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A New Species of the Shrimp Genus *Salmoneus* Holthuis, 1955 (Malacostraca: Decapoda: Alpheidae) from the Exposed Shores of Eastern and Southern Oman †

Arthur Anker [1,2]

[1] Departamento de Ecologia, Zoologia e Genética, Instituto de Biologia, Campus Universitário Capão do Leão, Universidade Federal de Pelotas (UFPEL), Pelotas 96010-610, RS, Brazil; arthuranker7@gmail.com
[2] Red Sea Research Center, 4700 King Abdullah University of Science and Technology (KAUST), Ibn-Al Haytham (Building 2), Sea Side, Thuwal 23955-6900, Saudi Arabia
† Zoobank: urn:lsid:zoobank.org:pub:4C4F43F3-BBFB-4702-9172-807C9815C276.

Abstract: *Salmoneus sultanus* sp. nov. is described based on several specimens collected on the exposed shores of Masirah Island and Dhofar, Oman, a region characterised by seasonal upwellings cooling water temperature to less than 23 °C. The new species is compared with the morphologically most similar congeners present in the north-western Indian Ocean, e.g., *S. latirostris* (Coutière, 1897), *S. cristatus* (Coutière, 1897), *S. serratidigitus* (Coutière, 1897), and *S. chadwickae* Ďuriš and Horká, 2016; the latter species is recorded for the first time from Oman. The conspicuous colour pattern of *S. sultanus* sp. nov. appears to be diagnostic, differing greatly from that of *S. latirostris*, *S. cristatus*, *S. serratidigitus*, and *S. chadwickae*.

Keywords: Crustacea; Caridea; alpheid shrimp; *Salmoneus*; Arabian Sea; Indo-West Pacific

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Citation: Anker, A. A New Species of the Shrimp Genus *Salmoneus* Holthuis, 1955 (Malacostraca: Decapoda: Alpheidae) from the Exposed Shores of Eastern and Southern Oman. *Arthropoda* **2023**, *1*, 473–487. https://doi.org/10.3390/arthropoda1040022

Academic Editor: Christopher Boyko

Received: 11 August 2023
Revised: 26 October 2023
Accepted: 22 November 2023
Published: 15 December 2023

1. Introduction

Salmoneus Holthuis, 1955 [1] is currently the third largest genus in the shrimp family Alpheidae Rafinesque, 1815, with a rapidly increasing number of species and many more species awaiting description (Anker 2022 [2] and references therein; Komai 2022 [3]; Ashrafi et al., 2023 [4]; A. Anker, pers. obs.). The north-western Indian Ocean is one of the major hotspots of the diversity of *Salmoneus*, with at least 15 species so far recorded from the coastal areas of the Red Sea, Gulf of Aden, Arabian Sea, Gulf of Oman, and Arabian/Persian Gulf (Coutière 1897 [5], 1899 [6]; Holthuis 1958 [7]; Kazmi 1974 [8]; Banner and Banner 1981 [9]; Ďuriš and Horká, 2016 [10]; Anker 2019a [11], 2022 [2]; Anker and Ashrafi 2019 [12]; Anker et al., 2020 [13]; Ashrafi et al., 2020 [14], 2022 [15]).

In January and November 2022, several specimens of a brightly coloured species of *Salmoneus* were collected in the shallow waters of Mirbat, the Dhofar Governorate of Oman, and near the southern tip of Masirah Island, Ash Sharqiyah South Governorate of Oman, respectively. The diagnostic colour of the specimens suggested that they may belong to an undescribed species, which was confirmed by examination of the material and its comparison with all morphologically similar species. Therefore, in the present study, a new species of *Salmoneus* is described based on the aforementioned material from Oman.

2. Materials and Methods

The herein reported specimens were collected during two BioBlitz surveys in Oman in 2022 (see Acknowledgments). All shrimps were collected with a dip net while snorkelling in very shallow water (less than 1 m) at low tide. Type material was deposited in the collections of the Florida Museum of Natural History, University of Florida, Gainesville, FL, USA (FLMNH). The carapace length (cl, in mm) was measured from the tip of the rostrum

to the posterior margin of the carapace. Comparative material used in this study, collected in Oman and Saudi Arabia in 2022, is listed below.

Comparative material examined. *Salmoneus latirostris* (Coutière, 1897): 1 non-ovig. specimen (cl 5.0 mm), FLMNH UF 71449, Red Sea, Saudi Arabia, Thuwal, KAUST, near Island Recreational Center, 22°18′53.3″ N/39°05′22.8″ E, sandflat with fine sand and coral rubble, patchily over fossilised coral terrace, in burrow, suction (yabby) pump, depth 0.3–0.5 m, leg. A. Anker, 09.12.2022 (AA-22-377). *Salmoneus cristatus* (Coutière, 1897): 1 ovig. specimen (cl 2.9 mm), FLMNH UF 68811, Red Sea, Saudi Arabia, north of Rabigh, 22°55′32.17″ N/38°51′21.45″ E, back reef, shallow lagoon with sand and coral rubble, in coral rubble crevices, hand and hammer, depth 1 m, leg. A. Anker et al., 23.06.2022 (AA-22-140). *Salmoneus chadwickae* Ďuriš and Horká, 2016: 1 ovig. specimen (cl 4.9 mm), FLMNH UF 71448, Oman, Masirah Island, Ghab, 20°15′19.3″ N/58°37′26.9″ E, shallow sand flat near exposed rocky outcrops, on silty sand under large rocks, depth at low tide 0.5 m, leg. A. Anker, 18.11.2022 (BOMAN-14536).

3. Taxonomy

Family Alpheidae Rafinesque, 1815 [16]
Genus *Salmoneus* Holthuis, 1955 [1]
Salmoneus sultanus sp. nov.
(Figures 1, 2A–E, 3 and 4)

Type material. Holotype: ovig. specimen (cl 5.0 mm), FLMNH UF 71451, Oman, Masirah Island, Ghab, 20°15′19.3″ N/58°37′26.9″ E, shallow sand flat near exposed rocky outcrops, on silty sand under large rocks, depth at low tide 0.5 m, leg. A. Anker, 18.11.2022 (BOMAN-14537). Paratypes: 1 ovig. specimen (cl 5.2 mm), FLMNH UF 71447, same collection data as for holotype (BOMAN-14538); 1 ovig. specimen (cl 5.8 mm), FLMNH UF 68848, Oman, Dhofar, Mirbat, Roshan Resort, 16°58′31.2″ N/54°41′38.3″ E, shallow sand flat near exposed rocky outcrops, on fine sand under large rocks, depth at low tide less than 0.5 m, leg. A. Anker, 24.01.2022 (BOMAN-09605); 1 ovig. specimen (cl 5.0 mm, infested with hemiarthrine isopod, latter removed), FLMNH UF 68834, same locality and habitat as for previous specimens, leg. A. Anker, 26.01.2022 (BOMAN-10081); 1 ovig. specimen (cl 5.1 mm), FLMNH UF 68836, same collection data as for previous specimen, (BOMAN-10072); 1 ovig. specimen (cl 4.8 mm), FLMNH UF 68840, Oman, Dhofar, Mirbat, east of Eagles Bay, 16°56′31.1″ N/54°48′07.9″ E, shallow bay, under rocks, depth at low tide less than 0.5 m, leg. A. Anker, 24.01.2022 (BOMAN-09640); 1 ovig. specimen (cl 4.6 mm), FLMNH UF 68839, Oman, Dhofar, Mirbat, east of military base, 16°57′41.4″ N/54°49′51.4″ E, shallow bay with rocks and algae, in sand under rocks, depth 0–0.5 m, leg. A. Anker et al., 25.01.2022 (BOMAN-07169).

Description. Moderately sized species of *Salmoneus* (type material: cl 4.6–5.8 mm). Carapace (Figure 1A,B) densely covered with erect setae; pterygostomial angle broadly rounded; cardiac notch deep. Rostrum (Figure 1A,B) subtriangular in dorsal view, horizontal in lateral view, 1.2 times as long as wide at base (measured between orbital notches) acute distally; tip reaching, almost reaching, or slightly overreaching distal margin of second article of antennular peduncle; lateral margins slightly convex in proximal half; dorsal carina distinct only in distal half, fading before reaching eye level; ventral carina without tooth; post-rostral tubercle. Orbital teeth (Figure 1A,B) moderately developed, about 0.2 of rostrum length, subtriangular, acute distally, slightly turned mesially, not extending beyond eyes; shape of orbital notches intermediate between V and U. Each epistomial sclerite with short blunt process.

Pleon (Figure 1C) patchily covered with erect setae; pleura of first to fifth pleonite rounded posteroventrally, that of fifth pleonite more angular; sixth pleonite not particularly elongate, with subacute projection flanking telson on posterior margin and barely discernible suture separating posteroventral angle; however, not forming articulated plate; preanal plate broadly rounded.

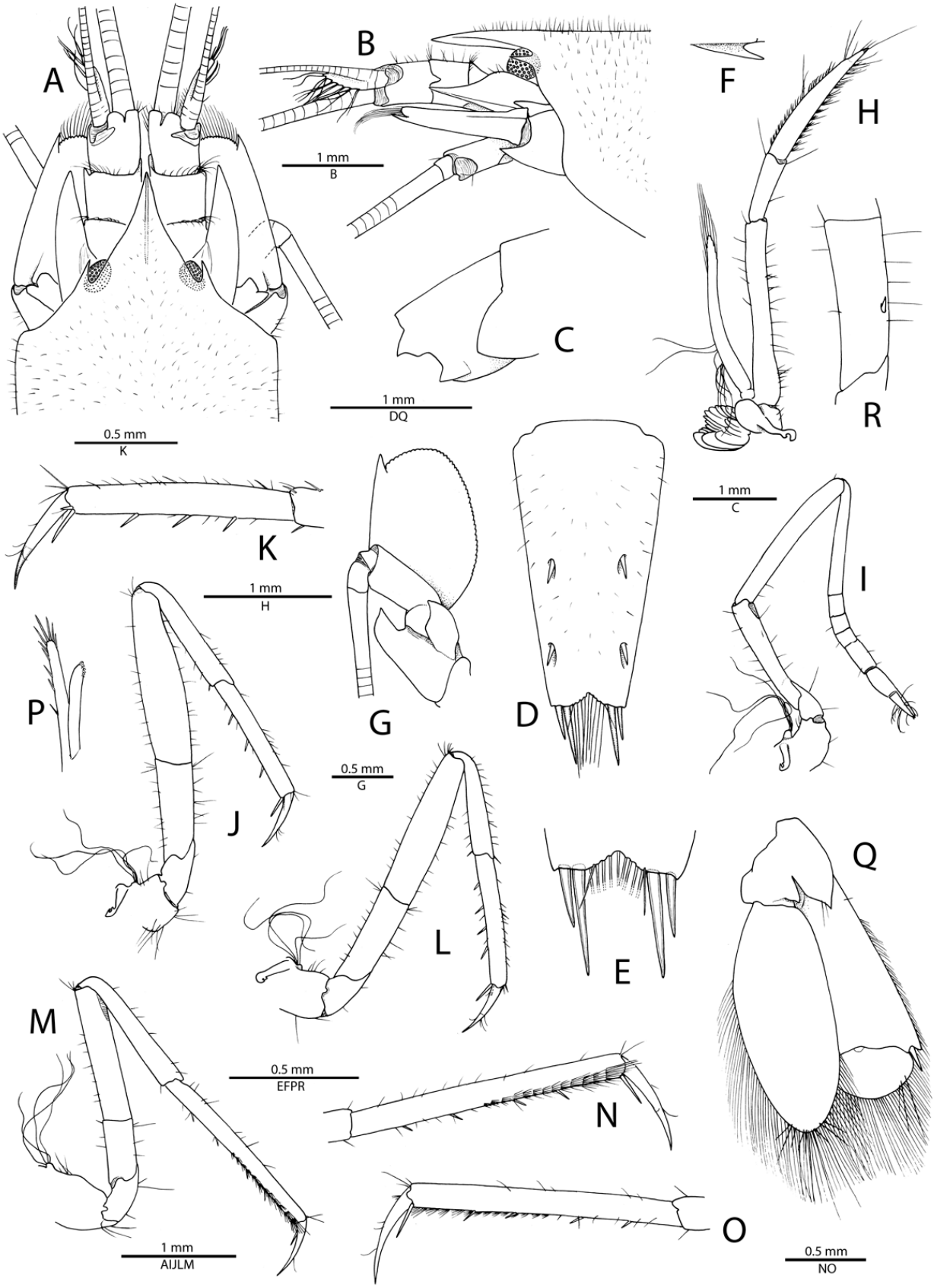

Figure 1. *Salmoneus sultanus* sp. nov., holotype, ovigerous specimen (cl 5.0 mm) from Masirah Island, Oman (FLMNH UF 71451) (**A**–**Q**), paratype, ovigerous specimen (cl 5.1 mm) from Mirbat, (Legend continued on next page)

Oman (FLMNH UF 68836) (**R**): (**A**), frontal region, dorsal; (**B**), same, lateral; (**C**), pleon, fifth and sixth pleonites, lateral; (**D**), telson, dorsal; (**E**), same, posterior margin, dorsal; (**F**), ventromesial tooth of first article of antennular peduncle; (**G**), antenna, ventral; (**H**), third maxilliped, lateral; (**I**), second pereiopod, lateral; (**J**), third pereiopod, lateral; (**K**), same, distal portion of carpus, propodus, and dactylus, mesial; (**L**), fourth pereiopod, lateral; (**M**), fifth pereiopod, lateral; (**N**,**O**), same, distal portion of carpus, propodus and dactylus, lateral (**N**) and mesial (**O**); (**P**), second pleopod, appendices masculina and interna, anterior (lateral); (**Q**), uropod, dorsal; (**R**), third pereiopod, ischium, lateral.

Telson (Figure 1D,E) moderately stout, subrectangular, distinctly tapering distally, about 2.2 times as long as proximal width; dorsal surface covered with setae and armed with two pairs of stout spiniform setae situated at about 0.5 and 0.8 telson length, respectively, posterior pair located closer to lateral margin than anterior pair; posterior margin with two pairs of elongate spiniform setae, mesial almost twice as long as lateral, and broad V-shaped median notch, latter furnished with row of several plumose setae and with one stiff seta near each lateral margin.

Eyes (Figure 1A,B) partly exposed dorsally and largely exposed laterally, with only most proximal part of eyestalks concealed by base of rostrum and orbital teeth; cornea not particularly reduced, normally pigmented; anterodorsal margin rounded.

Antennular peduncle (Figure 1A,B,F) very stout; stylocerite stout, broad, with subacute tip, latter reaching or slightly overreaching distal margin of second article; ventromesial carina with anteriorly directed, sharp tooth; second article about 0.9 times as long as wide; third article slightly longer than second; lateral antennular flagellum with fused portion composed of three subdivisions; accessory (free) ramus with poorly demarcated subdivisions bearing seven or so groups of aesthetascs. Antenna (Figure 1A,B,G) with basicerite stout, armed with large, sharp, distoventral tooth; scaphocerite not reaching distal end of antennular peduncle, with moderately strong distolateral tooth, latter not reaching beyond anterior margin of broad blade; carpocerite stout, short, reaching half-length of scaphocerite; flagellum long, not particularly thickened.

Mouthparts typical for genus in external view. Third maxilliped (Figure 1H) slender; coxa with strap-like epipod (mastigobranch) and rounded lateral plate; antepenultimate article about 0.4 length of antepenultimate article, distally widening, almost three times as long as distal width; penultimate article more than twice as long as penultimate article, strongly tapering distally, apex in form of subacute corneous point, without spiniform setae; exopod well developed, however, not reaching end of antepenultimate article; arthrobranch normally developed.

First pereiopods = chelipeds (Figure 2) very different in size, asymmetrical in shape, carried folded at rest. Major cheliped (Figure 2A–C) moderately long and robust; ischium unarmed, somewhat depressed ventrally; merus long, slender, distally widening, about 5.5 times as long as distal width (height), depressed ventrally, with smooth margins; carpus cup-shaped, distally wider, with several blunt lobes distoventrally; chela moderately swollen, subcylindrical, longer than merus and ischium combined, smooth; palm about twice as long as maximal width, about 0.9 of merus length, smooth, with deep, complex groove ventroproximally; fingers about 0.8 length of palm, slightly twisted, pollex slightly longer than dactylus, fingertips strongly curved, crossing subapically; cutting edges of pollex and dactylus serrated on almost entire length (except for proximal and distal one-tenths), with 12–13 rounded-subtriangular teeth, proximal-most smallest. Minor cheliped (Figure 2D,E) much smaller and weaker than major cheliped, slender; ischium stout, almost four times as long as wide, unarmed; merus 1.6 times as long as ischium, about five times as long as maximal width; carpus subcylindrical, about 1.1 times as long as merus, distally widening; chela about 0.7 of carpus length; fingers slightly shorter than palm, simple, slightly gaping, with unarmed cutting edges.

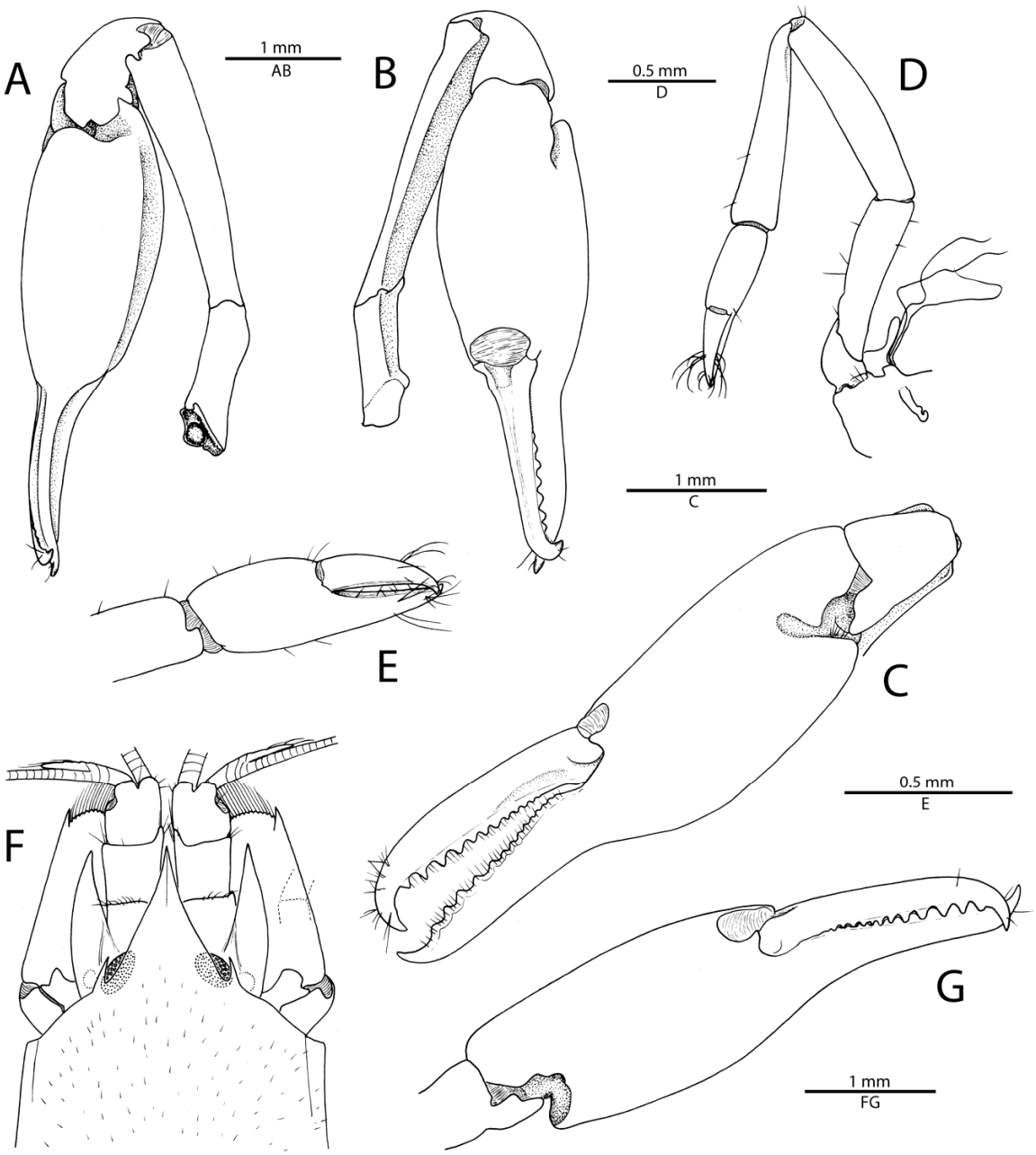

Figure 2. *Salmoneus sultanus* sp. nov., holotype, ovigerous specimen (cl 5.0 mm) from Masirah Island, Oman (FLMNH UF 71451) (**A**–**E**): (**A**), major (right) cheliped, mesial; (**B**), same, lateral; (**C**), same, carpus and chela, mesial; (**D**), minor (left) cheliped, lateral; (**E**), same, distal portion of carpus and chela, mesial. *Salmoneus latirostris* (Coutière, 1897): non-ovigerous specimen (cl 5.0 mm) from Thuwal, Saudi Arabia (FLMNH UF 71449) (**F**,**G**): (**F**), frontal region, dorsal; (**G**), left (major) cheliped, distal portion of carpus and chela, mesial.

Second pereiopod (Figure 1I) moderately slender; ischium elongate, about six times as long as wide, unarmed; merus 1.5 times as long as ischium; carpus with five subarticles; first longer than combined length of remaining four, approximate length ratio of carpal subarticles: 6.0:1.2:1:1:2.0. Third pereiopod (Figure 1J,K,R) moderately stout; ischium about 2.5 times as long as distal width, unarmed or with one small spiniform seta on ventrolateral surface; merus somewhat swollen, with slightly convex ventral and dorsal margins, about 1.8 times as long as ischium, about four times as long as maximal width; carpus much slenderer than merus, about 0.65 length of merus, distoventrally with short spiniform seta;

propodus subequal to carpus in length, ventral margin armed with three widely spaced spiniform setae, distoventral margin adjacent to dactylar base with one pair of spiniform setae, lateral longer and stouter; dactylus about 0.4 of propodus length, moderately slender, about 5.5 times as long as broad at base, gently curved, conical, simple. Fourth pereiopod (Figure 1L) generally similar to third pereiopod, noticeably shorter and slenderer; merus not swollen, about 4.2 times as long as wide; propodus distinctly longer than carpus, ventral margin armed with four spiniform setae, in addition to one distal pair of spiniform setae adjacent to dactylar base; dactylus similar to that of third pereiopod. Fifth pereiopod (Figure 1M–O) much slenderer than third and fourth pereiopods; ischium short, 1.8 times as long as broad, unarmed; merus about 2.3 as long as ischium, almost 4.5 times as long as wide; carpus 0.9 length of merus, slightly slenderer than merus; propodus 1.5 times as long as carpus, ventromesial margin with four or five widely spaced spiniform setae, in addition to one long distal spiniform seta adjacent to dactylar base; propodal grooming brush well developed, composed of 14 or so transverse rows of microserrulate setae extending from about mid-length of article to its distal end; dactylus slightly less than 0.3 length propodus, otherwise similar to those of third and fourth pereiopods.

Second pleopod with appendix masculina much longer than appendix interna (Figure 1P), not exceeding distal margin of endopod; appendix masculina furnished with slender spiniform setae along inner (mesial) margin and on apex. Uropod (Figure 1Q) with lateral lobe of protopod distally produced as small acute tooth; exopod moderately broad, ovate, with small distolateral tooth adjacent to stout spiniform seta; diaeresis sinuous, with blunt lateral tooth; endopod as long as exopod, slightly narrower, without diagnostic features.

Colour pattern. Body largely bright red, with some colourless areas on carapace, for instance, around postorbital area and near branchiostegial and posterior margins, and colourless patches on flanks of some pleonites; red chromatophores on pleon forming diffuse transverse bands; antennular peduncle and antennal scaphocerite with red markings, flagella with purplish tinge distally; major and minor cheliped hyaline white; remaining pereiopods whitish; pleopods with pale red pleopods and whitish exopods and endopods; telson and uropods deep red; eggs or ovaries dark orange red (Figures 3 and 4).

Etymology. The specific epithet refers to the Sultanate of Oman, which is governed by a Sultan (Latin noun *sultanus*); used as a noun in apposition.

Distribution. Presently known from two localities in Oman, southern tip of Masirah Island (type locality: holotype and one of the paratypes) and Mirbat, Dhofar (remaining paratypes).

Ecology. All specimens were collected under large rocks in fine sand, sometimes with a significant silt component, at depths not exceeding 0.5 m at low tide (about 1–1.5 m at high tide).

Remarks. *Salmoneus sultanus* sp. nov. appears to be part of the *S. serratidigitus* (Coutière, 1897) species group of Anker and Marin (2006) [17],which is likely not monophyletic (A. Anker, pers. obs.). This group includes, in the Indo-West Pacific, *S. serratidigitus*, *S. latirostris* (Coutière, 1897), *S. sibogae* (De Man, 1910) (synonym of *S. serratidigitus* according to Banner and Banner (1981) [9]), *S. mauiensis* (Edmondson, 1930), *S. hilarulus* (De Man, 1910), *S. nhatrangensis* Anker and Marin, 2006, *S. farasan* Anker, 2022, *S. arabicus* Anker, 2022 (cf. Coutière 1897 [5], 1899 [6]; De Man 1910 [18], 1911 [19]; Edmondson 1930 [20]; Banner 1953 [21]; Banner and Banner 1981 [9]; Anker and Marin 2006 [17]; Anker 2022 [2]), as well as several species in the eastern Pacific and both sides of the Atlantic Ocean (cf. Manning and Chace 1990 [22]; Grippa 2004 [23]; Anker 2007 [24], 2010 [25], 2019b [26], 2020 [27]). At least three other Indo-West Pacific species were mentioned by Anker and Marin (2006) [17] as possibly belonging to the *S. serratidigitus* group, viz. *S. babai* Miyake and Miya, 1966, *S. brevirostris* (Edmondson, 1930) and *S. auroculatus* Anker and Marin, 2006 (cf. Edmondson 1930 [20]; Banner 1953 [21]; Miyake and Miya 1966 [28]; Anker and Marin 2006 [17]). In addition, *S. cristatus* and morphologically allied species characterised by a more strongly pronounced mid-dorsal carina of the carapace may have phylogenetic affinities with some members of the *S. serratidigitus* group (cf. Banner and Banner 1981) [9]). Similarly, *S. shojaei* Ashrafi, Anker, and Ďuriš, 2022 appears to be morphologically interme-

diate between *S. latirostris* and the more typical members of the *S. gracilipes* Miya, 1972 [29] species group of Anker and Marin (2006) [17] (cf. Ashrafi et al., 2022 [18]). The position of some morphologically distinctive species, such as *S. pinguis* Komai and Anker, 2012, *S. yoyo* Anker, Firdaus, and Pratama, 2014, and *S. venustus* Anker, 2019, is not clear (cf. Komai and Anker 2012 [30]; Anker et al., 2014 [31]; Anker 2019a [11]). A comprehensive phylogenetic analysis of *Salmoneus* and related genera based on molecular data is currently under way (Ashrafi et al., in prep.).

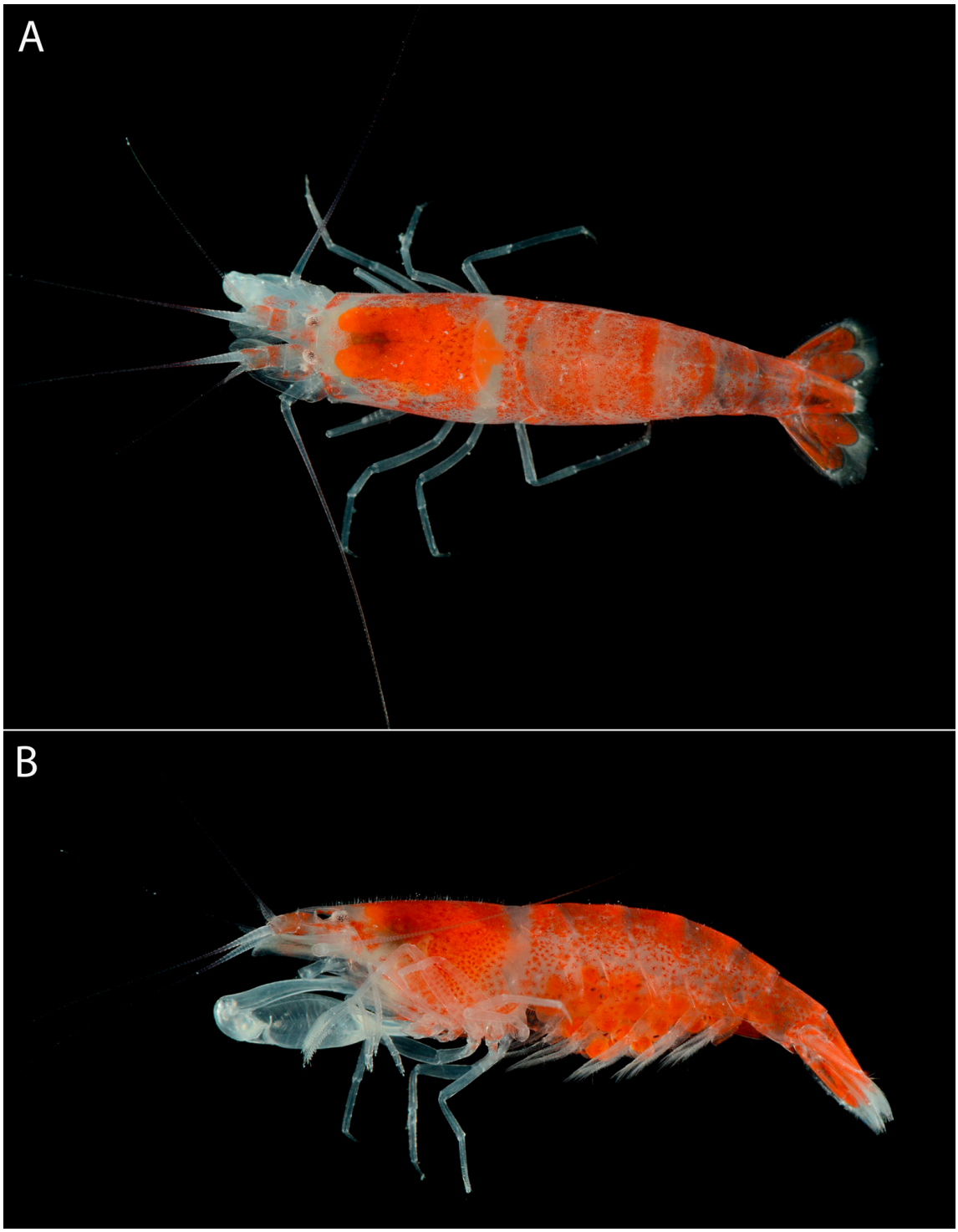

Figure 3. *Salmoneus sultanus* sp. nov., holotype, ovigerous specimen (cl 5.0 mm) from Masirah Island, Oman (FLMNH UF 71451). Shrimp alive in dorsal (**A**) and left lateral (**B**) views. Photographs by the author.

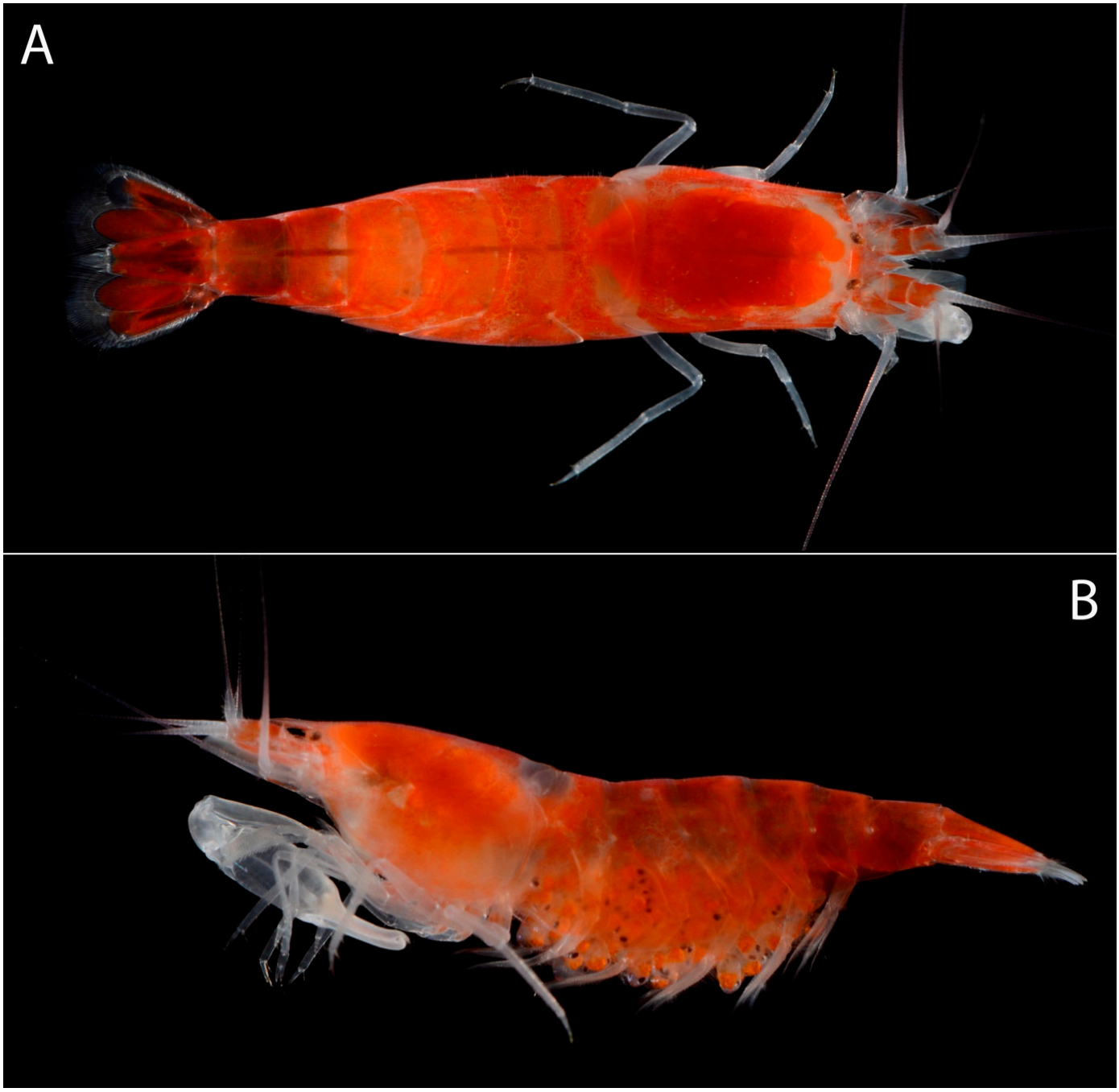

Figure 4. *Salmoneus sultanus* sp. nov., paratype, ovigerous specimen (cl 5.8 mm) from Mirbat, Oman (FLMNH UF 68848). Shrimp alive in dorsal (**A**) and left lateral (**B**) views. Photographs by the author.

Considering the combination of all morphological features of *S. sultanus* sp. nov., the new species appears to be closest to *S. latirostris*, *S. serratidigitus* (including features described for *S. sibogae*), *S. mauiensis*, *S. farasan*, and *S. arabicus* among the Indo-Pacific taxa (cf. Coutière 1899 [6]; Edmondson 1930 [20]; Banner 1953 [21]; Banner and Banner 1981) [9]; Anker 2022 [2]; present study), and *S. setosus* Manning and Chace, 1990, *S. teres* Manning and Chace, 1990, *S. kekovae* Grippa, 2004, *S. rocas* Anker, 2007, and *S. inconspicuus* Anker, 2020 among the Atlantic taxa (cf. Manning and Chace 1990 [22]; Grippa 2004 [23]; Anker 2007 [24], 2020 [27]).

The specimen from Thuwal, Red Sea coast of Saudi Arabia, which is herein reported as *S. latirostris* (Figure 5), corresponds well to the very brief and superficial description provided by Coutière (1897) [5], with a few figures published in Coutière (1899) [6]. Furthermore, this specimen has a red-banded colour pattern, as observed by Coutière (1899) [6] in Djibouti. This species awaits a full redescription; however, due to time constraints the author was able to prepare line drawings of the frontal region and major cheliped only (Figure 2F,G), for purely comparative purposes. The species will be eventually redescribed, although it would be better to wait until more material from the Red Sea and Gulf of Aden becomes available. Nevertheless, *S. sultanus* sp. nov. can be separated from *S. latirostris* (based on the present specimen and Coutière's (1897 [5], 1899 [6] accounts) by the well-demarcated rostral carina (which is very faint in *S. latirostris*, cf. Figures 1a and 2f; see also Coutière 1899 [6]: Figure 21); the slightly longer stylocerite, reaching the distal margin of the second article of the antennular peduncle (*vs.* falling well short of this margin in *S. latirostris*, cf. Figures 1a and 2f); the ischium of the minor cheliped and second pereiopod unarmed (*vs.* each armed with one stout spiniform seta in *S. latirostris*, A. Anker, pers. obs., see also Figures 1I and 2D); the second pereiopod carpus with the second to fourth subarticles being about equal in length (*vs.* with the second distinctly longer than the third or fourth in *S. latirostris*, cf. Figure 1I and Coutière 1899 [6]: Figure 299); the third pereiopod merus quite stout, at most four times as long as greatest width (*vs.* rather slender, almost five times as long as wide, in *S. latirostris*, cf. Figures 1J and 5B); and the third pereiopod ischium unarmed or armed with very small seta (*vs.* armed with two strong spiniform setae in *S. latirostris*, A. Anker, pers. obs., see also Figure 1J,R). The major chelae of the two species appear to be very similar, including the number of teeth on the serrated finger cutting edges (cf. Figure 2C,G).

The type species of *Salmoneus*, *S. serratidigitus*, was briefly described by Coutière (1897) [5], with some figures published in Coutière's (1899) [6] famous alpheid monograph. Banner and Banner (1981) [9] published a lengthy account on the results of their search for Coutière's type specimens of *Salmoneus* in European and US museums. These authors concluded that the original type specimens of *S. serratidigitus*, *S. latirostris*, *S. cristatus*, and also J. De Man's *S. sibogae* were probably lost. Nevertheless, they provided a detailed description and illustrations of a specimen from Djibouti (Museum of Comparative Zoology, Harvard University, MCZ 5556) personally collected and identified by H. Coutière as *S. serratidigitus* (Banner and Banner 1981 [9]: Figure 8a–i). These illustrations (but not Banner and Banner 1981 [9]: Figure 7a–g), should be used for any interspecific comparisons involving *S. serratidigitus* until a highly desirable redescription of the species. *Salmoneus sultanus* sp. nov. can be easily separated from *S. serratidigitus* by the shape of the rostrum, which is broader and with lateral margins slightly convex in the proximal half in the new species (*vs.* narrower and with lateral margins broadly concave throughout in *S. serratidigitus*); the eyes partly visible in dorsal view (*vs.* entirely concealed dorsally in *S. serratidigitus*); the posterior margin of the telson with a broadly V-shaped notch (*vs.* with a narrower and more U-shaped notch in *S. serratidigitus*); and the ischia of the third and fourth pereiopods either unarmed or armed with one very small spiniform seta (*vs.* armed with up to three strong spiniform setae in *S. serratidigitus*) (cf. Figure 1A,D,E,J,L,R; Banner and Banner 1981 [9]: Figure 8a,g–i). Using essentially the same criteria, the new species from Oman can be distinguished from *S. sibogae* (currently in the synonymy of *S. serratidigitus*, but possibly valid, see Anker and De Grave 2016 [32]), except for the posterior margin of the telson, which is very similar between these two species (cf. De Man 1911 (1915) [19]: Figure 9).

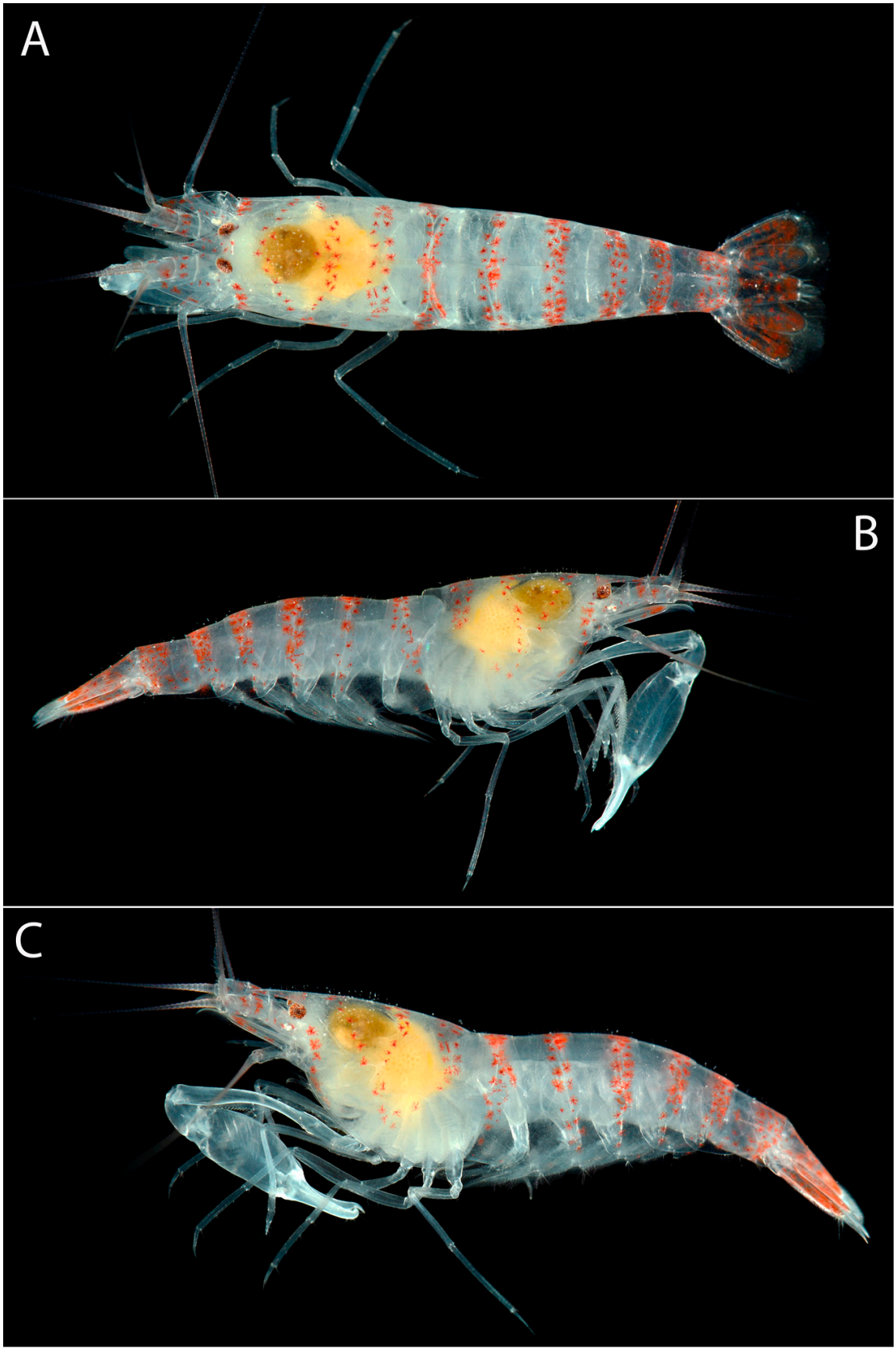

Figure 5. *Salmoneus latirostris* (Coutière, 1897), non-ovigerous specimen (cl 5.0 mm) from Thuwal, Saudi Arabia (FLMNH UF 71449). Shrimp alive in dorsal (**A**), right lateral (**B**), and left lateral (**C**) views. Photographs by the author.

Salmoneus sultanus sp. nov. can be easily distinguished from *S. mauiensis* by the general shape of the rostrum (see under *S. serratidigitus*); the stylocerite reaching to the distal margin of the second article of the antennular peduncle (*vs.* by far overreaching this margin in *S. mauiensis*); the second article for the antennular peduncle subquadrate, as long as wide (*vs.* much wider than long in *S. mauiensis*); and the major chela fingers with 11–12 teeth (*vs.* with only 7–8 teeth in *S. mauiensis*) (cf. Figures 1A and 2C; Banner 1953 [21]: Figure 2). The new species also differs from the recently described *S. farasan* and *S. arabicus*, for instance, from the former species by the major and minor cheliped ischium being unarmed (*vs.* armed with one spiniform seta in *S. farasan*) and several features of the third pereiopod, including the armature of the ischium and relative proportions of the merus, propodus and dactylus (cf. Figures 1J and 2A,B; Anker 2022 [2]: Figures 1h and 2a,e), and from the latter species by the much longer stylocerite, reaching the distal margin of the second article of the antennular peduncle (*vs.* slightly overreaching the mid-length of this article in *S. arabicus*), and the armature of the ischium of the chelipeds and second and third pereiopods (cf. Figures 1A,I,J and 2A,B; Anker 2022 [2]: Figures 4a,g,h and 5b). Furthermore, *S. sultanus* sp. nov. can be easily discriminated from *S. hilarulus* by the different proportions of the third pereiopod dactylus (which is unusually stout in *S. hilarulus*), and from *S. nhatrangensis* by the rather normal configuration of orbital notches (which are very deep and peculiarly shaped in *S. nhatrangensis*) (cf. De Man 1911 (1915) [19]; Anker and Marin 2006 [17]).

Salmoneus sultanus sp. nov. differs from the eastern Atlantic *S. kekovae* and the western/central Atlantic *S. setosus*, *S. rocas* (possibly junior synonym of *S. setosus*), *S. teres*, and *S. inconspicuus* by several important morphological features, for example, from *S. kekovae* by the shape of the rostrum and telson, as well as the armature of the finger cutting edges of the major chela and third pereiopod ischium (cf. Grippa 2004 [23]); from *S. setosus* and *S. rocas* by the configuration of the rostrum and telson, and the relative proportions of the antennular parts, including the length of the stylocerite (cf. Manning and Chace 1990 [22]; Anker 2007 [24]); from *S. teres* and *S. inconspicuus* by the armature of the second pereiopod and configuration of the posterior margin of the telson; and specifically from *S. inconspicuus* also by the armature of the major and minor chelipeds and third pereiopod (cf. Manning and Chace 1990 [22]; Anker 2020 [27]).

The moderately developed, short rostral carina of *S. sultanus* sp. nov. can be used to separate the new species from all species with a well-developed rostral carina, often continuing posteriorly and sometimes reaching the posterior fourth of the carapace, including *S. cristatus* and *S. chadwickae*, which are distributed from the Red Sea to Iran, and *S. auroculatus* Anker and Marin, 2006 (Coutière 1899 [6]; Banner and Banner 1981) [9]; Anker and Marin 2006 [17]; Ďuriš and Horká, 2016 [10]).

The bright red colour of *S. sultanus* sp. nov. (Figures 3 and 4) immediately separates the new species from the red-banded *S. latirostris* (Figure 5) and *S. cristatus* (Figure 6), uniform yellow or orange yellow *S. serratidigitus* (Coutière 1899 [6]; Anker et al., 2015 [33]; Anker and De Grave 2016 [32]; Anker 2019b [26]; possibly more than one species involved), *S. mauiensis* (Edmondson 1930 [20]), *S. chadwickae* (Figure 7; see also Ďuriš and Horká 2016) [10]), and *S. setosus* (Anker 2020 [27]), and whitish *S. farasan*, *S. arabicus* (Anker 2022 [2]), *S. nhatrangensis*, *S. auroculatus* (Anker and Marin 2006 [17]), *S. inconspicuus* (Anker 2020 [27]), and several other species. The life colours of *S. teres* and the species described as *S. sibogae* are presently unknown. Several other species of *Salmoneus* have colour patterns dominated by red chromatophores or with red patches or bands, for instance, *S. yoyo*, *S. venustus*, *S. rostratus* Barnard, 1962 [34], *S. spiridonovi* Marin, 2021, and *S. tricristatus* Banner, 1959 [35] (Anker and Marin 2006 [17]; Anker et al., 2014 [31]; Anker 2019a [11]; Marin 2021 [36]), whereas *S. rashedi* Ashrafi, Ďuriš and Naderloo, 2020 is bright yellow with reddish bands (Ashrafi et al., 2020 [14]). However, none of these species is morphologically similar to *S. sultanus* sp. nov.

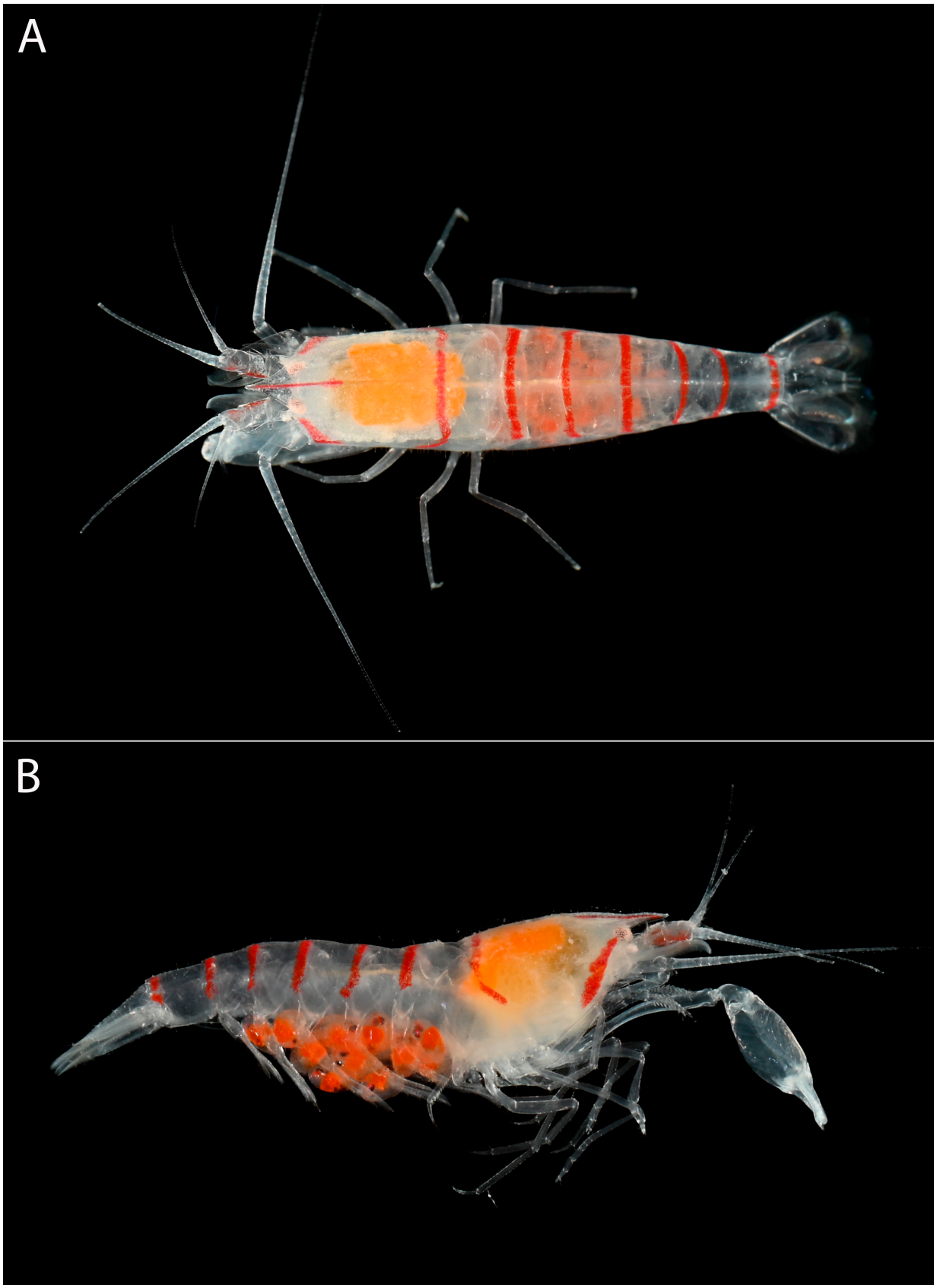

Figure 6. *Salmoneus cristatus* (Coutière, 1897), ovigerous specimen (cl 2.9 mm) from Rabigh, Saudi Arabia (FLMNH UF 68811). Shrimp alive in dorsal (**A**) and right lateral (**B**) views. Photographs by Viktor Nunes Peinemann and Arthur Anker.

Figure 7. *Salmoneus chadwickae* (Ďuriš and Horká, 2016), ovigerous specimen (cl 4.9 mm) from Masirah Island, Oman (FLMNH UF 71448). Shrimp alive in dorsal (**A**) and left lateral (**B**) views. Photographs by the author.

Funding: This research received no external funding.

Acknowledgments: The Omani material was collected during two BioBlitz surveys (PI: Gustav Paulay, FLMNH) with the first on the coasts of the Governorate of Dhofar in January 2022, and the second on the eastern coast of Masirah Island in November 2022. Jonathan Meiburg and Viktor Nunes Peinemann (KAUST) offered excellent companionship in the field in Oman. Fieldwork in Thuwal, Saudi Arabia, was supported by KAUST (FCC/1/1973-49-01) and baseline research funds to Francesca Benzoni. Some photographs were taken by KAUST students under the author's supervision during a short macrophotography workshop at KAUST in June 2022. Digitalisation of line drawings was made in the laboratory of João R.V. Iganci (Universidade Federal de Pelotas, Brazil).

Conflicts of Interest: The author declares no conflict of interest.

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