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Sergestid shrimps from the Albatross Philippine Expedition, 1907–1910, including the new species *Sergia foresti* (Crustacea: Decapoda: Penaeidea)

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Abstract.—Eighteen species of sergestid shrimps are reported from 72 benthic trawl, towed net, dip net, and seine collections made by R/V *Albatross* in the Philippines in 1907–1910. Included are one species each of *Acetes*, *Allosergestes*, *Deosergestes*, *Neosergestes*, *Parasergestes*, *Sergestes*, and *Sicyonella* and eleven species of *Sergia*. *Sergia foresti*, taken from off Mindanao, Philippines, is described as new.

Although the Philippine Expedition of the U. S. Fisheries Steamer *Albatross* took place 90 yr ago, this is still one of the most comprehensive marine surveys of the Indonesian and Philippine regions ever made. While the majority of the material collected by this expedition was reported in a series of volumes in the United States National Museum Bulletin, crustacean publications were poorly represented. Indeed, the bulk of the crustacean reports is found in a recent series of papers on the caridean shrimps (see Chace 1997). During the expedition, 577 dredging and 41 hydrographic stations were occupied, in addition to many shore stations (see Anonymous 1910 and Chace 1983, for accounts of the Expedition). At most stations, collecting was by some form of dredge or benthic trawl, with fewer tows in the water column using ring nets.

Species of the meso-, bathy- and benthopelagic genera *Allosergestes* Judkins & Kensley, 2008, *Deosergestes* Judkins & Kensley, 2008, *Neosergestes* Judkins & Kensley, 2008, *Parasergestes* Judkins & Kensley, 2008, *Sergestes* H. Milne-Edwards, 1830, and *Sergia* Stimpson, 1860, occurred relatively infrequently and in small numbers in these collections, primarily a consequence of their ability to avoid the trawl and net apparatus used by the *Albatross*. Nevertheless, although only 18 sergestid species were taken, these include one undescribed and some rarely seen species.

This paper recognizes the genera separated from *Sergestes* s.l. by Judkins & Kensley (2008).

Materials and Methods

The material covered in this report came from 42 bottom trawl hauls, 18 ring net tows, and 12 nearshore dip net or seine collections. Nearshore collecting usually was done at night under electric light. Station locations with gear deployed are listed in Appendix I. The Albatross material is deposited in the National Museum of Natural History (USNM), Smithsonian Institution, Washington, D.C.

Results

Eighteen sergestid species were identified in the Albatross material (Appendix II). The shallow water species *Acetes sibogae* and *Sicyonella maldivensis* were collected inshore by dipnet or seine,

although *S. maldivensis* also was captured in two offshore trawl tows. *Allosergestes sargassi*, *Deosergestes seminudus*, *Neosergestes orientalis*, *Parasergestes armatus*, *Sergestes atlanticus* and eleven species of *Sergia* were taken by trawl or ring net. Species of *Sergia* include *S. creber*, *S. crosnieri*, *S. filicta*, *S. fulgens*, *S. grandis*, *S. inequalis*, *S. japonica*, *S. lucens*, *S. oksanae*, *S. prehensilis*, and the new species described herein.

Sergia foresti, new species
Fig. 1

Material examined.—Holotype, USNM 306864, male carapace length (cl) 6.0 mm, paratypes, USNM 306865, 7 females cl 7.4–7.7 mm, *Albatross* sta 5241, Pujada Bay, Mindanao, 6°50′45″N, 126°14′38″E, 393 m, 9 ft Albatross-Blake beam trawl fishing on bottom.

Description.—Carapace (Fig. 1A) integument firm; rostrum triangular, directed obliquely upward; supraorbital spine and ridge lacking; cervical groove barely defined, post-cervical groove dorsally strong; hepatic spine present, blunt; hepatic ridge rounded, connecting to rounded suprabranchial ridge posteriorly; suprabranchial photophores located on inner surface, i.e., in branchial chamber. Antennular peduncle article 3 in male, upper flagellum modified into clasping organ (Fig. 1D) consisting of basal rounded lobe bearing strong distal spine, falcate spinose article basally broad, with 7 spines and irregular band of setae on inner surface, distal part of clasper ridged, apically rounded, distal flagellum of at least 6 articles. Appendix masculina (Fig. 1F) cupped, with 3 stout setae arising inside cup, approximately 19 short spines arising on outer margin of cup.

Photophores: eyestalk 1 vp, 1 vd; antennular peduncle article III 1 vd; between antennular bases 1; antennal base 1, scaphocerite (Fig. 1G) 3; labrum 1 a; mandibular body 1; maxilliped I sternite 2 sm; maxilliped II sternite 1 m, basis 1, ischium 1, carpus 1, propodus 1; maxilliped III sternite 1 m 2 sm, basis 1, ischium 1, merus 1 d, carpus 1 d; pereopod I sternite 1 m 2 l; pereopod II sternite 1 m 2 sm 1 l, ischium 1 p, merus 1 d; pereopod III sternite 1 m 2 sm 1 l, ischium 1 p 1 d, merus 1 d; pereopod IV sternite 1 m 2 sm 1 l; pereopod V sternite 2 pl; upper branchiostegite 2; pleopods I–V pleonite 1 m 2 al, base 1; uropod (Fig. 1B) pleonite 3 m, base 1, endopod 1 p, exopod 1 d (a = anterior, d = distal, vd = ventrodistal, p = proximal, vp = ventroproximal, l = lateral, al = anteriolateral, pl = posteriolateral, m = medial, sm = submedial; numbers are for appendage on one side or somite between).

Petasma (Fig. 1C): processus ventralis extending furthest distally with unarmed triangular ridge at base, comprised of outer cylindrical branch bearing 5 distal hooks and shorter medially directed branch bearing several closely packed hooks; lobus armatus consisting of 4 short, rounded hook-bearing lobules at base of processus ventralis; lobus connectons reaching to about midpoint of processus ventralis, broadly truncate with row of distal hooks, with secondary unarmed blunt protuberance at outer midpoint and inner ridge extending from base to about midpoint; lobus terminalis a short rounded hook-bearing lobule below lobus connectons and lobus armatus; lobus accessorius a small hook-bearing protuberance at base of lobus terminalis; lobus inermis absent.

Thelycum (Fig. 1E): sternite between pereopod 3 legs having anterior transversely curved ridge, followed by transversely broad plate having anterolateral point, plate narrowest at midline; posteromesial coxal lobe of pereopod 3 partly covering lateral photophore of sternite; sternite between pereopod 4 legs broadly convex.

Etymology.—This species is named for the eminent carcinologist Professor Jacques Forest.

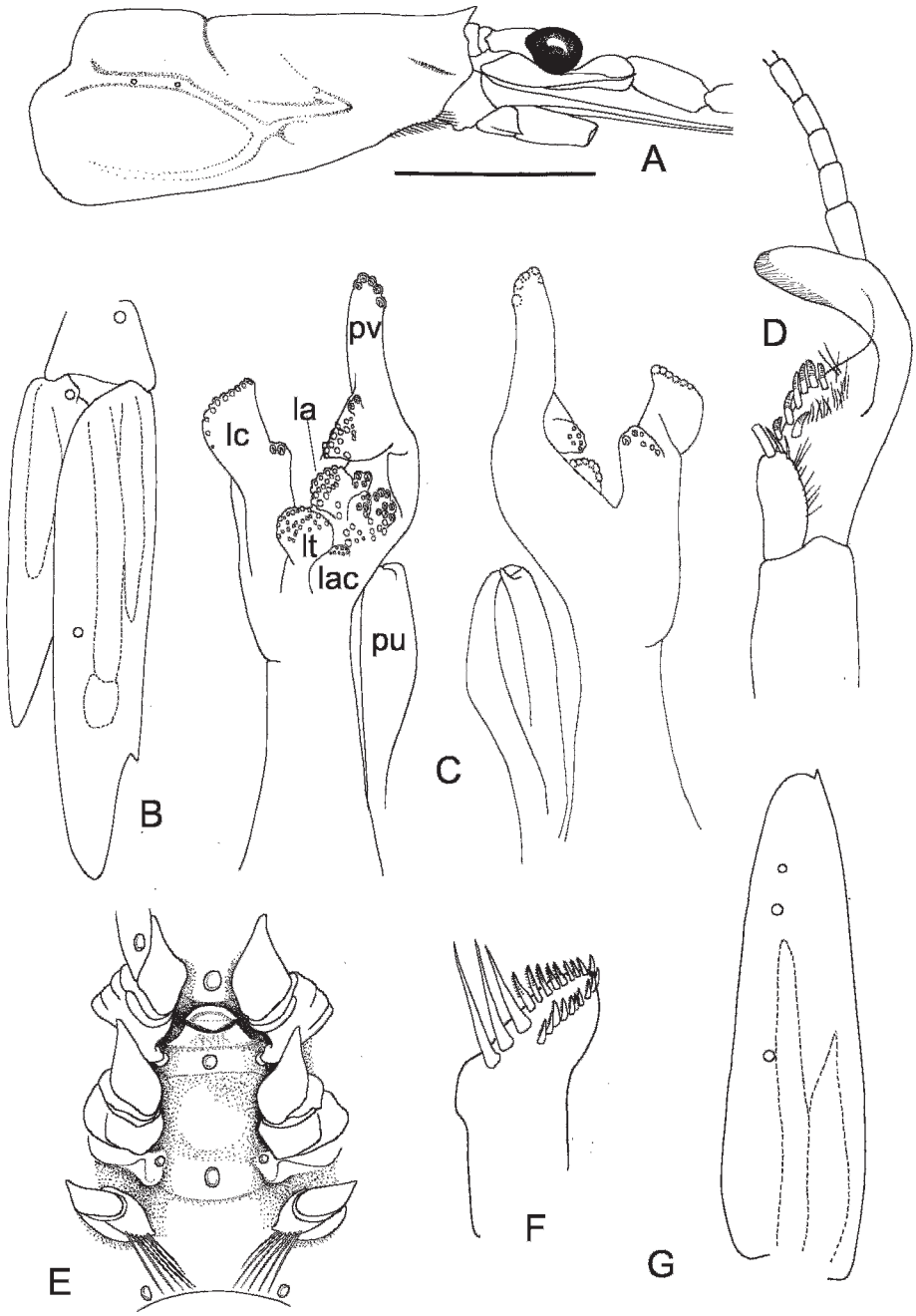

Fig. 1. *Sergia foresti*. A, carapace, lateral view; B, uropod (right), ventral view; C, capitulum of petasma (right), anterior and posterior views; D, clasping organ of antennular flagellum (right), ventral view; E, thelycum, ventral view; F, appendix masculina (right), medial view; G, scaphocerite (right), ventral view. A–D, F, G from holotype, male cl 6.0 mm (USNM 306864); E from paratype, female (USNM 306865).

Remarks.—Vereshchaka (2000) divided the species of *Sergia* into nine groups or isolated species: *S. tenuiremis* (Krøyer, 1855), *S. inoa* (Faxon, 1893), the *S. japonica* (Bate, 1881) species group, the *S. gardineri* (Kemp, 1913) species group, the *S. phorca* (Faxon, 1893) species group, the *S. robusta* (Smith, 1882) species group, the *S. prehensilis* (Bate, 1881) species group, the *S. challengeri* (Hansen, 1903) species group, and the *S. lucens* (Hansen, 1922) species group. This division is based primarily on photophores and the petasma but also on the hepatic tubercle/spine, the ocular papilla, the endopod of the first maxilliped, and the posterior branchial lobe on somite XII. The *S. prehensilis*, *S. challengeri* and *S. lucens* species groups all possess lensed photophores. *Sergia foresti* belongs to the *S. lucens* species group with three previously described species: *S. crosnieri* Vereshchaka, 2000, *S. erythraeensis* Iwasaki & van Couwelaar, 2001, and *S. lucens*. This group is defined by the enlarged and armed processus ventralis of the petasma. Also, the lobus connectens and lobus terminalis are inferior in size to the processus ventralis and the lobus inermis is reduced or absent in this group. *Sergia erythraeensis* and *S. foresti* have the most elaborate petasma with a bilobed processus ventralis, each lobe with multiple hooks, a shorter but relatively large lobus connectens, and a short lobus terminalis and lobus armatus each with multiple hooks. *Sergia foresti* differs from *S. erythraeensis* (Iwasaki & van Couwelaar, 2001: fig. 3) in lacking a lobus inermis, possessing only a rudimentary lobus accessorius but having a multi-lobed lobus armatus. *Sergia lucens* (Omori, 1969: fig. 3) and *Sergia crosnieri* (Vereshchaka, 2000: fig. 86) have simpler petasma, with a single-lobed processus ventralis, no lobus accessorius and no lobus armatus (in the case of *S. crosnieri*), or only a vestigial one (in the case of *S. lucens*).

Distribution.—Each of the species in the *Sergia lucens* group occurred in only a single *Albatross* collection, and thus, little is added to knowledge of their geographic distribution. The closely related *S. lucens* and *S. crosnieri* occurred in the same collection between Burias and Luzon, and *S. foresti* was taken at a single station several degrees to the south. The other species in the group, *S. erythraeensis*, is known only from the Red Sea (Iwasaki & van Couwelaar 2001). Other than *S. lucens* which has been studied extensively by Omori (1969), the biology of these species can only be inferred and must await future investigation. It also is likely that additional species belonging to the group will be discovered in collections from slope environments of the western Pacific, Indian ocean and adjoining seas.

Discussion

The basic petasma plan in the *Sergia lucens* group differs radically from the plans in all other *Sergia*, including the *S. challengeri* and *S. prehensilis* groups which show closer affinities to species of *Sergia* lacking lensed photophores. Species of the *S. lucens* group also possesses fewer photophores than those of the *S. challengeri* and *S. prehensilis* groups (Vereshchaka 2000:198). These differences suggest that the *S. lucens* species group is not closely related to the *S. challengeri* and *S. prehensilis* groups.

Photophore numbers and distibution vary little or not all within lens-bearing *Sergia* species and appear to be specific to each species (see Vereshchaka 2000). The photophores are all on the ventral surface of the body or on ventral-facing surfaces or margins of the appendages, no doubt serving as a luminescent countershading device to avoid or reduce capture by predators (Latz 1995). However, the species-specific patterns of these focused light sources also probably allow individuals to maintain visual contact for swarm

cohesion and to locate reproductive partners.

Most species in the lensed photophore groups are benthopelagic and restricted to continental and island slope environments, living close to the bottom during the day and rising into the water column at night (see Vereshchaka 1994, 2000). The ranges of benthopelagic species are limited geographically relative to pelagic species of *Sergia*, and the majority of individuals probably occur within semi-isolated local populations. Lensed photophores may play a visual role in maintaining populations within favorable but restricted habitats.

Possession of lensed photophores and similar benthopelagic habits suggest that the *S. prehensilis*, *S. challengeri* and *S. lucens* species groups share a common ancestor. However, the *S. lucens* group shows no obvious relationship in petasma structure to the other groups with lensed photophores or to any other extant group of *Sergia*. Lensless and lensed photophores are similar in structure, differing primarily in thickness and shape of the overlying integument [see Terao (1917) for lens-bearing photophores; Dennell (1940) for the lensless type]. Lensed photophores may have evolved more than once from a primitive lensless structure as an adaption to continental and island slope environments.

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Appendix I

Albatross Philippine Expedition collections with sergestid specimens. Gear: 12A = 12 ft Agassiz trawl; 9AB = 9 ft Albatross-Blake beam trawl; I4 = intermediate 4 5.5 ft ring net; I5 = intermediate 5 5.5 ft ring net; 6M = 6 ft McCormick trawl; 9T = 9 ft Tanner beam trawl; 12T = 12 ft Tanner beam trawl.

Station D5111: Southern Luzon, 16 Jan 1908, 13°45′15″N, 120°46′30″E, 432 m, 12T, bottom

Station D5120: Off Sombrero Island, 20 Jan 1908, 13°5′3 0″N, 120°30′15″E, 640 m, I4

Station D5168: Tawi Tawi, Sulu Archipelago, 28 Feb 1908, 4°56′30″N, 119°45′40″E, 146 m, 12A, bottom

Station D5172: Off Jolo, 5 Mar 1908, 6°03′15″N, 120°35′30″E, 582 m, 12A, bottom

Station D5184: Between Panay and Negros, 30 Mar 1908, 10°18′30″N, 122°23′30″E, 1034 m, 12A, bottom

Station D5185: Between Panay and Negros, 30 Mar 1908, 10°05′45″N, 122°18′30″E, 1006 m, I4

Station D5190: Off Pescador Island, 1 Apr 1908, 10°08′15″N, 123°16′45″E, 457 m, I4

Station D5203: Off southern Leyte Island, 10 Apr 1908, 9°58′N, 125°07′40″E, 1418 m, 12A, bottom

Station D5214: Off Masbate, 21 Apr 1908, 12°25′18″N, 123°37′15″E, 398 m, 12A, bottom

Station D5216: Between Burias and Luzon, 22 Apr 1908, 12°52′N, 123°23′30″E, 393 m, 12A, bottom

Station D5223: Between Marinduque and Luzon, 24 Apr 1908, 13°36′N, 121°25′30″E, I4, surface

Station D5227: East of Mindoro, 5 May 1908, 12°53′45″N, 121°52′30″E, 530 m, I4
Station D5230: Between Bohol and Leyte, 7 May 1908, 10°01′50″N, 124°42′30″E, I4, surface
Station D5231: Between Bohol and Leyte, 7 May 1908, 10°01′15″N, 124°43′15″E, 146 m, I4
Station D5232: Between Bohol and Leyte, 7 May 1908, 10°00′45″N, 124°44′06″E, 183 m, I4
Station D5241: Pujada Bay and vicinity, 8 May 1908, 6°50′45″N, 126°14′38″E, 393 m, 9AB, bottom
Station D5246: East of Mindanao, 15 May 1908, 6°29′15″N, 126°18′45″E, 183 m, I4
Station D5258: Off southern Panay, 2 Jun 1908, 10°27′45″N, 122°12′30″E, I5, surface
Station D5267: Verde Island Passage, 8 Jun 1908, 13°42′20″N, 120°58′25″E, 183 m, 12A, bottom
Station D5268: Verde Island Passage, 8 Jun 1908, 13°42′N, 120°57′15″E, 311 m, 12A, bottom
Station D5269 Verde Island Passage, 8 Jun 1908, 13°39′50″N, 120°59′30″E, 402 m, 12A, bottom
Station D5280: Malavatuan Island, 17 Jul 1908, 13°55′20″N, 120°25′55″E, 353 m, 12A, bottom
Station D5287: Off Sombrero Island, 29 Jul 1908, 13°37′40″N, 120°39′E, 567 m, I5
Station D5299: China Sea, vicinity of Luzon, 8 Aug 1908, 20°05′N, 116°05′E, 958 m, 12A, bottom
Station D5319: China Sea near Taiwan, 5 Nov 1908, 21°31′N, 117°53′E, 37 m, I4
Station D5320: China Sea, vicinity of Hong Kong, 6 Nov 2008, 20°58′N, 120°03′E, 915 m, I4
Station D5326: Northern Luzon off Hermanos Island, 12 Nov 1908, 18°32′30″N, 122°01′E, 420 m, 12T, bottom
Station D5327: Northern Luzon off Hermanos Island, 12 Nov 1908, 18°31′30″N, 122°03′E, 362 m, 12T, bottom
Station D5329: Northern Luzon off Font Island 18°33′N, 19 Nov 1908, 121°37′30″E, 388 m, 12T, bottom
Station D5348: Palawan Passage, 10°57′45″N, 27 Dec 1908, 118°38′15″E, 686 m, 12T, bottom
Station D5366: Batangas Bay, Luzon, 13°39′N, 22 Feb 1909, 120°58′30″E, 439 m, I4
Station D5379: Mompog Island, 12°59′15″N, 122°30′40″E, 4 Mar 1909, 1683 m, 12A, bottom
Station D5387: Bagatao Island Light, between Burias and Luzon, 11 Mar 1909, 12°54′40″N, 123°20′30″E, 382 m, 12A, bottom
Station D5388: Between Burias and Luzon, 11 Mar 1909, 12°51′30″N, 123°26′15″E, 413 m, 12A, bottom
Station D5400: North of Cebu, 16 Mar 1909, 11°24′24″N, 124°05′30″E, 45 m, 6M, bottom
Station D5401: North of Cebu, 16 Mar 1909, 11°24′25″N, 124°06′E, 55 m, 6M, bottom
Station D5437: West coast of Luzon, 8 May 1909, 15°45′54″N, 119°42′45″E, 823 m, I4
Station D5450: East Point, Batan Island, 4 Jun 1909, 13°23′15″N, 124°00′30″E, 746 m, 12A, bottom
Station D5458: East coast of Luzon, 8 Jun 1909, 13°10′54″N, 123°59′38″E, 366 m, 12A, bottom
Station D5463: East coast of Luzon, 16 Jun 1909, 13°40′57″N, 123°57′45″E, 549 m, 12A, bottom
Station D5486: Between Leyte and Mindanao, 31 Jul 1909, 10°02′N, 125°19′20″E, 1070 m, 12A, bottom
Station D5497: Between Leyte and Mindanao, 3 Aug 1909, 9°07′15″N, 124°59′30″E, 1464 m, I4
Station D5498: Between Leyte and Mindanao, 3 Aug 1909, 9°07′15″N, 124°59′30″E, 1756 m, 12A, bottom
Station D5523: Northern Mindanao, 10 Aug 1909, 8°48′44″N, 123°27′35″E, 658 m, 12T, bottom
Station D5525: Between Siquijor and Bohol Island, 11 Aug 1909, 9°12′30″N, 123°44′07″E, 741 m, 12T, bottom
Station D5530: Between Siquijor and Bohol Island, 11 Aug 1909, 9°26′45″N, 123°38′30″E. I4, surface
Station D5544: Northern Mindanao, 6 Sep 1909, 8°16′30″N, 122°26′30″E, 1098 m, I4
Station D5548: Off Jolo Island, 17 Sep 1909, 6°00′20″N, 120°45′35″E, 424 m, 9T, bottom
Station D5549: Off Jolo Island, 17 Sep 1909, 6°01′15″N, 120°44′20″E, 481 m, 9T, bottom
Station D5551: Off Jolo Island, 17 Sep 1909, 5°54′48″N, 120°44′24″E, 353 m, 9T, bottom
Station D5563: Between Jolo and Tawi Tawi, 21 Sep 1909, 5°48′12″N, 120°30′48″E, 409 m, 9T, bottom
Station D5567: North of Tawi Tawi, 21 Sep 1909, 5°48′00″N, 120°33′45″E, 490 m, 9T, bottom
Station D5569: North of Tawi Tawi, 22 Sep 1909, 5°33′15″N, 120°15′30″E, 554 m, 9T, bottom
Station D5572: North of Tawi Tawi, 12 Sep 1909, 5°31′26″N, 120°09′45″E, 611 m, 9T, bottom
Station D5587: Vicinity of Sibuko Bay, 27 Sep 1909, 4°10′35″N, 118°37′12″E, 759 m, 9T, bottom
Station D5621: Molucca Passage, 28 Nov 1909, 0°15′00″N, 127°24′35″E, 545 m, 12A, bottom
Station D5651: Gulf of Boni, 17 Dec 1909, 4°43′50″S, 121°23′24″E, 1281 m, 12A, bottom
Station D5662: Flores Sea, 21 Dec 1909, 5°43′00″S, 119°18′00″E, 386 m, 12A, bottom
Station D5667: Macassar Strait, 29 Dec 1909, 2°56′00″S, 118°47′30″E, 671 m, 12A, bottom
Station D5672: Macassar Strait, 30 Dec 1909, 0°29′00″S, 118°51′00″E. I4, surface

Localities for *Sicyonella maldivensis*

Subic Bay: 6 Jan 1908, dip net & electric light
Tumindao Reef, Sulu Archipelago: 25 Feb 1908, electric light, 3–5 m
Tumindao Reef, Sulu Archipelago: 26 Feb 1908, electric light
Varadero Harbor, Mindoro: 22 Jul 1908
Port San Vicente: 18 Nov 1908, seine
Malcochin Harbor, Linapacan Island: 18 Dec 1908, electric light
Malampaya River, Palawan: 26 Dec 1908, 10°50′44″N, 119°23′09″E, seine, 9 m

Capulaan Bay, Pagbilao: 23 Feb 1909, 13°35′30″N, 121°48′E, electric light
Port Dupon, Leyte Island: 17 Mar 1909, electric light
Palawan: 2 Apr 1909
Station 5596: Off Zamboanga, Mindinao, 11 Oct 1909, surface

Localities for *Acetes sibogae*
Manila Bay: 7 Dec 1907

Appendix II

Sergestid species recorded from the Albatross Philippine Expedition. Numbers of (M)ales, (F)emales, and (J)uveniles are in parentheses following the station number or location.

Acetes sibogae Hansen, 1919
Manila Bay(1M)
Allosergestes sargassi Ortmann, 1893
Station D5227(3M, 2F)
Deosergestes seminudus Hansen, 1919
Stations 5120(1M), D5227(9M, 9F, 4J), 5287(3M, 2F), 5348(1F), 5525(1F), 5587(2F), 5651(1F)
Neosergestes orientalis Hansen, 1919
Stations 5120(2M), 5190(1F), D5223(5M, 13F), D5227(3M, 6F), D5231(1M, 3F), D5258(27M, 43F), 5319(1M), 5437(1M), 5497(6F), 5530(2F), 5672(1M, 1F)
Parasergestes armatus Krøyer, 1855
Stations 5184(1M), 5185(1M, 1F, 1J), 5544(1F)
Sergestes atlanticus H. Milne-Edwards, 1830
Station 5672(17M, 9F)
Sergia creber (Burkenroad, 1940)
Stations 5185(1M, 2F, 5J), 5203(1M), 5299(1M,1F), 5327(1M, 1F), 5450(1F), 5486(3M), 5497(2M, 1F)
Sergia crosnieri Vereshchaka, 2000
Station 5216(1M)
Sergia filicta (Burkenroad, 1940)
Station 5463(1M)
Sergia foresti, new species
Station 5241(1M, 7F)
Sergia fulgens (Hansen 1919)
Stations 5111(1F), 5120(2M, 2F), 5168(1F), 5172(4M, 1F), 5185(7J), 5214(2F), 5216(9M, 6F), D5227(1M, 1J), D5231(12M, 15F, 32J), D5232(1M, 1F), 5246(1M), 5267(7M, 7F), 5268(10M, 12F), 5269(2M, 4F), 5280(1M, 1F), 5287(1M, 2F), 5326(2M, 2F), 5327(1M, 1F), 5329(1F), D5366(1M), 5387(2M, 1F), 5388(2F), 5458(5J), 5486(3M, 7F), 5497(1M, 3F), 5548(27M, 20F), 5549(2M, 7F), D5551(1F), 5563(1M), 5567(29M, 10F), 5569(2M, 6F), 5572(1M, 1F), 5621(7M, 5F), 5667(1M, 1F)
Sergia cf. *grandis* (Sund 1920)
Station 5299(1F)
Sergia inequalis (Burkenroad 1940)
Station 5185(1M, 1F)
Sergia japonica (Bate 1881)
Stations 5230(3M), D5379(1F), 5486(1M, 4F), 5497(2F), 5498(1F), 5523(1F), 5662(1F)
Sergia lucens (Hansen 1922)
Station 5216(1M)
Sergia oksanae Vereshchaka, 2000
Stations D5231(13M), 5486(1M)
Sergia prehensilis (Bate 1881)
Stations 5120(1F), 5320(2F)
Sicyonella maldivensis Borradaile, 1910
Stations 5400(2F), 5596(3F)
Subic Bay(4F)
Sulu Archipelago, Tumindao Reef: 25 Feb 1908(16M, 7F, 1J)
Sulu Archipelago, Tumindao Reef: 26 Feb 1908(2M, 6F)
Varadero Harbor, Mindoro(1F)
Port San Vicente(1F)
Malcochin Harbor, Linapacan Island(1F)
Malampaya River, Palawan(61J)
Capulaan Bay, Pagbilao(4M)
Port Dupon, Leyte Island(3F)
Palawan(7F)