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DOI:
https://doi.org/10.1163/15685403-bja10289

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Crustaceana 96 (4) 345-381

CRUSTACEANA

A NEW SPECIES OF *PALAEMONELLA* (DECAPODA, CARIDEA, PALAEMONIDAE) ASSOCIATED WITH SCLERACTINIAN CORALS OF THE GENUS *EUPHYLLIA* DANA

BY

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ABSTRACT

A new species of *Palaemonella*, *P. sandyi* sp. nov., is described on the basis of specimens collected in association with euphylliid scleractinian corals, *Euphyllia glabrescens* and *E. cristata*. Material was collected from the Maldives, Cebu in the Philippines, Semporna in Malaysia, and from Java, Bali, Sulawesi, Kalimantan, Ternate and Raja Ampat in Indonesia. The new species is similar to *P. colemani* and *P. euphyllius*, which are associated with euphylliid corals of the genus *Fimbriaphyllia*. The new species can be distinguished from *P. colemani* and *P. euphyllius*, as well as from the species *P. philippinensis* and *P. smiti*, which are both symbionts with plerogyrid scleractinians, on the basis of morphological characters in the rostrum and ambulatory pereiopods, colouration, and molecular data.

Key words. — Crustacea, Decapoda, Caridea, Palaemonidae, *Palaemonella*, new species, coral symbiont

RÉSUMÉ

Une nouvelle espèce de *Palaemonella*, *P. sandyi* sp. nov., est décrite à partir de spécimens collectés en association avec des coraux scléractiniaires Euphylliidae *Euphyllia glabrescens* et *E. cristata*. Le matériel a été récolté aux Maldives, à Cebu aux Philippines, à Semporna en Malaysie, et à Java, Bali, Sulawesi, Kalimantan, Ternate, et Raja Ampat en Indonésie. La nouvelle espèce est similaire à *P. colemani* et *P. euphyllius*, qui sont associées aux coraux Euphylliidae du genre *Fimbriaphyllia*. La nouvelle espèce se distingue de *P. colemani* et de *P. euphyllius*, ainsi que des espèces *P. philippinensis* et *P. smiti*, tous deux symbiontes de scléractiniaires *Plerogyra*, par des

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caractères morphologiques du rostre et des péréiopodes ambulatoires, par la coloration et par les données moléculaires.

Mots clés. — Crustacea, Decapoda, Caridea, Palaemonidae, *Palaemonella*, nouvelle espèce, symbionte de coraux

INTRODUCTION

Horká et al. (2016) studied the phylogeny of symbiotic palaemonids based on three-marker analyses comprising a subset of 107 species from 48 genera. They distinguished several clades of which their Clade 1 contained free-living and mostly hexacorallian associated genera: *Cuapetes*, *Exoclimenella*, *Harpilius*, *Ischnopontonia*, *Palaemonella*, *Periclimenella*, *Philarius* and *Vir*. The same clade, with the addition of the genera *Anapontonia* and *Eupontonia*, was recovered by the analyses of Chow et al. (2021).

Recent comprehensive molecular phylogenetic studies of species within this clade were performed by Frolová et al. (2022, and in prep.). The analyses revealed that the genus *Vir* Holthuis, 1952, should be regarded a junior synonym of *Palaemonella* Dana, 1852.

The analyses (Frolová et al., in prep.) included the holotype of *Palaemonella colemani* (Bruce, 2003), which was originally reported to be associated with *Plerogyra sinuosa* (Dana, 1846). This specimen however, clustered in one of the two paraphyletic clades with specimens identified as *Palaemonella euphyllius* (Marin & Anker, 2005), which was described to be associated with euphylliid scleractinians of the genus *Fimbriaphyllia* Veron & Pichon, 1980. In his description of *P. colemani*, Bruce (2003) published a photograph by Neville Coleman of a shrimp on *Plerogyra sinuosa*. The colour pattern with the purple bands at the joints of the pereiopods and bright red/purple antennal flagella turns out to be a colour morph of *P. philippinensis* (Bruce & Svoboda, 1984) (fig. 19B, C, E, F), as shrimps with this colour pattern fall within a cluster of 16S sequences with the *P. philippinensis* specimens with the typical longitudinal purple lines on the pereiopods. A specimen with a combination of both purple longitudinal lines and purple bands also ended up in this cluster (fig. 19D). These specimens are associated with the plerogyrid scleractinians *Plerogyra sinuosa* and *Physogyra lichtensteini* (Milne Edwards & Haime, 1851). It thus seems that the colour photograph accompanying the description of *P. colemani* is not from the same specimen from which the holotype description was derived. The indication of the host on the original locality data provided by Bruce (2003) is ‘coral’ and not further specified. It might still be that the locality data is correct. Sammy De Grave (pers. commun.) was diving with Neville Coleman in 1996 at Loloata Island (the type locality of *P.*

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colemani) and made notes on the colour patterns and hosts of the specimens collected. Among the material was a shrimp from an *Euphyllia* sp. which had the colour pattern known for specimens associated with *Euphyllia* and *Fimbriaphyllia*. Although the genus *Fimbriaphyllia* was already erected in those days, species in that genus were still often listed in *Euphyllia*. It is here suggested that the type of *P. colemani* was collected from a specimen of *Fimbriaphyllia*. As tissue of the holotype of *P. euphyllius* is not available for DNA analyses, it is not clear which of the two paraphyletic clades includes the real *P. euphyllius*. For the time being it is thus not possible to draw conclusions on the taxonomic status of *P. euphyllius*; whether it is a valid species or if it has to be synonymized with *P. colemani*.

The analyses by Frolová et al. (in prep.) also made clear that the holotype of *Vir longidactylus* Marin, 2008 clustering together in a branch with *Palaemonella smiti* (Fransen & Holthuis, 2007), should be synonymized with the latter species. The colour pattern of the holotype female of *Vir longidactylus* (see Marin, 2008, fig. 9c) exactly matches that of the holotype of *Palaemonella smiti* (see Fransen & Holthuis, 2007, figs. 32, 34).

The molecular phylogenetic analyses by Frolová et al. (in prep.) further indicated that two yet undescribed species could be recognized in this clade with coral associated species. One of those two species, *Palaemonella rubrolineata* Fransen, van der Veer & Frolová, 2022, associated with pocilloporid scleractinians, was recently described.

The other yet undescribed species is associated with the euphylliid scleractinians *Euphyllia glabrescens* (Chamisso & Eysenhardt, 1821) and *Euphyllia cristata* Chevalier, 1971. It formed a distinct clade and is herein described. This species is morphologically similar to *P. colemani* and *P. euphyllius*. Apart from its DNA, it can also be distinguished on the basis of several morphological characters and slight differences in its colouration.

MATERIAL AND METHODS

Specimens of the new species as well as *Palaemonella colemani/euphyllius*, *P. philippinensis* and *P. smiti* were collected during several expeditions in the Indo-West Pacific: Ambon, Indonesia, 1990 (Strack, 1993); Cebu, Philippines, 1999; Bali, Indonesia, 2001; NE Kalimantan, Berau Islands, Indonesia, 2003; Kepulauan Seribu, Java, Sea Indonesia, 2005; Santo, Vanuatu, 2006 (Bouchet et al., 2011); Raja Ampat, West Papua, 2007 (Hoeksema & van der Meij, 2008); Ternate, Molucca, Indonesia, 2009; Semporna, Malaysia, 2010 (Kassem et al., 2012); Lembeh Strait, NE Sulawesi, 2012; the Maldives, 2014; and Thulau, Red Sea, 2014.

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Specimens were studied with a dissecting stereomicroscope (Zeiss Discovery.V8) and a compound microscope (Olympus BX53) both provided with a drawing tube. All drawn figures were performed by C.H.J.M. Fransen. Drawings were scanned (Canon Canoscan 9000F) with a resolution of 600 dpi and subsequently mounted into plates using Adobe Photoshop software (Adobe Systems). Post-orbital carapace length (pocl.) was measured from the posterior margin of the orbit to the posterior margin of the carapace; rostral characters (R) are formulated as R = number of postorbital dorsal teeth + number of dorsal teeth on rostrum proper/number of ventral rostral teeth; fcn. = field collection number. Specimens were deposited in the Museum Zoologicum Bogoriense, Research Center for Biology, Indonesian Institute of Sciences, Cibenong, Indonesia (MZB); the Naturalis Biodiversity Center, Leiden, The Netherlands (RMNH); and the Muséum National d'Histoire Naturelle, Paris, France (MNHN).

Genomic DNA was extracted from analysed tissue using the extraction kit QIAamp DNA Micro Kit (QIAGEN, Germany) according to the manufacturer's protocols. The 16S mitochondrial gene was amplified with 16Sar and 16Sbr rDNA primers (Palumbi et al., 1991). The PCR reaction was performed with 1.0 μl forward primer (10 μmol/l), 1.0 μl reverse primer (10 μmol/l), 2.5μl dNTP (2.5 mM) (Amersham), 0.25 μl *Taq* DNA polymerase (5 U/μl) (Qiagen), 2.5 μl CoralLoad 10× PCR buffer (Qiagen) and 1 μl template DNA. Initial denaturation took place for 3 minutes at 94°C, followed by 39 cycles of denaturation, annealing and extension (10 seconds at 94°C; 1 minute at 50°C and 1 minute at 72°C, respectively). Final extension was performed for 5 minutes at 72°C. Sequencing reactions were performed using ABI3730XL DNA Sequencer by Macrogen (Amsterdam, The Netherlands).

SYSTEMATIC PART

Family PALAEMONIDAE Rafinesque, 1815
Genus *Palaemonella* Dana, 1852
Palaemonella sandyi sp. nov.
(figs. 1-10, 13, 16E, 17A)

Vir euphyllius — Marin & Savinkin, 2007, fig. 95B; Marin, 2007, fig. 1D, 3.

Material examined.— Holotype ovigerous female, pocl. 4.7 mm, RMNH.CRUS.D.53057: stn. BER.07, Indonesia, NE Kalimantan, Berau Islands, Kakaban Island, N-side, 02°09′47.1″N, 118°32′03.3″E, 06.x.2003, scuba diving, depth 15 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384736.

Paratypes: Philippines: Cebu: 1 ovigerous female pocl. 3.5 mm, RMNH.CRUS.D.48534: stn. CEB.04, Cebu Strait, W of Bohol, NW side of Cabilao Island, La Estrella Dive Resort, 9°53.20′N 123°45.53′E, vertical wall, caves, 17.xi.1999, scuba diving, depth 7 m, on *Euphyllia glabrescens*,

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collected by C.H.J.M. Fransen. — One ovigerous female pocl. 4.6 mm, RMNH.CRUS.D.48535: stn. CEB.07, Cebu Strait, W of Bohol, NW side of Cabilao Island, Baluarte Point, 9°53.39′N 123°45.51′E, gentle slope, solid substrate, few boulders, 12.xi.1999, scuba diving, depth 10 m, on *Euphyllia glabrescens*, collected by B.W. Hoeksema. — One male pocl. 2.1 mm, RMNH.CRUS.D. 48536: stn. CEB.10, Cebu Strait, W of Bohol, SE side of Cabilao Island, SW of Talisay, 9°52.28′N 123°46.76′E, gentle slope, low coral density, 13.xi.1999, scuba diving, depth 15 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen. — One male pocl. 2.3 mm, RMNH.CRUS.D.48537: stn. CEB.16, Cebu Strait, W of Bohol, SW side of Sandingan Island, 9°50.69′N 123°47.27′E, gentle, sandy reef slope with coral patches, 18.xi.1999, scuba diving, depth 20 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen. — Indonesia: Bali: 2 ovigerous females pocl. 3.4 and 4.0 mm, RMNH.CRUS.D.50408: stn. BAL.18, Padang Bai, E-side Tanjung Sari, 08°31′11″S 115°30′37″E, shallow reef flat and slope, sandy slope, 08.iv.2001, scuba diving, depth 20 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen. — One male pocl. 3.0 mm, with abdominal bopyrid, RMNH.CRUS.D.50406: stn. BAL.20, Tulamben beach, 'Coral Garden' off hotel area, 08°16′36″S 115°35′37″E, shallow reef flat and slope, sandy slope, 12.iv.2001, scuba diving, depth 20 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen. — One ovigerous female pocl. 4.0 mm, RMNH.CRUS.D.50407: stn. BAL.28, E side of Nusa Lembongan, Selat Ceningan, 08°41′03″S 115°27′43″E, shallow sandy channel with seagrass, off mangrove, few patches of coral, 18.iv.2001, scuba diving, depth 2 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen. — One ovigerous female pocl. 3.6 mm, RMNH.CRUS.D.50405: stn. BAL.32, N side of Nusa Penida, off Tukad Adegan, 08°40′32″S 115°31′18″E, deep reef slope with patches of sand, 20.iv.2001, scuba diving, depth 10 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen. — One ovigerous female pocl. 3.1 mm, RMNH.CRUS.D.49852: stn. BAL.35, N side of Nusa Penida, off Desa Prapat, 08°40′12″S 115°29′42″E, deep reef slope with patches of dense coral cover and sand, 22.iv.2001, scuba diving to 30 m depth, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384727. — West Papua, Raja Ampat: damaged ovigerous female, RMNH.CRUS.D.53063: stn. RAJ.08, Mioskon Island, 00°29.808′S 130°43.623′E, 21.xi.2007, scuba diving, depth 17.5 m, on *Euphyllia glabrescens*, collected by E. van der Veer, GenBank accession nr. OQ384730. — One ovigerous female pocl. 4.3 mm, RMNH.CRUS.D.53060: stn. RAJ.14, Akber Reef, 00°34.253′S 130°39.561′E, 23.xi.2007, scuba diving, depth 17.7 m, on *Euphyllia glabrescens*, collected by E. van der Veer, GenBank accession nr. OQ384731. — One male pocl. 2.4 mm, 1 ovigerous female pocl. 4.3 mm, RMNH.CRUS.D.53097: stn. RAJ.14, Akber Reef, 00°34.253′S 130°39.561′E, 23.xi.2007, scuba diving, depth 17.7 m, on *Euphyllia glabrescens*, collected by E. van der Veer. — Damaged juvenile pocl. 1.2 mm, RMNH.CRUS.D. 58048: stn. RAJ.15, SW Kri, Kuburan, 00°33.713′S 130°39.673′E, 23.xi.2007, scuba diving, depth unknown, on *Euphyllia glabrescens*, collected by E. van der Veer. — One ovigerous female pocl. 2.9 mm, RMNH.CRUS.D.53065: stn. RAJ.21, SE Manuar, Nikson new, 00°34.857′S 130°38.527′E, 26.xi.2007, scuba diving, depth 8 m, on *Euphyllia cristata*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384728. — One ovigerous female pocl. 2.0 mm, RMNH.CRUS.D.53064: stn. RAJ.21, SE Manuar, Nikson new, 00°34.857′S 130°38.527′E, 26.xi.2007, scuba diving, depth 5.5 m, on *Euphyllia cristata*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384729. — One ovigerous female pocl. 2.0 mm, RMNH.CRUS.D.53059: stn. RAJ.21, SE Manuar, Nikson new, 00°34.857′S 130°38.527′E, 26.xi.2007, scuba diving, depth 3.5 m, on *Euphyllia cristata*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384732. — Stn. RAJ.29, N Batanta, W Teluk Gegenlol, 00°49.709′S 130°42.700′E, 28.xi.2007, scuba diving, depth ca. 8 m, on *Euphyllia glabrescens*, not collected, photo C.H.J.M. Fransen. — Java Sea, Kepulauan Seribu: 1 ovigerous female pocl. 5.1 mm, RMNH.CRUS.D.53062: stn. SER.02, off Jakarta, Damar Besar Island, NW-side, 5°57′17″S 106°50′27″E, 08.ix.2005, scuba diving, depth 7 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384733. — One ovigerous female pocl. 4.5 mm, RMNH.CRUS.D.53061: stn. SER.05, off Jakarta, Untung

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Jawa Island, NW-side, 5°58′27″S 106°42′11″E, 09.ix.2005, scuba diving, depth 7 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384734. — One ovigerous female pocl. 4.3 mm, RMNH.CRUS.D.53066: stn. SER.17, off Jakarta, Belanda Island, NW-side, 5°36′13″S 106°36′13″E, 14.ix.2005, scuba diving, depth 10 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384735. — NE Kalimantan, Berau Islands: 1 ovigerous female pocl. 3.1 mm, RMNH.CRUS.D.53058: stn. BER.05, Berau delta, Lighthouse-2 reef, 02°09′33.9″N 118°10′11.4″E, 05.x.2003, scuba diving, depth 5 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384738. — Ternate, Molucca: 1 non ovigerous female pocl. 2.4 mm, RMNH.CRUS.D.53516: stn. TER.06, Kampung Cina/Tapak 2, 0°47′15″N 127°23′25″E, sandy slope with coral patches and boulders, 27.x.2009, scuba diving, depth 10 m, on *Eyphyllia glabrescens*, collected by C.H.J.M. Fransen fcn. CF00021. — Lembeh Strait: stn. LEM.01, Tanjung Nanas I, 1°27′40.428″N 125°13′36.408″E, 30.i.2012, scuba diving, depth 12 m, on *Euphyllia glabrescens*, not collected, photo C.H.J.M. Fransen. — One ovigerous female pocl. 2.8 mm, RMNH.CRUS.D.58049: stn. LEM.08, Pantai Perigi, 1°28′10.0194″N 125°14′38.796″E, 02.ii.2010, scuba diving, depth 7 m, on *Euphyllia glabrescens*, collected by Cessa Rauch. — One ovigerous female pocl. 2.3 mm, RMNH.CRUS.D.58050: stn. LEM.36, Pulau Putus, 1°31′20.7474″N 125°16′37.2714″E, 18.ii.2010, scuba diving, depth 15 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen. — Malaysia, Semporna: 1 non-ovigerous female pocl. 1.9 mm, 1 male pocl. 1.9 mm, RMNH.CRUS.D.58051: stn. SEM.01, Mid Rock, Roach Reef, 04°10′39.0″N 118°18′12.1″E, 29.xi.2010, scuba diving, depth 12.5 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen. — One ovigerous female pocl. 4.1 mm, RMNH.CRUS.D.53830: stn. SEM.28, Pandanan Island, 04°4′36.0″N 118°55′14.1″E, 08.xii.2010, scuba diving, depth 15 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen. — Maldives: One male pocl. 2.3 mm, RMNH.CRUS.D.58052: stn. MAL.03, N Nilandhe Atoll, Magoodhoo island, Blue Cove, 3°05′39.8″N 72°57″59.4″E, 06.v.2014, scuba diving, depth 20 m, on *Euphyllia glabrescens*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384737.

Comparative material of *Palaemonella colemani/euphyllius*: Philippines: Cebu: 2 ovigerous females pocl. 3.4 and 3.6 mm, RMNH.CRUS.D.48531: stn. CEB.08, W of Bohol, S side of Cabilao Island, Cabacungan Point, 9°51.55′N 123°45.95′E, reef edge with dense coral cover, overhanging wall, 11.xi.1999, scuba diving, depth 8 m, on *Fimbriaphyllia ancora*, collected by C.H.J.M. Fransen. — One ovigerous female pocl. 2.8 mm, purple-banded colour variety, RMNH.CRUS.D.48532: stn. CEB.08, W of Bohol, S side of Cabilao Island, Cabacungan Point, 9°51.55′N 123°45.95′E, overhanging wall with caves, 11.xi.1999, scuba diving, depth 10 m, on *Fimbriaphyllia ancora*, collected by C.H.J.M. Fransen. — Three ovigerous females pocl. 2.9, 3.2 and 3.5 mm, 1 male pocl. 2.2 mm, purple-banded colour variety, RMNH.CRUS.D.48533: stn. CEB.13, W of Bohol, N side of Sandingan Island, 9°51.87′N 123°47.76′E, rubble slope, 13.xi.1999, scuba diving, depth 20 m, on *Fimbriaphyllia ancora*, collected by C.H.J.M. Fransen. — One ovigerous female pocl. 2.0 mm, with lateral bopyrid, RMNH.CRUS.D.48538: sta. CEB.08, W of Bohol, S side of Cabilao Island, Cabacungan Point, 9°51.55′N 123°45.95′E, reef edge with dense coral cover, 11.xi.1999, scuba diving, depth 5 m, on *Fimbriaphyllia divisa*, collected by C.H.J.M. Fransen. — Indonesia: Ambon: 1 male pocl. 1.6 mm, RMNH.CRUS.D.48234: stn. RBE.05, Indonesia, Moluccas, Ambon, Leitimur, Ambon Bay, outer bay, Tg. Benteng (= Galghoek), 02.xii.1990, scuba diving, depth 6-8 m, on *Fimbriaphyllia ancora*, collected by C.H.J.M. Fransen. — One male pocl. 2.0 mm, 1 ovigerous female pocl. 2.4 mm, RMNH.CRUS.D.48237: stn. RBE.23, Hitu, N coast, Kaitetu (near Hila), 23.xi.1990, snorkeling, depth 5 m, on *Fimbriaphyllia divisa*, collected by C.H.J.M. Fransen. — Bali: 1 male pocl. 2.0 mm, ? purple-banded colour variety, RMNH.CRUS.D.49851: stn. BAL.15, NE-side Pulau Serangan, 08°44′03″S 115°15′05″E, 07.iv.2001, slowly declining reef slope, sandy base, scuba diving, depth 20 m, on *Fimbriaphyllia ancora*, collected by C.H.J.M. Fransen, GenBank accession nr OQ384747. — One ovigerous female pocl. 1.9 mm, purple-banded colour variety, RMNH.CRUS.D.50403: stn. BAL.18,

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Padang Bai, E-side Tanjung Sari, 08°31′11″S 115°30′37″E, 08.iv.2001, shallow reef flat and slope, sandy slope, scuba diving, depth 20 m, on *Fimbriaphyllia ancora* or *F. paraancora*, collected by C.H.J.M. Fransen. — One male pocl. 2.4 mm, 1 ovigerous female pocl. 3.1 mm, RMNH.CRUS.D.49853: stn. BAL.21, Tulamben beach, 'Liberty wreck', 08°16′26″S 115°35′28″E, 10, 11.iv.2001, wreck with shallow reef flat and slope, sandy slope, scuba diving, depth 35 m, on *Fimbriaphyllia divisa*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384748. — West Papua, Raja Ampat: stn. RAJ.06, S. Mansuar, (Sawandarik village), 00°35.428′S 130°36.194′E, 20.xi.2007, depth 20 m, on *Fimbriaphyllia ancora*, not collected, photo C.H.J.M. Fransen. — Two ovigerous females pocl. 2.3 and 3.5 mm, RMNH.CRUS.D.53094: stn. RAJ.08, Mioskon Island, 00°29.808′S 130°43.623′E, 21.xi.2007, scuba diving, depth 17.6 m, on *Fimbriaphyllia ancora*, collected by E. van der Veer, GenBank accession nr. OQ384740. — One ovigerous female pocl. 3.0 mm, RMNH.CRUS.D.53095: stn. RAJ.11, SE Gam, Friwen Wonda, 00°28.499′S 130°41.913′E, 22.xi.2007, scuba diving, depth 18.7 m, on *Fimbriaphyllia ancora*, collected by C.H.J.M. Fransen, CF041, GenBank accession nr. OQ384739. — One ovigerous female pocl. 3.5 mm, 1 male pocl. 2.2 mm, RMNH.CRUS.D.53096: stn. RAJ.11, SE Gam, Friwen Wonda, 00°28.499′S 130°41.913′E, 22.xi.2007, scuba diving, depth unknown, on *Fimbriaphyllia ancora*, collected by E. van der Veer, GenBank accession nr. OQ384741. — Stn. RAJ.28, Batanta, N pulau Yarifi, 00°46′46.7″S 130°42′42,7″E, 28.vii.2007, scuba diving, depth ca. 5 m, on *Fimbriaphyllia ancora*, not collected, photo C.H.J.M. Fransen. — One male pocl. 2.8 mm, RMNH.CRUS.D.53069: stn. RAJ.70, NW Batanta, cape, 00°47.408′S 130°29.223′E, 14.xii.2007, scuba diving, depth 9.5 m, on *Fimbriaphyllia divisa*, collected by E. van der Veer, GenBank accession nr. OQ384742. — Java Sea, Kepulauan Seribu: 1 ovigerous female pocl. 2.5 mm, RMNH.CRUS.D.53054: stn. SER.15, Kelapa Island, NW-side, 5°39′16″S 106°33′32″E, 13.ix.2005, scuba diving, depth 18 m, on *Fimbriaphyllia divisa*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384744. — One ovigerous female, pocl. 3.7 mm, RMNH.CRUS.D.53053: stn. SER.23, Jukung Island, NW-side, 5°34′01″S 106°31′38″E, 15.ix.2005, scuba diving, depth 20 m, on *Fimbriaphyllia divisa*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384743. — NE Kalimantan, Berau Islands: 1 ovigerous female pocl. 3.6 mm, RMNH.CRUS.D.53055: stn. BER.02, Derawan Island, W-side, Mangakalase, 02°16′52.5″N 118 °13′39.4″E, 04.x.2003, scuba diving, depth 10 m, on *Fimbriaphyllia divisa*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384745. — One male pocl. 1.6 mm, 1 juvenile pocl. 1.0 mm, RMNH.CRUS.D.58053: stn. BER.13, Sangalaki Island, reef, S-side, 02°04′46.9″N 118°23′47.3″E, 08.x.2003, scuba diving, depth 15 m, on *Fimbriaphyllia ancora* or *F. paraancora*, collected by C.H.J.M. Fransen. — One ovigerous female pocl. 2.2 mm, RMNH.CRUS.D.53056: stn. BER.30, lighthouse-1 reef, N-side (S of Derawan Isl.), 02°16′02.1″N 118°14′22.6″E, 18.x.2003, scuba diving, depth 20 m, on *Fimbriaphyllia ancora*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384746. — One ovigerous female pocl. 3.6 mm, RMNH.CRUS.D.580544: stn. BER.37, lighthouse-1 reef, W-side (S of Derawan Isl.), 02°15′29.5″N 118°14′08.9″E, 22.x.2003, scuba diving, depth 18 m, on *Fimbriaphyllia paradivisa*, collected by C.H.J.M. Fransen. — Ternate: 1 ovigerous female pocl. 2.6 mm, RMNH.CRUS.D.53573: stn. TER.20, Halmahera mainland, Tanjung Sidangolo, 00°53′39.6″N 127°29′28.1″E, 05.xi.2009, scuba diving, depth 5 m, on *Fimbriaphyllia ancora*, collected by C.H.J.M. Fransen fcn. CF00080-81. — One ovigerous female pocl. 2.2 mm, RMNH.CRUS.D.53580: stn. TER.21, Halmahera mainland, Tanjung Ratemu (S of river), 00°54′24.7″N 127°29′17.7″E, 05.xi.2009, scuba diving, depth 22 m, on *Fimbriaphyllia yaeyamensis*, collected by C.H.J.M. Fransen fcn. CF00087. — One ovigerous female pocl. 2.2 mm, purple-banded colour variety, RMNH.CRUS.D.58055: stn. TER.24, Halmahera, Ternate, Dufadufa/Benteng Toloko, 00°48′49.1″N 127°23′21.6″E, 07.xi.2009, scuba diving, depth 12 m, on *Fimbriaphyllia yaeyamensis*, collected by C.H.J.M. Fransen fcn. CF00096. — Lembeh Strait: 1 male pocl. 1.8 mm, 1 ovigerous female pocl. 3.7 mm, RMNH.CRUS.D.58056: stn. LEM.18, Teluk Rarandam, 01°27′3.2034″N 125°14′17.52″E, 08.ii.2012, scuba diving, depth 10 m, on *Fimbriaphyllia divisa*, collected by C.H.J.M. Fransen. — Stn. LEM.22, Pulau Abadi,

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10.ii.2012, 01°26′1.0314″N 125°12′22.284″E, not collected, on *Fimbriaphyllia ancora*, photo C.H.J.M. Fransen. — Malaysia, Semporna: 1 juvenile pocl. 1.4 mm, RMNH.CRUS.D.58057: stn. SEM.07, Erzherzog Reef, 04°14′26.5″N 118°23′35.2″E, 01.xii.2010, scuba diving, depth 12 m, on *Fimbriaphyllia divisa*, collected by C.H.J.M. Fransen. — One ovigerous female pocl. 4.1 mm, RMNH.CRUS.D.53805: stn. SEM.22, Bumbun Island W (channel), 04°27′40.7″N 118°38′09.1″E, 05.xii.2010, scuba diving, depth unknown, on *Fimbriaphyllia divisa*, collected by B.W. Hoeksema. — One ovigerous female pocl. 2.1 mm, 1 male pocl. 1.9 mm, RMNH.CRUS.D.58060: stn. SEM.30, S Kulapuan Isl., 04°30′41.3″N 118°51′58.4″E, 09.xii.2010, scuba diving, depth 25 m, on *Fimbriaphyllia divisa*, collected by C.H.J.M. Fransen. — Vanuatu: 1 non ovigerous female, pocl. 1.9 mm, RMNH.CRUS.D.58058: stn. FR28-CF98, Santo, W. Palikulo Bay, 15°17′12.84″S 167°8′27.06″E, 22.ix.2006, slowly declining coral slope, sandy reef flat, scuba diving, depth 35 m, on *Fimbriaphyllia ancora* or *F. paraancora*, collected by C.H.J.M. Fransen.

Comparative material of *Palaemonella philippinensis*: Philippines, Cebu: 1 ovigerous female pocl. 2.8 mm R = 2 + 5/2, 1 male pocl. 2.6 mm R = 1 + 5/2, RMNH.CRUS.D.48528: stn. Cebu.10, Cebu Strait, W of Bohol, SE side of Cabilao Island, SW of Talisay, 9°52.28′N 123°46.76′E, gentle slope, low coral density, much rubble, 13.xi.1999, scuba diving, depth 20 m, on *Physogyra lichtensteini*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384763. — Indonesia: 1 male pocl. 2.4 mm R = 1 + 6/2, RMNH.CRUS.D.53080: stn. RAJ.08, West Papua, Raja Ampat Islands, Mioskon Island, 00°29.808′S 130°43.623′E, 21.xi.2007, scuba diving, depth 16.4 m, on *Physogyra lichtensteini*, collected by E. van der Veer, GenBank accession nr. OQ384749. — One male pocl. 1.7 mm R = 2 + 5/2, RMNH.CRUS.D.53086: stn. RAJ.11, West Papua, Raja Ampat Islands, SE Gam, Friwen Wonda, 00°28.499′S 130°41.913′E, 22.xi.2007, scuba diving, depth 15.3 m, on *Physogyra lichtensteini*, collected by E. van der Veer, GenBank accession nr. OQ384755. — One male pocl. 1.8 mm R = 2 + 5/1, RMNH.CRUS.D.53082: stn. RAJ.25, West Papua, Raja Ampat Islands, S. Gam, E entrance Besir Bay, Cape Besir, 00°30.859′S 130°34.191′E, 27.xi.2007, scuba diving, depth 8 m, on *Plerogyra sinuosa*, collected by E. van der Veer, GenBank accession nr. OQ384751. — One male pocl. 2.4 mm R = 2 + 6/2, 1 non ovigerous female pocl. 2.2 mm R = 1 + 6/2, RMNH.CRUS.D.53083: stn. RAJ.28, West Papua, Raja Ampat Islands, N Batanta, N pulau Yarifi, 00°46.779′S 130°42.711′E, 28.xi.2007, scuba diving, depth 15.5 m, on *Plerogyra sinuosa*, collected by C.H.J.M. Fransen, GenBank accession nr. OQ384752. — stn. RAJ.41, West Papua, Raja Ampat Islands, West Papua, SE Gam, Desa Besir, 00°27.802′S 130°41.243′E, 02.xii.2007, scuba diving, depth ca. 1012 m, on *Physogyra lichtensteini*, not collected, photo C.H.J.M. Fransen. — One ovigerous female pocl. 3.1 mm R = 2 + 6/1, RMNH.CRUS.D.53544: stn. TER.12, Ternate, Tanjung Tabam, 0°50′5.1″N 127°23′10″E, 30.x.2009, scuba diving, depth 10 m, on *Plerogyra sinuosa*, collected by C.H.J.M. Fransen fcn. CF-00048. — One ovigerous female pocl. 2.6 mm R = 1 + 6/1, RMNH.CRUS.D.58059: stn. THU.06, Red Sea, Abu Gishaa, 22°15′18.7″N 39°01′32.3″E, 10.xi.2014, scuba diving, depth 20.3 m, on *Plerogyra sinuosa*, collected by H.M. Jensen.

Comparative material of *Palaemonella smiti*: Indonesia: 1 male pocl. 1.6 mm R = 1 + 7/2, RMNH.CRUS.D.53076: stn. RAJ.14, West Papua, Raja Ampat Islands, Akber Reef, 00°34.253′S 130°39.561′E, 23.xi.2007, scuba diving, depth unknown, on *Physogyra lichtensteini*, collected by E. van der Veer, GenBank accession nr. OQ384765. — One ovigerous female pocl. 2.2 mm, rostrum broken, RMNH.CRUS.D.53077: stn. RAJ.15, Raja Ampat Islands, West Papua, SW Kri, Kuburan, 00°33.713′S 130°39.673′E, 23.xi.2007, scuba diving, depth unknown, on *Physogyra lichtensteini*, collected by C.H.J.M. Fransen fcn. CF059, GenBank accession nr. OQ384766. — One male pocl. 1.6 mm R = 1 + 7/2, RMNH.CRUS.D.53078: stn. RAJ.19, Raja Ampat Islands, West Papua, Maya's mimpi, 00°30.456′S 130°39.919′E, 25.xi.2007, scuba diving, depth 16.2 m, on *Physogyra lichtensteini*, collected by E. van der Veer, GenBank accession nr. OQ384767. — Stn. RAJ.20, Raja Ampat Islands, West Papua, Turtles Reef, 00°32.586′S 130°41.851′E, 25.xi.2007, depth unknown, on *Physogyra lichtensteini*, not collected, photograph C.H.J.M. Fransen. — One

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ovigerous female pocl. 3.4 mm R = 2 + 5/2, RMNH.CRUS.D.53079: stn. RAJ.21, Raja Ampat Islands, West Papua, SE Manuar, Nikson new, 00°34.857′S 130°38.527′E, 26.xi.2007, scuba diving, depth 18.5 m, on *Physogyra lichtensteini*, collected by C.H.J.M. Fransen fcn. CF080, GenBank accession nr. OQ384768. — Stn. RAJ.41, Raja Ampat Islands, West Papua, SE Gam, Desa Besir, 00°27.802′S 130°41.243′E, 02.xii.2007, depth ca. 15 m, on *Physogyra lichtensteini*, not collected, photograph C.H.J.M. Fransen. — Malaysia, NE Borneo: 1 ovigerous female pocl. 2.6 mm R = 2 + 6/1, RMNH.CRUS.D.53843: stn. SEM.29, Semporna, Mataking Isl., 04°34′57.6″N 118°56′46.5″E, 08.xii.2010, scuba diving, depth 5 m, on *Physogyra lichtensteini*, collected by C.H.J.M. Fransen. — Maldives: stn. MAL.01, Magoodhoo Island, House reef right, 05.v.2014, scuba diving, depth 10 m, not collected, photo C.H.J.M. Fransen.

Description.— Small, slender shrimp of slightly compressed body form. Carapace (fig. 1) smooth, slightly swollen posteriorly, especially in adult ovigerous females; orbit obsolescent; inferior orbital angle slightly produced; antennal spine long, slender, acute and marginal; supraocular and hepatic spines absent. Rostrum (fig. 1) relatively short, 0.47-0.52 times pocl., straight, horizontal, almost reaching distal margin of scaphocerite, with 5 or 6, seldom 4, acute dorsal teeth, of which usually one small and subdistal, usually proximal two teeth postorbital, sometimes second tooth at level of orbit, with few plumose setae in front of teeth; ventral margin usually without or with single acute tooth at level of distal margin of proximal segment of antennular peduncle, seldom with 2 or 3 teeth, with few plumose setae in front, no further setae on ventral margin.

Abdomen (fig. 1A, B) normal, third tergite not produced, sixth somite about 1.5 times length of fifth, slightly longer than deep, with posterolateral and posteroventral angles bluntly produced; pleura of first five somites enlarged, broadly rounded.

Telson (figs. 1A, B, 7C) about 1.6 times longer than sixth abdominal somite, 2.5 times longer than proximal width, lateral margins convergent, sublinear, with two pairs of small subequal dorsal spines at about 0.57 and 0.79 of telson length, distal margin (fig. 7E) about 0.32 of proximal margin width, rounded, with small median process, lateral spines small, similar to dorsal spines, intermediate spines robust, 6 times as long as lateral spines, submedian spines about 0.6 times length of intermediate spines, setulose.

Eye (fig. 1A, B) with globular cornea, with distinct accessory pigment spot in cornea posterodorsally; cornea half as wide as maximum width of eyestalk; eyestalk 2.2 times longer than maximum width.

Antennula (fig. 2A, B) normal; basal segment of antennular peduncle about half as long as scaphocerite, with acute ventromedial tooth, distal margin convex, with plumose setae, distolateral tooth reaching halfway dorsal length of intermediate segment, lateral margin slightly convex, medial margin straight with plumose setae, statocyst normal; stylocerite slender, acute, reaching to half segment length; distal segment slightly longer than intermediate segment, together about 0.5 of

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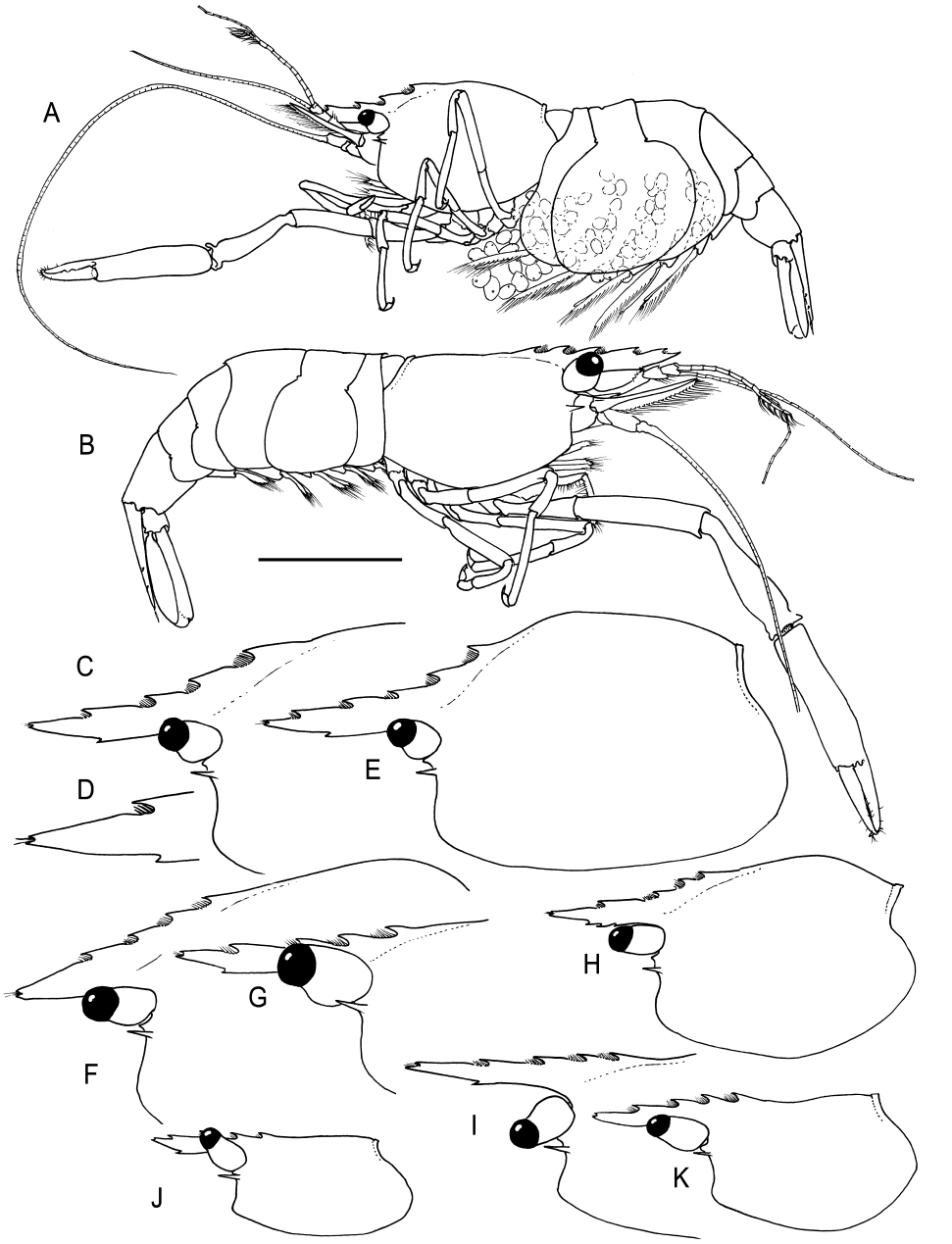

Fig. 1. *Palaemonella sandyi* sp. nov. A, C, D, Ovigerous female RMNH.CRUS.D.53066; B, male RMNH.CRUS.D.53097; E, ovigerous female RMNH.CRUS.D.53097; F, ovigerous female RMNH.CRUS.D.53062; G, ovigerous female RMNH.CRUS.D.53059; H, ovigerous female RMNH.CRUS.D.53060; I, male RMNH.CRUS.D.50406; J, male RMNH.CRUS.D.58051; K, male RMNH.CRUS.D.58052. A, B, Habitus, lateral; E, H, J, K, carapace lateral; C, F, G, I, rostrum, lateral; D, idem, tip. Scale A = 4 mm; B, C, E, F, H-K = 2 mm; D, G = 1 mm.

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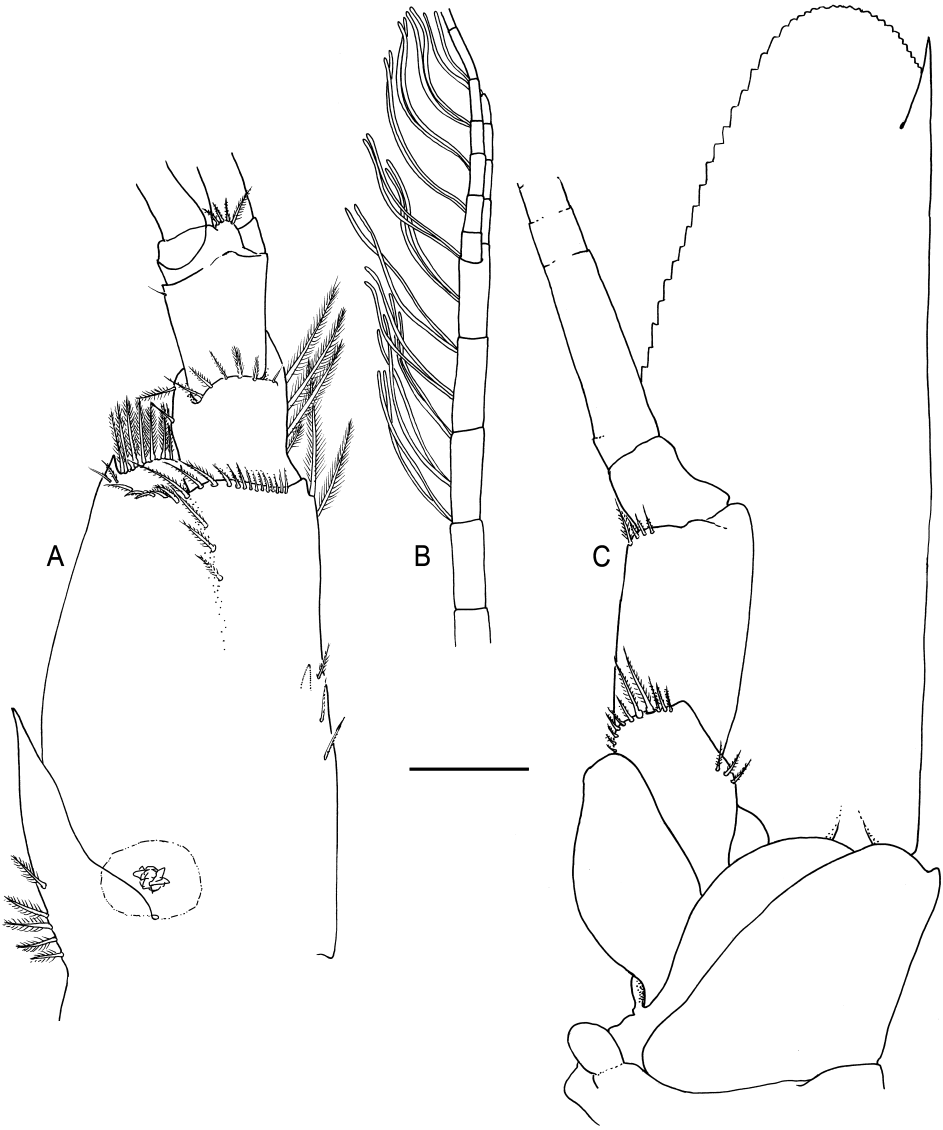

Fig. 2. *Palaemonella sandyi* sp. nov., ovigerous female RMNH.CRUS.D.53066. A, Left antennule, peduncle, dorsal view; B, idem, upper antennular flagellum; C, left antenna, ventral view. Scale = 0.5 mm.

basal segment length; flagella long, slender, upper flagellum biramous, proximal 6-14 segments fused, with number increasing with size of specimen, shorter free ramus with 4 segments, with 5-10 groups of aesthetascs, longer free ramus slender, slightly longer than shorter free ramus.

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Antenna (fig. 2C) normal; basicerite unarmed; ischiocerite and merocerite normal; carpocerite subcylindrical, reaching to about 0.43 of scaphocerite length; flagellum well developed; scaphocerite extending well beyond antennular peduncle, 2.8 times longer than maximum width, distal margin rather small, broadly rounded, lateral margin straight with acute distolateral tooth not exceeding distal margin of lamina.

Epistome and labrum normal.

Fourth thoracic sternite (fig. 7F) with strong, broad, blunt, median process.

Fifth thoracic sternite (fig. 7F) with shallow lateral plates posteromedial of second pereiopods.

Sixth to eight thoracic sternites unarmed, increasing in width posteriorly.

Mandible (fig. 3A, B) robust, with small unsegmented palp with few small simple setae; molar process stout with large angular teeth and brushes of stout setae; incisor process also stout with three large acute distal teeth.

Maxillula (fig. 3C) with upper lacinia normal, not broadened, with two rows of robust simple and serrulate spines medially; lower lacinia slender, setose distally; palp distinctly bilobed, upper lobe without setae, lower lobe with a small, ventral, short, recurved seta.

Maxilla (fig. 3D) with basal endite well developed, distinctly bilobed; distal and proximal lacinia equal in length, both fringed medially by many long simple setae, proximomedial border without setae; coxal endite obsolete, median margin straight, without setae; scaphognathite about 2.5 times as long as width in midlength; palp well developed, basally broad, tapering distally.

First maxilliped (fig. 3E) with basal and coxal endites distinct; basal endite broad, anterior and lateral borders setose, medial margin straight, with slender simple and serrulate setae; coxal endite sparsely setose medially; exopod well developed, flagellum with about 8 plumose setae distally, caridean lobe small, narrow; coxa with very large bilobed epipod, anterior lobe slightly larger than posterior lobe; palp tapering distally with one large plumose seta subdistally on medial border.

Second maxilliped (fig. 4A) with endopod normally developed; with dactylar segment narrow, 5 times longer than broad, densely fringed with numerous coarsely serrulate, spiniform, and long curled, finely serrulate setae medially; distomedial lobe of propodal segment slightly produced, rounded, with row of long slender simple and serrulate setae, ventrolateral margin devoid of setae except for long seta on proximal end; carpal segment distomedially angular, without setae, unarmed; meral segment medially excavate, without setae; basal and ischial segments fused, both segments medially excavate, with few short setae medially; exopod normal, with long plumose setae distally; coxal segment slightly produced

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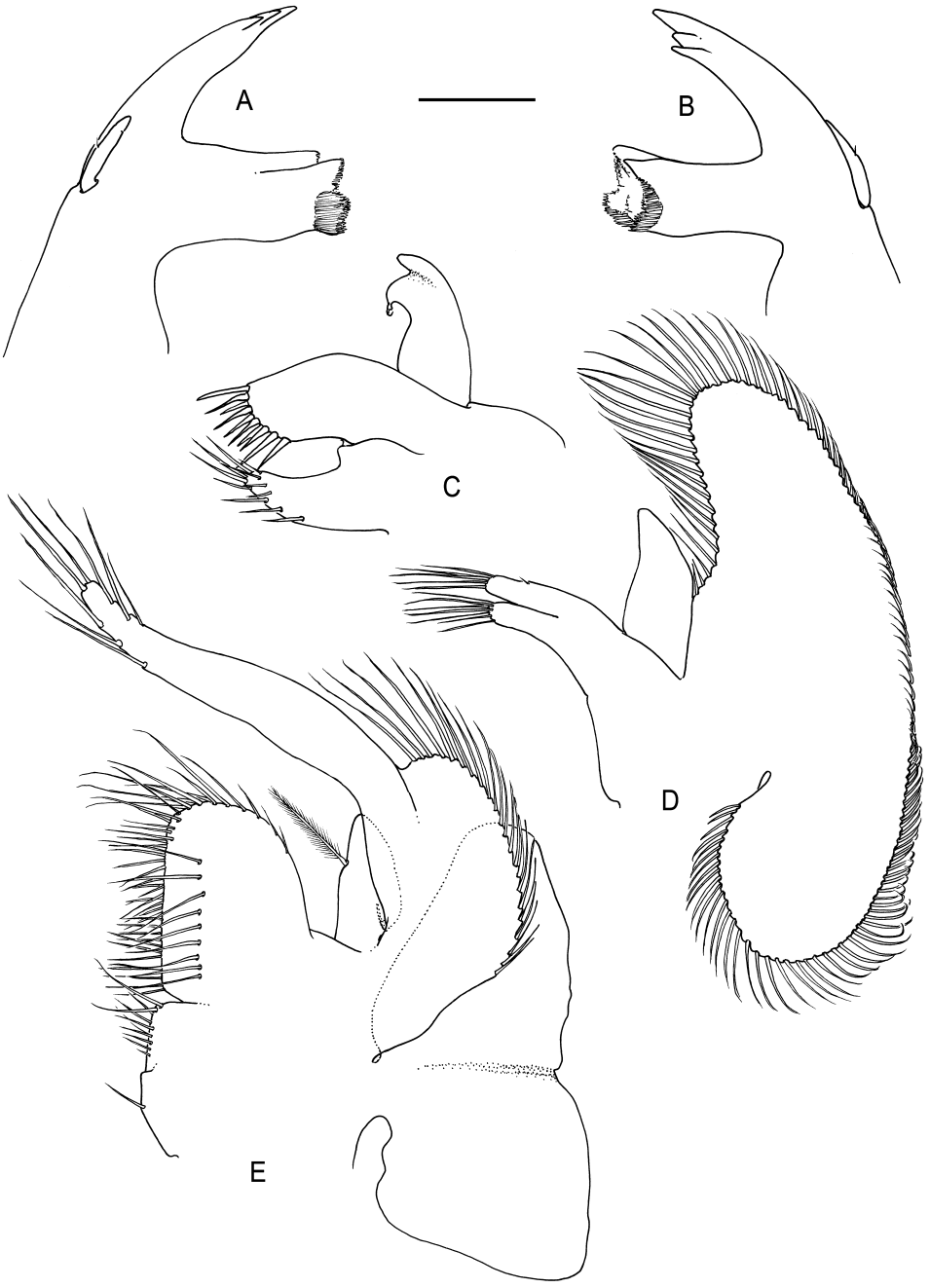

Fig. 3. *Palaemonella sandyi* sp. nov., ovigerous female RMNH.CRUS.D.53066. A, Left mandible, dorsal view; B, idem, ventral view; C, left maxillula, ventral view; D, left maxilla, ventral view; E, left first maxilliped, ventral view. Scale = 0.5 mm.

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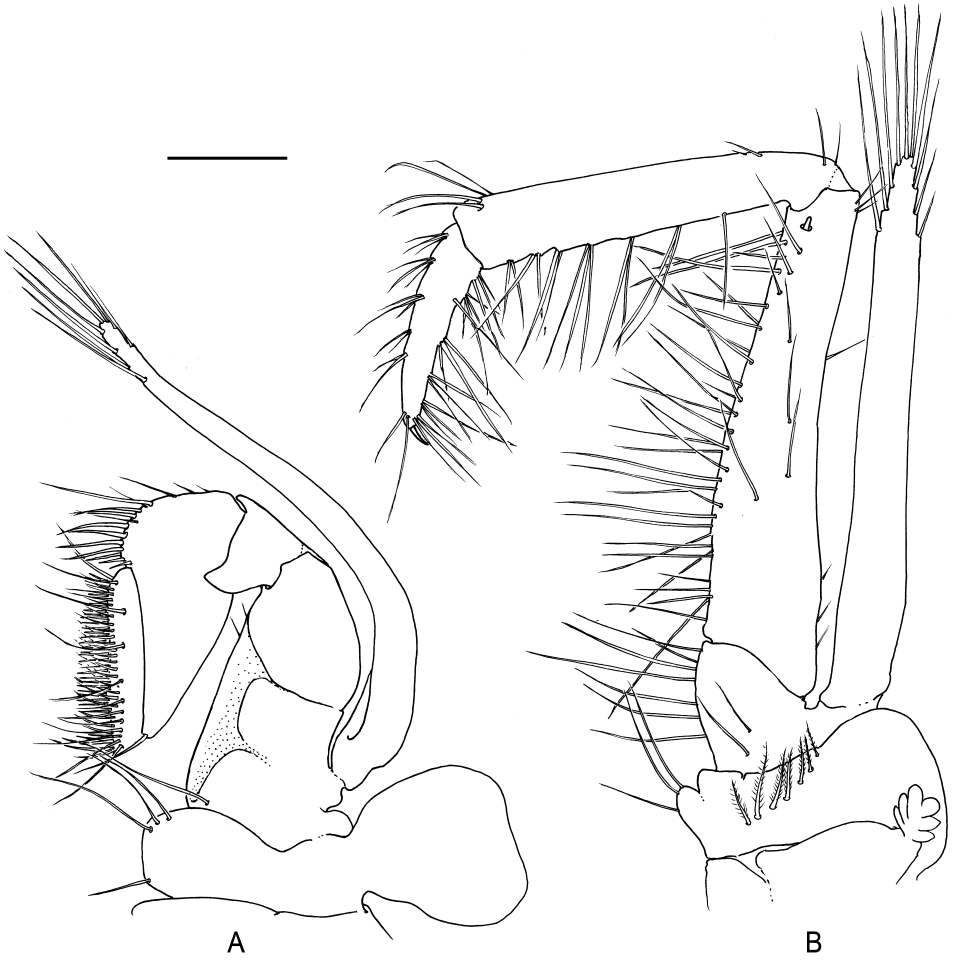

Fig. 4. *Palaemonella sandyi* sp. nov., ovigerous female RMNH.CRUS.D.53066. A, Left second maxilliped, ventral view; B, left third maxilliped, ventrolateral view. Scale = 0.5 mm.

medially, with few long setae; epipod small, simple, subrectangular, without podobranch.

Third maxilliped (fig. 4B) with endopod slender, reaching with terminal segment to distal margin of carpocerite; ischiomerus and basis distinct, ischiomerus 4 times longer than wide, flattened and twisted, setose medially, with one robust spine in distal part; carpal segment 5 times longer than wide, 0.77 of ischiomeral length, subcylindrical, with groups of long serrulate setae medially; terminal segment 0.41 of ischiomeral segment, tapering distally with terminal spine, medial and lateral margins with groups of serrulate setae; basis with few simple setae along slightly convex median margin; exopod well developed, reaching distal margin of

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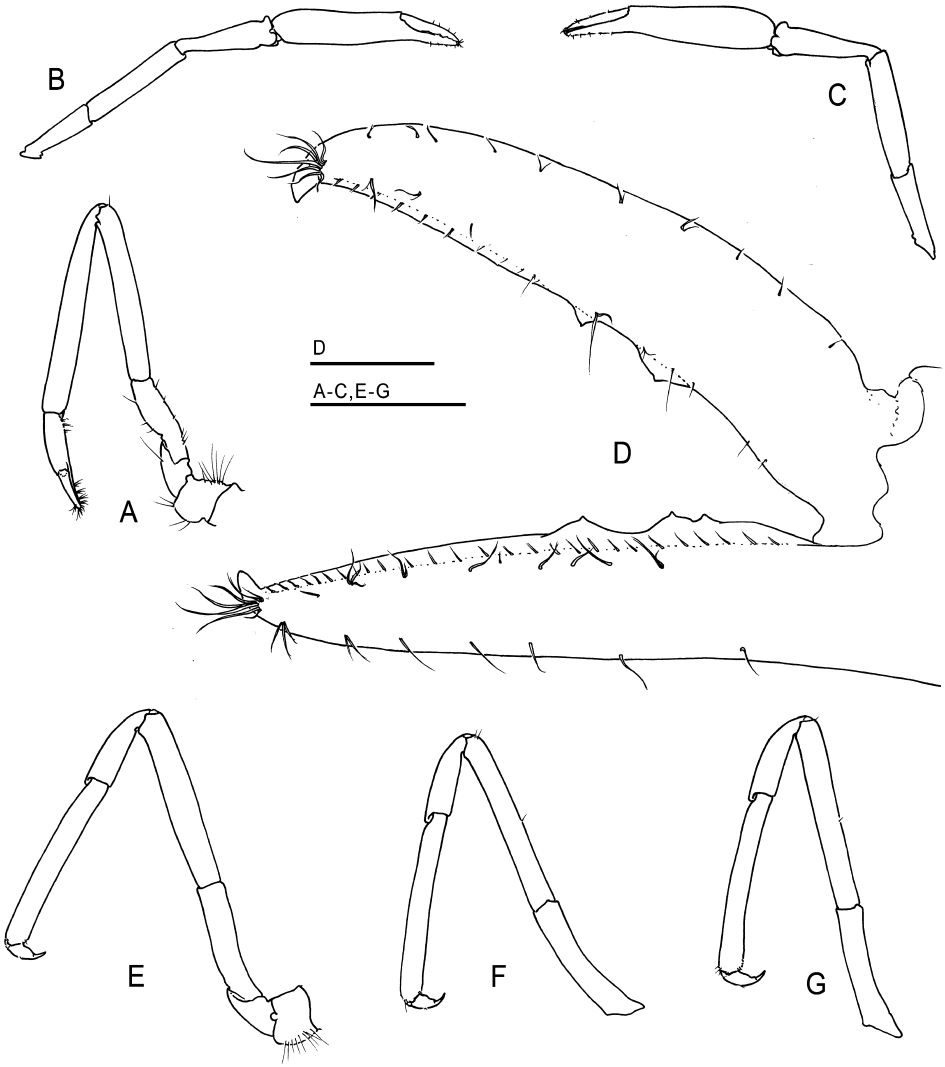

Fig. 5. *Palaemonella sandyi* sp. nov., ovigerous female RMNH.CRUS.D.53066. A, Left first pereiopod, lateral view; B, left second pereiopod, lateral view; C, right second pereiopod, lateral view; D, idem, fingers of chela, medial view; E, left third pereiopod, lateral view; F, left fourth pereiopod, lateral view; G, left fifth pereiopod, lateral view. Scale A, E-G = 2 mm; B, C = 4 mm; D = 0.5 mm.

ischiomerus, with about 10 plumose setae distally; coxa with small medial lobe, rounded epipod laterally, and small arthrobranch.

First pereiopods (fig. 5A) slender, exceeding carpocerite with distal part of merus, carpus and chela; chela normal, slightly compressed, palm 1.4 times as long as fingers, with several rows of cleaning setae proximoventrally, fingers slender,

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tapering, both with brushes of simple setae and hooked tip distally, cutting edges simple, entire; carpus 2.1 times chela length, slender, 8 times longer than distal width, tapering slightly proximally, with several cleaning setae distoventrally; merus 0.85 times carpus length, about 7.3 times longer than wide; ischium and basis with few long simple setae medially; coxa with small setose ventromedial lobe and setae dorsally.

Second pereiopods (fig. 5B-D) equal and similar; chela about 2.5 times carapace length in females to about 4 times carapace length in males, palm smooth about 3.5 times longer than deep, slightly swollen proximally, fingers 0.5 times palm length, slender, dactylus about 4.7 times longer than proximal depth, dorsal margin slightly convex, tip hooked, acute, cutting edge with 2 teeth in proximal half, distal cutting edge entire; fixed finger similar, with 1 large tooth at level between two dactylar teeth and 2 teeth proximally; carpus about 0.5 of chela length, about 3.5 times longer than distal width, tapering proximally, constricted then flared distally with blunt angular dorsal lobe; merus slightly longer than carpus, 4.7 times longer than central width, without distomesial tooth; ischium about 0.7 length of merus, tapering proximally; basis and coxa without special features.

Third pereiopods (fig. 5E) exceeding carpocerite by propodus and dactylus; dactylus (fig. 6A, B) simple, curved, 0.18 of propodus length, 2.2 times longer than proximal depth, corpus 1.5 times longer than proximal width, distal width 0.36 times proximal width, dorsal margin convex, with 3-4 simple setae at about 0.65 of length, ventral margin proximally slightly convex, distally concave, without accessory tooth, without setae; unguis indistinctly demarcated, 0.5 of corpus length, simple, curved, distally acute; propodus about 8.5 times longer than wide, slightly compressed, straight, uniform, with few small setae distally, with two very small distoventral spines, without ventral spines; carpus normal, about almost half propodus length, unarmed; merus almost as long as propodus, 5.8 times longer than wide, uniform, unarmed; ischium, basis and coxa without special features. Fourth pereiopods (figs. 5F, 6C, D) similar to third, slightly longer. Fifth pereiopods (figs. 5G, 7A, B) similar to fourth, slightly longer.

Uropods (fig. 7C) extending beyond telson; protopodite robust, unarmed; exopod with lateral margin distally convex, non-setose, with small acute posterolateral tooth (fig. 7D), flanked medially by mobile spine twice as long as posterolateral tooth; endopod about as long as exopod.

Pleopods with endopod shorter than exopod.

Ova about 200-300, size 0.5 mm.

First pleopod of female with exopod three times longer than endopod, with long plumose setae medially and distally.

Male endopod of first pleopod (fig. 8A) half as long as exopod, about 3.3 times longer than wide, with median margin concave, distally slightly expanded, with

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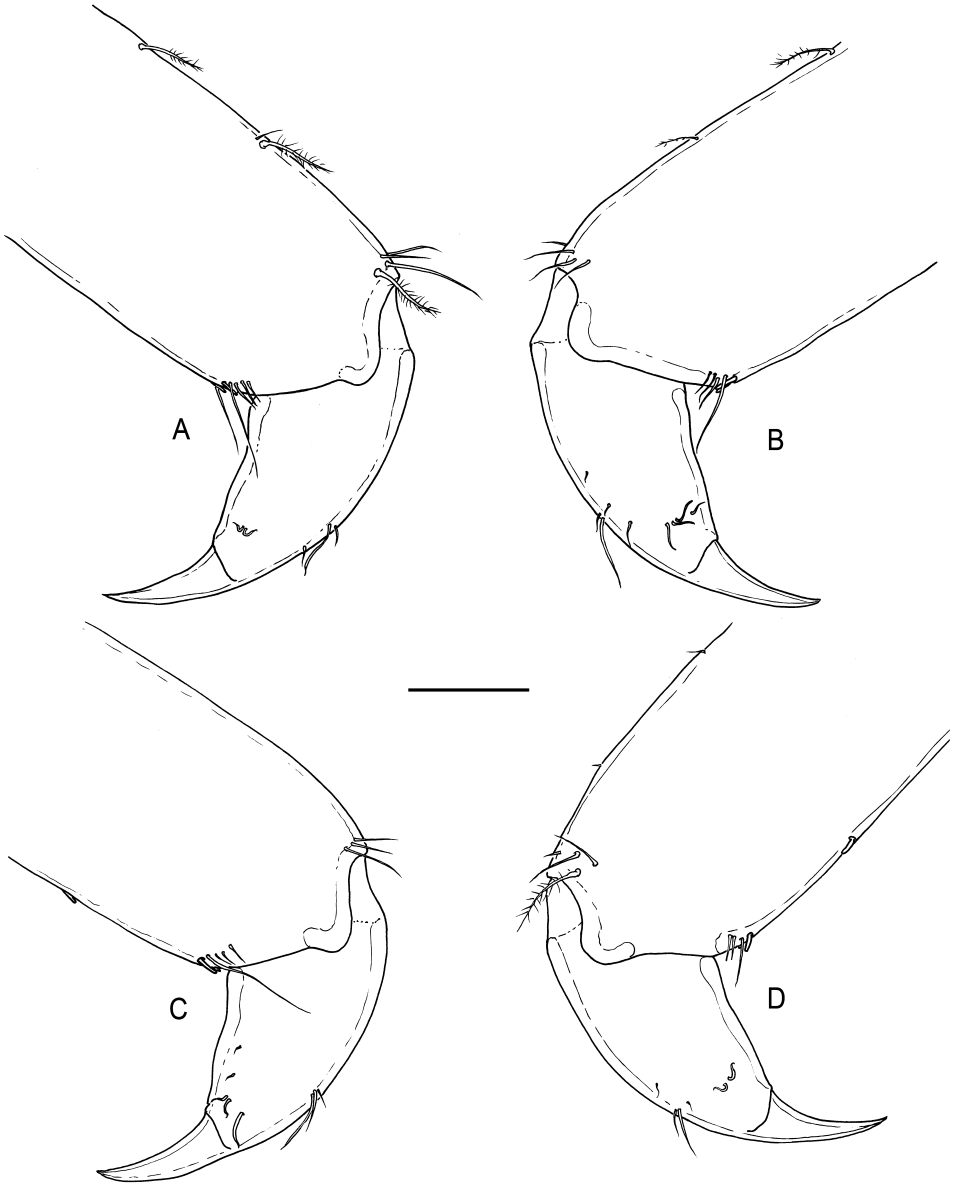

Fig. 6. *Palaemonella sandyi* sp. nov., ovigerous female RMNH.CRUS.D.53066. A, Left third pereiopod, dactylus, medial view; B, idem, lateral view; C, left fourth pereiopod, dactylus, medial view; D, idem, lateral view. Scale = 0.25 mm.

relatively short plumose marginal setae. Endopod of second pleopod (fig. 8B, C) 0.8 times length of exopod; appendix masculina well developed, with several rows of strong serrulate setae; appendix masculina falling short of endopod, slightly longer than appendix interna.

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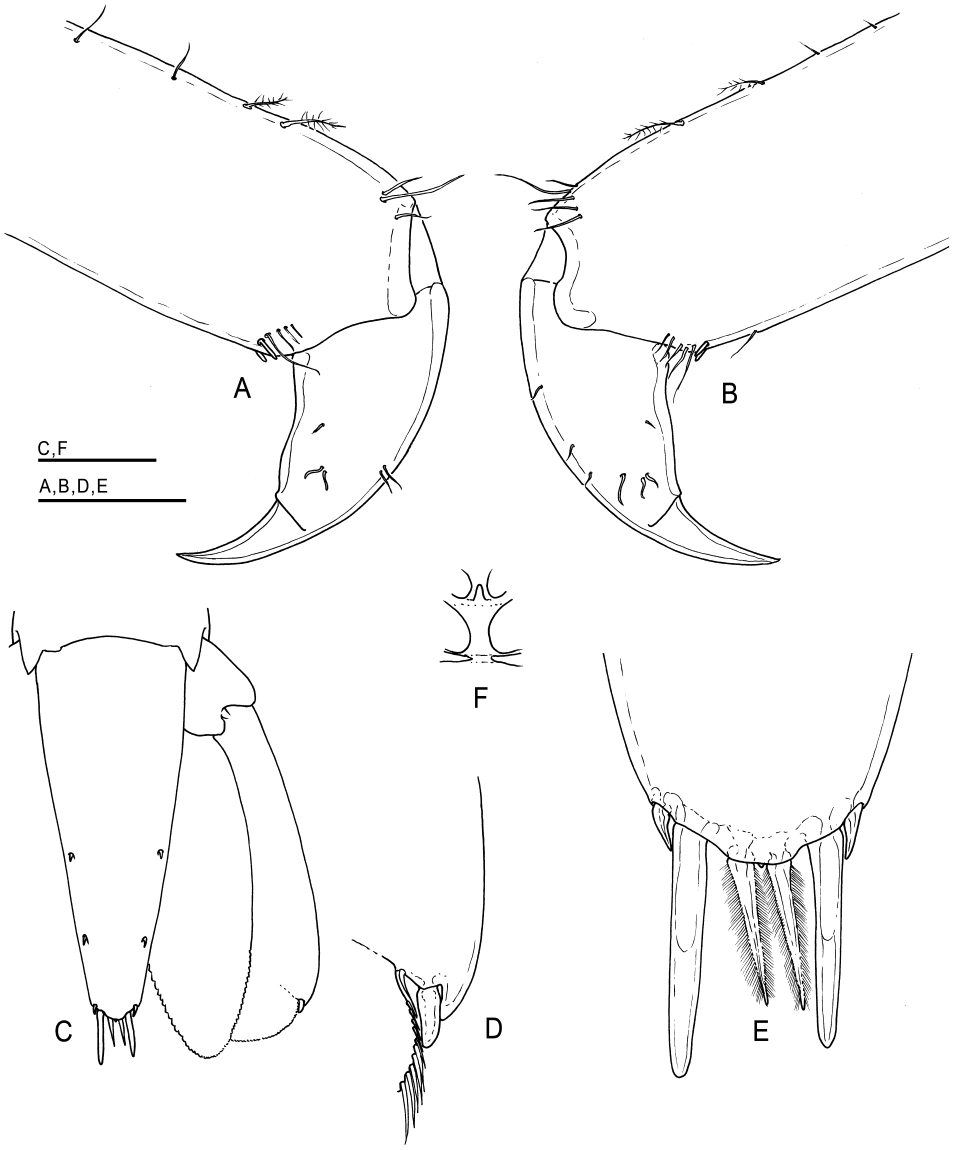

Fig. 7. *Palaemonella sandyi* sp. nov., ovigerous female RMNH.CRUS.D.53066. A, Left fifth pereiopod, dactylus, medial view; B, idem, lateral view; C, telson and right uropod, dorsal view; D, right uropodal exopod, distolateral part, dorsal view; E, telson, tip, dorsal view; F, fourth and fifth thoracic sternites, ventral view. Scales A, B, D, E = 0.25 mm; C = 1 mm; F = 2 mm.

Size.— Maximal pocl. in males 3.3 mm, in ovigerous females 5.0 mm.

Colouration (figs. 9-10).— Body and appendages translucent, body often with small red chromatophores, pereiopods usually translucent, at least dactylus, propodus and carpus. Hepatopancreas whitish to greenish in large specimens. Eyestalks

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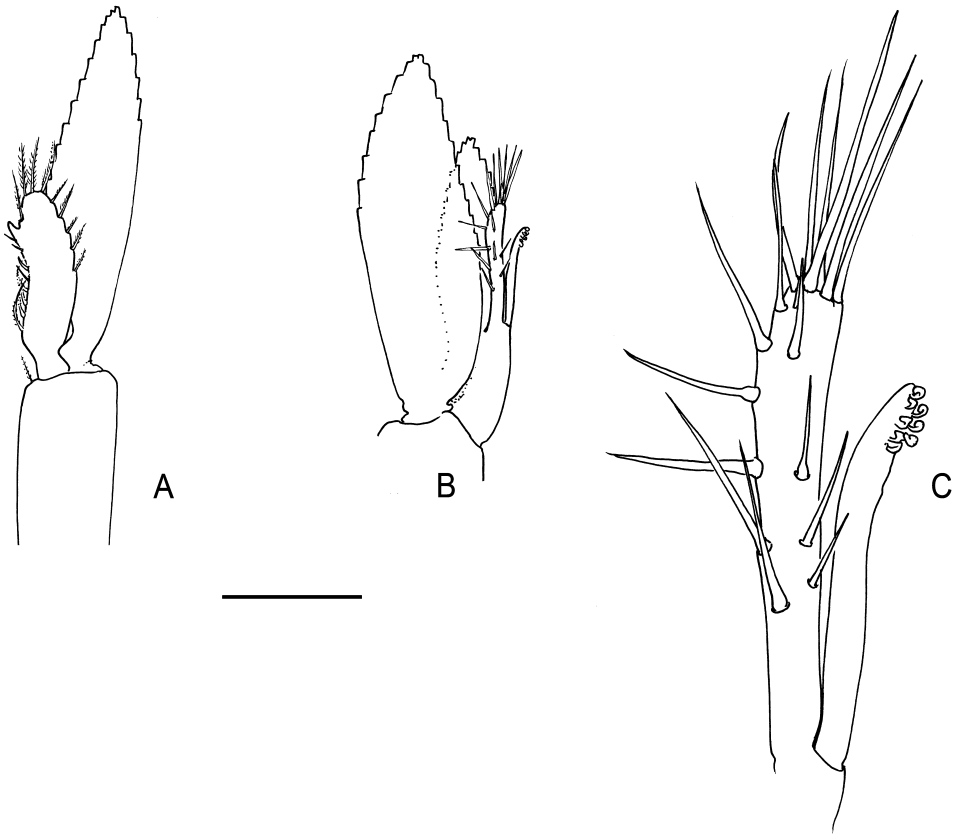

Fig. 8. *Palaemonella sandyi* sp. nov., male RMNH.CRUS.D.53097. A, Left first pleopod; B, left second pleopod; C, idem, detail of appendix masculina and appendix interna. Scales A, B = 0.5 mm; C = 0.125 mm.

with red longitudinal lines and with white band of chromatophores dorsally continuing between eyes under rostrum; these bands continuing on cornea. Yellow spots near bases of anterior appendages. Statocysts translucent.

Host.— Scleractinia: Euphylliidae: *Euphyllia glabrescens* (Chamisso & Eysenhardt, 1821) and *Euphyllia cristata* Chevalier, 1971.

Distribution.— The species has been recorded in the Indo-West Pacific from the Maldives, Cebu in the Philippines, Semporna in Malaysia, Nhatrang in Vietnam, and from NW Java, Bali, NE Sulawesi, NE Kalimantan, Ternate, and Raja Ampat in Indonesia.

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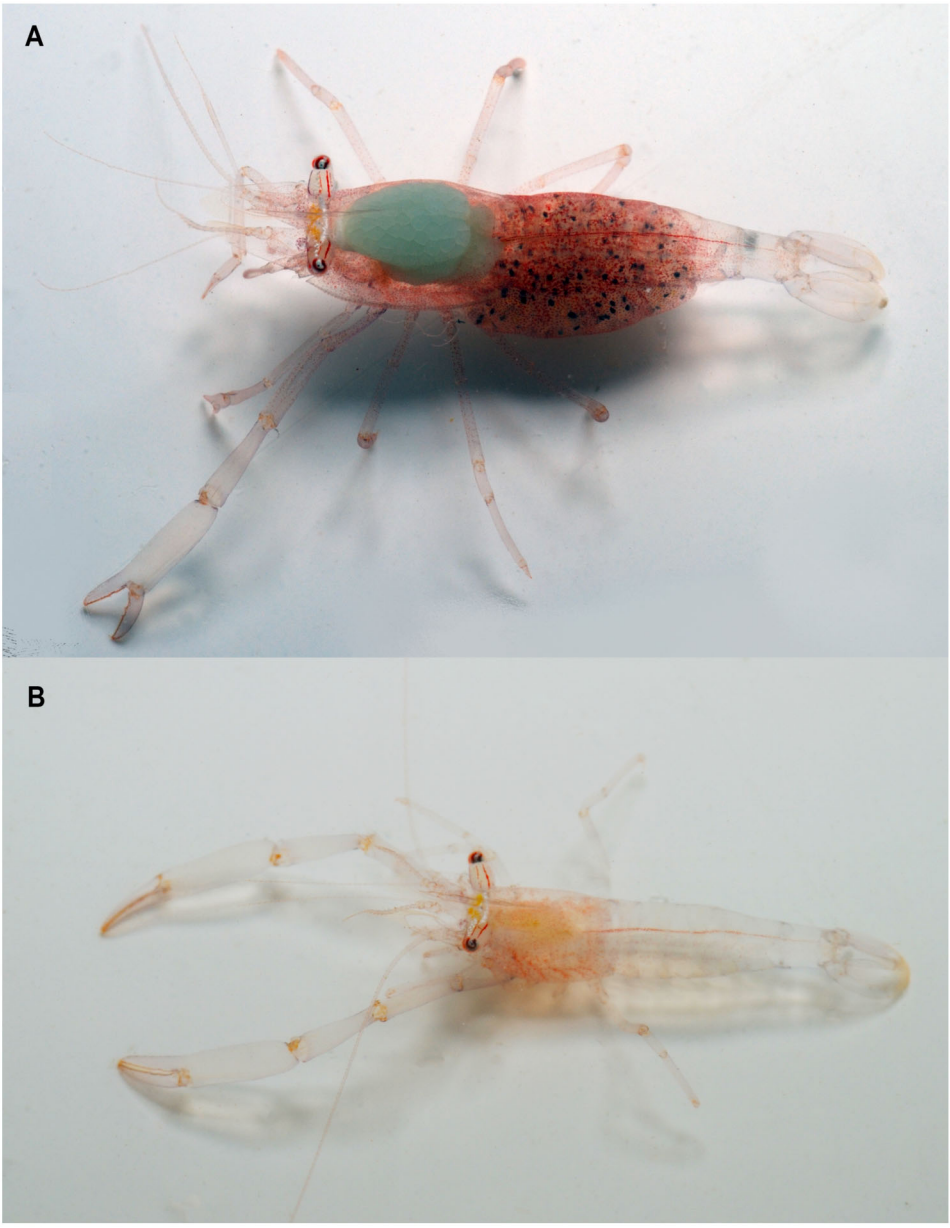

Fig. 9. *Palaemonella sandyi* sp. nov. A, Ovigerous female, pocl. 4.3 mm, RMNH.CRUS.D.53060; B, male, pocl. 2.4 mm, RMNH.CRUS.D.53097. Photographs by C.H.J.M. Fransen.

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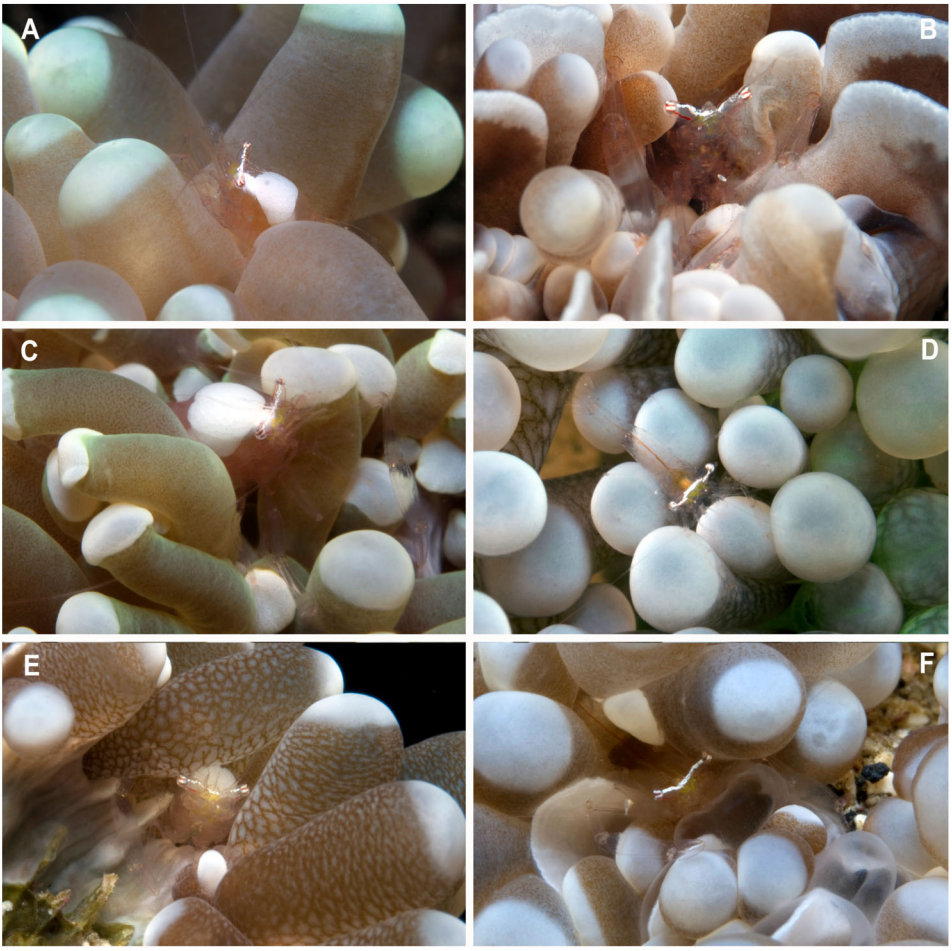

Fig. 10. *Palaemonella sandyi* sp. nov., on *Euphyllia glabrescens* (Chamisso & Eysenhardt, 1821). A, Stn. RAJ.29; B, stn. TER.06, RMNH.CRUS.D.53516; C, stn. SEM.28, RMNH.CRUS.D.53830; D, stn. MAL.03, RMNH.CRUS.D.58052; E, stn. LEM.36, RMNH.CRUS.D.58050; F, LEM.01. Photographs by C.H.J.M. Fransen.

Etymology.— Named after the late A. J. ("Sandy") Bruce, in recognition of his enormous contribution to shrimp taxonomy. The name is a noun in the genitive singular.

Remarks.— *Palaemonella sandyi* sp. nov. is morphologically similar to *P. colemani/euphyllius* (figs. 11-18). It can be distinguished from *P. colemani/euphyllius* by the following features in the rostrum and ambulatory pereiopods: (1) A subapical dorsal rostral tooth is often present (89%, $N = 27$, fig. 1C-J) in *P. sandyi* sp. nov., whereas in *P. colemani/euphyllius* the rostrum is more often without a subapical dorsal rostral tooth (46%, $N = 28$, fig. 15A-G); (2) the rostrum usually

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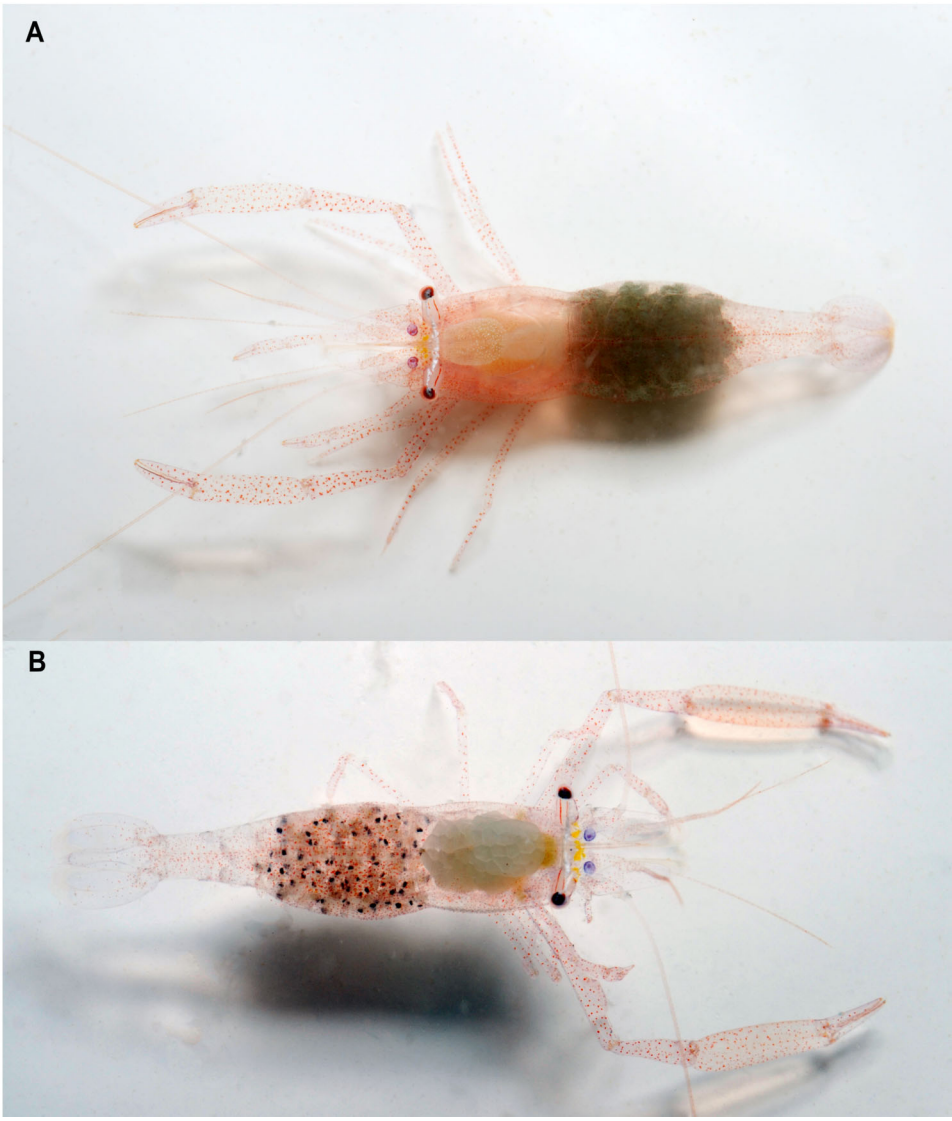

Fig. 11. *Palaemonella colemani/euphyllius*, stn. RAJ.08, RMNH.CRUS.D.53094, from *Fimbriaphyllia ancora* (Veron & Pichon, 1980). A, Ovigerous female, pocl. 3.5 mm, dorsal view; B, ovigerous female, pocl. 2.3 mm, dorsal view. Photographs by C.H.J.M. Fransen.

has two postorbital teeth, the second might be situated above the orbit in smaller specimens, in *P. sandyi* sp. nov. (fig. 1C-J), whereas in *P. colemani/euphyllius* one postorbital tooth is present, never two (fig. 15); (3) the rostrum is relatively short in relation with the pocl. (between 0.47-0.52) in the new species, whereas its ratio is between 0.71-1.10 in *P. colemani/euphyllius* (table I, fig. 13); (4) the dactylus of the ambulatory pereiopods is more compact and stout in the new species with

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Fig. 12. *Palaemonella colemani/euphyllius*. A, Stn. LEM.22, on *Fimbriaphyllia ancora* (Veron & Pichon, 1980); B, stn. LEM.18, RMNH.CRUS.D.58056, on *Fimbriaphyllia divisa* (Veron & Pichon, 1980); C, stn. RAJ.06, on *Fimbriaphyllia ancora*; D, stn. SEM.30, RMNH.CRUS.D.58060, on *Fimbriaphyllia divisa*; E, stn. RAJ.28, on *Fimbriaphyllia ancora*; F, stn. TER.21, RMNH.CRUS.D.53580, on *Fimbriaphyllia yaeyamensis* (Shirai, 1980). Photographs by C.H.J.M. Fransen.

a length-width ratio of about 2.2 (figs. 5E-G, 16E), whereas this ratio is about 4.1 in *P. colemani/euphyllius* (fig. 16A-D); (5) the unguis of the ambulatory dactylus is more strongly curved in the new species (figs. 6A-D, 7A, B, 17A), whereas it is less curved in *P. colemani/euphyllius* (figs. 17B, C, 18A-C); (6) the propodi of the ambulatory pereiopods are rather short with a length/width ratio of 7.6-8.1 (figs. 5E-G, 16E) in *P. sandyi* sp. nov., whereas the propodi are slender and straight with a length/width ratio of 8.4-13.4 in *P. colemani/euphyllius* (fig. 16A-D); 7) the ventral margin of the ambulatory propodi is devoid of spines in *P. sandyi* sp. nov. (figs. 5E-G, 16E), whereas a subdistal ventral spine can be present in *P. cole-*

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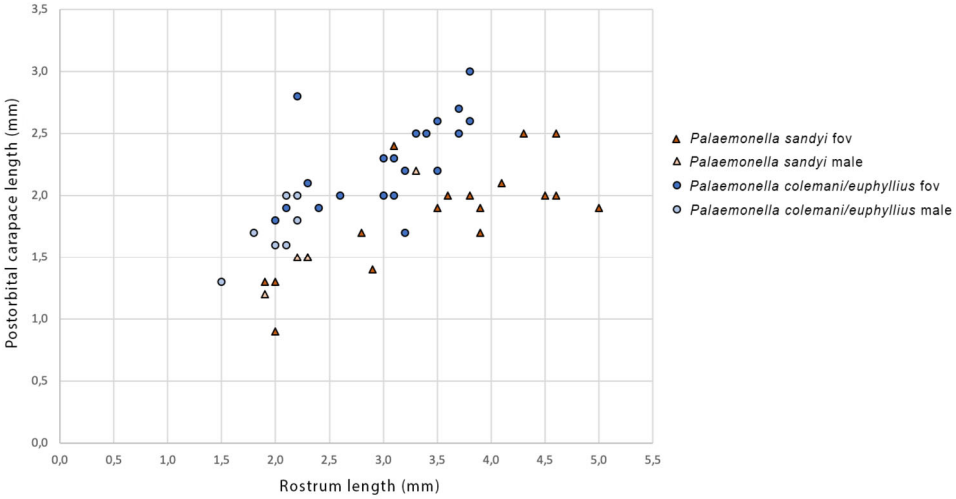

Fig. 13. Ratio between rostrum length and postorbital carapace length in *Palaemonella sandyi* sp. nov. and *P. colemani/euphyllius*.

mani/euphyllius (fig. 16B, C); 8) the distoventral spines of the ambulatory propodi are very short in *P. sandyi* sp. nov. (figs. 6A-D, 7A, B, 17A), whereas they are usually much longer in *P. colemani/euphyllius* (figs. 17B, C, 18A-C). This character however, is not visible in the drawing Bruce (2003) made of this feature. A molecular analysis including the holotype of *P. colemani/euphyllius* however showed it to be conspecific with the other specimens listed here.

In the colouration, there are also small differences between *Palaemonella sandyi* sp. nov. and *P. colemani/euphyllius*. *Palaemonella sandyi* sp. nov. has the pereiopods usually devoid of red chromatophores (figs. 9, 10), at least, propodus and carpus are completely translucent. In *P. colemani/euphyllius* there seems to be more variation in the colour pattern. In part of the specimens photographed, red chromatophores are present on the all joints (figs. 11, 12), whereas in other specimens (fig. 14A, C-F) the pereiopods are without red chromatophores and may have purple bands on the joints. As no morphological differences between the specimens with different colouration could be observed, the purple-banded form is here regarded a colour variety of *P. colemani/euphyllius*. Of the specimen collected on Bali (stn. BAL.15 RMNH.CRUS.D.49851), a 16S sequence has been obtained. On this locality however, photographs of specimens with (fig. 14A) and without (fig. 14B) have been taken and it is not clear if the specimen collected had the purple-banded colouration or not. As no trustworthy DNA sequences are yet available of this purple-banded form to look into the genetic relatedness to the non-banded variety and to detect possible cryptic speciation going on. In *P. sandyi* sp. nov. the statoliths have no

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Fig. 14. *Palaemonella colemani/euphyllius*. A, B, Stn. BAL.15, RMNH.CRUS.D.49851, on *Fimbriaphyllia ancora* (Veron & Pichon, 1980); C, stn. CEB.08, RMNH.CRUS.D.48532, on *Fimbriaphyllia ancora*; D, stn. BAL.18, RMNH.CRUS.D.50403, on *Fimbriaphyllia ancora/paraancora* [cf. *F. paraancora* (Veron, 1990)]; E, stn. CEB.13, RMNH.CRUS.D.48533, on *Fimbriaphyllia ancora*; F, stn. TER.24, on *Fimbriaphyllia yaeyamensis* (Shirai, 1980). Photographs by C.H.J.M. Fransen.

colour whereas these are always purplish in *P. colemani/euphyllius* (figs. 11, 12, 14).

The purple coloured bands on the joints can also be present in a colour variety of *Palaemonella philippinensis* (fig. 19B, C, E, G) whereas the colouration in this species is usually with longitudinal purple lines on the pereiopods (fig. 19A, F, H), seldom both patterns are combined (fig. 19D). There are however distinct differences between the colour patterns of the purple banded *P. colemani/euphyllius* and *P. philippinensis*: (1) the white transverse line on the eyestalks, connected with

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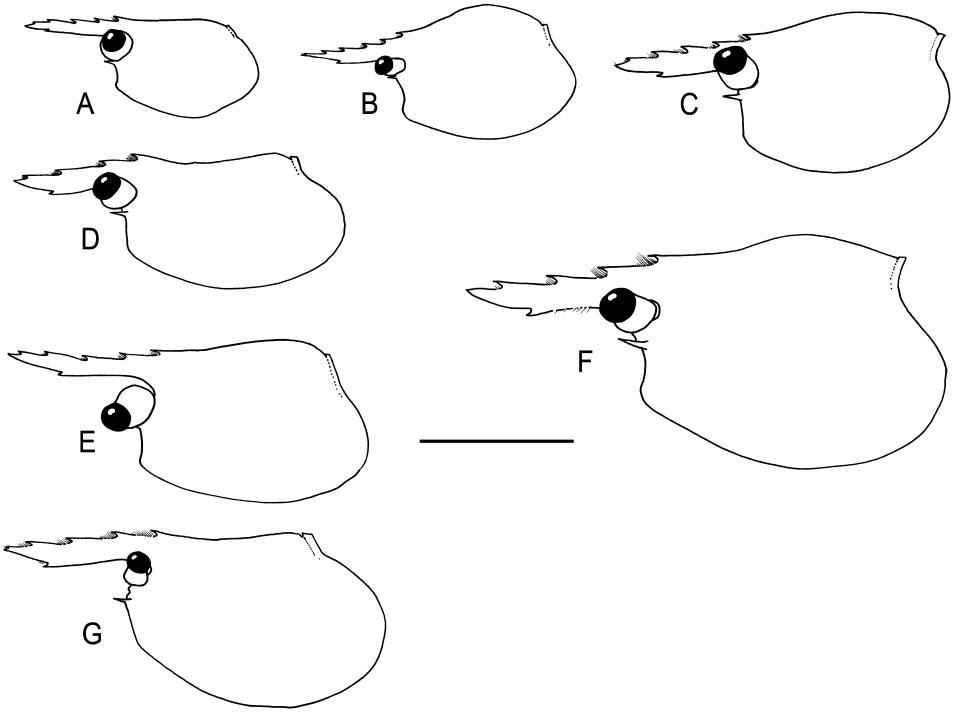

Fig. 15. *Palaemonella colemani/euphyllius*, rostrum, carapace and eye, lateral view. A, Juvenile, RMNH.CRUS.D.58057, on *Fimbriaphyllia divisa*; B, ovigerous female, RMNH.CRUS.D.53055, on *Fimbriaphyllia divisa*; C, ovigerous female, RMNH.CRUS.D.53573, on *Fimbriaphyllia ancora*; D, male, RMNH.CRUS.D.49851, on *Fimbriaphyllia ancora*; E, ovigerous female, RMNH.CRUS.D.53056, on *Fimbriaphyllia ancora*; F, ovigerous female, RMNH.CRUS.D.49853, on *Fimbriaphyllia divisa*; G, ovigerous female, RMNH.CRUS.D.58055, on *Fimbriaphyllia yaeyamensis*. Scales A, C-G = 2 mm; B = 4 mm.

chromatophores under the rostrum as a continuous line in *P. colemani/euphyllius* (figs. 11, 12, 14) and is absent in *P. philippinensis* (fig. 19). In *P. philippinensis* usually two small white dots on the eyestalks are present but never a continuous white line (fig. 19); (2) the specimens of *P. colemani/euphyllius* (figs. 11, 12, 14) all have the typical purple coloured statocysts whereas these are colourless in *P. philippinensis* (fig. 19); the antennal and antennular flagella are transparent in specimens of *P. colemani/euphyllius* (figs. 11, 12, 14) whereas these are bright red/purple in *P. philippinensis* (fig. 19).

The colouration of *Palaemonella smiti* (fig. 20) is rather distinct from the other species in that the antennulae and antennae are red, never purple. The chelipeds are colourless and the ambulatory pereiopods have longitudinal red lines in the adult specimens. These lines can be indistinct or absent in juveniles (fig. 20C). The eyestalks do not have the white lines but do possess few small white chromatophores

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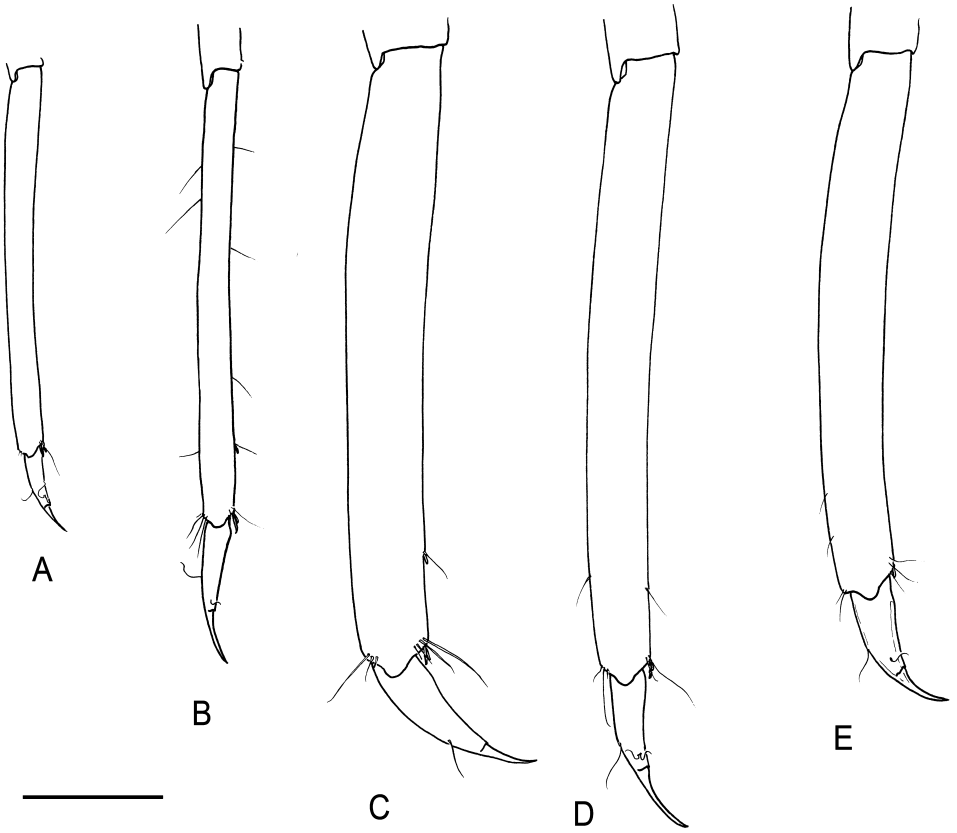

Fig. 16. A-D, *Palaemonella colemani/euphyllius*, third pereiopod, propodus and dactylus. A, Ovigerous female, RMNH.CRUS.D.53055, on *Fimbriaphyllia divisa*; B, juvenile, RMNH.CRUS.D.58057, on *Fimbriaphyllia divisa*; C, male, RMNH.CRUS.D.49851, on on *Fimbriaphyllia ancora*; D, ovigerous female, RMNH.CRUS.D.53056, on *Fimbriaphyllia ancora*; E, male, *Palaemonella sandyi* sp. nov., third pereiopod propodus and dactylus, RMNH.CRUS.D.58051, on *Euphyllia glabrescens*. Scale A = 1.25 mm; B-E = 0.5 mm.

like in *P. philippinensis*. The statocyst are purple, however less distinct than in *P. colemani/euphyllius*.

[The two following sections, i.e., Acknowledgements and References, can be found after the succeeding pages with figs. 17-20 and table I. Please note.]

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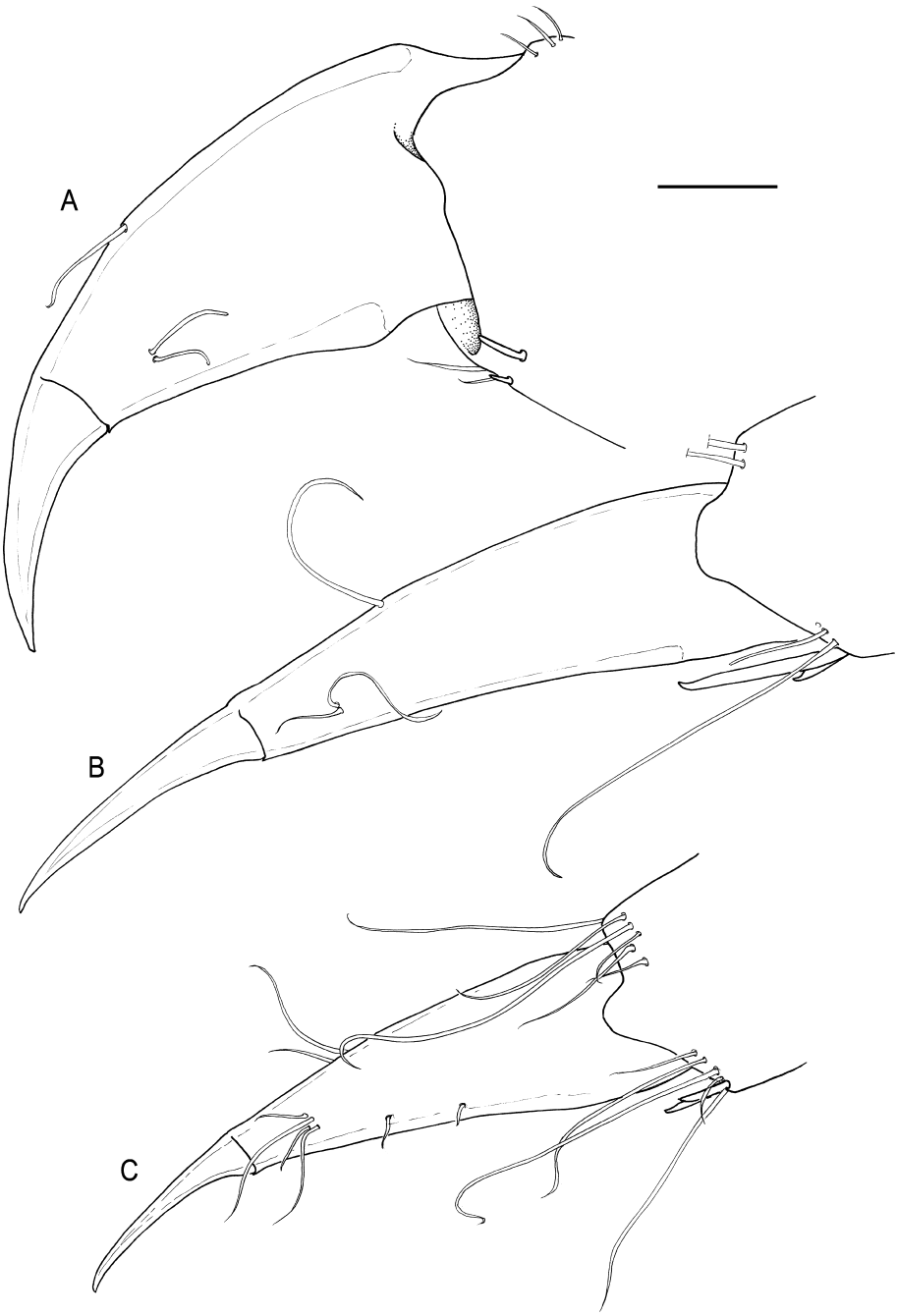

Fig. 17. A, *Palaemonella sandyi* sp. nov., third pereiopod dactylus, male, RMNH.CRUS.D.58051, on *Euphyllia glabrescens*; B-C, *Palaemonella colemani* (Bruce, 2003), third pereiopod dactylus; B, ovigerous female, RMNH.CRUS.D.53055, on *Fimbriaphyllia divisa*; C, ovigerous female, RMNH.CRUS.D.58055, on *Fimbriaphyllia yaeyamensis*. Scale = 0.125 mm.

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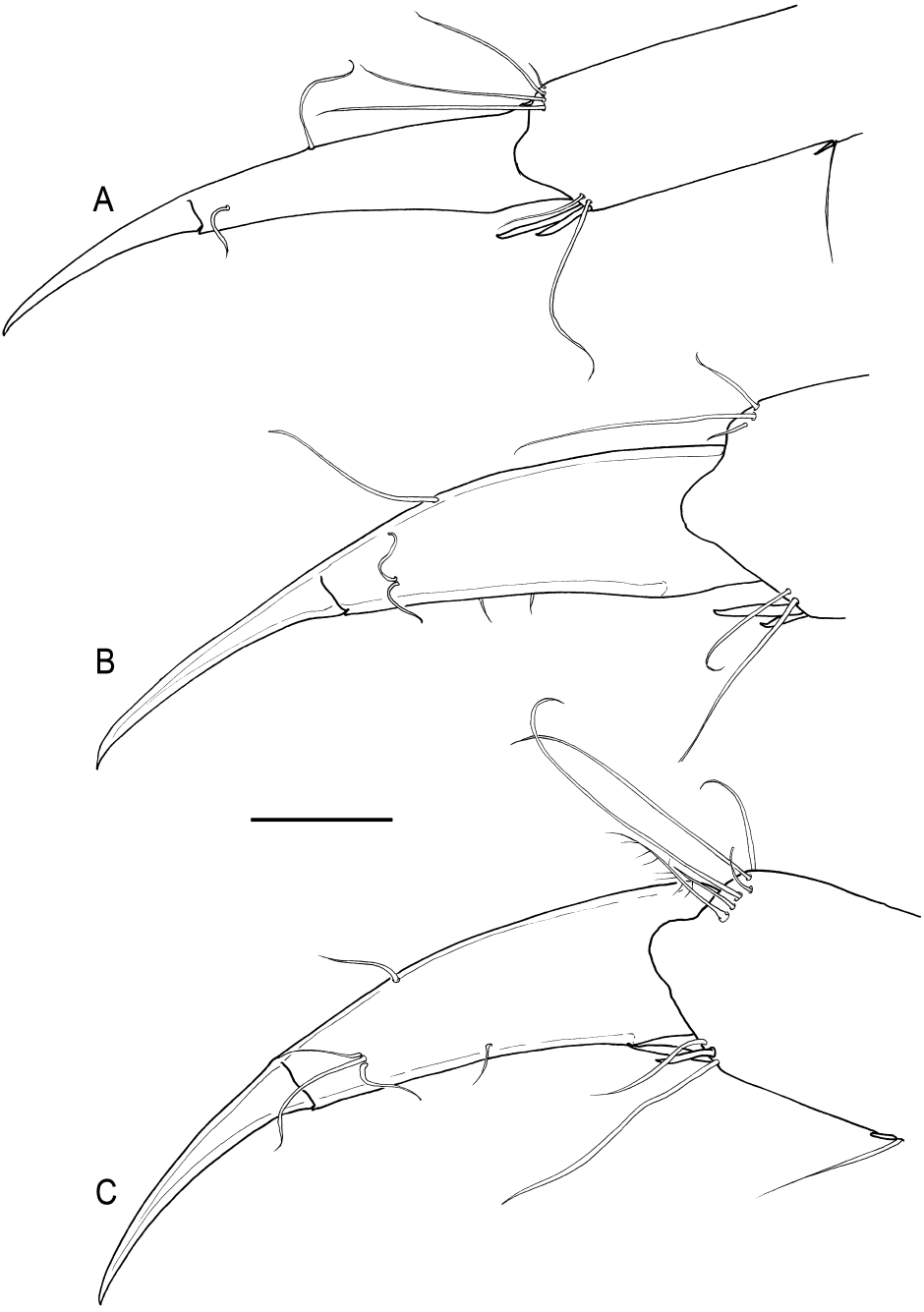

Fig. 18. *Palaemonella colemani/euphyllius*, third pereiopod dactylus. A, Juvenile, RMNH.CRUS.D.58057, on *Fimbriaphyllia divisa*; B, ovigerous female, RMNH.CRUS.D.53056, on *Fimbriaphyllia ancora*; C, ovigerous female, RMNH.CRUS.D.49853, on *Fimbriaphyllia divisa*. Scale = 0.125 mm.

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TABLE I

Meristics of specimens examined for comparison between *Palaemonella sandyi* sp. nov. and *P. colemani/euphyllius*

Species	Voucher	Locality	Host	Sex	pocl. (mm)	Rostrum				
						Length (mm)	Dorsal teeth	Postorb. teeth	Ventral teeth	Tip bifid
Palaemonella sandyi sp. nov.	RMNH.CRUS.D.48534	CEB.04	*Euphyllia glabrescens*	fov	3.6	2.0	6	2	1	yes
	RMNH.CRUS.D.48535	CEB.07	*Euphyllia glabrescens*	fov	4.6	2.5	5	2	1	yes
	RMNH.CRUS.D.48536	CEB.10	*Euphyllia glabrescens*	m	2.2	1.5	5	1	1	yes
	RMNH.CRUS.D.48537	CEB.16	*Euphyllia glabrescens*	m	2.3	1.5	5	2	0	yes
	RMNH.CRUS.D.50405	BAL.32	*Euphyllia glabrescens*	fov	3.8	2.0	6	2	0	yes
	RMNH.CRUS.D.50406	BAL.20	*Euphyllia glabrescens*	m	3.3	2.2	5	2	1	no
	RMNH.CRUS.D.50407	BAL.28	*Euphyllia glabrescens*	fov	3.9	1.7	5	2	0	yes
	RMNH.CRUS.D.50408	BAL.16	*Euphyllia glabrescens*	fov	3.9	1.9	5	2	0	no
	RMNH.CRUS.D.50408	BAL.16	*Euphyllia glabrescens*	fov	3.5	1.9	5	2	1	yes
	RMNH.CRUS.D.53057	BER.07	*Euphyllia glabrescens*	fov	4.5	2.0	3	2	0	–
	RMNH.CRUS.D.53058	BER.05	*Euphyllia glabrescens*	fov	3.1	2.4	6	1	1	yes
	RMNH.CRUS.D.53059	RAJ.21	*Euphyllia glabrescens*	fov	2.0	1.3	5	2	1	yes
	RMNH.CRUS.D.53061	SER.05	*Euphyllia glabrescens*	fov	4.6	2.0	5	1	0	yes
	RMNH.CRUS.D.53062	SER.02	*Euphyllia glabrescens*	fov	5.0	1.9	4	2	0	yes
	RMNH.CRUS.D.53064	RAJ.21	*Euphyllia glabrescens*	fov	2.0	0.9	5	2	1	yes
	RMNH.CRUS.D.53065	RAJ.21	*Euphyllia glabrescens*	fov	2.9	1.4	5	2	1	yes
	RMNH.CRUS.D.53066	SER.17	*Euphyllia glabrescens*	fov	4.3	2.5	5	2	1	yes
	RMNH.CRUS.D.53830	SEM.28	*Euphyllia glabrescens*	fov	4.1	2.1	5	2	0	no
	RMNH.CRUS.D.58049	LEM.08	*Euphyllia glabrescens*	fov	2.8	1.7	5	2	1	yes
	RMNH.CRUS.D.58050	LEM.36	*Euphyllia glabrescens*	fov	2.3	1.5	6	2	1	yes
	RMNH.CRUS.D.58052	MAL.03	*Euphyllia glabrescens*	m	2.3	1.5	5	2	0	yes
	RMNH.CRUS.D.58051	SEM.01	*Euphyllia glabrescens*	m	1.9	1.2	5	1	1	yes
	RMNH.CRUS.D.58051	SEM.01	*Euphyllia glabrescens*	f	1.9	1.3	5	1	1	yes

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TABLE I
(Continued)

Species	Voucher	Locality	Host	Sex	pocl. (mm)	Rostrum				
						Length (mm)	Dorsal teeth	Postorb. teeth	Ventral teeth	Tip bifid
P. colemani/euphyllius	RMNH.CRUS.D.48234	RBE.05	*Fimbriaphyllia ancora*	m	1.5	1.3	4	0	1	no
	RMNH.CRUS.D.48237	RBE.23	*Fimbriaphyllia divisa*	fov	2.6	2.0	5	1	1	no
	RMNH.CRUS.D.48237	RBE.23	*Fimbriaphyllia divisa*	m	2.1	1.6	5	0	1	no
	RMNH.CRUS.D.48531	CEB.08	*Fimbriaphyllia ancora*	fov	3.7	2.7	4	1	2	yes
	RMNH.CRUS.D.48531	CEB.08	*Fimbriaphyllia ancora*	fov	3.4	2.5	5	1	1	yes
	RMNH.CRUS.D.48532	CEB.08	*Fimbriaphyllia ancora*	fov	3.2	1.7	4	1	1	no
	RMNH.CRUS.D.48533	CEB.13	*Fimbriaphyllia ancora*	fov	3.2	2.2	5	1	1	yes
	RMNH.CRUS.D.48533	CEB.13	*Fimbriaphyllia ancora*	fov	3.1	2.0	5	1	1	yes
	RMNH.CRUS.D.48533	CEB.13	*Fimbriaphyllia ancora*	fov	3.0	2.0	5	1	1	yes
	RMNH.CRUS.D.48533	CEB.13	*Fimbriaphyllia ancora*	m	2.2	1.8	5	1	2	yes
	RMNH.CRUS.D.48538	CEB.08	*Fimbriaphyllia divisa*	fov	2.0	1.8	5	1	2	yes
	RMNH.CRUS.D.49851	BAL.15	*Fimbriaphyllia ancora*	m	2.0	1.6	4	1	1	no
	RMNH.CRUS.D.49853	BAL.21	*Fimbriaphyllia divisa*	fov	3.3	2.5	4	1	1	no
	RMNH.CRUS.D.50403	BAL.18	*Fimbriaphyllia ancora*	fov	1.9	–	4	1	1	no
	RMNH.CRUS.D.53055	BER.02	*Fimbriaphyllia divisa*	fov	3.8	2.6	6	1	1	yes
	RMNH.CRUS.D.53056	BER.30	*Fimbriaphyllia ancora*	fov	2.4	1.9	5	1	1	no
	RMNH.CRUS.D.53094	RAJ.08	*Fimbriaphyllia ancora*	fov	3.5	2.2	–	–	–	–
	RMNH.CRUS.D.53094	RAJ.08	*Fimbriaphyllia ancora*	fov	2.3	2.1	–	–	–	–
	RMNH.CRUS.D.53095	RAJ.11	*Fimbriaphyllia ancora*	fov	3.0	2.3	–	–	–	–
	RMNH.CRUS.D.53096	RAJ.11	*Fimbriaphyllia ancora*	fov	3.5	2.6	–	–	–	–
	RMNH.CRUS.D.53096	RAJ.11	*Fimbriaphyllia ancora*	m	2.2	2.0	–	–	–	–
	RMNH.CRUS.D.53054	SER.15	*Fimbriaphyllia divisa*	fov	3.1	2.3	4	1	1	no
	RMNH.CRUS.D.53053	SER.23	*Fimbriaphyllia divisa*	fov	3.8	3.0	5	1	2	yes
	RMNH.CRUS.D.58055	TER.24	*Fimbriaphyllia yaeyamensis*	fov	2.2	2.8	5	1	1	yes
	RMNH.CRUS.D.58056	LEM.18	*Fimbriaphyllia divisa*	fov	3.7	2.5	5	1	1	yes
	RMNH.CRUS.D.58056	LEM.18	*Fimbriaphyllia divisa*	m	1.8	1.7	5	1	1	no
	RMNH.CRUS.D.58057	SEM.07	*Fimbriaphyllia divisa*	juv	1.4	1.2	5	0	1	no
	RMNH.CRUS.D.53805	SEM.22	*Fimbriaphyllia divisa*	fov	4.1	–	5	1	2	–
	RMNH.CRUS.D.58060	SEM.30	*Fimbriaphyllia divisa*	fov	2.1	1.9	5	1	1	yes
	RMNH.CRUS.D.58060	SEM.30	*Fimbriaphyllia divisa*	m	2.1	2.0	5	1	1	yes

Fov, ovigerous female; f, female; m, male; pocl., postorbital carapace length.

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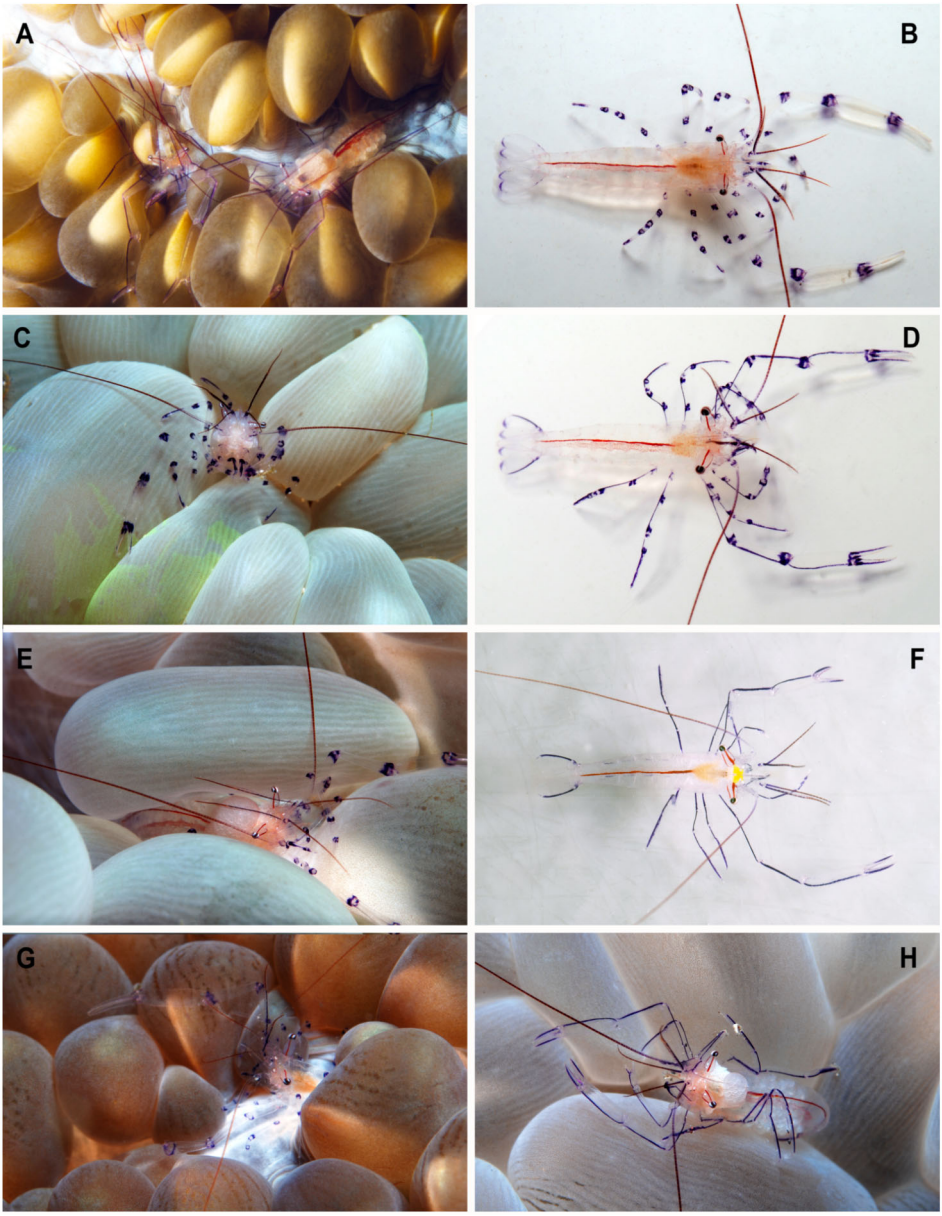

Fig. 19. *Palaemonella philippinensis* (Bruce & Svoboda, 1984). A, Stn. Cebu.10, RMNH.CRUS.D.48528, on *Physogyra lichtensteini* (Milne Edwards & Haime, 1851); B, stn. RAJ.08, RMNH.CRUS.D.53080, from *Physogyra lichtensteini*; C, stn. RAJ.25, RMNH.CRUS.D.53082, on *Plerogyra sinuosa* (Dana, 1846); D, stn. RAJ.11, RMNH.CRUS.D.53086, from *Physogyra lichtensteini*; E, stn. RAJ.28, RMNH.CRUS.D.53083, on *Plerogyra sinuosa*; F, stn. THU.06, RMNH.CRUS.D.58059, from *Plerogyra sinuosa*; G, stn. RAJ.41, on *Physogyra lichtensteini*, not collected; H, stn. TER.12.0069, RMNH.CRUS.D.53544, from *Plerogyra sinuosa*. Photographs by C.H.J.M. Fransen.

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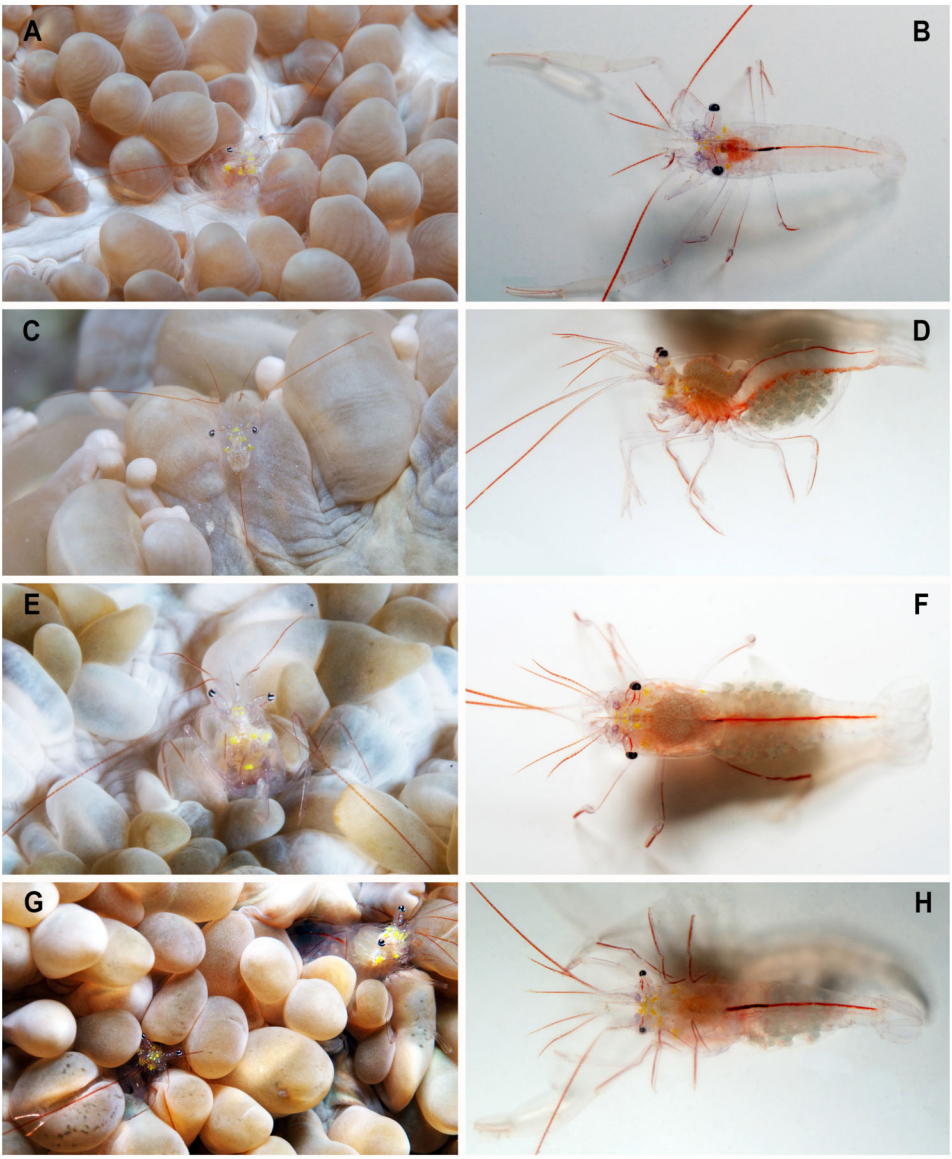

Fig. 20. *Palaemonella smiti* (Fransen & Holthuis, 2007), all from *Physogyra lichtensteini* (Milne Edwards & Haime, 1851). A, Stn. RAJ.41, not collected; B, stn. RAJ.14, RMNH.CRUS.D.53076; C, stn. MAL.01, not collected; D, F, stn. RAJ.20, second pereiopods missing, not collected; E, stn. SEM.29, RMNH.CRUS.D.53843; G, stn. RAJ.15, RMNH.CRUS.D.53077; H, stn. RAJ.21, right second cheliped missing, RMNH.CRUS.D.53079. Photographs by C.H.J.M. Fransen.

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ACKNOWLEDGEMENTS

Mr. H.L. Strack organized the Rumphius Biohistorical Expedition (1990) to Ambon, in cooperation with the Nationaal Natuurhistorisch Museum, Leiden, the Oceanological Institute of the Indonesian Institute of Sciences (LIPI) and Universitas Pattimura, both at Ambon, Indonesia (Strack, 1993). The "Cebu Strait" Expedition (2000) by the NNM and the University of San Carlos (USC), Cebu, with chief-scientist Dr B.W. Hoeksema (NNM) and counterpart Dr Thomas Heeger and Dr Filipina B. Sotto (USC). The "Lombok Strait" Expedition (2001) by the NNM, the Center of Oceanological Research and Development (PPPO) of LIPI in Jakarta, and the World Wildlife Foundation (WWF) Wallacea project at Denpasar, with Chief-scientist Dr B.W. Hoeksema and counterpart Ir. M.I. Yosephine Tuti H (PPPO-LIPI). The 2003 Berau 203 expedition around the Berau Islands, East Kalimantan was organised by Naturalis Biodiversity Center in Leiden, the Netherlands (chief scientist B.W. Hoeksema) and the Research Center for Oceanography, Indonesian Institute of Sciences (RCO-LIPI) (chief scientist Suharsono), as part of the East Kalimantan Programme. The 1000 Islands Expedition, September 2005, organized by the Research Centre for Oceanography, Indonesian Institute of Sciences (PPO-LIPI, Jakarta, Indonesia) and the National Museum of Natural History – Naturalis (Leiden, the Netherlands). The SANTO 2006 Global Biodiversity Survey was initiated by the Muséum national d'Histoire naturelle, Paris (MNHN), Institut de Recherche pour le Développement (IRD) and ProNatura International. Dr Philippe Bouchet acted as expedition leader for the marine theme (Bouchet et al., 2011). The 2007 Raja Ampat expedition was organized by NCB Naturalis and the Indonesian Institute of Sciences, LIPI, under the umbrella of Ekspedisi Widya Nusantara (E-Win) of LIPI. We are grateful to LIPI for granting research permits and to Dr Bert Hoeksema (NCB Naturalis) for his efforts in organizing the expedition (Hoeksema & van der Meij, 2008). The Ternate expedition in the northern Moluccas was organised by the Research Center of Oceanography, Indonesian Institute of Sciences (RCO-LIPI) (Jakarta, Indonesia) and Naturalis Biodiversity Center (NBC) (Leiden, The Netherlands). This expedition was part of the Ekspedisi Widya Nusantara project (E-Win expeditions), with Chief-scientist Dr B.W. Hoeksema (Naturalis) and counterpart Ir. M.I. Yosephine Tuti H (PPPO-LIPI). The Semporna Marine Ecological Expedition (2010) was jointly organized by WWF-Malaysia, Universiti Malaysia Sabah's Borneo Marine Research Institute, Naturalis Biodiversity Center and Universiti Malaya's Institute of Biological Sciences. Research permission was granted by Economic Planning Unit, Prime Minister's Department, Economic Planning Unit Sabah, Sabah Parks

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and Department of Fisheries Sabah. Dr Bert W. Hoeksema and Zarinah Waheed acted as expedition leaders for the biodiversity theme (Kassem et al., 2012). The Marine Biodiversity Workshop at Lembeh Strait (2012) was organized by Universitas Sam Ratulangi (UNSRAT in Manado) and the Bitung field station of the Research Centre of Oceanography (PPO-LIPI) in cooperation with Naturalis Biodiversity Center. Prof Dr Suharsono, former director of the Research Centre for Oceanography (PPO-LIPI), is acknowledged for his support. Prof Dr Markus T. Lasut (Universitas Sam Ratulangi), Dr Bert W. Hoeksema (Naturalis) and Ir. Yosephine Tuti (PPO-LIPI) acted as workshop coordinators. Dr Francesca Benzoni organized the Marine Biodiversity Workshop (2014) at the Marine Research and Higher Education Centre University of Milano-Bicocca, Magoodhoo Island, Faafu Atoll, Republic of Maldives. Mike Berumen (Red Sea Research Center, King Abdullah University of Science and Technology), hosted an expedition organised by B.W. Hoeksema in November 2014 off the coast of Thulau, Red Sea. We thank Bert Hoeksema for the identification of the coral hosts. Leids Universitair Fonds, Jan Joost ter Pelkwijk Fonds, Alida M. Buitendijk Fonds, Van Tienhoven Fonds, and Schure Beijerink Popping Fonds funded fieldwork carried out by E. van der Veer. The study was partially supported also from the student grant project sgs02/PřF/2022 (Pavlína Frolová, under the supervision of ZĎ, University of Ostrava).

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First received 28 January 2023.
Final version accepted 27 March 2023. Published online 27 April 2023.

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