excluded, so the number of species of the Order Mysida should be 1130.

In the 188 scientific papers, there were 23 species of 5 genera in 3 families in the Order Lophogastrida and 207 species of 63 genera in the Order Mysida from Southeast Asian waters (Table 1). This amounts to 40 % of Order Lophogastrida and about 18 % of Order Mysida in the world. The difference between the orders appears to reflect features of the depth at which they live and their geographical distribution. The Order Lophogastrida is distributed in oceanic areas and mainly in the meso- and bathypelagic waters, while most species of Order Mysida were restricted to the coastal or epipelagic waters. On the other hand, wide geographical distribution was reported for only15 of the 207 species of Order Mysida, while it was reported for 9 of 23 species of Order Lophogastrida.

Geographical distribution

According to the 188 reports, including the reports referred to previously and that of Mees and Meland (2012), the mysids in Southeast Asia were tentatively grouped into 10 types on the basis of their occurrence records (Table 2). Among them six types were composed of more than 10 species; 76 species were restricted to the Southeast Asian waters (Type A), 54 species were both in those waters and in the Indian Ocean (Type D), 25 species were in four water areas (Type I), 24 species were also found in the Atlantic Ocean as well as the Indian and the Pacific Oceans (Type J), 17 species were common to East Asian waters

Table 1. Taxonomic list of species of Order Lophogastrida and Order Mysida recorded in the Southeast Asian waters. (Species name in parenthesis is synonym. Number with asterisk indicates a species reported from waters deeper than 200 m.)

Order Lophogastrida
Family Lophogastridae
1. *Lophogaster inermis* Casanova, 1996
2. *Lophogaster intermedius* Hansen, 1910
3*. *Lophogaster manilae* Băcescu, 1985
4. *Lophogaster musorstomi* Băcescu, 1991
5. *Lophogaster pacificus* Fage, 1940
6*. *Lophogaster rotundatus* Illig, 1930
7*. *Lophogaster schmidti* Fage, 1940
8*. *Paralophogaster boucheti* Casanova, 1993
9. *Paralophogaster foresti* Băcescu, 1981
10. *Paralophogaster glaber* Hansen, 1910
11*. *Paralophogaster intermedius* Coifmann, 1936
12. *Paralophogaster philippinensis* Băcescu, 1981
Family Gnathophausiidae
13*. *Gnathophausia elegans* G. Sars, 1883
14*. *Gnathophausia fagei* Casanova, 1996
(= *Gnathophausia elegans fagei* Băcescu, 1991)
15*. *Gnathophausia gracilis* W.-Suhm, 1875
16*. *Gnathopahusia longispina* G. Sars, 1883
17*. *Gnathophausia zoea* W.-Suhm, 1875
(= *Gnathophausia cristata* Illig, 1906)
(= *Gnathophausia willemoesii* G. Sars, 1883)
18*. *Neognathophausia gigas* W. -Suhm, 1875
(= *Gnathophausia gigas* W. -Suhm, 1875)
19*. *Neognathophausia ingens* (Dohrn, 1870)
(= *Gnathophausia calcarata* G. Sars, 1883)
(= *Gnathophausia ingens* G. Sars, 1883)
(= *Lophogaster ingens* Dohrn, 1870)
Family Eucopiidae
20*. *Eucopia australis* Dana, 1852
21*. *Eucopia panayensis* Băcescu, 1991
22*. *Eucopia sculpticauda* Faxon, 1893
(= *Eucopia intermedia* Hansen, 1905)
23*. *Eucopia unguiculata* (W.-Suhm, 1875)
(= *Chalaraspis unguiculata* W.-Suhm, 1875, partim)
Order Mysida
Family Petalophthalmidae
1*. *Ceratomysis egregia* Hansen, 1910
2*. *Parapetalophthalmus suluensis* Murano and Bravo, 1998
3. *Petalophthalmus liui* Wang, 1998

Family Mysidae
Subfamily Boreomysinae
4*. *Boreomysis hanseni* Holmquist, 1956
5. *Boreomysis kistnae* Pillai, 1973
6*. *Boreomysis plebeja* Hansen, 1910
7*. *Boreomysis rostrata* Illig, 1906
8*. *Boreomysis sibogae* Hansen, 1910
(= *Boreomysis spinifera* Coifmann, 1936)
Subfamily Siriellinae
Tribe Metasiriellini
9. *Metasiriella kitaroi* Murano, 1986
Tribe Siriellini
10. *Hemisiriella parva* Hansen, 1910
11. *Hemisiriella pulchra* Hansen, 1910
12. *Siriella aequiremis* Hansen, 1910
13. *Siriella affinis* Hansen, 1910
14. *Siriella anomala* Hansen, 1910
15. *Siriella australiensis* Panampunnayil, 1995
16. *Siriella brucei* Murano and Fukuoka, 2008
17. *Siriella chaitiamvongae* Murano and Fukuoka, 2008
18. *Siriella conformalis* Hansen, 1910
19. *Siriella distinguenda* Hansen, 1910
20. *Siriella dubia* Hansen, 1910
21. *Siriella essingtonensis* Murano and Fukuoka, 2008
22. *Siriella gracilis* Dana, 1852
23. *Siriella hanseni* W. Tattersall, 1922
24. *Siriella inornata* Hansen, 1910
25. *Siriella izuensis* Murano and Fukuoka, 2008
(= *Siriella japonica* var. *izuensis* Ii, 1964)
(= *Siriella japonica* var. *sagamiensis* Ii, 1964)
(= *Siriella japonica* Sheng, Liu and Wang, 1989)
(= *Siriella japonica japonica* Liu and Wang, 2000)
26. *Siriella longiarticulis* Murano and Fukuoka, 2008
27. *Siriella media* Hansen, 1910
28. *Siriella mulyadii* Murano and Fukuoka, 2008
29. *Siriella nodosa* Hansen, 1910
30. *Siriella okadai* Ii, 1964
31. *Siriella plumicauda* Hansen, 1910
32. *Siriella quadrispinosa* Hansen, 1910
33. *Siriella rimata* Murano and Fukuoka, 2008
34. *Siriella scissilis* Murano and Fukuoka, 2008
35. *Siriella seafdeci* Murano and Fukuoka, 2008
36. *Siriella sinensis* Ii, 1964
37. *Siriella singularis* Nouvel, 1957
38. *Siriella thompsonii* (H. Milne Edwards, 1837)

Table 1. (cont.)

(= *Cynthia thompsonii* H. Milne Edwards, 1837)
39. *Siriella trispina* Ii, 1964
40. *Siriella vulgaris* Hansen, 1910
(= *Siriella vulgaris rostrata* W. Tattersall, 1951)
41. *Siriella wadai* Ii, 1964
Subfamily Rhopalophthalminae
42. *Rhopalophthalmus armiger* Hanamura and Murano, 2011
(= *Rhopalophthalmus longipes* Ii , 1964)
(= *Rhopalophthalmus macropsis* Pillai, 1964)
43. *Rhopalophthalmus egregius* Hansen, 1910
(= *Rhopalophthalmus phyllodus* Murano, 1988)
44. *Rhopalophthalmus hastatus* Hanamura, Murano and Alias, 2011
45. *Rhopalophthalmus kempi* O. Tattersall, 1957
46. *Rhopalophthalmus longipes* Ii , 1964
47. *Rhopalophthalmus orientalis* O. Tattersall, 1957
(= *Rhopalophthalmus egregious* Nakazawa, 1910)
48. *Rhopalophthalmus philippinensis* Hanamura and Murano, 2011
Subfamily Gastrosaccinae
49. *Anchialina dentata* Pillai, 1964
(= *Anchialina parva* Ii, 1964)
50. *Anchialina grossa* Hansen, 1910
51. *Anchialina media* Ii, 1964
52. *Anchialina obtusifrons* Hansen, 1912
53. *Anchialina penicillata* Zimmer, 1915
54. *Anchialina pillaii* Jo and Murano, 1992
55. *Anchialina typica orientalis* Nouvel, 1971
(= *Anchialina typica* Kröyer, 1861)
56. *Anchialina zimmeri* W. Tattersall, 1951
57. *Archaeomysis vulgaris* (Nakazawa, 1910)
(= *Gastrosaccus vulgaris* Nakazawa, 1910)
58. *Eurobowmaniella simulans* (W. Tattersall, 1915)
(= *Eurobowmaniella phuketensis* Murano, 1995)
(= *Gastrosaccus simulans* W. Tattersall, 1915)
59. *Gastrosaccus dunckeri* Zimmer, 1915
60. *Gastrosaccus yuyu* Bamper and Mortensen, 2012
61. *Haplostylus bengalensis* (Hansen, 1910)
(= *Gastrosaccus bengalensis* Hansen, 1910)
(= *Gastrosaccus philippiensis* W. Tattersall, 1951)
62. *Haplostylus indicus* (Hansen, 1910)
(= *Gastrosaccus indicus* Hansen, 1910)
63. *Haplostylus pacificus* (Hansen, 1912)
(= *Gastrosaccus pacificus* Hansen, 1912)
64. *Haplostylus parvus* (Hansen, 1910)
(= *Gastrosaccus parvus* Hansen, 1910)
65. *Haplostylus pusillus* (Coifmann, 1936)
(= *Gastrosaccus pusillus* Coifmann, 1936)
66. *Iiella elegans* (O. Tattersall, 1960)
(= *Gastrosaccus elegans* O. Tattersall, 1960)
67. *liella formosensis* (Ii, 1964)
(= *Gastrosaccus formosensis* Ii, 1964)
68. *liella hibii* (Ii, 1964)
(= *Gastrosaccus hibii* Ii, 1964)
69. *Iiella hispida* Jo and Murano, 1992
70. *Iiella malayensis* Fukuoka, 2011
71. *liella ohshimai* (Ii, 1964)
(= *Gastrosaccus ohshimai* Ii, 1964)
72. *Pseudanchialina inermis* (Illig, 1906)
(= *Chlamydopleon inerme* Illig, 1906)
(= *Pseudanchialina sibogae* Nouvel, 1944)
73. *Pseudanchialina pusilla* (G. Sars, 1883)
(= *Promysis pusilla* G. Sars, 1883)
(= *Anchialus pusillus* G. Sars, 1885)
Subfamily Erythropinae
74*. *Arachnomysis leuckartii* Chun, 1887
(= *Arachnomysis affinis* Hansen, 1910)
75*. *Dactylamblyops latisquamosa* (Illig, 1906)
(= *Chalcophthalmus latisquamosus* Illig, 1906)
76*. *Dactylamblyops fervida* Hansen, 1910
77*. *Echinomysis chuni* Illig, 1905
78. *Erythrops minuta* Hansen, 1910
79. Erythrops nana W. Tattersall, 1922
80. *Erythrops phuketensis* Fukuoka and Murano, 2002
81*. *Erythrops yongei* W. Tattersall, 1936
82*. *Euchaetomera glyphidophthalmica* Illig, 1906
83*. *Euchaetomera oculata* Hansen, 1910
84. *Euchaetomera typica* G.O. Sars, 1883
85*. *Euchaetomeropsis merolepis* (Illig, 1908)
(= *Euchaetomera merolepis* Illig, 1908)
86*. *Gibberythrops acanthura* (Illig, 1906)
(= *Erythrops* (*Gibberythrops*) *acanthura* Illig, 1906)
(= *Parerythrops acanthura* Illig, 1906)
87. *Gymnerythrops anomala* Hansen, 1910
88*. *Holmesiella affinis* Ii, 1937
89. *Hypererythrops semispinosa* Wang, 1998
90. *Hypererythrops spinifera* (Hansen, 1910)
(= *Erythrops spinifera* Hansen, 1910)
91*. *Hypererythrops suluensis* Murano, 2010
92. *Hypererythrops validisaeta* Fukuoka and Murano, 2002
93. *Hypererythrops zimmeri* Ii, 1937
94. *Liuimysis longicauda* Wang, 1998
95*. *Marumomysis hakuhoae* Murano, 1999
96. *Metamblyops philippinensis* (W. Tattersall, 1951)
(= *Gibberythrops philippinensis* W. Tattersall, 1951)

Table 1. (cont.)

97*. *Meterythrops pictus* Holt and W. Tattersall, 1905
(= *Meterythrops affine* Coifmann, 1936)
(= *Meterythrops indica* Hansen, 1910)
98. *Nakazawaia japonica* Murano, 1981
99*. *Paramblyops spatulicaudus* Murano, 2002
100*. *Paramblyops tenuicaudus* Murano, 2002
101. *Pleurerythrops inscita* Ii, 1964
102. *Pleurerythrops monospinosa* Liu and Wang, 1986
103. *Pseuderythrops abrahami* Biju and Panampunnayil, 2011
104*. *Pseuderythrops gracilis* Coifmann, 1936
105. *Pseuderythrops megalops* Murano, 1998
106. *Pseudomma semispinosum* Wang, 1998
107. *Pseudomma spinosum* Wang, 1998
108. *Shenimysis cordata* Wang, 1998
109*. *Synerythrops intermedia* Hansen, 1910
110*. *Teratamblyops philippinensis* Murano, 2001
111*. *Teratamblyops suluensis* Murano, 2001
Subfamily Leptomysinae
112. *Afromysis dentisinus* Pillai, 1957
113. *Dioptromysis perspicillata* Zimmer, 1915
114. *Dioptromysis proxima* Nouvel, 1964
115. *Doxomysis anomala* W. Tattersall, 1922
116. *Doxomysis brucei* Murano, 1990
117. *Doxomysis longiura* Pillai, 1963
118. *Doxomysis murariui* Băcescu, 1993
119. *Doxomysis nicobaris* Panampunnayil, 2002
120. *Doxomysis quadrispinosa* (Illig, 1906)
(= *Doxomysis pelagica* Hansen, 1912)
(= *Mysis quadrispinosa* Illig, 1906)
121. *Doxomysis sanuriensis* Băcescu, 1993
122. *Doxomysis spinata* Murano, 1990
123. *Iimysis orientalis* (Ii, 1937)
(= *Tenagomysis orientalis* Ii, 1937)
124. *Mysidopsis indica* W. Tattersall, 1922
125. *Mysidopsis kempi* W. Tattersall, 1922
126. *Neodoxomysis elongata* Murano, 1999
127. *Neodoxomysis littoralis* (W. Tattersall, 1922)
(= *Doxomysis littoralis* Tattersall, 1922)
128. *Neodoxomysis sahulensis* Murano, 1999
129. *Paraleptomysis sinensis* Liu and Wang, 1983
130. *Paraleptomysis xenops* (W. Tattersall, 1922)
(= *Leptomysis xenops* W. Tattersall, 1922)
131. *Prionomysis aspera* Ii, 1937
132. *Prionomysis australiensis* Murano, 1990
133. *Prionomysis stenolepis* W. Tattersall, 1922
134. *Promysis orientalis* Dana, 1852
(= *Uromysis armata* Hansen, 1910)
135. *Pseudoxomysis caudaensis* Nouvel, 1973
136. *Pseudoxomysis incisa* Murano, 2001
Subfamily Mancomysinae
137. *Palaumysis philippinensis* Hanamura and Kase, 2002
Subfamily Mysinae
138. *Acanthomysis brucei* Fukuoka and Murano, 2002
139. *Acanthomysis indica* (W. Tattersall, 1922)
(= *Neomysis indica* W. Tattersall, 1922)
140. *Acanthomysis longispina* Fukuoka and Murano, 2002
141. *Acanthomysis ornata* O. Tattersall, 1965
142. *Acanthomysis platycauda* (Pillai, 1964)
(= *Lycomysis platycauda:* Pillai, 1964)
(= not *Lycomysis platycauda* Pillai, 1961)
143. *Acanthomysis quadrispinosa* Nouvel, 1965
144. *Acanthomysis thailandica* Murano, 1988
145. *Anisomysis* (*Anisomysis*) *bifurcata* W. Tattersall, 1912
146. *Anisomysis* (*Anisomysis*) *brevicauda* Wang, 1989
147. *Anisomysis* (*Anisomysis*) *laticauda* Hansen, 1910
148. *Anisomysis* (*Anisomysis*) *megalops* (Illig, 1913)
(= *Kreagromysis megalops* Illig, 1913)
149. *Anisomysis* (*Anisomysis*) *minuta* Liu and Wang, 1983
150. *Anisomysis* (*Anisomysis*) *quadrispinosa* Wang, 1989
151. *Anisomysis* (*Anisomysis*) *spinata* Panampunnayil, 1993
152. *Anisomysis* (*Anisomysis*) *thurneysseni* Nouvel, 1973
153. *Anisomysis* (*Paranisomysis*) *ijimai* Nakazawa, 1910
154. *Anisomysis* (*Paranisomysis*) *takedai* Hanamura and Tsutsui, 2012
155. *Anisomysis* (*Pseudanisomysis*) *bipartoculata* Ii, 1964
156. *Anisomysis* (*Pseudanisomysis*) *hispida* Pillai, 1973
157. *Anisomysis* (*Pseudanisomysis*) *tattersallae* Pillai, 1973
158. *Anisomysis* (*Pseudanisomysis*) *xenops* W. Tattersall, 1943
159. *Javanisomysis gutzuii* Băcescu, 1992
160. *Gangemysis assimilis* (Tattersall 1908)
(= *Diamysis assimilis* (Tattersall, 1908))
(= *Potamomysis assimilis* Tattersall, 1908)
161. *Hyperacanthomysis longirostris* (Ii, 1936)
(= *Acanthomysis longirostris* Ii, 1936)
162. *Lycomysis spinicauda* Hansen, 1910
(= *Lycomysis pusilla* Zimmer, 1915)
163. *Mesopodopsis orientalis* (W. Tattersall, 1908)
(= *Macropsis orientalis* W. Tattersall, 1908)

Table 1. (cont.)

164. *Mesopodopsis tenuipes* Hanamura, Koizumi and Sawamoto, 2008
165. *Nanomysis insularis* Nouvel, 1957
166. *Nanomysis philippinensis* Murano, 1997
167. *Nanomysis siamensis* W. Tattersall, 1921
168. *Neomysis awatschensis* (Brandt, 1851)
(= *Neomysis nigra* Nakazawa, 1910)
(= *Mysis awatschensis* Brandt, 1851)
169. *Neomysis japonica* Nakazawa, 1910
170. *Nipponomysis patula* Fukuoka and Pinkaew, 2003
(= *Proneomysis quadrispinosa* Ii, 1964)
171. *Nipponomysis quadrispinosa* (Ii, 1964)
172. *Nipponomysis sinensis* (Wang, 1981)
(= *Proneomysis sinensis* Wang, 1981)
173. *Notacanthomysis hodgarti* (W. Tattersall, 1922)
(= *Acanthomysis hodgarti* (W. Tattersall, 1922))
(= *Neomysis hodgarti* W. Tattersall, 1922)
174. *Notacanthomysis laticauda* (Liu and Wang, 1980)
(= *Acanthomysis laticauda* Liu and Wang, 1980)
175. *Orientomysis calida* Fukuoka, Pinkaew and Chalermwat, 2005
176. *Orientomysis crassispinosa* (Liu and Wang, 1980)
(= *Acanthomysis crassispinosa* Liu and Wang, 1980)
177. *Orientomysis leptura* (Liu and Wang, 1980)
(= *Acanthomysis leptura* Liu and Wang, 1980)
178. *Orientomysis meridionalis* (Liu and Wang, 1983)
(= *Acanthomysis meridionalis* Liu and Wang, 1983)
179. *Orientomysis rotundicauda* (Liu and Wang, 1980)
(= *Acanthomysis rotundicauda* Liu and Wang, 1980)
(= *Acanthomysis longicauda* Murano, 1991)
180. *Orientomysis serrata* (Liu and Wang, 1980)
(= *Acanthomysis serrata* Liu and Wang, 1980)
181. *Orientomysis tenella* (Liu and Wang, 1980)
(= *Acanthomysis tenella* Liu and Wang, 1983)
Subfamily Heteromysinae
182. *Heteromysis gracilis* Murano, 1988
183. *Heteromysis inflaticauda* Wang, 1998
184. *Heteromysis minuta* O. Tattersall, 1967
185. *Heteromysis proxima* W. Tattersall, 1922
186. *Heteromysis singaporensis* O. Tattersall, 1967
187. *Heteromysis spinosa* Băcescu, 1986
188. *Heteromysis* (*Heteromysis*) *australica* Băcescu and Bruce, 1980
189. *Heteromysis* (*Heteromysis*) *communis* Băcescu, 1986
190. *Heteromysis* (*Heteromysis*) *gymnura* W. Tattersall, 1922
191. *Heteromysis* (*Olivaemysis*) *essingtonensis* Murano, 1988
192. *Heteromysis* (*Olivaemysis*) *meenakshiae* Bamber, 2000
193. *Heteromysis* (*Olivaemysis*) *quadrispinosa* Murano, 1988
194. *Heteromysis* (*Olivaemysis*) *sexspinosa* Murano, 1988
195. *Heteromysis* (*Olivaemysis*) *tenuispina* Murano, 1988
196. *Heteromysis* (*Olivaemysis*) *thailandica* Fukuoka and Murano, 2002
197. *Heterom ysis* (*Olivaemysis*) *zeylanica* W. Tattersall, 1922
198. *Heteromysoides macrops* Murano, 1988
199. *Heteromysoides nana* Murano, 1998
200. *Heteromysoides sahulensis* Murano, 1998
201. *Pseudomysidetes cochinensis* Panampunnayil, 1977
202. *Pseudomysidetes nudus* Fukuoka and Murano, 2002
Subfamily Mysidellinae
203. *Mysidella incisa* Wang, 1998
204*. *Mysidella macrophthalma* Murano, 2002
205. *Mysidella rotundincisa* Wang, 1998
206*. *Mysidella sulcata* Murano, 2002
207. *Mysidella tenuicauda* Wang, 1998

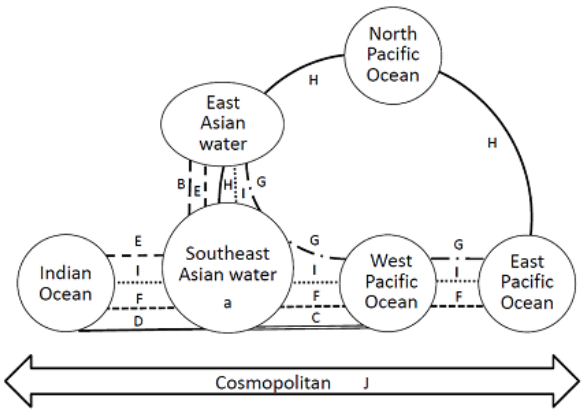

Figure 2. Tentative geographical distribution patterns of 230 species of Orders Lophogastrida and Mysida. These species were distributed in the Southeast Asian waters. Marks A to J indicated tentative distribution types and were shown in Table 2.

Table 2. Geographical regions of the Southeast Asian mysids for each order. Species were tentatively grouped according to their records of occurrence and depth distribution.

	Order	Lophogastrida				Mysida				
Type	Geographical region / distribution area or layer	epipelagic	meso-pelagic	bathy-pelagic	total	coastal epipelagic		meso-pelagic	bathy-pelagic	total
A	Restricted to SE Asia	2	2	1	5	43	19	6	3	71
B	SE Asia and E. Asia	1			1	8	7	1		16
C	SE Asia and West Pacific Ocean	2	2		4	3	4	1		8
D	SE Asia and Indian Ocean		1		1	38	13	2		53
E	SE Asia, EA and Indian Ocean				0	3	3			6
F	SE Asia, W. Pacific and Indian Ocean				0	4	3			7
G	SE Asia, W. Pacific and East Asia		2		2	3				3
H	SE Asia, East Asia and N. and E. Pacific Ocean				0	2		1		3
I	SE Asia, WP, EA and Indian Ocean	1			1	8	16	1		25
J	Cosmopolitan including SE Asia	1	3	5	9		6	6	3	15
	Total	7	10	6	23	112	71	18	6	207

(Type B) and 12 species were common to the West Pacific Ocean (Type C). The other types, Types E to H, were composed of three to seven species that have been reported in three to four water areas as shown in Fig. 2. Among them, species of Type H are distributed in the North and East Pacific Oceans.

More than two-thirds of the species of Order Lophogastrida have been reported from depths of more than 500 m, while the others were epipelagic (< 200 m) including no coastal species (Table 2). On the other hand, most species of Order Mysida were reported from coastal waters or the epipelagic layer. About one-third of them belong to Type A, which is followed by Type D. Meso- or bathypelagic species were included in Type A or J (Table 2).

Twenty-five species of 18 genera of Order Mysida were found in the samples from the supplementary collection (Table 3). *Anchialina typica orientalis* was the only species distributed over a wide geographical range.

Description of new species

Only six mysid species were globally known before 1870. Owing to many expeditions such as

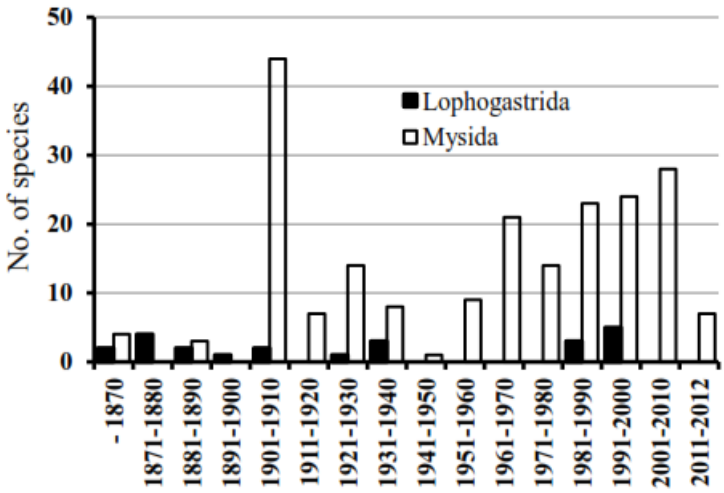

Figure 3. Number of species of Orders Lophogastrida and Mysida described as new each decade in the period from before 1870 to 2012. The species were accepted at present and were reported in the Southeast Asian waters.

Challenger (Sars, 1883, 1885), Siboga (Hansen, 1910), Deep-sea (Illig, 1905, 1906, 1908, 1913, 1930) and Dana (Fage, 1940-1942), many mysid species were described. Hansen (1910) reported about 40 species as new and a total of 62 species was known by 1910 in the world. By 1955 the number of mysid worldwide was about 520 in 106 genera (Gordan, 1957), and 765 species in middle 1970s (Mauchline and Murano, 1977). Mauchline (1980) corrected their numbers and added several species, resulting in the number increasing to 780. Müller (1992) collated the literature and the number increased to 979. At the end of 2012 the number reached 1130 (Mees and Meland, 2012).

The species of the Southeast Asian waters were summarized by Sawamoto and Fukuoka (2005). They collated110 documents and listed 191 species of 67 genera. The number was corrected to 230 species of 68 genera in the present study. On the basis of this information, species described in each decade from before 1870 to the present (Fig. 3) were counted. Twenty-three species of Order Lophogastrida were mostly described by 1940 and eight species were in the period 1981 to 2000. On the other hand, of the 207 species of Order Mysida only seven species were described before 1890, which jumped up to 44 species due mainly to Hansen's (1910) study. After 1981, more than 20 new species were described in each decade.The average increase rate was 2.2 species per year for the period from 1951 to 2012.

Key to species

Mauchline (1980) collated the literature and a generic key for the first time for all 120 genera. This step followed on from Tattersall and Tattersall (1951) who explained the general morphology of mysids with figures, but their key was not accompanied by illustrations. Murano (1997) adopted a key with figures for mysid species of Japanese waters, which had been useful for species identification and promoted mysid research considerably.

DISCUSSION

Taxonomic problems

On the basis of the present literature survey, gaps in mysid taxonomy in Southeast Asia to be addressed in the future are listed as follows: *Siriella vulgaris* might be a complex of several species (Mauchline and Fukuoka, 2008) and examination of male specimens is expected to provide definitive identification of *Siriella* species (Ii, 1964; Mauchline and Fukuoka, 2008); type specimens for *Javanisomysis gutzui* (Bacescu, 1992) should be redescribed ; *Anisomysis* (*Pseudanisomysis*) and *Neognathophausia* should be referred to as

Table 3. Mysid species collected and identified on the samples of 2004-2012 in the Southeast Asian waters. (A mark ○ indicates the species that is present in the samples.)

Name of the country	Indonesia	Vietnam		Malaysia			Thailand	occurrence	genus
species / sampling year	2005	2004	2005	2006	2008	2012	2009	total	total
Subfamily Siriellinae									
Hemisiriella pulchra Hansen, 1910		○						1	1
Siriella gracilis Dana, 1852						○		1	
Siriella mulyadii Murano and Fukuoka, 2008					○			1	
Siriella seafdeci Murano and Fukuoka, 2008					○			1	
Siriella spp.	○		○	○	○	○	○	6	1
Subfamily Rhopalophthalminae									
Rhopalophthalmus egregius Hansen, 1910			○	○				2	
Rhopalophthalmus longipes Ii , 1964				○				1	
Rhopalophthalmus spp.			○	○			○	3	1
Subfamily Gastrosaccinae									
Anchialina dentata Pillai, 1964		○						1	
Anchialina typica orientalis Nouvel, 1971					○			1	
Anchialina spp.		○			○	○		3	1
Haplostylus bengalensis (Hansen, 1910)					○			1	
Haplostylus indicus (Hansen, 1910)	○					○		2	1
Iiella elegans (O. Tattersall, 1960)				○				1	
Iiella malayensis Fukuoka, 2011					○			1	1
Haplostylus / Iiella spp.			○	○	○	○		4	
Pseudanchialina inermis (Illig, 1906)	○		○			○		3	
Pseudanchialina sp.		○						1	1
Subfamily Erythropinae									
Erythrops minuta Hansen, 1910				○		○		2	
Erythrops sp.						○		1	1
Gymnerythrops anomala Hansen, 1910	○							1	1
Subfamily Leptomysinae									
Doxomysis quadrispinosa (Illig, 1906)		○						1	1
Neodoxomysis sp.				○				1	1
Paraleptomysis xenops (W. Tattersall, 1922)			○					1	1
Prionomysis sp.					○			1	1
Pseudoxomysis caudaensis Nouvel, 1973			○	○				2	1
Subfamily Mysinae									
Acanthomysis indica (W. Tattersall, 1922)				○				1	
Acanthomysis platycauda (Pillai, 1964)							○	1	
Acanthomysis sp.				○			○	2	1
Anisomysis (*Paranisomysis*) *ijimai* Nakazawa, 1910 ?	○							1	1
Hyperacanthomysis spp.				○				1	1
Mesopodopsis tenuipes Hanamura, Koizumi and Sawamoto, 2008			○			○		2	1
Nipponomysis sinensis (Wang, 1981)			○				○	2	
Nipponomysis spp.			○					1	1
Notacanthomysis laticauda (Liu and Wang, 1980)				○				1	1
Orientomysis calida Fukuoka, Pinkaew and Chalermwat, 2005			○	○				2	
Orientomysis spp.			○	○				2	1
total	5	5	12	15	9	9	5	25	21

Carnegiomysis and *Gnathophausia* respectively (Meer and Meland, 2012) and their replacement should be publicised. In addition, redescriptions based on male specimens are expected for *Siriella brucei*, *Anisomysis* (*Anisomysis*) *meglops* and *A*. (*A*.) *quadrispinosa*, which were based on females, and for *Gymnerythrops anomala*, which was based on immature specimens. Reexamination is needed for *Anisomysis* (*A*.) *spinata* which was closely allied to *A*. (*A*.) *bifurcate* except for a subtle difference in the process on the uropodal endopod.

Geographical distribution

As summarized in Table 2, about one-thirds (76 species) of the present 230 species are endemic to Southeast Asia and 57% of these endemic species are comprised of coastal-water species. In addition, the rate of discovery of new species is still steadily increasing (Fig. 3), indicating a high level of potential (or hidden) species diversity of mysids in this region. These clearly indicate that the coastal water of Southeast Asia is a hotspot of mysid biodiversity at the global scale, and the importance of steady progress of basic taxonomic research in this region, now under the diverse threats to the coastal ecosystems due to human activities and climate change (Nishida et al., 2011).

In contrast to the coastal-water species, meso- and bathypelagic species generally show much wider geographic ranges (Mauchline, 1980), such as those over the Indo-Pacific or Indo-Pacific-Atlantic Oceans. This also applies in the present meso- and bathypelagic species in Type J (cosmopolitan). However, there are also meso- and bathypelagic species that belong to Type A (endemic to Southeast Asia) or some other types that are spread a little wider but still in a limited regions. Although the possibility cannot be ruled out that the geographic ranges of these species might be extended by future discoveries of new localities, these species will also be interesting models to examine processes of speciation and/or dispersion in meso- and bathypelagic zones, by integrative morphological and phylogeographical analyses.

It should be noted that currently available occurrence records of mysids, as compiled above, seem to cover the major regions of Southeast Asia rather evenly (Fig. 2), but they are still limited to only very small portions of the total habitats of mysids, in terms of both geographic regions (e.g. remote open waters, seawater ponds in islands), depth zones (e.g. deep-sea benthopelagic zone), and microhabitats (e.g. spaces among complex structures such as corals, mangroves, sea-grasses). Future research is expected into these barely investigated habitats, as well as poorly investigated geographic areas, such as the coastal waters of Borneo. In addition, it is expected that an integrative approach using genetic markers, along with conventional morphological analysis, will be applied in future studies of mysids to clarify the relationships between a set of morphological species that are difficult to distinguish, infra-morphospecific variants with unknown genetic relationships (e.g. Hanamura et al., 2008), and phylogenetic relationships among species. I hope the information presented above will of use to these studies.

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