

Seagrass Gammarid Amphipods of Libong Island, Trang Province, Thailand

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ABSTRACT.– Gammarid amphipods were collected from along the east coast of Libong Island, Trang Province, Thailand, where large patches of seagrass beds can be found, during October 2003 to August 2005. Seven species from six families were recorded, namely: *Ampelisca cyclops*, *A. miharaensis*, *Eriopisella sechellensis*, *Kamaka* sp. A, *Perioculodes longimanus*, *Syncheldium* sp. A and *Urothoe spinidigitus*. Their characters are described and illustrated. All specimens are deposited at the Reference Collection, Phuket Marine Biological Center, Thailand.

KEY WORDS: Taxonomy, Gammarid amphipods, Seagrass beds, Andaman Sea

INTRODUCTION

Gammarid amphipods are common and widely distributed macrofauna in marine and freshwater systems. They are diversified, in terms of the numbers of species and the niches occupied, and can be classified according to habitats as epifaunal, infaunal and demersal planktonic amphipods. Amphipods also play different roles in the trophodynamic relationship, as primary consumers, omnivores, carnivores and opportunistic feeders, and change their feeding modes according to food availability. Within Thailand amphipods are a major benthic fauna always found in

seagrass beds (Nateekanjanalarp, 1990; Intrasook, 1999), but there is little information on the diversity of aphipods in the seagrass beds. Indeed, the potential for unrecorded biodiversity is illustrated by the number of new species recorded in recent partial surveys. Thus, two new species of *Cerapus*, *C. chaomai* and *C. yuyatalay*, were recorded from the seagrass bed in the Andaman sea at Chaomai, in the Trang province (Lowry and Berents, 2002), whilst evaluation of the soft bottom amphipods focussed upon the Tin Mining area of western Phuket island recorded 25 species of amphipods consisting of the genera *Ampelisca*, *Byblis*, *Grandidierella*, *Corophium*, *Erichthonius*, *Gammaropsis*, *Lembos*, *Platyschnopus*, *Urothoe*,

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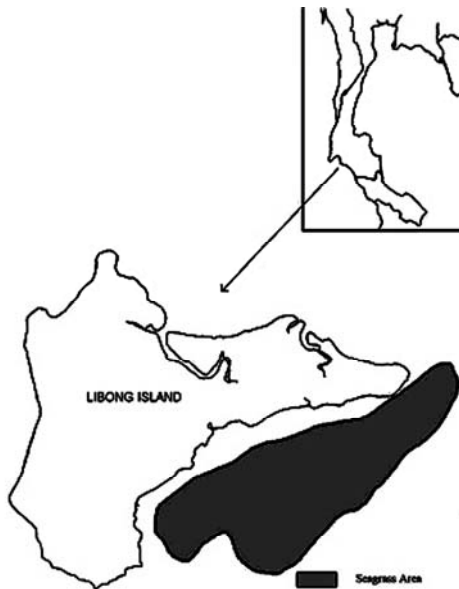


FIGURE 1. The study site at Libong Island, Trang Province (Modified from Poovachiranon et al., 2006).

Cheriphotis, *Photis*, *Leucothoe*, *Idullnella*, *Liljeborgia*, *Lysianassa*, *Elasmopus*, *Eriopisella*, *Perioculodes*, *Hapiniopsis*, *Manadibulphoxus*, *Paraphoxus*, *Floorchestia* and *Microrchestia*. In deeper water zones, four new species of gammarids from the genus *Lepidepcreum*, *L. andamanensis*, *L. hirayamai*, *L. somchaiti* and *L. lukini*, were recently recorded (Lowry and Stoddart, 2002), with *Nuuanu kata* additionally being newly described from the Andaman Sea (Lowry and Watson, 2002). In addition, a study of gammarid specimens from the Aoridae and Neomegamphopidae families from Phuket described four new species; *Wombalono rachayai*, *Bemlos delicatissima*, *Protolembos tegulapodus* and *Konatopus* (Myers, 2002), whilst Peart (2002) described four new species from the family

Ampithoidae; *Ampithoe rachanoi*, *Cymadusa aungtonyae*, *C. chalongana* and *C. Panwa*, in the Andaman coast. Finally, Lowry and Myers (2003) studied the families Amathillopsidae, Eusiridae and Iphimediidae from the Indo-West Pacific and recorded two new species; *Iphimedia phuketensis*, *I. rachanoi* from the Andaman Sea.

The study reported here was carried out during 2003 – 2005 with the objective to study the biodiversity of shallow water gammarid amphipods at Libong island, which is situated in the Andaman Sea within the Trang Province of Thailand.

MATERIALS AND METHODS

Study site

Libong Island is located at latitude $07^{\circ} 14' - 07^{\circ} 17' N$ and longitude $99^{\circ} 22' - 09^{\circ} 27' E$ on the western coastline of Amphoe Kantang, Trang Province, and is approximately 3 km from the mainland (Fig. 1). Two monsoon seasons can be distinguished in this area. The rainy southwest monsoon period is typically from June to October and the dry northeast monsoon period from November to February. Strong winds and wave action during the southwest monsoon can be found along this coast. Libong Island has a diverse ecosystem, including coral reefs, mangrove forests and an extensive seagrass bed. The study site is situated on the east coast of the island where the large seagrass bed can be found. There were eight species of seagrass; *Halophila ovalis*, *Halodule uninervis*, *Halodule pinifolia*, *Thalassia himprichii*, *Cymodocea rotundata*, *Enhalus acoroides*, *Cymodocea serrulata* and *Syringodium isoetifolium*, with the dominant species being *Halophila* spp., *Halodule* spp. and

Cymoducea spp. The island receives a large sediment loading from the Trang River which affected the seagrass beds around the island.

Specimens sampling

Seagrass leaves, stems rhizomes and sediments were collected from surface to a depth of 5 cm during low tide using 50 x 50 cm quadrats. The samples collected were washed through the 0.5 mm mesh size sieve. Specimens were preserved 10% (w/v) formalin seawater, and subsequent sorting and taxonomic identification of samples was carried out in the laboratory.

Taxonomy

Order Amphipoda Suborder Gammaridea Family Ampeliscaidae

Ampelisca cyclops Walker, 1904 (Fig. 2)

Ampelisca cyclops Walker 1904, p. 253, pl. 2, fig. 14; Stebbing 1906, p. 722; Pirlot 1936, p. 280; Barnard 1937, p. 149. Pillai, 1957, p. 31, fig. 1; Nayar, 1959, p. 8, pl. 2., Imbach, 1967, p 58, pl. 5. *Ampelisca iyoensis* Nagata 1959, p. 254, figs. 9–11.

Material examined. – 17 specimens, hand collected at low tide from bare sand near the seagrass bed, Libong Island, K. Wongkamhaeng, 7.10.2003. Two specimens, hand collected at low tide from within the seagrass bed, Libong Island, K. Wongkamhaeng, 5.9.2005.

Habitat.– Bare sand in the seagrass bed, among seagrass roots and rhizomes.

Description.– Head as long as first free pereonite combined with single cuticle lens.



FIGURE 2. *Ampelisca cyclops* Walker, 1904. A. Amphipod body P1-P7: pereopods 1-7. MP: Maxillipeds; MXI: First maxilla; MX II: Second maxilla; MN: Mandible; LL: Lower lip.

The pair of first antenna locate between both eyes and the pair of second antenna situated at the ventral corner of the head.

Second Antenna longer than the first. Mouthparts from lateral view form quadrate bundle. Upper lip round. Mandibles normal with toothed incisor. The lacinia mobilis present in right mandible. Mandibular molar small. Mandibular palps with dense fine setae along three articles. The lower lip normal with inner lobe. Inner plate of first maxilla with eight sickle shaped spines. The outer plates of first maxilla with four serrate spines. Second maxilla; equal inner and outer lobes with dense long setae. Maxilliped; outer lobe larger than inner lobe. Palps longer than outer lobe with three articles. Terminal of maxilliped palp claw-like.

Gnathopods 1 and 2 article 7 sharp, article 2-4 broad. Pereopods 3-4 similar in structure with article 2-4 much broader than article 7. Pereopods 5-6 similar in structure, articles 2 simple and article 3 longer than article 4. Articles 4 of pereopods 5-6 produce small lobe, fully cover article 5. Articles 6 inflated and longer than article 7. Pereopod 7; article 2 broad, produce posteroventral lobe. The pleons segments, round posteroventral corner without tooth. The first urosomal segment with large dorsal process. Uropod 1 exceed end of uropod 2. Outer ramus of uropod 1 naked and inner ramus bear a few spine. Both rami of uropod 2 with spines. Uropod 3 subfoliaceous, outer and inner rami equal. Telson cleft with apices acute and one seta at each tip.

Feeding and Behavior.— *A. cyclops* are typical tube dwellers living in sediment but occasionally appearing in plankton sample. Food items in their stomach were composed of benthic diatoms, macro algae and organic material.

Distribution.— *A. cyclops* was first described from specimens collected off the coast of Ceylon (Walker, 1904), and subsequently from the East Indies archipelagoes (Pirlot, 1936), Suez Canal (Barnard, 1937), the Mandras coast, India (Nayar, 1959), from plankton sampling at Trivandrum, India (Rabindranath, 1975), in the West Pacific along the Nhatrang Coast (Imbach, 1967) and Seto Inland Sea (Nagata, 1965). Within Thailand this species has been recorded from the eastern coast of Phuket (Bussarawich et al., 1984). The current known distribution for *A. cyclops* is summarized in Figure 9.

***Ampelisca miharaensis* Nagata, 1959**

(Fig. 3)

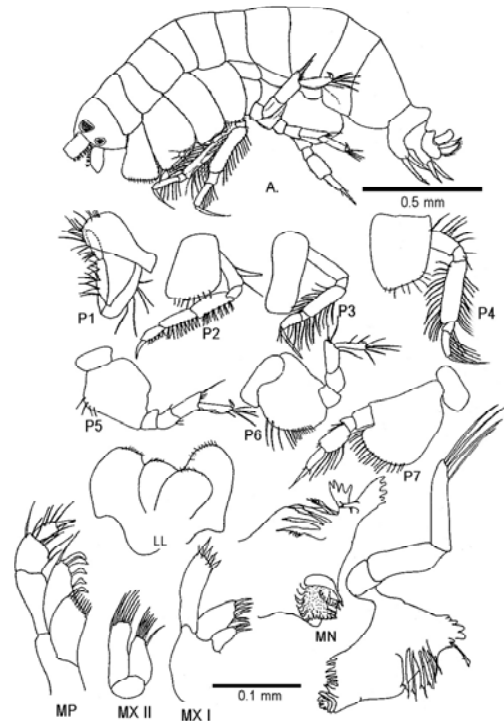


FIGURE 3. *Ampelisca miharaensis* Nagata, 1959 A. Amphipod body P1-P7: pereopods 1-7. MP: Maxillipeds; MX I: First maxilla; MX II: Second maxilla; MN: Mandible; LL: Lower lip.

Ampelisca miharaensis Nagata, 1959, p. 266–270; Nagata, 1960, p. 168, Nagata, 1965, p. 152–153; Imbach, 1967, p. 62, 64; Barnard, 1967, p. 7.

Material examined. – Seven specimens, hand collected at low tide from bare sand near the seagrass bed, Libong Island, K. Wongkamhaeng, 7.10.2003.

Description. – Head; small rostrum with four eyes, cuticle lense in lateral pair. Eye bigger than *A. cyclops*.

First antenna located between both eyes, second antenna at ventral corner of the head. Second antenna longer than the first. Mouthparts from lateral view form quadrate bundle. Upper lip is round. Mandibles normal with toothed incisor. The lacinia mobilis present in right mandible. Mandibular molar

small. Mandibular palps with dense fine setae along three articles. The lower lip normal with inner lobe. Maxilla 1; inner plate with eight sickle shaped spines, outer plates with four serrate spines. Maxilla 2; equal inner and outer lobes with dense long setae. Maxilliped; outer lobe larger than inner lobe, palp longer than outer lobe with three articles, terminals of palps claw-like.

Gnathopods 1 and 2 with sharp article 7 and broad articles 2-4. Pereopods 3-4 similar in structure with articles 2-4 much broader than article 7. Pereopods 5-6 similar in structure, articles 2 simple and article 3 longer than articles 4. Articles 4 of pereopods 5-6 produce small lobe that fully cover article 5. Articles 6 inflated and longer than article 7. Pereopod 7, article 2 broad, produce posteroventral lobe. The pleons segments have round posteroventral corner without tooth. Urosomal segment 1 with large dorsal process. Uropod 1 exceed end of uropod 2, outer rami of uropod 1 naked and inner ramus bearing a few spines. Both rami of uropod 2 with spines. Uropods 3 subfoliaceous, outer and inner rami equal. Telson cleft with apices acute and one seta at each tip.

Distribution.— *A. miharaensis* was first described from the stomach contents of fish collected around Shikoku Island (Nagata, 1959), and subsequently from Seto Inland Sea (Nagata, 1965), the Ariake Sea, Tomioka Bay and Shijiki Bay, West Kyuchu, Japan (Hirayama, 1983), and the West Pacific along Nhatrang Coast, Vietnam (Imbach, 1967). This is, however, the first record of *A. miharaensis* in Thai Waters.

The current known distribution of *A. miharaensis* is summarized in Figure 9.

Feeding and Behavior.— *A. miharaensis* is a tube dweller. Food items in their

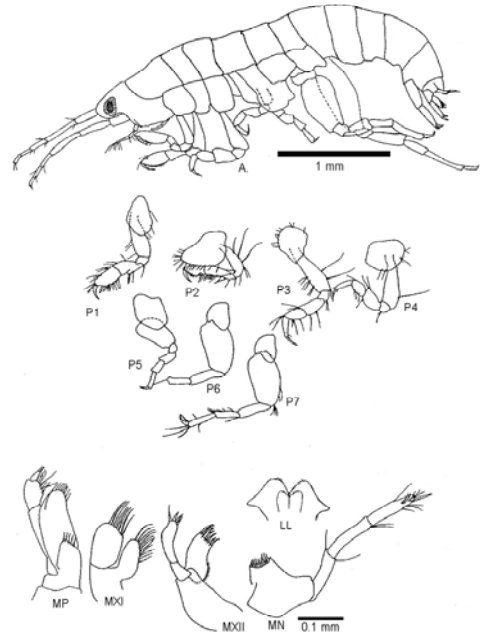


FIGURE 4. *Kamaka* sp. A. A: Amphipod body P1-P7: pereopods 1-7. MP: Maxillipeds; MXI: First maxilla; MX II: Second maxilla; MN: Mandible; LL: Lower lip.

stomach were comprised of benthic diatoms, macro algae and organic material.

Family Ischyroceridae

Kamaka sp. A

(Fig. 4)

Material examined.— 25 specimens, hand collected at low tide from bare sand near the seagrass bed, Libong Island, K. Wongkamhaeng, 7.10.2003. 18 specimens, hand collected at low tide in the seagrass bed, Libong Island, K. Wongkamhaeng, 5.9.2005.

Description.— Body subcylindrical. Urosomites are free. Rostrum and ocular lobe short. Antennal sinus moderate. Eyes large in ocular lobe. First antenna is as

long as the second. Mouthparts from lateral view form quadrate bundle. Upper lip round. Mandibles normal with toothed incisor. Mandibular molar small in tube form. Mandibular palps slender with three articles. The lower lip normal with entire outer lobe and well developed inner lobe. First maxilla have inner plates with seven slender spines. The outer plates of first maxilla with eight slender spines. Second maxilla with inner lobe smaller than outer lobes with dense long setae. Maxilliped with outer plate larger than inner plate. The palps longer than outer lobe with four articles, articles 2 long, article 3 unlobed, article 4 short with long spine and setae.

Coxae long and strongly overlapping. Gnathopods 1-2 simple and feeble. Dense setae on both gnathopods. Pereopods 3-4 normal and similar in shape with slender article 2, and long article 7. Pereopods 5-6 shorter than pereopods 7. Pereopods 5 and 6 have broad article 2. Pleopods are normal. Uropods 1 and 2 biramus with rami equal with peduncles. Uropod 3 biramus but both rami very short. Telson entire, short, and broader than long with 2 hooks at apice.

Feeding and Behavior.— *Kamaka* sp. A are grazers. Their food items consisted of benthic diatoms, macroalgae and organic particles. They search for food using short antennae together with eyes located in ocular lobe. Food particles are selected by the maxilliped and second maxilla and ground by the first maxilla together with lower lips and mandibles.

Family Melitidae

Eriopisella sechellensis (Chevereux, 1901) (Fig. 5)

Eriopisa sechellensis Chevereux, 1901, P. 403, figs. 19–21



FIGURE 5. *Eriopisella sechellensis* (Chevereux, 1901). A. Amphipod body P1-P7; pereopods 1-7. MP: Maxillipeds; MXI: First maxilla; MX II: Second maxilla; MN: Mandible; LL: Lower lip.

Niphargus chikensis, Cliton, 1921, P. 531, fig. 4; Cliton, 1925, P. 354, fig. 1

Eriopisella sechellensis, Barnard, 1935, P. 284, fig. 4; Nagata, 1965, P. 304, fig. 33; Sivaprakasam, 1967, P. 377, fig. 3; Hirayama, 1986a, P. 35, fig. 219

Material examined.— Six specimens, hand collected at low tide from bare sand near the seagrass bed, Libong Island, K. Wongkamhaeng, 7.10.2003.

Description.— Head free, not coalesced with peraeonite 1. Rostrum present and short. Eye present. Body laterally compressed.

First antenna longer than the second. Mouthparts well developed. Mandible incisor dentate with lacinia mobilis. Molars present and triturative with palps. Maxilla 1 present with strongly setose inner plates.

Maxilla 2 with both inner and outer plates. Maxilliped inner and outer plates well developed. Palps with 4-articulate, article 3 without rugosities. Labium smooth.

Coxae 1-4 longer than broad and overlapping. Gnathopod 1 are subequal to gnathopod 2 and both subchelate. Pereopod 3 and 4 similar shape with naked articles. Pereopods 5-7 with short setae at joints of each articles. Pereopod 5 shorter than pereopod 6. Article 2 of pereopod 5 expanded into subrectangular. Pereopod 6 and 7 are similar in structure.

Urosomites 1 to 3 free. Urosomite 1 longer than urosomite 2. Uropods 1-2 with naked apices of rami. Uropods 1-3 similar in structure and size. Uropod 1 peduncle naked. Uropod 2 with ventromedial spur and inner ramus subequal to outer ramus. Uropod 3 with short peduncle short and outer ramus longer than peduncle. Outer ramus 2 segments. Toelson laminar and cleft and longer than broad.

Feeding and Behavior.— *Eriopisella sechellensis* are grazers. The major food items in their stomach are epiphytic macroalgae, pennate diatoms and organic matter, respectively. Searching for food was by using long antennae with dense long fine setae, collecting food with the gnathopods and selecting food particles with the maxilliped and maxilla 2 and grinding food with the maxilla 1 together with lower lips and mandibles.

Distribution.— This species was first recorded at Sechelles Islands (Chevereux, 1901), and subsequently in Chilka Lake (Chilton, 1921), in Travancore and Appa Island, India (Barnard, 1935; Sivaprakasam, 1967) and in West Kyushu and Seto Inland Sea, Japan (Hirayama, 1986a). Within Thailand, this species has been recorded in Song Kla lake, southeastern part of Thailand (Chilton, 1925), and in the Andaman Sea at

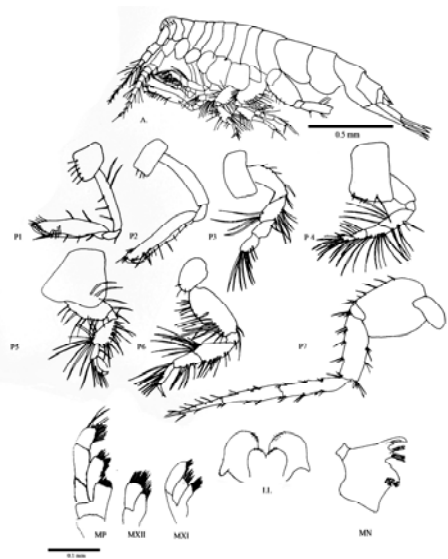


FIGURE 6. *Perioculodes longimanus* (Bate and Westwood, 1868). A. Amphipod body P1-P7; pereopods 1-7. MP: Maxillipeds; MX1: First maxilla; MX II: Second maxilla; MN: Mandible; LL: Lower lip.

the western shore of Phuket island (Bussarawich et al., 1984). The current known species distribution is summarized in Figure 9.

Family Oedicerotidae

Perioculodes longimanus (Bate and Westwood, 1868)

(Fig. 6)

Perioculodes longimanus, Nayar, 1959, P. 18, PL. V, figs. 21–33; Griffiths, 1976, P. 63, fig. 6E–F.

Material examined.— 12 specimens, hand collected at low tide in the seagrass bed, Libong Island, K. Wongkamhaeng, 5.9.2005.

Description.— Head free, not coalesced with pereonite 1. Eye present and large. Bodies laterally compressed.

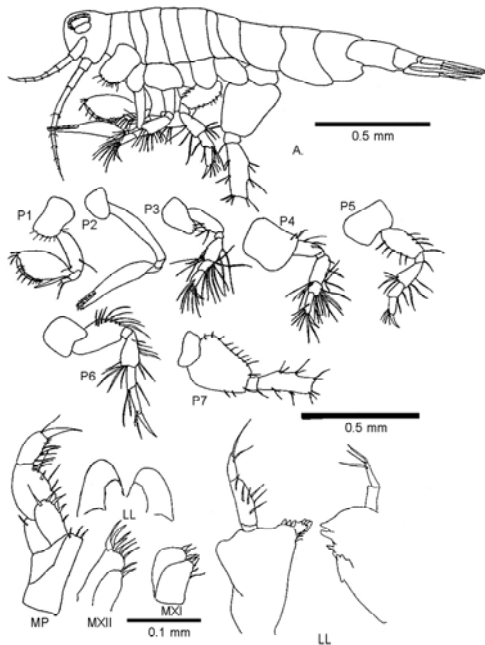


FIGURE 7. *Synchelidium* sp. A. A. Amphipod body P1-P7: pereopods 1-7. MP: Maxillipeds; MX1: First maxilla; MX II: Second maxilla; MN: Mandible; LL: Lower lip.

Mandible incisor dentate with lacinia mobilis. Molars present and tritulative with palps. Maxilla 1 present with strongly setose inner plates. Maxilla 2 with both inner and outer plates. Maxilliped inner and outer plates well developed. Palps have 4-articulate, article 3 without rugosities. Labium smooth.

Coxae 1-4 longer than broad and overlapping. Gnathopod 1 subequal to gnathopod 2. Gnathopod 2 subchelate. Pereopod 3 and 4 similar shape with naked articles. Pereopods 5-7 have short setae at joints of each articles. Pereopod 5 shorter than pereopod 6. Article 2 of pereopod 5 expanded into subrectangular or with posteroventral lobe. Pereopod 7 much longer than pereopod 5 and 6.

Urosomites 1 to 3 free. Urosomite 1 longer than urosomite 2. Uropods 1-2 with

naked apices of rami. Uropods 1-3 similar in structure and size. Uropod 1 peduncle naked. Uropod 2 with ventromedial spur and inner ramus subequal to outer ramus. Uropod 3 peduncle short and outer ramus subequal to peduncle. Telson laminar and cleft and longer than broad.

Feeding and Behavior.— *Perioculodes longimanus* are detritus feeders. The major food in their gut consisted of organic matter and sand grains. They prefer soft particles due to their small mandibular incisors and molar. The mandibular palps have long fine setae along three articles for cleaning and collecting food particles attached on their antennae. Articles 7 of both gnathopods are sharp and naked for digging in the sediment.

Distribution.— This species has been recorded in plankton samples from Mandras Coast, India (Nayar, 1959), and subsequently in Mozambique (Griffiths, 1976). Within Thailand, this species has been recorded at the western shores of Phuket island (Bussarawich *et al.*, 1984). The current known species distribution is summarized in Figure 9.

Synchelidium sp. A (Fig. 7)

Material examined. – Five specimens, hand collected at low tide from bare sand near the seagrass bed, Libong Island, K. Wongkamhaeng, 7.10.2003.

Description.— Head are free, not coalesced with peraeonite 1. Rostrum present and short. Eye present and large. Bodies laterally compressed.

Mandible incisor dentate with lacinia mobilis. Molars present and tritulative with palps. Maxilla 1 present with strongly setose inner plates. Maxilla 2 with both inner and outer plates. Maxilliped inner and outer plates are well developed. Palps with 4-

articulate, article 3 without rugosities. Labium smooth.

Coxae 1-4 longer than broad and overlapping. Gnathopod 1 subequal to gnathopod 2. Gnathopod 2 subchelate. Pereopod 3 and 4 similar shape with naked articles. Pereopods 5-7 with short setae at joints of each articles. Pereopod 5 shorter than pereopod 6. Article 2 of pereopod 5 expanded into subrectangular or with posteroventral lobe. Pereopod 7 much longer than pereopod 5 and 6.

Urosomites 1 to 3 free. Urosomite 1 longer than urosomite 2. Uropods 1-2 with naked apices of rami. Uropods 1-3 similar in structure and size. Uropod 1 peduncle naked. Uropod 2 with ventromedial spur and inner ramus subequal to outer ramus. Uropod 3 with short peduncle short and outer ramus subequal to peduncle. Telson laminar and cleft and longer than broad.

Feeding and Behavior.— *Synchelidium* sp. A are detritus feeders. They search for food using the short antennae together with their large eyes. Food particles are collected using the maxilliped and second maxilla and are ground using the first maxilla together with lower lips and mandibles. They prefer soft particles due to their small mandibular incisors and molar. The mandibular palps have long fine setae along three articles for cleaning and collecting food particles attached on their antennae. Articles 7 of both gnathopods are sharp and naked for digging in the sediment.

Family Urothoidae

Urothoe spinidigitus Walker, 1904

(Fig. 8)

Urothoe spinidigitus Walker, 1904; Nayar, 1959, p 13, pl. III, figs. 16-28. Imbach, 1967, p. 80, pl. 22

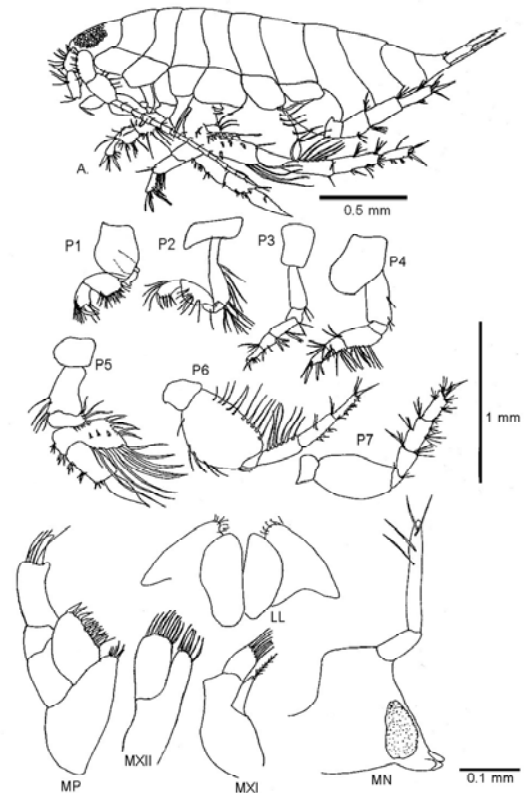


FIGURE 8. *Urothoe spinidigitus* Walker, 1904. A. Amphipod body P1-P7; pereopods 1-7. MP: Maxillipeds; MXI: First maxilla; MX II: Second maxilla; MN: Mandible; LL: Lower lip.

Material examined.— 15 specimens, hand collected at low tide from bare sand near the seagrass bed, Libong Island, K. Wongkamhaeng; eight specimens, hand collected at low tide from in the seagrass bed, Libong Island, K. Wongkamhaeng, 5.9.2005.

Description.— The first antenna are shorter than the second. Second antenna are longer than the body length. Mandible incisors are dentate and lacinia mobilis are present on both sides. Molars are trititative. Maxilla 1 have inner plate with strongly setose along medial margin. Maxilla 2 have both inner plates and outer plates.

Maxilliped have inner and outer plates with dense setae and 4 articles palp. The terminal of palps are claw-like.

Coxae 1-4 are overlapping. Gnathopod 1 are subequal to gnathopod 2. Both gnathopod are subchelate. Pereopod 3 and 4 are similar shape with dense long setae. Pereopods 5-7 have many rows of facial and marginal robust setae and feather like setae. Pereopod 5 are shorter than pereopod 6. Article 2 expanded. Pereopod 6 are longer than pereopod 7 and have similar structure.

Urosomites 1 to 3 are free. Urosomite 1 is longer than urosomite 2. Uropods 1-2 apices of rami can be with robust setae or without robust setae. Uropods 1-3 are similar in structure and size. Uropod 1 peduncles do not have long plumose setae. Uropod 2 have inner ramus shorter than or subequal to outer ramus. Uropod 3 have short peduncle so that outer ramus are longer than peduncle. Rami of uropod 3 have dense feather like setae. Telson is laminar and cleft.

Feeding and Behavior.— The major food found in the stomach of *U. spinidigitus* was organic material. They have long setae with small antennae and large eyes using for searching food. Their gnathopods are small with dense setae that are used for collecting food. Their maxilla 1 and 2 have robust setae that allow feeding on hard food. Their maxillipeds have dense fine setae for sorting food. Their mandibular molars are soft with small tooth incisor. These amphipods can consume small particles due to dense setae on their maxillipeds and second maxilla. They have spinose pereopods for digging in the sediment.

Distribution.— This species was first recorded at Ceylon (Walker, 1904), and subsequently at the Mandras Coast (Nayar, 1959), and the South China Sea from north of Hon-Lon Island to Nhatrang

coast (Imbach, 1967). Within Thailand, this species has been recorded at the western coast of Phuket Island (Bussarawich et al., 1984). The current known distribution range of this species is shown in Figure 9.

DISCUSSION

A. cyclops and *U. spiniditus* are widely distributed in the Indo-West Pacific region including Ceylon, the East Indies archipelagic, Mandras Coast, Trivandrum, Phuket, Vietnam and also the Seto inland Sea. *A. cyclops* can be distinguished by the presence of a large head (equal to three segments of the pereopods combined together) with a long rostrum and their setose first coxae (Rabindranath, 1975). The *A. cyclops* specimens of this study have one pair of corneal eyes but, in contrast, the specimens of Rabindranath (1975) had two pairs of corneal eyes. The mandibular palp of amphipods was composed of three segments similar to what had been reported by Walker (1904), Pirlot (1936), Pillai (1957) and Nayar (1959). Rabindranath (1975) suggested that Walker (1904) did not consider the partition between articles 2 and 3, which differs from Nayar's (1959) in that Walker's figure showed four segments of the mandibular palp due to the accidental division of the second segment by the cross line. Nagata (1959) reported a sexual dimorphism, in that male *A. cyclops* have a deeper groove than females.

Imbach (1967) suggested that *A. cyclops* can be divided into two subspecies, the *A. cyclops iyoensis* and *A. cyclops cyclops*. The characters of *A. cyclops* are combined from the two subspecies. The *A. cyclops* specimens of this study have the same

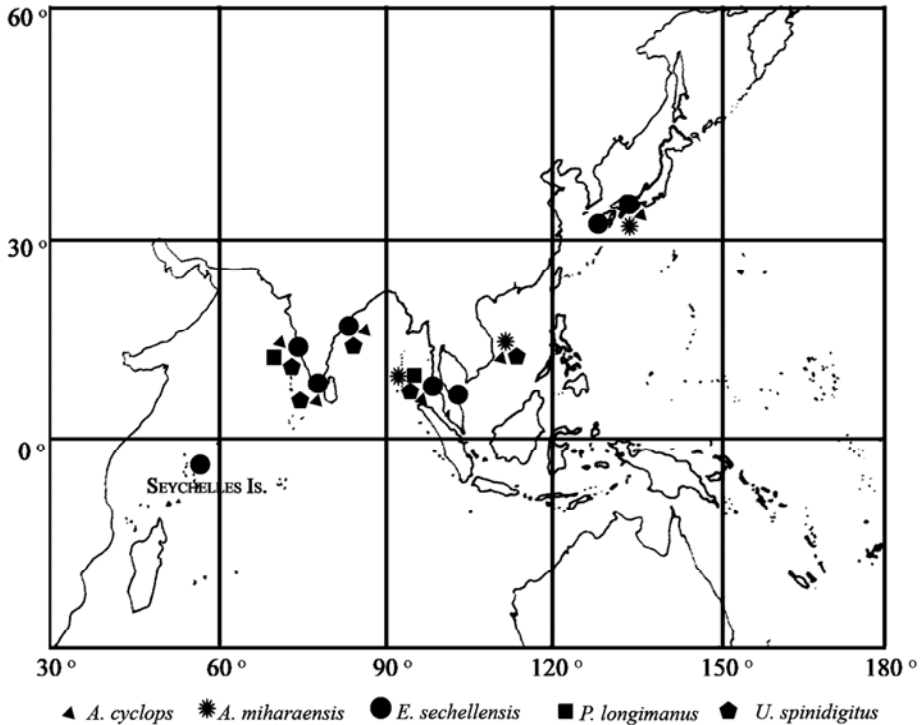


FIGURE 9. The current known distribution of *A. cyclops*, *A. miharaensis*, *E. sechellensis*, *P. longimanus* and *U. spinidigitus* in the Indo-West Pacific.

characters as those described by Walker (1904), especially on pereopod 7.

Amphipods can be found in both benthic and pelagic habitats (Rabindranath, 1975) and also occupy many soft bottom habitat types including estuaries and seagrass beds. Some amphipods can be found in both adjacent habitats, such as *Quadrivisia bengalensis*, and live in both seagrass beds and mangrove forest (Bussarawich, 1985; Intrasook, 1999). Amphipods from the family Ampeliscidae are nestlers that dig a tube and live under the sediment, algae or debris. Amphipods are distributed according to their habitats, available food supplies and specific feeding adaptations (Thomas, 1993). *A. cyclops*, that can live in both benthic and pelagic habitats, has a relatively

diverse variety of food items and is dominant in the seagrass beds.

The *A. miharaensis* specimens reported here from Libong Island are the first record of this species in Thai waters. The species was first described from the stomach contents of Triglid fishes at Shikoku Island (Nagata, 1959). Diagnostic characters of this species are that the peduncular segment two of the second antenna are distinctly longer than the first peduncular segment, the shape of head with its narrow anterodistal end, the quadrate posteroventral corner of the third pleonal epimeron and the posterior lobe of article 2 of pereopod 7. The *A. mihraensis* specimens from Libong island reported in this study have similar characters to those reported by Nagata

(1959), but are different from those reported by Imbach (1967) in that the conical lens are larger.

Kamaka sp. A differs from *K. taditadi* in that the male gnathopod 2 is not eusirid in form. It differs from *K. biwae* in the short second antenna. This species has a spine on the outer rami of uropods 1-2, but this character is lacking in *K. derzhavini*. This species differs from *K. kuthae* in that the second antenna is shorter than all of the body segments together and article 4 of pereopods 3-4 is not well expanded epically (Thomas, 1993; Barnard and Karman, 1991).

E. sechellensis was first described from the Sechelle Islands (Chevreux, 1901), and can be distinguished by the expanded article 6 of gnathopod 2; that the datylus of pereopod 5-7 has one setae at the apical part and that the uropod 3 outer ramus is long with two segments. The specimens of this study have gnathopods 1 and 2 with expanded article 6, which is similar to that of previously reported specimens of *Eriopisa sechellensis* (Chevreux, 1901; Nagata, 1965; Sivaprakasam, 1967) and *Nighargus chikensis* (Chilton, 1925), but different from Chilton (1921), in that article 6 of gnathopod 2 is not expanded. Indeed, Nagata (1965) suggested that there is even variation in specimens collected from the same area where the shape of the article 6 of gnathopod 2 can vary from triangular to subquadrate in shape.

The article 2 of pereopod 7 of the specimens of *E. sechellensis* from Libong Island reported here is oblong-oval, similar to the specimens reported by Chilton (1921 and 1925) and Sivaprakam (1967). The end of pereopods 5-7 bear one or two spinules at the base of ungula and the first coxa is strongly pronounced at the antero-distal corner, which is also similar to that reported

by others (Chevreux, 1901; Chilton, 1921, 1925; Nagata, 1965). However, the outer ramus of the third uropod has two segments but the first segment is longer than the second, which is different from Chilton's figure that the first and second segments are subequal.

E. sechellensis occupy many habitat types, including brackish water; Chikalake and Song Kla Lake (Chilton, 1921, 1925), seagrass beds, *Zostera* belts and soft bottoms (Nagata, 1965; Bussarawich et al., 1984). The major foods that were found in their stomachs were pinnate diatoms, algae and organic materials respectively. At this study site (Libong Island), *E. sechellensis* were only found in the wet season because of the food availability and the salinity (Wongkamhaeng, 2004).

P. longimanus was first described by Bate and Westwood (1868) from specimens from the Atlantic Coast, and can be distinguished by the characters that article 6 of the first and second gnathopods are about five times as long as wide and the round distal angle of the propodus. (Schellenberg, 1928; Griffiths, 1976). The eyes are broadest at the top. The other characters of this species are similar to the descriptions of Nayar (1959), except the character of male *P. longimanus* where the second antenna are composed of 60 segments but the specimens found in this study were females and juveniles that did not have this character. *P. longimanus* is distributed in wide area, including the Atlantic Ocean, Southern Africa coast, Indian Ocean and Thailand.

Synchelidium sp. A differs from *S. miraculum* in that the mail is short, a thin mandibular palp and the second antenna is shorter than the total body length. (Hirayama, 1987). It differs from *S. americanum* in having a short second antenna and a larger inner plate of maxilla 1.

This species does not have a horizontally projecting forward head and not decurved like gealeat and its rostrum is minute like *S. rosripiculum* (Hirayama, 1986b).

U. spinidigitus can be distinguished by pereopod 5 where the upper part is projecting behind with seven or eight marginal setae and the front margin is almost straight. The article 5 is greatly expanded with two parallel transverse ridges bordered with strong spines and very long plumose setae.

The specimens of *U. spinidigitus* found at Libong Island have brown eyes in contrast to the red eyes described by Walker (1904), whilst the coxae are also different. In the Libong island specimens the first coxa is not acutely angular in the front, the second coxa is not slightly expanded and the third and fourth coxa are not oblong. These Libong Island specimens are therefore similar to those described by Imbach (1967) and Nayar (1959), except the article 4 of the maxilliped palp which, in this study is broader than Imbach's specimen.

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