A new snapping shrimp (Crustacea Decapoda, Alpheidae, *Alpheus*) from the estuarine mudflats of Kuwait

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Key words: Caridea; Alpheidae; snapping shrimp; *Alpheus*; new species; mudflat; Kuwait; Persian Gulf; facultative association; goby.
A new snapping shrimp, *Alpheus lutosus* spec. nov., is described from the intertidal mudflats of Bubiyan Island, northern Kuwait, south of the vast Shatt-Al-Arab delta. The new species appears to be closely related to *Alpheus hoplocheles* Coutière, 1897 from similar estuarine habitats in China and Japan, differing mainly in the absence of a sharp distolateral tooth on the palm of the major chela, the less marked rostral carina, and the number of spines on the propodus of the third pereiopod. Both *A. lutosus* spec. nov. and *A. hoplocheles* are unique within the *A. edwardsii* species group in having a strong sharp distomesial tooth on the palm of the otherwise typical *edwardsii*-type major chela. At the type locality, *A. lutosus* spec. nov. is often associated with the goby *Acentrogobius dayi* Koumans, 1944.

Introduction

As with other Caridea, the Alpheidae of the Persian Gulf (Arabian Gulf in some literature) are still relatively poorly known; a brief historical overview to the known fauna is provided by De Grave (2007). The first alpheid species descriptions and records from the Persian Gulf were made by Nobili (1905, 1906) and Coutière (1908), based on collections made by J. Bonnier and C. Péréz. For most of the 20th century there was little if any prospecting activity for carideans in this area, the next report of Alpheidae being that of Motoh (1975) who recorded 2 species from Kuwait. Banner & Banner (1981) reported upon a further 15 species based on a collection made by the Danish Persian Gulf Expedition in 1937-1938. Titgen (1982) in an unpublished PhD thesis reported 4 alpheid species from Dubai, and summarised all previous records of caridean shrimps from the Gulf, totaling 25 species in the family Alpheidae. However, Titgen's summary does not include *Alpheus perezi* Coutière, 1908 and *A. persicus* Nobili, 1905 (although the latter species is considered a synonym of *A. malleodigitus* (Bate, 1888), see Banner & Banner 1966, 1982). Some of these records appear rather dubious, for instance the occurrence of *Alpheus dentipes* Guérin, 1832, an eastern Atlantic species, in Saudi Arabia (see Basson et al. 1977), is most likely a misidentification, as is the record of *A. distinguendus* De Man, 1909 from Kuwait (Motoh, 1975). Most recently, De Grave (2007) recorded *Athanas parvus* De Man, 1910 from the United Arab Emirates, previously recorded in the unpublished thesis of Titgen (1982) as *A. sibogae* De Man, 1910. Thus until the present study, the total number of Alpheidae from the Persian Gulf stood at 27 species.

In 2004, Dr. David T. Jones (University College North Wales, Bangor, UK) collected a series of specimens of *Alpheus* on the intertidal mudflats of Bubiyan Island, northern Kuwait, tentatively identified as *Alpheus euphrosyne euphrosyne* De Man, 1897, a species known from the Persian Gulf (Banner & Banner, 1981). However, despite superficial resemblance with *A. euphrosyne*, these specimens were clearly different from *A. euphrosyne* and related forms (cf. Banner & Banner 1982) by the presence of a sharp tooth on the distomesial margin of the palm of the major chela. To our knowledge, the only other species of *Alpheus* with a similar major chela is *A. hoplocheles* Coutière, 1897 known only from coastal mudflats of China and Japan. One of us (SDG) examined the lectotype of *A. hoplocheles* kept in the collections of the National Museum of Natural History, Leiden (RMNH). We then compared *Alpheus* sp. from Kuwait with *A. hoplocheles* and concluded that these two species are sufficiently different to be considered as distinct. Therefore, a new species of *Alpheus* is described below based on D.T. Jones' material from Bubiyan Island. Additional, non-type material, from Kuwait Bay collected in 1978 and deposited as "*Alpheus* sp." in the Florida Museum of Natural History, Gainesville, FL, USA (FLMNH) also belongs to the new species.

All drawings were made under a dissecting microscope equipped with a camera lucida, carapace length (CL, from the tip of the rostrum to the posterior margin of the carapace) is used as the standard measurement. The material is deposited in the collection of the National Museum of Natural History, Leiden, the Netherlands (formerly Rijksmuseum van Natuurlijke Historie (RMNH)); Oxford University Museum of Natural History, Oxford, UK (OUMNH); and the Florida Museum of Natural History, Gainesville, FL, USA (FLMNH).

Systematic part

Alpheus Fabricius, 1798

Alpheus lutosus spec. nov.
(figs 1-18)

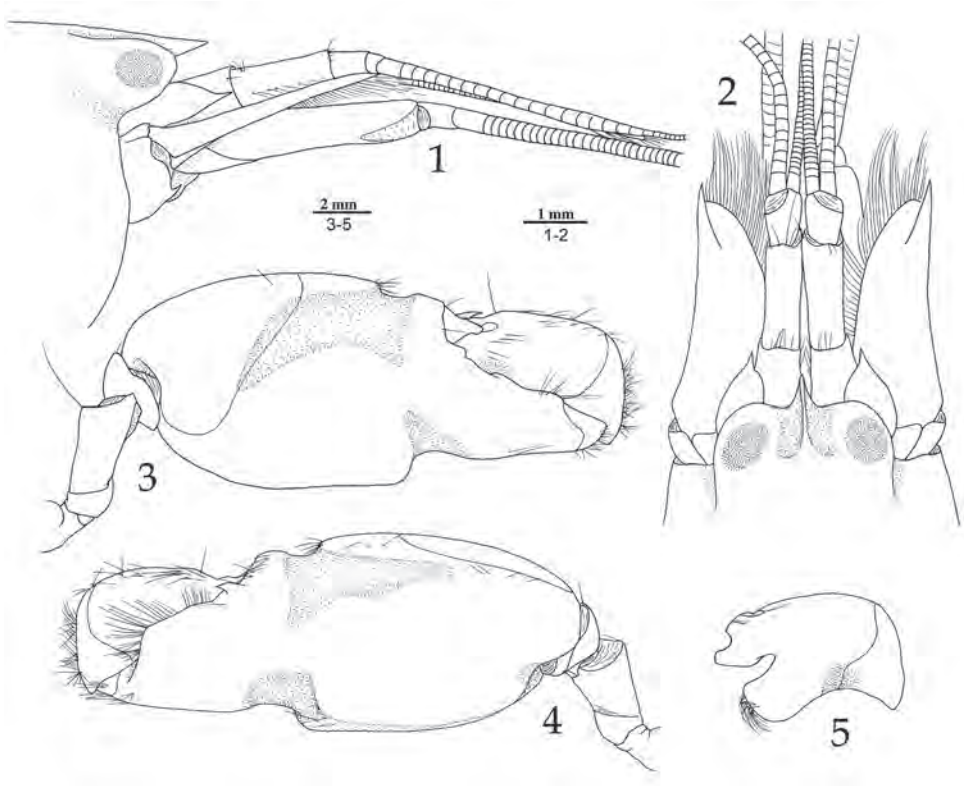
Material examined.— Holotype, ♂ (RMNH D 53106), Kuwait, Shatt-Al-Arab delta, Bubiyan Island, Ras Al-Barshah and area bordering Khor Al-Subbiya, approx. 29° 36'N 48°188'E, muddy intertidal, in burrows with gobies, leg. D. Jones et al., 01.x.2004, CL 8.6 mm. Paratypes: ♀ (RMNH D 53107), CL 8.4 mm; ♂ (CL 6.4 mm), 3 ♀♀ (CL 7.1-8.5 mm) (OUMNH.ZC.2007-17-001); ♂ (OUMNH.ZC.2007-17-002), dissected and illustrated, CL 10.0 mm; all same data as holotype. Non-type material examined: 1 ♂ (CL 9.0 mm), 3 ♀♀ (CL 6.0-8.7 mm) (FLMNH UF Arthropoda 3872), Kuwait, Kuwait Bay, Al Jahrah, mudflat, coll. Vaughan, ZZZ-89003, 01.ii.1978.

Description.— Medium-sized species of *Alpheus edwardsii* group. Rostrum conical, acute distally, not flattened dorsally; rostral carina feebly developed, flattening posteriorly (fig. 2), reaching 0.23-0.38 CL; orbital hoods moderately swollen, rounded, unarmed; adrostral furrows shallow. Antennular peduncle with second segment more than twice as long as wide; stylocerite not reaching distal margin of first segment (fig. 2); mesioventral carina with low, shark fin shaped tooth (fig. 16). Antenna with basicerite bearing small, subacute (sometimes blunt) distoventral tooth (fig. 1); scaphocerite relatively long, with slightly concave lateral margin and narrow blade, latter not over-

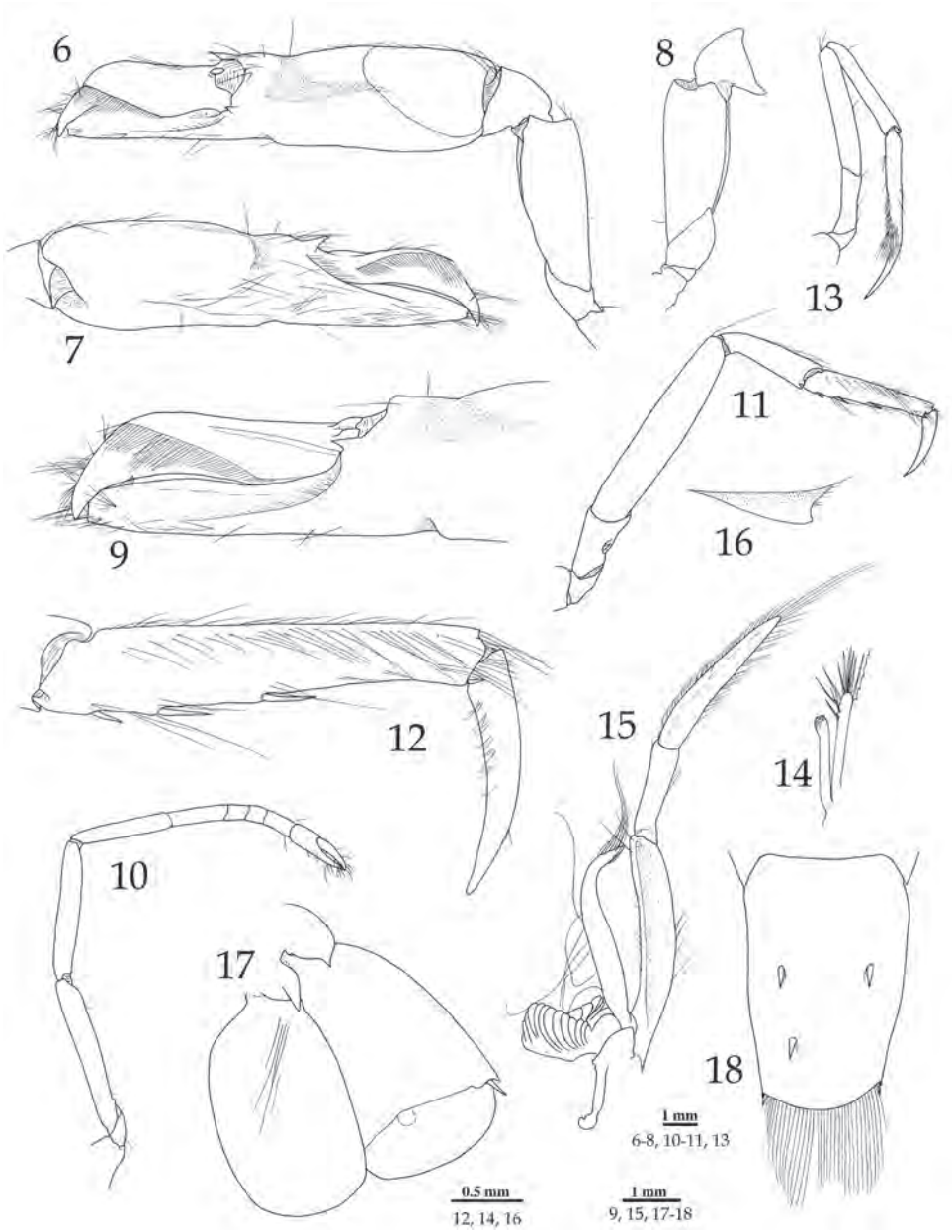
reaching strong distolateral tooth (fig. 2); carpocerite reaching beyond scaphocerite and end of antennular peduncle (fig. 1).

Mouthparts typical for *Alpheus* in external observation. Third maxilliped slender, pediform; antepenultimate segment flattened ventrolaterally; proportions of antepenultimate, penultimate and ultimate segments as illustrated (fig. 15); lateral plate on coxa protruding, blunt distally; arthrobranch well developed.

Major cheliped similar in both sexes, although larger and with slightly different proportions in males; ischium very short, merus short, stout, blunt distodorsally, without distinct distomesial tooth; carpus broadly cup-shaped; chela with palm roughly twice as long as fingers, distodorsal margin with broad notch extending on lateral surface as broad, posteriorly extending longitudinal depression (fig. 3), and on mesial surface as posteriorly extending longitudinal groove (fig. 4), dorsal shoulder not overhanging, rounded, sloping smoothly into notch (fig. 4); ventral margin with deep, broad notch, adjacent areas depressed on both mesial and lateral surface (figs 3-4), ventral shoulder not protruding anteriorly, rounded; distal margin of palm with sharp tooth mesially, without such tooth laterally (figs 3-4); dactylus only slightly overreaching pollex (fig. 3), with well developed plunger, latter furnished with stamen-shaped sensillae (fig. 5).



Figs 1-5. *Alpheus lutosus* spec. nov., male paratype (OUMNH.ZC.2007-17-002). 1, frontal region, lateral; 2, same, dorsal; 3, major (right) cheliped, lateral; 4, same, mesial; 5, same, dactylus showing plunger, lateral.



Figs 6-18. *Alpheus lutosus* spec. nov., male paratype (OUMNH.ZC.2007-17-002). 6, minor (left) cheliped, lateral; 7, same, chela, mesial; 8, same, ischium to carpus, mesial; 9, same, chela fingers, lateral; 10, right second pereiopod, lateral; 11, right third pereiopod, lateral; 12, same, propodus and dactylus; 13, right fifth pereiopod; 14, right second pleopod, appendix masculina and appendix interna; 15, right third maxilliped, lateral; 16, right antennule, ventromesial carina of first segment, lateral; 17, right uropod, dorsal; 18, telson, dorsal.

Male minor cheliped with short ischium, stout merus and cup-shaped carpus, proportions as illustrated (figs 6, 8); chela with palm approximately 1.2-1.3 times longer than fingers; distodorsal margin with distinct depression extending on lateral surface as shallow, posteriorly extending longitudinal groove (figs 6, 9), and on mesial surface as short, not posteriorly extending transverse groove (fig. 7); ventral margin with distinct notch visible in both lateral and mesial views (figs 6-7, 9); distal margin of palm with small acute tooth both laterally and mesially (figs 7, 9); dactylus markedly expanded, with lateral and mesial ridges furnished with balaeniceps setae (figs 6-7, 9); pollex with row of setae proximally on mesial side, without organised setae laterally (figs 6-7). Female minor cheliped with ischium, merus and carpus similar to those in male; chela with fingers non-balaeniceps, moderately slender, about as long as palm; palm with shallow depression dorsolaterally, ventral margin without sinus.

Second pereiopod slender; merus slightly shorter than ischium; carpus five-segmented, ratio of segments approximately 4/2.5/1/1/1.5; chela as long as second carpal segment (fig. 10). Third pereiopod relatively slender; ischium with small ventrolateral spine (fig. 11); merus about 4.5 times as long as wide; carpus slightly less than half length of merus, without spines; propodus significantly longer than carpus but much shorter than merus, ventral margin with 3-4 spines, dorsolateral margin with row of elongate setae (fig. 12); dactylus about half propodus length, subspatulate (fig. 12). Fourth pereiopod generally similar to third. Fifth pereiopod small, slender; ischium unarmed (fig. 13); carpus 0.75 length of merus; propodus with dense setal brush (fig. 13), without spines.

First pleopod with relatively small endopod (especially in males). Second pleopod with appendices masculina and interna in males (fig. 14). Uropod with lateral lobe of protopod ending in acute point; exopod and endopod broad, rounded; diaeresis of exopod almost straight, lateral portion with small, broadly subtriangular lobe adjacent to slender distolateral spine (fig. 17). Telson broad, almost rectangular (only slightly tapering posteriorly), dorsal spines well developed, situated centrally, i.e. at some distance from lateral margins (fig. 18), first pair more or less at telson mid-length or slightly in front, second pair at 0.75 telson length (right posterior spine missing in illustrated specimen, cf. fig. 18); posterior margin broadly rounded, each posterolateral angle with two spines: one minuscule lateral spine and one stronger and longer mesial spine, latter still significantly smaller than dorsal spines of telson (fig. 18).

Size. — Medium-size species of *Alpheus*: CL of males ranging from 6.0 mm to 10.0 mm, CL of females ranging from 7.0 to 8.7 mm; TL of largest specimens approaching 40 mm.

Colour. — Carapace and abdomen pale olive-greenish, semitransparent; major and minor chelae pale yellow-greenish, much darker distally (fingers of major chela dark olive-green); walking legs semitransparent straw-yellowish; uropods with patch of intense blue chromatophores across posterior half (based on colour photograph provided by J. Gardiner).

Etymology. — The specific name *lutosus* (Latin adjective for "muddy" or "in mud") refers to the preference of this species for muddy habitats.

Ecology. — *Alpheus lutosus* spec. nov. is relatively common in the intertidal and estuarine mudflats of the Shatt-Al-Arab delta, in burrows made under stones or in muddy banks, sometimes associated with the goby *Acentrogobius dayi* Koumans, 1944

(identified by R. Winterbottom, ROM). Most likely, *Acentrogobius dayi* does not establish body contact with the snapping shrimp and belongs to the category of so-called "facultative" shrimp gobies (see Karplus, 1992). Two other species of *Alpheus* have been observed syntopically at the type locality: *A.* cf. *lobidens* De Haan, 1849 and *A.* cf. *rapax* Fabricius, 1798 (D. T. Jones, pers. comm.).

Distribution. — Presently known only from Kuwait: Bubiyan Island, southwest of Shatt-Al-Arab delta, and Al Jahrah in Kuwait Bay (west of Kuwait City); most likely also occurring in the Iraqi and Iranian side of the Shatt-Al-Arab delta.

Remarks. — *Alpheus lutosus* spec. nov. is assumed to be closely related to *A. hoplocheles* from China and Japan (Coutière, 1897; Miya, 1995; Liu & He, 2007). These two species differ from all other species of the *A. edwardsii* group by the presence of a sharp distal tooth on the mesial side of the otherwise typical *edwardsii*-type major chela. They also have many other features in common, such as the subspatulate dactyli on the third to fifth pereiopods; the well developed, posteriorly non-flattened rostrum, the ischium of the third and fourth pereiopods bearing a small spine; as well as the well developed balaeniceps condition of the male minor chela. However, *A. hoplocheles* may be distinguished from *A. lutosus* spec. nov. by the presence of a strong, protruding and sharp distal tooth also on the lateral side of the palm of the major chela (Miya, 1995; see also Liu & He, 2007); in *A. lutosus* spec. nov., this tooth is not protruding and rounded (cf. fig. 3). Furthermore, in *A. hoplocheles*, the major chela has a more protruding ventral shoulder, with a more pronounced, narrower groove on the lateral side of the palm; similarly, the dorsal shoulder is sharper and more overhanging (compare Miya, 1995 and figs. 3-4). Another important distinguishing feature is the ventral armature of the propodus of the third and fourth pereiopods: in *A. hoplocheles*, the propodus is armed with nine spines (including the distoventral spine) vs. only three or four spines in *A. lutosus* spec. nov. In addition, in *A. hoplocheles*, the rostrum appears to be slightly longer, just falling short of the first segment of the antennular peduncle; the stylocerite is also longer; the lateral margin of the scaphocerite is somewhat more concave; the rostral carina is better marked, extending to about 0.7 CL (vs. 0.23-0.38 CL in *A. lutosus* spec. nov.); the proportion palm/fingers of the major claw is approximately 1.3/1 (vs. 1.7/1 in *A. lutosus* spec. nov.); the proportion palm/fingers of the female minor chela (based on female lectotype) is close to 1/1.3 (vs. close to 1/1 in *A. lutosus* spec. nov.); the ratio of carpal segments in the second pereiopod is approximately 3/2.5/1/1/1.4 (vs. 4/2.5/1/1/1.5 in *A. lutosus* spec. nov.); and the proportion propodus/dactylus of the third pereiopod is approximately 2.4/1 (vs. ~2/1 in *A. lutosus* spec. nov.). Finally, the two species appear to be geographically widely separated, *A. hoplocheles* occurring from central Japan to southern China, whilst *A. lutosus* spec. nov. is presently known only from the western Persian Gulf.

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