

ANOPLODACTYLUS OPHIUROPHILUS N. SP., A SEA SPIDER ASSOCIATED WITH BRITTLE STARS IN THE SEYCHELLES

by

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ABSTRACT

A new species of Pycnogonida, *Anoplodactylus ophiurophilus*, is described. It is associated with three species of the genus *Ophiocoma* in the Seychelles (Indian Ocean) and constitutes the first recorded case of a sea spider found on Ophiuroidea. In comparison with the 83 species actually recognized in *Anoplodactylus*, the new species shows hardly any morphological adaptations due to this remarkable association.

RÉSUMÉ

Une espèce nouvelle de Pycnogonides, *Anoplodactylus ophiurophilus*, est décrite. Elle est associée à trois espèces du genre *Ophiocoma* aux Seychelles (Océan Indien), le premier cas connu d'un Pycnogonide rencontré sur des Ophiures. En comparaison avec les 83 espèces reconnues dans le genre *Anoplodactylus*, l'espèce nouvelle ne montre guère d'adaptations morphologiques relatives à cette association remarquable.

INTRODUCTION

To Dr. N. A. Sloan, Queen Mary College, University of London, I am indebted for entrusting me with a number of small pycnogonids found in remarkable abundance clinging to the ventral (oral) side of the arms of ophiuroids of the genus *Ophiocoma* in the Seychelles (Indian Ocean). *Ophiocoma doederleini* De Loriol, 1899, had the highest incidence of pycnogonid associates; lower infestation rates were found on *O. erinaceus* Müller & Troschel, 1842 and *O. pica* Müller & Troschel, 1842 (see Sloan, in preparation, for detailed data on infestation rates and the nature of the association). The pycnogonid proved to be a new species of the large genus *Anoplodactylus* which will be described in the sequel.

Anoplodactylus ophiurophilus n. sp. (Figs. 1-9)

Material examined: One ovigerous ♂ (holotype), 1 ♀ (allotype); 10 ovigerous ♂♂, 3 ♂♂, 15 ♀♀ (paratypes). Aldabra atoll, Seychelles (09°24'S 46°20'E), in very shallow waters (eu- and sublittoral), Feb. 25, 1978. Associated with the ophiuroid *Ophiocoma doederleini* De Loriol, 1899 (Zoölogisch Museum Amsterdam coll. no. Pa. 2841-42).

Description

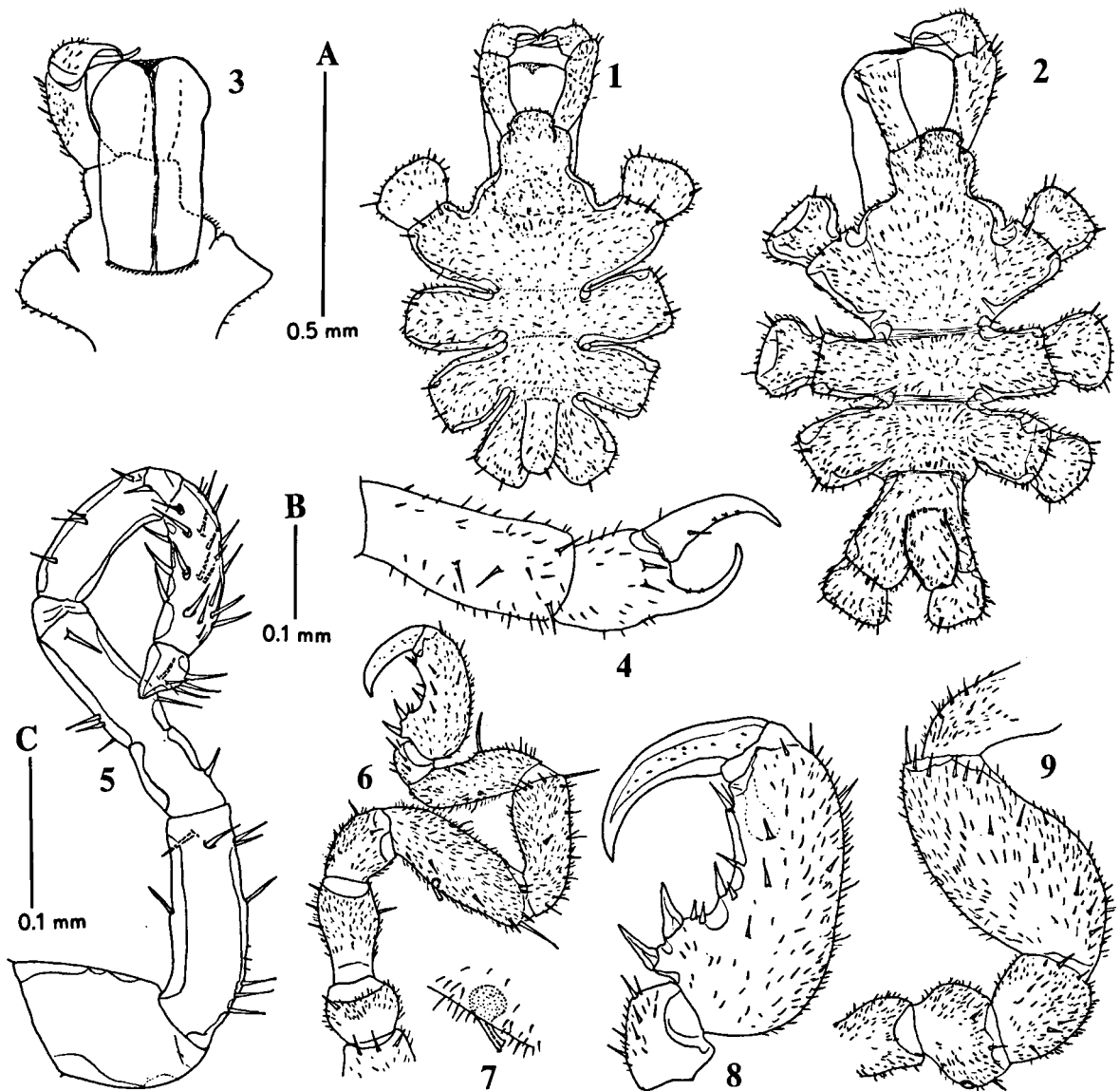
Male: Trunk with indistinct segmentation lines on the dorsal surface, more distinct ones on the ventral side. Neck short, expanded in front of the first lateral processes. Lateral processes touching in their basal part, separated distally; distodorsally armed with two or three small spines. Ocular tubercle low, directed anteriorly, rounded, eyes not visible at least in preserved material; lateral sense organs present as small processes on the lateral surface of the ocular tubercle, in subterminal position. Abdomen about as long as the fourth lateral processes, directed upward at an angle of some 35°. The entire trunk, including the ocular tubercle, the lateral processes and the abdomen, covered with a short pubescence.

Proboscis straight, almost cylindrical, slightly wider subterminally (type B''' to D''', according to the classification of Fry & Hedgpeth, 1969: 20-21).

Chelifore scape pubescent, chela almost as long as scape. Palm with some spinules; immovable finger shorter than the palm, strongly curved, armed with two small denticles; movable finger longer than the palm, less curved, armed with a spinule and some very small denticles.

No trace of palps. Oviger 6-segmented; relative lengths of the segments 14, 22, 25, 17, 16 and 6% (total: 100%). Reversed spines are numerous on segment 5. Segment 6 triangular, small. Eggs on oviger small (diameter 44-53 μm) and very numerous.

Like the trunk, the legs are covered with short setules. No genital spur. Sexual apertures found with certainty only on coxa 2 of leg 4. Femur with a single, short cement gland duct, just in



Figs. 1-9. *Anoplodactylus ophiurophilus* n. sp., paratypes: 1, trunk, ♂, dorsal (scale A); 2, trunk, ♀, dorsal (A); 3, anterior part of the body, ♀, ventral (A); 4, chelifore, ♂ (B); 5, oviger, ♂ (B); 6, third leg, ♂ (A); 7, cement gland aperture, ♂ (C); 8, distal segments of third leg, ♂ (B); 9, basal segments of third leg, ♀ (A).

front of the middle of the segment, on its dorsal surface. Femur the longest, tibia 2 the shortest of the longer leg segments. Tarsus of normal shape (not wedge-shaped). Propodus with a very strong heel, armed with two heavy spines; sole with two basal and two distal spines, but without the usual row of regular spinules and without a lamina. Claw strong, curved, without any trace of auxiliary claws.

Female: Trunk more slender; lateral processes slightly more widely separated; segmentation lines more distinct, also on the dorsal surface of the trunk. Proboscis as in male, thus without ventral outgrowths. No palps, no ovigers. Sexual apertures on coxa 2 of all legs; no genital spur. Femur strongly swollen. Otherwise, the morphology is similar to that of the male.

Measurements of two paratypes, in mm

	♂	♀
Length cephalic somite (from tip of ocular tubercle)	0.41	0.51
Length second trunk somite	0.12	0.16
Length third trunk somite	0.11	0.17
Length fourth trunk somite (to tip of fourth lateral processes)	0.23	0.24
Length abdomen	0.17	0.18
Width across second lateral processes	0.60	0.61
Length proboscis (ventral)	0.46	0.53
Greatest width proboscis	0.24	0.29
Third leg — coxa 1	0.16	0.19
coxa 2	0.23	0.22
coxa 3	0.17	0.24
femur	0.38	0.59
tibia 1	0.30	0.44
tibia 2	0.29	0.40
tarsus	0.06	0.11
propodus	0.28	0.36
claw	0.17	0.25

Distinction from other species

I recognize, at least provisionally, 83 valid species in the genus *Anoplodactylus*, which are listed in alphabetical sequence below. Also enumerated are the species requirenda, as well as a number of taxa that are at present considered synonyms, homonyms or alternative spellings.

1. *aculeatus* Möbius, 1902
2. *anarthrus* Loman, 1908
3. *angulatus* (Dohrn, 1881) (ex *Phoxichilidium*)
4. *aragaoi* Sawaya, 1950
5. *arcuatus* Child, 1977
6. *arescus* Marcus, 1959
7. *arnaudae* Stock, 1978
8. *australis* (Hodgson, 1914) (ex *Phoxichilidium*)
9. *bahamensis* Child, 1977
10. *batangensis* (Helfer, 1938) (ex *Pycnosoma*)
11. *brasiliensis* Hedgpeth, 1948 (pro *A. pygmaeus* Marcus, 1940, non Hodge, 1864)
12. *brevicollis* Loman, 1908
13. *californicus* Hall, 1912
14. *capensis* (Flynn, 1928) (ex *Phoxichilidium*)
15. *compactus* Hilton, 1939
16. *coxalis* Stock, 1968
17. *cribellatus* Calman, 1923
18. n. sp. Stock, in press (pro *A. virescens* Arnaud, 1974, non Hodge, 1864)
19. *derjugini* Losina-Losinsky, 1929
20. *digitatus* (Böhm, 1879) (ex *Phoxichilidium*)
21. *erectus* Cole, 1904
22. *eroticus* Stock, 1968
23. *evansi* Clark, 1963
24. *evelinae* Marcus, 1940
25. *gestiens* (Ortmann, 1890) (ex *Phoxichilidium*)
26. *glandulifer* Stock, 1954
27. *guyanensis* Child, 1977
28. *baswelli* (Flynn, 1918) (ex *Halosoma*)
29. *hokkaidoensis* (Utinomi, 1954) (ex *Phoxichilidium*)
30. *inermis* Losina-Losinsky, 1961
31. *insigniformis* Stock, 1975
32. *insignis* (Hoek, 1881) (ex *Phoxichilidium*)
33. *iuleus* Stock, 1975
34. *jonesi* Child, 1974
35. *jungersi* Fage, 1949
36. *laminifer* Arnaud, 1974
37. *lentus* Wilson, 1878
38. *longiceps* Stock, 1951 (pro *A. longicollis* Williams, 1941, preoccupied)
39. *longiformis* Child, 1977
40. *mamillosus* Stock, 1954
41. *marcusi* (de Mello-Leitão, 1949) (ex *Halosoma*)
42. *maritimus* Hodgson, 1914
43. *massiliensis* Bouvier, 1916
44. *massiliformis* Stock, 1975
45. *micros* Bourdillon, 1955
46. *minusculus* Clark, 1970
47. *minutissimus* Stock, 1954
48. n. sp. Stock, in press (pro *A. robustus* Stock, 1954, 1955, 1975, non Dohrn, 1881)
49. *multiclavus* Child, 1977
50. *neglectus* Hoek, 1898
51. *nodosus* Hilton, 1939
52. *oculatus* Carpenter, 1905
53. *oculospinus* Hilton, 1942
54. *pacificus* Hilton, 1942
55. *pectinus* Hedgpeth, 1948
56. *pelagicus* Flynn, 1928
57. *petiolatus* (Krøyer, 1844) (ex *Phoxichilidium*)
58. *pharus* Stock, 1975
59. *polignaci* Bouvier, 1914
60. *portus* Calman, 1927
61. *pulcher* Carpenter, 1907
62. *pycnosoma* (Helfer, 1938) (ex *Peritrachia*)
63. *pygmaeus* (Hodge, 1864) (ex *Pallene*)
64. *quadratispinosus* Hedgpeth, 1943
65. *robustus* (Dohrn, 1881) (ex *Phoxichilidium*)
66. *simplex* Clark, 1963
67. *simulator* Stock, 1975
68. *spinus* (Losina-Losinsky, 1961) (ex *Phoxichilidium*)
69. *squalidus* Clark, 1973
70. *stictus* Sawaya, 1945
71. *stocki* Băcescu, 1959
72. *tarsalis* Stock, 1968
73. *toros* Child & Hedgpeth, 1971
74. *trispinosus* Stock, 1951
75. *tubiferus* (Haswell, 1884) (ex *Phoxichilidium*)
76. *turbidus* Stock, 1975
77. *typhlops* Sars, 1888
78. *unilobus* Stock, 1959
79. *unospinus* Hilton, 1942
80. *versluyisi* Loman, 1908
81. *virescens* (Hodge, 1864) (ex *Phoxichilidium*)
82. *viridintestinalis* (Cole, 1904) (ex *Halosoma*)
83. *xenus* nom. nov. (pro *A. baswelli* Stock, 1954, non Flynn, 1918, see Clark, 1963: 49)

Species inquirenda, homonyms, synonyms, alternative names:
angulirostris (Dohrn, 1881: 34, 35, 68), nom. alt. pro *A. angulatus* (Dohrn, 1881).
antillianus Stock, 1975, jun. syn. of *A. jonesi* Child, 1974.
carvalhoi Marcus, 1940, jun. syn. of *A. portus* Calman, 1927.

exiguus (Dohrn, 1881) (ex *Phoxichilidium*), jun. syn. of *A. pygmaeus* (Hodge, 1864).
hedgpethi Băcescu, 1959 (as *A. petiolatus hedgpethi*), species inquirenda aff. *guyanensis* Child, 1977.
insignis bermudensis Cole, 1904 (identical with *insignis* s. str.).
intermedius Hilton, 1942, jun. syn. of *A. batangensis* (Helfer, 1938).
investigatoris Calman, 1923, jun. syn. of *A. digitatus* (Böhm, 1879).
lappa (Böhm, 1879) (ex *Pallene*), species inquirenda.
longicollis (Dohrn, 1881), jun. syn. of *A. petiolatus* (Krøyer, 1844).
longicollis Williams, 1941, homonym of *longicollis* (Dohrn, 1881); now: *A. longiceps* Stock, 1951.
longirostris (Dohrn, 1881: 34), nom. alt. pro *longicollis* (Dohrn, 1881).
maritimus sensu Hedgpeth, 1948 (non Hodgson, 1914) = *A. iuleus* Stock, 1975.
mutilatus (Frey & Leuckart, 1847) (ex *Phoxichilidium*), species inquirenda.
parvus Giltay, 1934, jun. syn. of *A. maritimus* Hodgson, 1914.
parvus (Hilton, 1939) (ex *Phoxichilidium*), homonym of *parvus* Giltay, 1934; now: *A. hokkaidoensis* (Utinomi, 1954).
plumulariae (Von Lendenfeld, 1883) (ex *Phoxichilidium*), species inquirenda.
projectus Hilton, 1942, jun. syn. of *A. portus* Calman, 1927.
robustus Hilton, 1939, homonym of *A. robustus* (Dohrn, 1881); jun. syn. of *A. portus* Calman, 1927.
robustus Zilberberg, 1963 (non Dohrn, 1881); cf. *A. marcusii* (de Mello-Leitão, 1949).
saxatilis Calman, 1923, jun. syn. of *A. digitatus* (Böhm, 1879).
spinus Möbius, 1902; transferred to *Parapallene*.
stylirostris Hedgpeth, 1948, jun. syn. of *A. batangensis* (Helfer, 1938).
stylops Loman, 1908, jun. syn. of *A. pulcher* Carpenter, 1907.
teñurostris Lebour, 1948, jun. syn. of *A. batangensis* (Helfer, 1938).

Of the 83 species enumerated above, the following 14 differ from *A. ophiurophilus* n. sp. in having the femoral cement glands (♂) discharging through more than one aperture on each leg: *angulatus*, *australis*, *cribellatus*, "n. sp. no. 18", *glandulifer*, *hokkaidoensis*, *longiceps*, *longiformis*, *multiclavus*, *oculatus*, *pyncosoma*, *robustus*, *virescens* and *xenus* (the condition of the cement gland is unknown for 15 species, e.g. because the male of those species is unknown).

Another 9 species have a single cribriform or pore-like cement gland aperture (♂), at any rate not a duct-like one as in the new species described above: *compactus*, *evelinae*, *insignis*, *lentus*, *massiliensis*, "n. sp. no. 48", *pectinus*, *polignaci*, *virid-*

intestinalis (here again, the condition of the cement gland aperture is unknown in the same 15 species as in the preceding paragraph).

The 37 species listed below differ from *A. ophiurophilus* n. sp. in possessing a distinct propodal lamina (♀, ♂): *aragaoi*, *arcuatus*, *arescus*, *arnaudae*, *babamensis*, *brasiliensis*, *compactus*, *cribellatus*, *digitatus*, *erectus*, *gestiens*, *glandulifer*, *guyanensis*, *iuleus*, *jonesi*, *jungersi*, *laminifer*, *longiformis*, *mamillosus*, *maritimus*, *micros*, *minusculus*, *minutissimus*, *multiclavus*, *nodosus*, *oculospinus*, *pacificus*, *petiolatus*, *pharus*, *pygmaeus*, *stictus*, *stocki*, *tarsalis*, *toros*, *trispinosus*, *turbidus*, *viridintestinalis* (the condition of the propodal armature is unknown for one species).

One species, *batangensis*, has a styliiform proboscis (♀, ♂) of a shape quite unlike that of the present new species (the shape of the proboscis is known for all 83 species listed above).

The following 11 species are known to possess ventral outgrowths on the ♀ proboscis, whereas the presently described species is devoid of such outgrowths: *arnaudae*, *brevicollis*, *digitatus*, *evansi*, *insignis*, *jungersi*, *polignaci*, *portus*, *stictus*, *unilobus*, *versluyisi* (the condition of the ♀ proboscis is unknown for 19 species, e.g. because the female sex is unknown).

Most species of the genus, viz. 75, possess rudimentary auxiliary claws. Only eight species are devoid of auxiliaries, a condition shared by *A. ophiurophilus* n. sp. These eight species are: *aculeatus*, *anarthrus*, *arescus*, *batangensis*, *pectinus*, *pygmaeus*, *stictus*, and *tarsalis*.

The above comparisons show that only two species of *Anoplodactylus* share the six character states used in the preceding lines with *A. ophiurophilus* n. sp., viz. *A. aculeatus* and *A. anarthrus*. The former of these two, *aculeatus*, does not resemble in the least the new species, since it possesses long spurs on the coxae, femur and first tibia, has chelae with closing (as opposed to gaping) fingers, and carries a regular row of spinules on the propodal sole (in fact, *A. aculeatus* is very close to, if not identical with, *A. insignis*). The second of the two species, *anarthrus*, is more similar to *A. ophiurophilus* n. sp., but possesses a row of six regular spinules of a size on the pro-

podal sole, and has touching (as opposed to separated) lateral processes.

It is clear, therefore, that the material from the Seychelles represents an undescribed species, which I propose to call *A. ophiurophilus* in virtue of its unique association with ophiurans of the genus *Ophiocoma*. It is remarkable, though, that the pycnogonid has developed so few morphological adaptations to its peculiar mode of life. As point of fact, the new species could almost be considered a generalized *Anoplodactylus* without any striking characters. The only, however slight, adaptation might be found in the morphology of the propodus, which is strongly curved, lacking the usual row of sole spines, and forming with the opposing claw a strongly prehensile device.

Up to now not a single pycnogonid was known to be associated with ophiuroids, although other echinoderm groups are reported as possible food source (Holothuroidea, Echinoidea; refs. in Stock, 1978). Members of the genus *Anoplodactylus* have been recorded mainly from different groups of hydroids (refs. in King, 1973, tables III & IV) and medusae, but the closely related genus *Pycnosoma* was recorded from the echinoderm *Strongylocentrotus*, a sea urchin, by Losina-Losinsky, 1933.

Anoplodactylus is predominantly a warm-water

genus, with only few representatives in temperate (e.g. *A. petiolatus*), cool (e.g. *A. laminifer*) or polar (e.g. *A. australis*) waters. Several representatives of the genus have been found, however, in cooler deep waters (e.g. *A. arnaudae*, *A. oculatus*) There is no doubt that the genus reaches its greatest proliferation in the tropics of both the Indo-Pacific and the Caribbean.

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