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Short Communication

Additional records of the deep-sea scissor-foot shrimp *Psalidopus huxleyi* Wood-Mason & Alcock, 1892 (Decapoda: Caridea: Psalidopodidae) from the Arabian and Andaman Seas, India

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In this paper, a taxonomic account of the rare deep-sea caridean shrimp *Psalidopus huxleyi* Wood-Mason & Alcock, 1892 is provided based on four specimens collected during exploratory cruises onboard the "Fishery Oceanographic Research Vessel Sagar Sampada" in the Andaman Sea (635 meters depth) and the Southeastern Arabian Sea (957 m). This species has often been recorded from the Western Pacific Ocean, but this study represents the rediscovery of the species from localities close to the type localities since its original description.

[**Keywords**: Deep-sea, Northern Indian Ocean, Psalidopodidae, Shrimps, Taxonomy]

Introduction

The monogeneric caridean family Psalidopodidae Wood-Mason is known as the scissor-foot shrimps characterized by their spiky body and chela with two movable fingers, scissor-like, of the first pair of pereopods[1]. They are found in the deep sea, inhabiting muddy bottoms along continental slopes at depths ranging from 412 to 2881 m[(refs. 2-4)].

The type species *P. huxleyi* was originally described from a single ovigerous female collected at 7½ miles east of N. Cinque Island, Andaman Sea, at a depth of 896 m[(ref. 1)]. Another species, namely *P. spiniventris* Wood-Mason & Alcock, 1892 was described on the basis of three specimens collected from RIMSS *Investigator* station 116 (East of Rutland Island) as well as an undetermined location southeast of Cinque Island[1]. Alcock reported *P. spiniventris* collected from the Arabian Sea off the Laccadives (RIMSS *Investigator* station 177) and off Cape Comorin at depths of 878 – 1164 m[(ref. 5)]. The third taxon *Psalidopus japonensis* was described by Kubo (1952)[6] based on material collected from off Kii Peninsula, Japan. Chace & Holthuis[2] revised *Psalidopus* based on material from the Western Atlantic and Northwestern Pacific Oceans, concluding that *P. spiniventris* and *P. japonensis* were synonymous with *P. huxleyi*. Toriyama & Horikawa (1992)[3] described the fourth species, *P. tosaensis*, based on material collected from Tosa Bay, Japan.

The systematic faunal surveys conducted within the Indian Exclusive Economic Zone (EEZ) by the Centre for Marine Living Resources & Ecology (CMLRE), Kochi, India, onboard the Fishery Oceanographic Research Vessel Sagar Sampada (FORVSS) during 2017 – 2018, resulted in modest collections of deep-sea caridean shrimps, including specimens of *P. huxleyi* from the Andaman Sea and Eastern Arabian Sea. This report focusing on *Psalidopus huxleyi*, presents an account of additional four specimens. In spite of the previous records of *P. huxleyi* from the Western Pacific localities and off Java, Indonesia, no specimens of the species have been collected from the type locality and nearby areas. Material recorded in the present investigation represents the rediscovery of the species from localities close to the type localities of *P. huxleyi* and the synonymised *P. spiniventris*.

Materials and Methods

The study area comprises the continental slope regions off the Andaman and Nicobar Islands and the southwestern coast of India. The specimens examined were collected during FORVSS cruise 367 leg II (November 2017) in the Andaman Sea (635 m depth) using a High-Speed Demersal Trawl II net (Crustacean Version) and cruise 374 (April 2018) in the Southeastern Arabian Sea (957 m) using an Expo model trawl net with 30 mm cod end mesh size (Fig. 1). The samples were cleaned to remove debris, examined, and photographed with an Olympus TG-5 underwater camera. The sex was distinguished by the presence or absence of an appendix masculina on the second pair of pleopods. The total length and carapace length of the specimens were recorded with a digital calliper with 0.01 mm precision. The map used in the present work was plotted using QGIS mapping software version 3.32.1[(ref. 7)].

The material examined is deposited as reference voucher collection in the Referral Centre of the CMLRE, which was the regional node of the Ocean Biodiversity Information System (OBIS) for the Indian Ocean. The occurrence data associated with these specimens will be available at the OBIS portal (https://obis.org/). Abbreviations used in the following text are listed in alphabetical order: FORVSS - Fishery Oceanographic Research Vessel Sagar Sampada; HSDT (CV) - High-Speed Demersal Trawl II net (Crustacean Version); IO/SS/CAR - Indian Ocean/Sagar Sampada/Caridea.

Results

Infraorder: Caridea Dana, 1852[ref. 8]

Family: Psalidopodidae Wood-Mason, 1892

Genus: *Psalidopus* Wood-Mason, 1892

Psalidopus huxleyi Wood-Mason & Alcock, 1892 (Fig. 2)

Psalidopus huxleyi Wood-Mason & Alcock, 1892[ref. 1]: 273, pl. 14: Figs. 1, 2, 7 [type locality: 7.5 miles E. of N. Cinque Island, Andaman Sea, 490 fathoms (= 896 m) depth, RIMSS Investigator stn. 10, Agassiz trawl; cf. Huys *et al.*[9]]; Alcock[10]: 31; Alcock[5]: 112; De Man[11]: 85, pl. 16: Fig. 47; Holthuis[12]: 81.

Psalidopus spiniventris Wood-Mason & Alcock, 1892[ref. 1]: 274, pl. 14: Figs. 3 – 6a, 8; pl. 15 [type locality: 13 km E of Cinque Island, Andaman Sea, RIMSS Investigator stn. 5, 500 fathoms (= 914 m) depth, Blake trawl]; Alcock & Anderson[13]: 153; Alcock[10]: 31; Alcock[5]: 113; Alcock[14]: 150, 259, 264, Fig. 21.

Psalidopus huxleyi: Alcock & McArdle[15]: pl. 51: Fig. 5; Balss[16]: 113, 148, 154, Fig. 197; Balss[17]: 1300; Holthuis[12]: Fig. 55; Holthuis[18]: 215, 220; Balss 1957[ref. 19]: 1540, Fig. 1143; Balss[20]: 1744; Hemming[21]: 141, 148, 174, 179; Chace & Holthuis[2]: 11, Figs. 7 – 15; Toriyama & Horikawa[3]: 6, Fig. 4; Davie 2002[ref. 22]: 370; Chan *et al.*[23]: 134, Fig. 8B.

Psalidopus japonensis Kubo 1952[ref. 6]: 91, Figs. 1 – 2, pl. 5 [type locality: off Daiō-zaki, Kii Hantō, 530 m depth].

Material examined

One ovigerous female (IO/SS/CAR/00031; CL 24 mm), 1 male (IO/SS/CAR/00032; CL 22 mm),

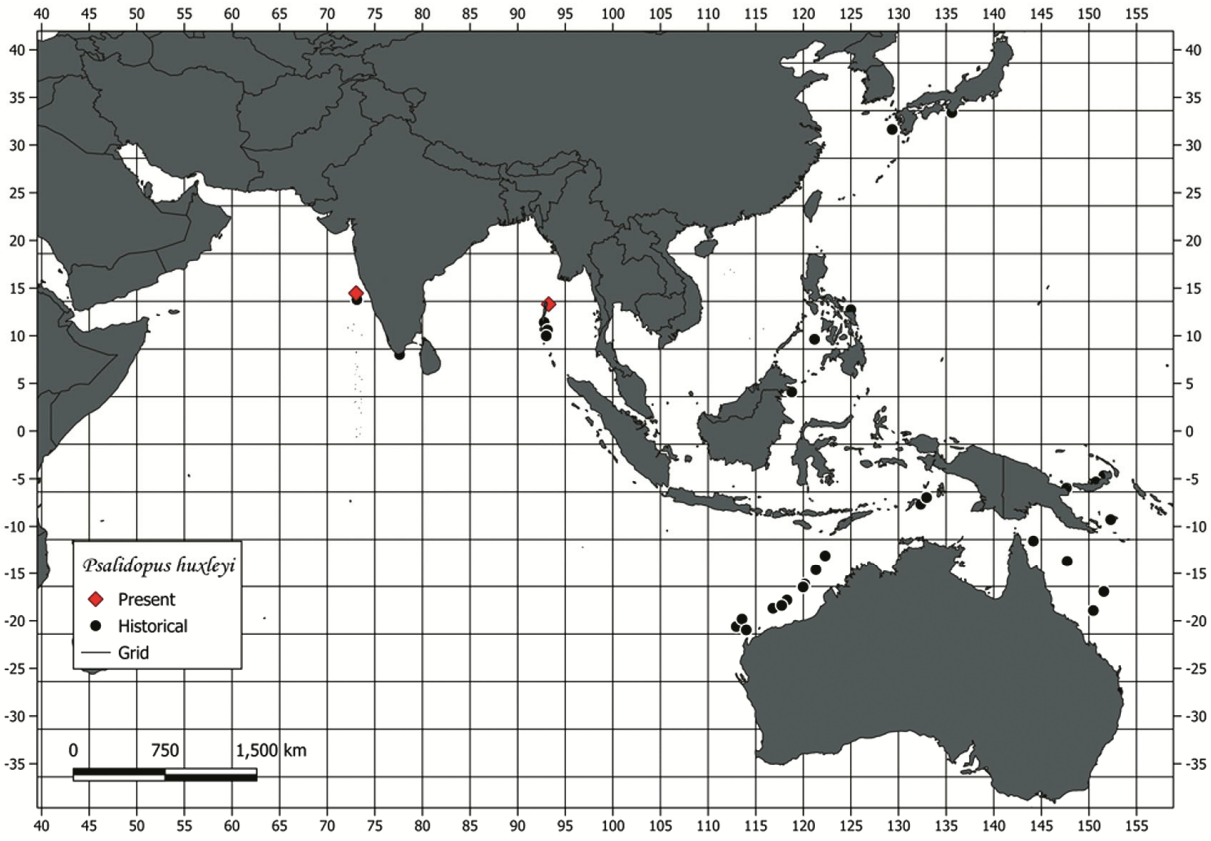

Fig. 1 — Map indicating the known geographical distribution of *Psalidopus huxleyi* Wood-Mason & Alcock, 1892

Andaman Sea, FORVSS stn. 367 leg II 08, 13°15'15" N, 93°15'14" E, 635 m depth, HSDT (CV), coll. Dr. Rajeesh Kumar M.P., 26 November 2017. 1 ovigerous female (CL 30 mm), 1 non-ovigerous female (CL 28 mm) (IO/SS/CAR/00061), Southeastern Arabian Sea, FORVSS stn. 37410, 14°22'02"N, 73°01'10"E, 957 m depth, Expo model net, coll. Dr. Vinay P. Padate, 09 April 2018.

Abbreviated description

Body exceedingly spiny; rostrum distinctly upcurved, armed with 11 – 12 dorsal, 9 – 10 ventral and 11 – 13 lateral spines. Carapace armed with 10 – 13 spines in dorsal midline; 6 – 7 in anterior intermediate row; 6 in posterior intermediate row; 3 in anterior antennal row; 6 – 8 in posterior antennal row; 7 in branchial region; 6 in anterior sublateral row; 5 – 7 in posterior sublateral row. Pleonal tergites 1 – 6 armed in dorsal midline with 4, 4 – 5, 5 – 8, 6, 2 and 4 – 5 spines, respectively; telson with paired series of submedian dorsal spines. Eyes very small, cornea unpigmented. Antennular peduncle with stylocerite abruptly constricted to long terminal spine overreaching distolateral margin of second segment. Antennal scaphocerite 2.8 – 5.0 times as long as wide; antennal peduncle article 1 armed with 3 lateral spines, dorsal spine shorter than others. First pereopods overreaching antennal peduncle by length of dactyli or slightly more; second pereopods overreaching antennal peduncle by slightly more or less than half length of chela; third pereopods barely reaching level of distal margin of scaphocerite; fourth pereopods reaching anteriorly to level of third pereopods; fifth pereopods overreaching antennal scale by length of dactyl or slightly more; uropods not overreaching telson. Ovigerous female bearing 26 large eggs.

Colouration

Body mostly reddish with large white patches, ventral part of pleon and pleopods pinkish white. Eye with white cornea. Pereopods generally reddish, fingers of first pereopod yellowish. Eggs brown (Fig. 2).

Distribution

Widely distributed in the Indo-West Pacific region, ranging from India and the Timor Sea to the Sulu Sea,

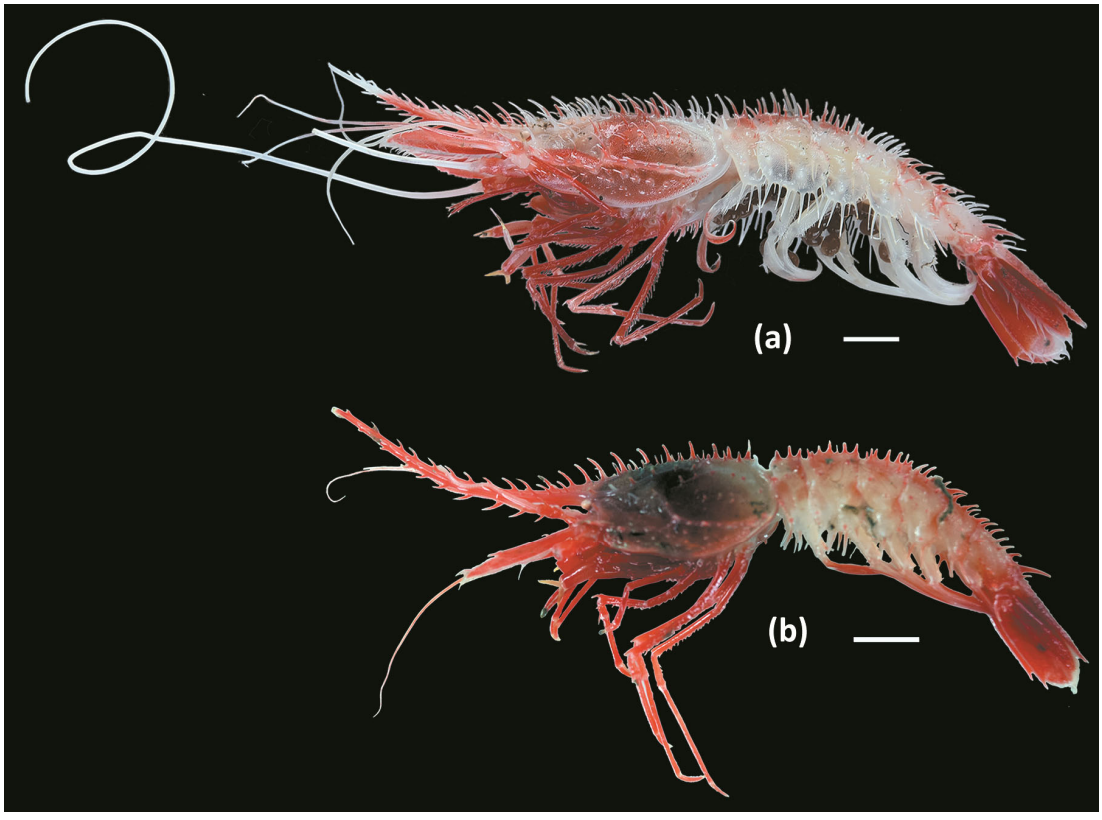

Fig. 2 — *Psalidopus huxleyi* Wood-Mason & Alcock, 1892: a) Ovigerous female (IO/SS/CAR/00061; CL 30 mm), Southeastern Arabian Sea (lateral view), and b) Female (IO/SS/CAR/00031; CL 26 mm), Andaman Sea (lateral view)

Celebes Sea, Japan and Australia[2]. In Indian waters, this species has been reported from the Andaman Sea[1], Lakshadweep Sea[13], and off Cape Comorin[5]. Typically inhabits depths ranging between 446 and 1163 m[(ref. 2)].

Remarks

The present study represents the rediscovery of *Psalidopus huxleyi* from nearby the type localities, *i.e*., Andaman Sea and the Eastern Arabian Sea (the type locality of the synonymous *P. spiniventris* was embraced).

Chace & Holthuis[2] clarified the morphological differentiation between *P. huxleyi* and *P. barbouri*. *Psalidopus tosaensis* was rather distinctive from the two congeners, as shown by Toriyama & Horikawa[3].

The present material from the Eastern Arabian Sea with 5 – 7 spines in the posterior sublateral row on the carapace expands the known intraspecific range provided by Chace & Holthuis[2]. Although the range of rostral spination in both the Andaman Sea and Arabian Sea specimens lies well within the intraspecific range of the species[2], the Andaman Sea specimens differ from the Arabian Sea specimens in the higher number of rostral spines in the dorsal, ventral and lateral rows (Table 1). *Psalidopus huxleyi* has been encountered along the continental slope and was primarily collected through the bottom trawls. Associated crustacean fauna encountered during the sampling surveys in the Indian EEZ included deep-water shrimps (*Acanthephyra*, *Aristaeopsis*, *Aristeus*, *Benthesicymus*, *Eupasiphae*, *Glyphocrangon*, *Heterocarpus*, *Hymenopenaeus*, *Nematocarcinus*, *Oplophorus*, *Plesionika*, *Psathyrocaris* and *Pseudaristeus*), crabs (*Cyrtomaia*, *Dicranodromia*, *Ethusina*, *Gordonopsis*, *Homolochunia*, *Paromolopsis*, *Pleistacantha*, *Samadinia* and *Tanaoa*), lobsters (*Nephropsis*, *Puerulus* and *Stereomastis*), anomurans (*Munidopsis* and *Uroptychus*), and giant isopods (*Bathynomus*).

Despite the variations in the spine counts observed in the present study as well as in published literature[2], the number of specimens analysed during the present study is inadequate to provide a comprehensive understanding of the morphological variations within this species and therefore necessitates the collection and examination of a substantial number of specimens. Moreover, the collected specimens were initially preserved in formalin solution for a considerable duration, thereby rendering it difficult to generate DNA barcodes from these samples.

Table 1 — Comparison of diagnostic characters of *P. huxleyi* specimens between Southeastern Arabian and Andaman Sea of present study

Morphological (spine counts)	Arabian Sea	Bay of Bengal
No. of rostral spines		
Dorsal	11 – 12	15
Ventral	9 – 10	13
Lateral	11 – 13	16
No. of carapace spines		
Dorsal midline	10 – 13	14
Anterior intermediate row	6 – 7	7
Posterior intermediate row	6	
Anterior antennal row	3	
Posterior antennal row	6 – 8	
Branchial region	7	
Anterior sublateral row	6	
Posterior sublateral row	5 – 7	
No. of mid-dorsal spines on abdomen		
First abdomen somite	4	4
Second abdomen somite	4 – 5	5
Third abdomen somite	5 – 8	5
Fourth abdomen somite	6	6
Fifth abdomen somite	2	2
Sixth abdomen somite	4 – 5	5
Morphometrics (mm)		
Total Length (TL)	126 – 140	133
Carapace Length (CL)	28 – 30	24

Identification key to the species of the genus *Psalidopus* Wood-Mason & Alcock, 1892

1. Rostrum variably ascendant, lateral spines distributed throughout the length of the rostrum. Antennal scale with large spines on proximal half of lateral margin. Exopodal uropod with nearly smooth lateral margin ……. 2
- Rostrum horizontally straight, lateral spines restricted to proximal portion. Antennal scale with small spines on proximal half of lateral margin. Exopodal uropod with spinose lateral margin …….. *P. tosaensis* Toriyama & Horikawa, 1993
2. Rostrum nearly straight. Carapace with 0 – 3 spines in the posterior antennal row. Dorsal midline of sixth abdominal somite with 5 – 9 spines ..... *P. barbouri* Chace, 1939
- Rostrum curved dorsad. Carapace with 5 – 10 spines in the posterior antennal row. Dorsal midline of sixth abdominal somite with 4 – 5 spines … *P. huxleyi* Wood-Mason & Alcock, 1892

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Conflict of Interest

Authors do not have any conflict of interest in publishing this manuscript.

Ethical Statement

The organisms under the study are not under scheduled list/protection categories, thus ethical clearance is not applicable.

Author Contributions

KG: Taxonomic identification and manuscript preparation; VPP: Sample collection, taxonomic identification and manuscript preparation; SK: manuscript editing; and SSC: Planning of study, manuscript editing and review.

References

1 Wood-Mason J & Alcock A, Natural history notes from H.M. Indian marine survey steamer "Investigator", Commander R.F. Hoskyn, R.N., commanding. Series II, No. 1, On the results of deep-sea dredging during the season 1890–1891, *Ann Mag Nat Hist*, *Ser 6*, 9 (1892) 265–275, pls. 14–15.

2 Chace F A & Holthuis L B, *Psalidopus*: the scissor-foot shrimps (Crustacea: Decapoda: Caridea), *Smithson Contrib Zool*, 277 (1978) 1–22. https://doi.org/10.5479/si.00810282.277

3 Toriyama M & Horikawa H, A new caridean shrimp, *Psalidopus toasensis*, from Tosa Bay, Japan (Decapoda: Caridea, Psalidopodidae), *Bull Nansei Natl Fish Res Inst*, 26 (1993) 1–8.

4 Wadley V & Evans D, *Crustaceans from the deepwater trawl fisheries of Western Australia*, (CSIRO Division of Fisheries, Hobart, Australia), 1991, pp. 44.

5 Alcock A, *A descriptive catalogue of the Indian deep-sea Crustacea Decapoda Macrura and Anomala*, *in the Indian Museum. Being a revised account of the deep-sea species collected by the Royal Indian Marine Survey Ship Investigator*, (Trustees of the Indian Museum, Calcutta), 1901, pp. 286. https://doi.org/10.5962/bhl.title.16083

6 Kubo I, On two rare species of Psalidopodidae and Nephropsidae, *J Tokyo Univ Fish*, 39 (1952) 91–100, pl. 5.

7 QGIS Development Team, QGIS Geographic Information System, Open-source Geospatial Foundation Project. Available online at: http://qgis.osgeo.org (Accessed on September 2023)

8 Dana J D, *United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the Command of Charles Wilkes, U.S.N.*, Vol 13, Crustacea, Part I, (C. Sherman, Philadelphia), 1852, pp. 685. https://doi.org/10.5962/bhl.title.69333

9 Huys R, Low M E Y, De Grave S, Ng P K L & Clark P F, On two reports associated with James Wood-Mason and Alfred William Alcock published by the Indian Museum and the Indian Marine Survey between 1890 and 1891: Implications for malacostracan nomenclature, *Zootaxa*, 3757 (1) (2014) 1–78. https://dx.doi.org/10.11646/zootaxa.3757.1.1

10 Alcock A, Summary of the Deep-sea Zoological Work of the Royal Indian Marine Survey Ship Investigator from 1884 to 1897, *Sci Mem Officers Med Sanit Dept Gov India*, 11 (1899) 1–49.

11 Man J G, The Decapoda of the Siboga Expedition, VI: Families Pasiphaeidae, Stylodactylidae, Hoplophoridae, Nematocarcinidae, Thalassocaridae, Pandalidae, Psalidopodidae, Gnathophyllidae, Processidae, Glyphocrangonidae and Crangonidae, *Siboga-Exped*, 39 (a) 3 (1920) 1–318, pls. 1–25.

12 Holthuis L B, The Recent Genera of the Caridean and Stenopodidean Shrimps (Class Crustacea, Order Decapoda, Supersection Natantia) with Keys for Their Determination, *Zool Verh*, 26 (1955) 1–157, 105 Figs.

13 Alcock A & Anderson A R S, An account of a recent collection of deep-sea Crustacea from the Bay of Bengal and Laccadive Sea. Natural history notes from H.M. Royal Indian Marine Survey Steamer "Investigator", commander C.F. Oldham, R.N., commanding. ―Series II, No. 14, *J Asiatic Soc Bengal*, 63 (1894) 141–185, pl. 9.

14 Alcock A, *A Naturalist in Indian Seas or, Four Years with the Royal Indian Marine Survey Ship "Investigator,"* (John Murray, London), 1902, pp. 329. https://doi.org/10.5962/bhl.title.97237

15 Alcock A & McArdle A F, *Illustrations of the Zoology of the Royal Indian Marine Surveying Ship "Investigator", under the command of Commander T.H. Heming, R.N.. Crustacea. Part IX. Published under the Authority of Captain W.S. Goodridge, R.N., Director of the Royal Indian Marine,* (Office of the Superintendent of Government Printing, Calcutta), 1901, pls. XLIX–LV.

16 Balss H, Decapoda, III: Morphologischer Teil, In: *Klassen und Ordnungen Tierreichs*, Vol 5, Fünfter Band 1, Abteilung 7, edited by H G Bronn (Geest & Portig K G, Leipzig), 1940, pp. 22–160, figs. 7–205.

17 Balss H, Decapoda, VI: Okologie, In: *Klassen und Ordnungen Tierreichs*, Vol 5, Fünfter Band 1, Abteilung 7 (10), edited by H G Bronn (Geest & Portig K G, Leipzig), 1955, pp. 1285–1367, figs. 1043–1069.

18 Holthuis L B, Proposed Addition to the "Official List of Generic Names in Zoology" of the Names of One Hundred and Two Genera of Caridea (Class Crustacea, Order Decapoda), Including Proposals for the Use of the Plenary Powers (a) to Validate the Emendation to "*Gnathophyllum*" of the Generic Name "*Gnatophyllum*" Latreille, 1814, and (b) to Validate the Family-Group Names "Hippolytidae" Bate, 1888 and "Eugonatonotidae" Chace, 1937, *Bull Zool Nomencl*, 11 (7) (1955) 204–228. https://doi.org/10.5962/bhl.part.2844

19 Balss H, Decapoda, VIII: Systematic, In: *Klassen und Ordnungen Tierreichs*, Vol 5, Fünfter Band 1, Abteilung 7

(12), edited by H G Bronn (Geest & Portig K G, Leipzig), 1957, pp. 1505–1672, figs. 1131–1199.

20 Balss H, Decapoda, IX: Geographische Verbreitung, In: *Klassen und Ordnungen Tierreichs*. Vol 5, Fünfter Band 1, Abteilung 7 (13), edited by H G Bronn (Geest & Portig K G, Leipzig), 1957, pp. 1673–1770, figs. 1200–1212.

21 Hemming F, Opinion 470: Addition to the "Official List of Generic Names in Zoology" of the Names of One Hundred and Two Genera of Caridea (Class Crustacea, Order Decapoda) and Use of the Plenary Powers for Various Purposes in Connection Therewith, *Opinions and Declarations Rendered by ICZN*, 16 (9) (1957) 129–202.

22 Davie P J F, Crustacea: Malacostraca: Phyllocarida, Hoplocarida, Eucarida (Part 1), In: *Zoological Catalogue of Australia*, Vol 19.3A, edited by A Wells & W W K Houston, (CSIRO Publishing, Melbourne), 2002, pp. 1–551.

23 Chan T Y, Komai T & Yang C H, A list of shrimps and lobsters (Crustacea: Decapoda: Dendrobranchiata, Caridea, Stenopodidea, Polychelida, Astacidea, Achelata, Axiidea, Gebiidea) photographed during the SJADES 2018 biodiversity cruise, *Raffles Bull Zool, Suppl, 36* (2021) 119–161. https://doi.org/10.26107/RBZ-2021-0035