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Shallow-water Pycnogonida from Kenya and Sri Lanka, with descriptions of three new species

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Abstract. 15 species of shallow-water Pycnogonida are recorded from Kenya and Sri Lanka. *Ammothea stauromata* Child, 1982, *Tanystylum tubirostrum* Stock, 1954, *Anoplodactylus anarthrus* Loman, 1908 and *Anoplodactylus tarsalis* Stock, 1968 were found in the Indian Ocean for the first time. Three species new to science, *Ammothea watamu* n. sp., *Callipallene kenyensis* n. sp. and *Anoplodactylus krappi* n. sp. are described.

Key words. Pycnogonida, Kenya, Sri Lanka, records, *Ammothea watamu* n. sp., *Callipallene kenyensis* n. sp., *Anoplodactylus krappi* n. sp.

This paper is based on two surveys carried out by the author in 1989 in Kenya and Sri Lanka. Samples in Kenya have been taken at low tide in the vicinity of Watamu, south of Malindi. 12 species in 6 genera with 3 species new to science could be collected in that area. Number of species found in Sri Lanka has been very much lower, possibly due to the freshwater influence of the Bentota-river at the west-coast, only 1 km south of the area studied. 4 species in 4 genera have been found, all belonging to species with a wide distribution in the Indo-Pacific Ocean. One species, *Tanystylum bredini* Child, 1970 could be collected in both Kenya and Sri Lanka.

Specimens are deposited in the Senckenberg-Museum, Frankfurt a.M., Germany (SMF) and the Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany (ZFMK).

Systematic Account

Ammotheidae

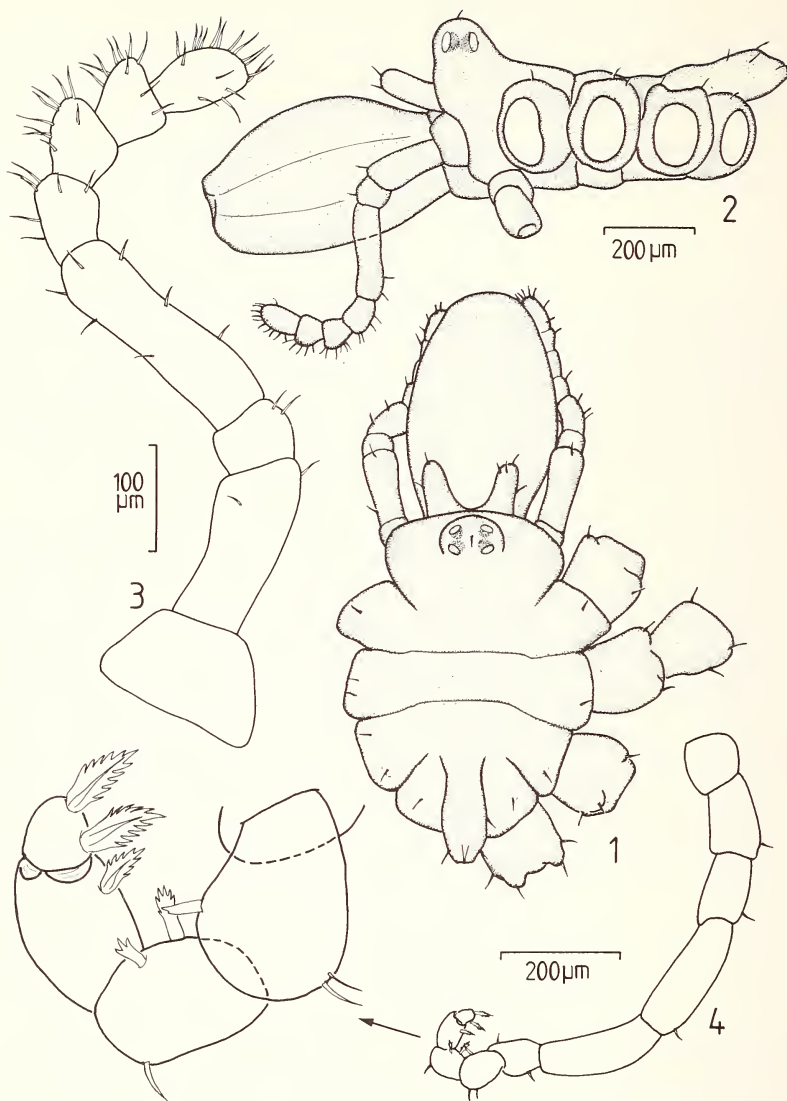
Ammothea Leach, 1814

Ammothea watamu n. sp. (Figs 1—6)

Holotype: ♂ (SMF 1610), Kenya; near Watamu, south of Malindi; dead corals covered with algae, 0—0.5 m, exposed locality, 24 July—7 August 1989. **Paratypes:** 2 ♂, 2 ♀, 2 juv. (ZFMK), collected together with holotype.

Diagnosis: *A. watamu* n. sp. is characteristic through its features intermediate between the genera *Ammothea* and *Tanystylum*. There is no suture line between 3rd and 4th trunk somite, the three anterior trunk somites have no trace of dorsal tubercles and the chelifores are unisegmented stumps. The lateral processes are touching, bearing 1—2 short dorsodistal setae.

Description (♂): Outline of trunk broad-oval, suture line lacking between third and fourth segment. Lateral processes touching, all with 1—2 short dorsodistal setae. Ocular tubercle wider than long, distally broadly rounded, apex with short simple seta.



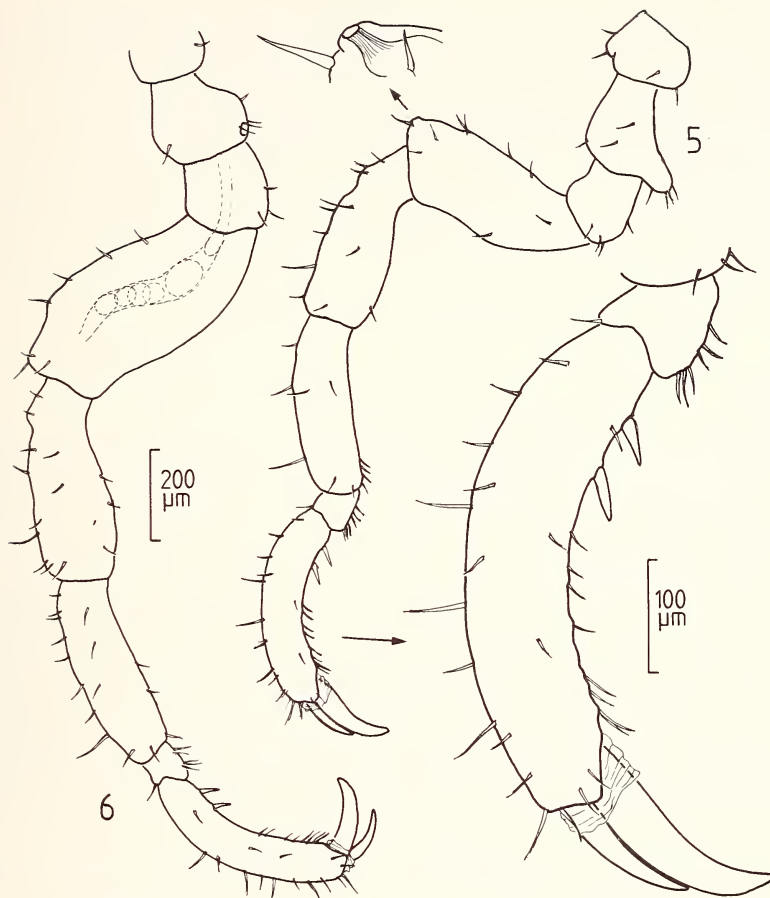
Figs 1—4: *Ammothea watamu* n. sp., ♂ holotype: 1) dorsal view; 2) lateral view; 3) palp; 4) oviger.

Eyes relatively large, oval and well pigmented.

Proboscis broad-oval, about 1.6 times longer than wide and $\frac{3}{4}$ of trunk length. Abdomen roughly cylindrical, distally narrowed with 2—3 simple setae, not reaching beyond proximal half of first coxae of 4th lateral processes.

Chelifores 1-segmented, without trace of chelae, rather short (about $\frac{1}{3}$ of proboscis length), armed with 2—4 short setae in distal half.

Palpi 8-segmented; basal segment widest, subequal in length to ovate 8th segment;



Figs 5—6: *Ammothea watamu* n. sp. — 5) ♂ holotype, 3rd leg; 6) ♀ paratype, 3rd leg.

fourth segment longest, 1.3 times longer than second. In particular, segments 5—8 with several short lateral and ventral setae.

Oviger 10-segmented; segments 1—3 and the more elongate segments 4—5 subequal in length; terminal segment smallest; 7th segment with distal bidentate spine; segments 8 + 10 with a pair of leaf-like, 9 with only one, compound spines, largest on terminal segment.

Legs relatively short and robust, armed with several short setae, mostly dorsal and lateral on tibiae and propodus; coxae 1 and 3 subequal in length; second coxa 1.6 times longer than coxae 1 and 3, with oval ventrodistal genital spur (reminiscent of genus *Achelia*); femur and tibia subequal in length, femur the more robust segment; dorsodistal cement-gland-opening located on very short, rounded tubercle; tarsus very short, of $\frac{1}{2}$ propodus length, bearing about 6 short, ventral setae; propodus relatively slender, well curved, without heel; sole with two strong spines in proximal

third, distally with about 8 short setae; main claw curved, robust, of 0.44 propodus length; auxiliaries robust, slightly curved, of two thirds length of main claw.

Measurements (mm):	
Length of trunk (anterior margin of cephalic segment to tip of abdomen)	0.78
Width of trunk (across first lateral processes)	0.61
Length of proboscis	0.53
Length of abdomen	0.27
Third leg:	
Coxa 1	0.15
Coxa 2	0.21
Coxa 3	0.16
Femur	0.39
Tibia 1	0.38
Tibia 2	0.38
Tarsus	0.10
Propodus	0.45
Main claw	0.19

♀: quite similar in habitus to ♂; second coxae of legs shorter and more robust than in ♂, lacking ventrodiscal genital spur; also, femur slightly longer and more robust than in ♂.

Etymology: The specific name is derived from the type locality, Watamu.

Distribution: Kenya.

Remarks: *A. watamu* n. sp. is remarkable within the genus, having characters of both the genera *Ammothella* and *Tanystylum*. Actually I see no close affinities to other species. However, there may be relationships to *Ammothella ovatooides* Stock, 1973 from Australia. This species also has the chelifores reduced to elongate stumps and an oval proboscis. The more slender habitus with narrowly separated lateral processes and the 9-segmented palpi distinguish that species easily from *A. watamu* (see Stock 1973: 103, fig. 1).

Ammothella Verrill, 1900

Ammothella indica Stock, 1954

Material: Kenya, near Watamu. — 1 ♂, 5 juv. (ZFMK); dead corals covered with algae, 0–0.5 m, exposed locality, 24 July–7 August. 1 ♂, 1 ♀, 4 juv. (SMF 1611); from dead corals covered with algae, 0–0.5 m, strongly exposed locality near reef slope, 7 August 1989.

A. indica is very common in the Indo-Pacific Ocean. On the African continent it was known only from the Durban area, South Africa (Stock 1959: 551).

Ammothella stauromata Child, 1982

Material: 1 ♀ (ov.) (SMF 1612), Kenya; near Watamu, dead corals covered with algae, 0–0.5 m, exposed locality, 7 August 1989.

A. stauromata is widely distributed in the tropical Indo-Pacific Ocean. It has been reported from the Marshall Islands (Child 1982 a: 271), the Philippines (Child 1988: 5), Moorea, Society Islands (Müller 1989: 125), American Samoa (Nakamura & Child 1988: 809) and the Fiji Islands (Müller, in press, a). The present record is the first from the Indian Ocean. More often it has been taken on coral reefs at depths from the intertidal down to 3 meters. The specimen from Kenya is unique through the presence of functional chelifore fingers in an ovigerous female.

Ammothella tippula Child, 1983

Material: Sri Lanka; near Moragalla, south of Beruwala. — 1 ♂ (ov.), 1 ♀ (ZFMK), reef-flat; from algae and sediment in shallow rockpools, 11 May 1989. 1 ♀ (ov.) (ZFMK), inner reef edge; from dead barnacles covered with algae, intertidal, 14 May 1989. 1 ♀ (SMF 1613), sea-grass-bed on reef-flat, 7–16 May 1989. 1 ♀ (SMF 1614), reef-flat near outer reef-edge; from barnacles, intertidal, 7–16 May 1989.

A. tippula apparently has a wide distribution in shallow water in the Indo-West-Pacific. In the Indian Ocean it was known only from Aldabra Atoll, Seychelles (Child 1988 b: 51) and La Réunion (Müller, in press, b).

Nymphopsis Haswell, 1885*Nymphopsis curtiscapus* Stock, 1974

Material: Kenya; near Watamu, south of Malindi. — 2 ♂ (ov.), 3 ♀, 3 juv., deposited as follows: (1 ♂ [ov.], 2 ♀ ZFMK; 1 ♂ [ov.], 1 ♀, 3 juv. SMF 1615); dead corals covered with algae, 0–0.5 m, exposed locality, 7 August 1989. 1 juv. (ZFMK); dead corals covered with algae, 0–0.5 m, strongly exposed locality near reef slope, 24 July–7 August 1989.

This species was known only from Madagascar and Somalia (Stock 1982: 187). The up to now unknown female is quite similar in its general habitus to the male with the exception of having much shorter ventrodistal genital spurs on the second coxae of the 3rd and 4th leg.

Tanystylum Miers, 1879*Tanystylum bredini* Child, 1970 (Figs 7–15)

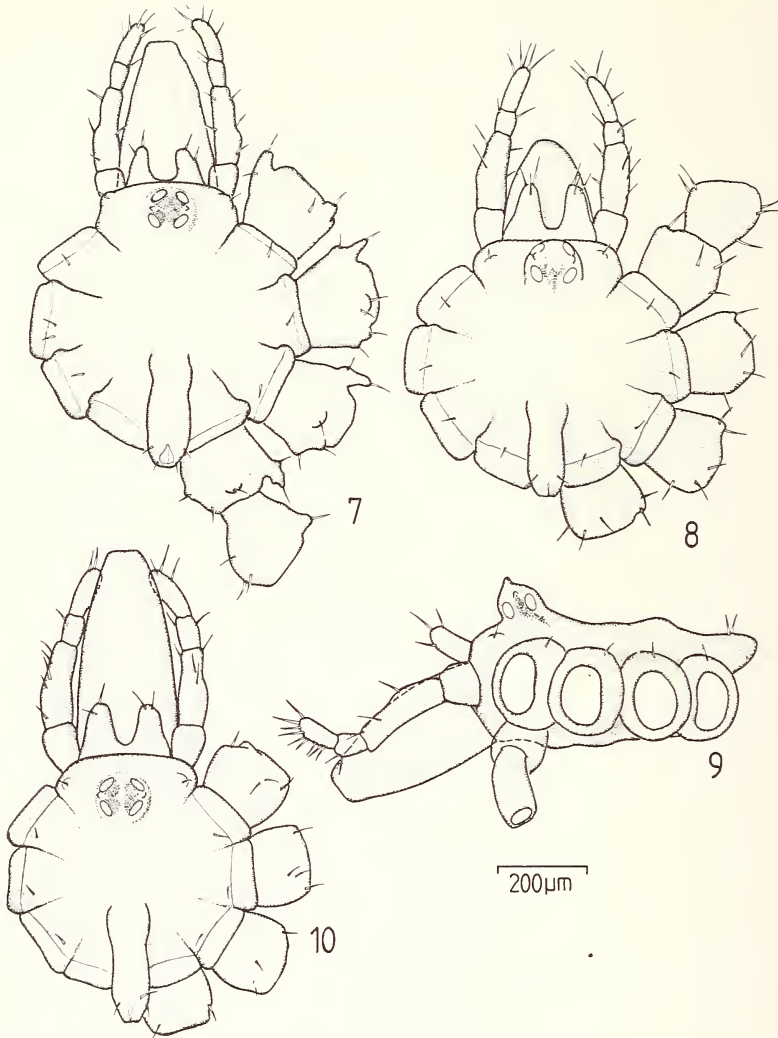
Material: Kenya. — 1 ♂, 2 ♀ (ov.), 1 juv. (ZFMK); near Watamu, south of Malindi; dead corals covered with algae, 0–0.5 m, exposed locality, 24 July–7 August 1989. Sri Lanka. — 12 ♂ (9 ov.), 3 ♀, 3 juv. (SMF 1616); near Moragalla, south of Beruwala; reef-flat near outer reef-edge, from barnacles, intertidal, 7–16 May 1989.

Although the variability of that species has been shown by Müller (1989: 132, Figs 11–21) based on material from Moorea, Society Islands, it was found to be useful to take in consideration some differing features in specimens from Kenya and Sri Lanka. The single male found in Kenya has the anterodistal spiny tubercles of the first coxae somewhat longer than specimens reported from Moorea. Contrary, specimens from Sri Lanka have these tubercles on the first coxae almost entirely reduced and have the terminal palp segment shorter than in material from Moorea. The shape of the ovigera and legs of both males and females from Sri Lanka are in good agreement with the material figured by Child (1970) and Müller (1989). Up to now *T. bredini* was known only from French Polynesia and the Seychelles (Child 1988 b: 52).

Tanystylum tubirostrum Stock, 1954 (Figs 16–20)

Material: 1 ♂ (ov.) (SMF 1617), Kenya; near Watamu, south of Malindi; dead corals covered with algae, 0–0.5 m, exposed locality, 24 July–7 August 1989.

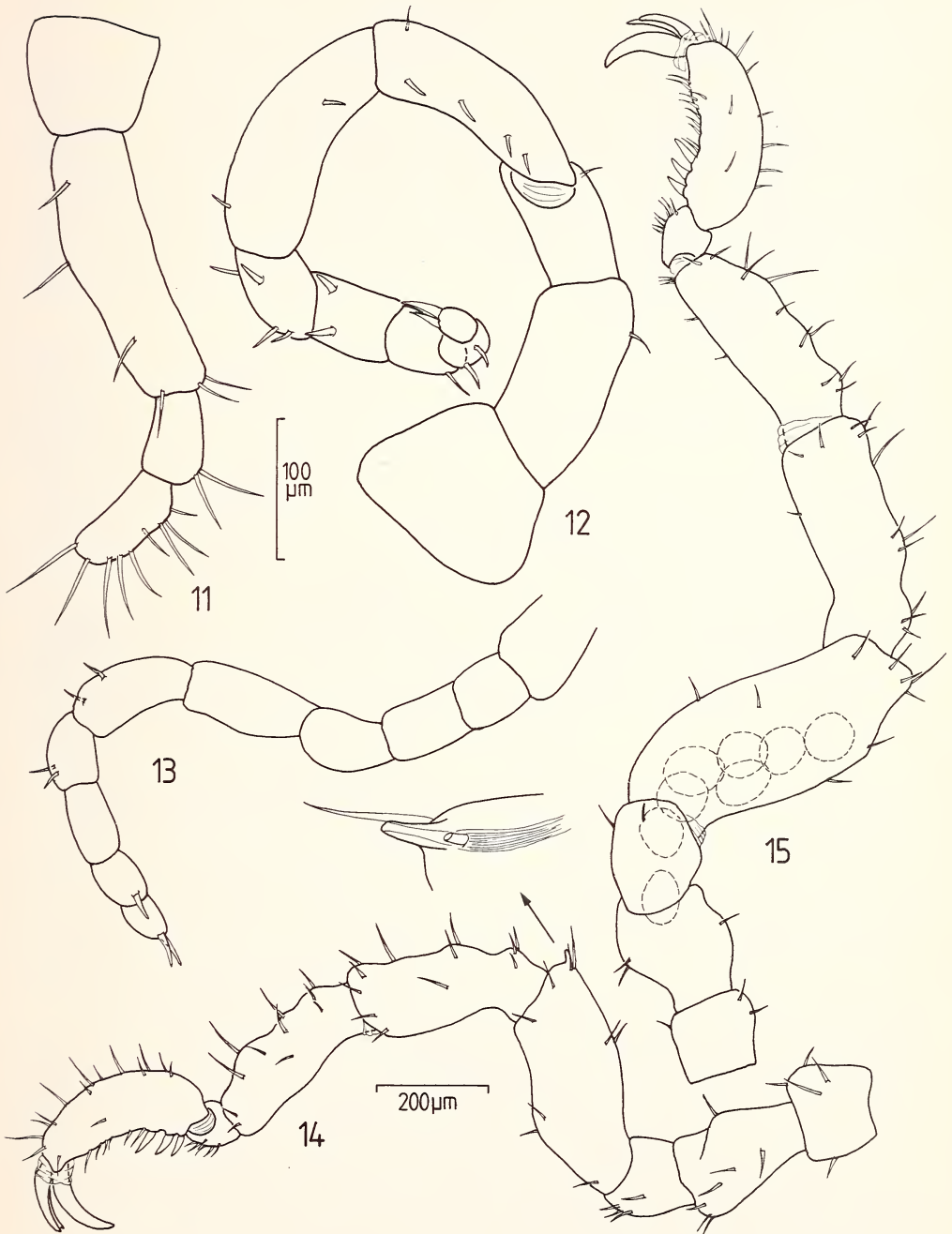
The type locality for this species is the island Bonaire in the southern Caribbean. Later it was found at several other locations in the tropical western Atlantic, which are listed in Child (1982 b: 363). In the Indo-Pacific Ocean it was known only from the Pacific coast of Panama (Child 1979: 34). This is now the second record for the



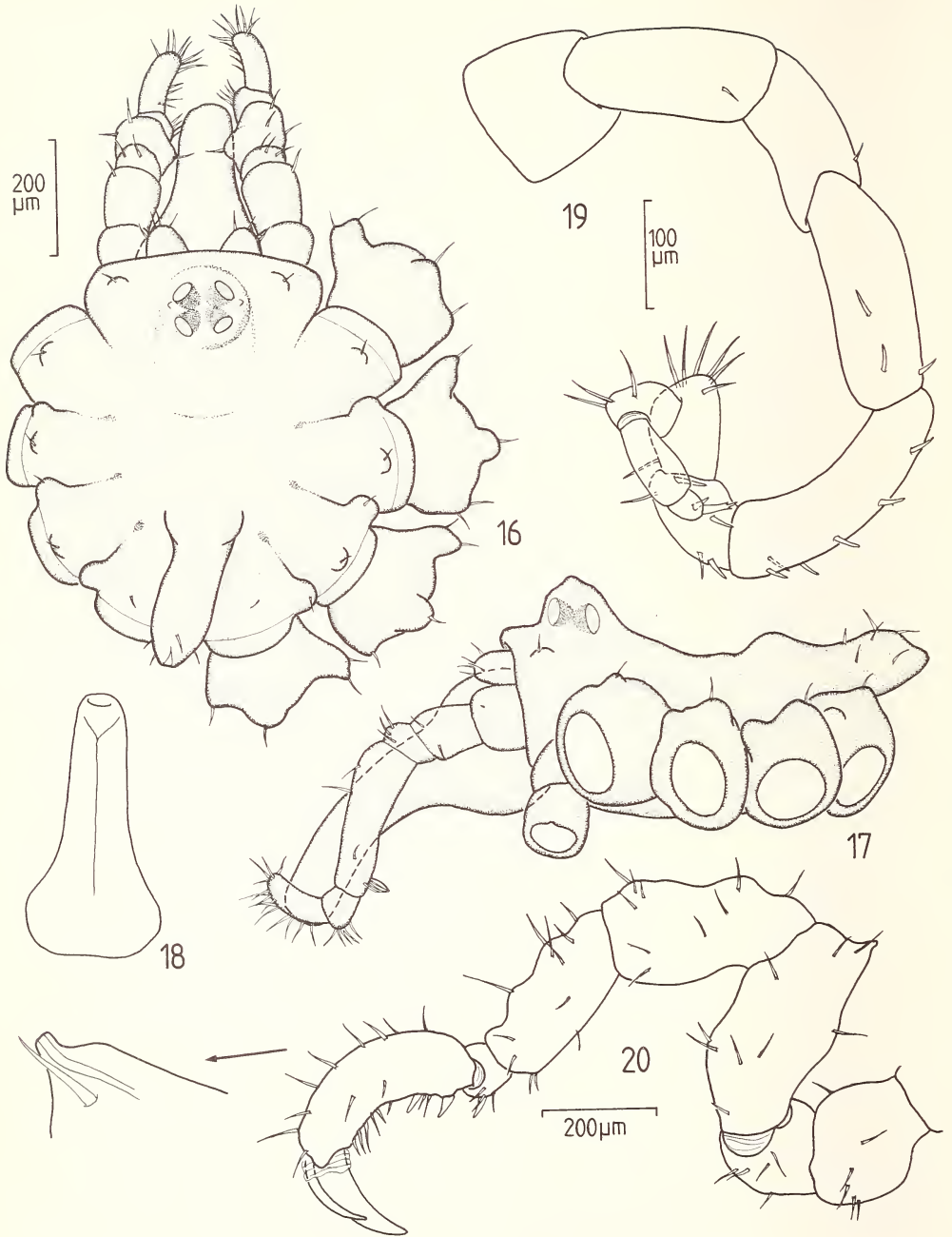
Figs 7–10: *Tanystylum bredini* Child, 1970: 7) ♂, dorsal view, Kenya; 8) ♂, dorsal view, Sri Lanka; 9) same specimen, lateral view; 10) ♀, dorsal view, Sri Lanka.

species from the Indo-Pacific and it greatly extends the known distribution to the east coast of Africa.

There are only minor differences to the original description (Stock 1954 a: 117, figs 24, 25). The single male found in Kenya has the chelicerae slightly more projecting and the distal apophysis of the 7th oviger segment shorter and more rounded. Specimens I examined from Panama Pacific (U.S. National Museum number 170514) lack any dorsal tubercles on the lateral processes and the chelicerae cannot be seen in dorsal view. The proboscis of the male from Kenya has its tube-shaped part slightly wider than specimens from Panama Pacific.



Figs 11–15: *Tanystylum bredini* Child, 1970, Sri Lanka: 11) ♂, palp; 12) ♂, oviger; 13) ♀, oviger; 14) ♂, 3rd leg; 15) ♀, 3rd leg.



Figs 16–20: *Tanystylum tubirostrum* Stock, 1954, ♂: 16) dorsal view; 17) lateral view; 18) proboscis, ventral view; 19) oviger; 20) 3rd leg.

Callipallenidae

Callipallene Flynn, 1929*Callipallene dubiosa* Hedgpeth, 1949

Material: 1 ♀ (ov.) (SMF 1618), Kenya; near Watamu, south of Malindi; dead corals covered with algae, 0–0.5 m, exposed locality, 24 July–7 August 1989.

The single female collected agrees well with the description given by Stock (1954 b: 42, Fig. 17). It seems to be a common shallow-water species in the Indo-West-Pacific and is newly recorded from Kenya. The distribution of *C. dubiosa* has been summarized by Kim & Hong (1986: 38).

Callipallene kenyensis n. sp. (Figs 21–26)

Holotype: ♀ (ov.) (SMF 1619), Kenya; near Watamu, south of Malindi; dead corals covered with algae, 0–0.5 m, exposed locality, 24 July–7 August 1989. Paratypes: 2 ♀ (1 ov.) (ZFMK); collected together with holotype.

Diagnosis: *C. kenyensis* n. sp. is characterized through its robust habitus with short neck, chelifore-fingers with 6–8 strong teeth, 4 distal oviger segments with row of 3–5 oval, denticulate leaflike spines, propodus without distinct heel and propodal sole with 3 strong spines in proximal third and 4 smaller spines in distal two thirds.

Description (♂): Small-sized species of compact habitus. Trunk oval in outline, no suture line between third and fourth segment. Lateral processes not longer than wide, distally separated by about half their own diameter or less, glabrous. Neck short, without parallel sides, expansion before chelifores wider than long. Ocular tubercles rounded, wider than long.

Eyes large, oval, well pigmented.

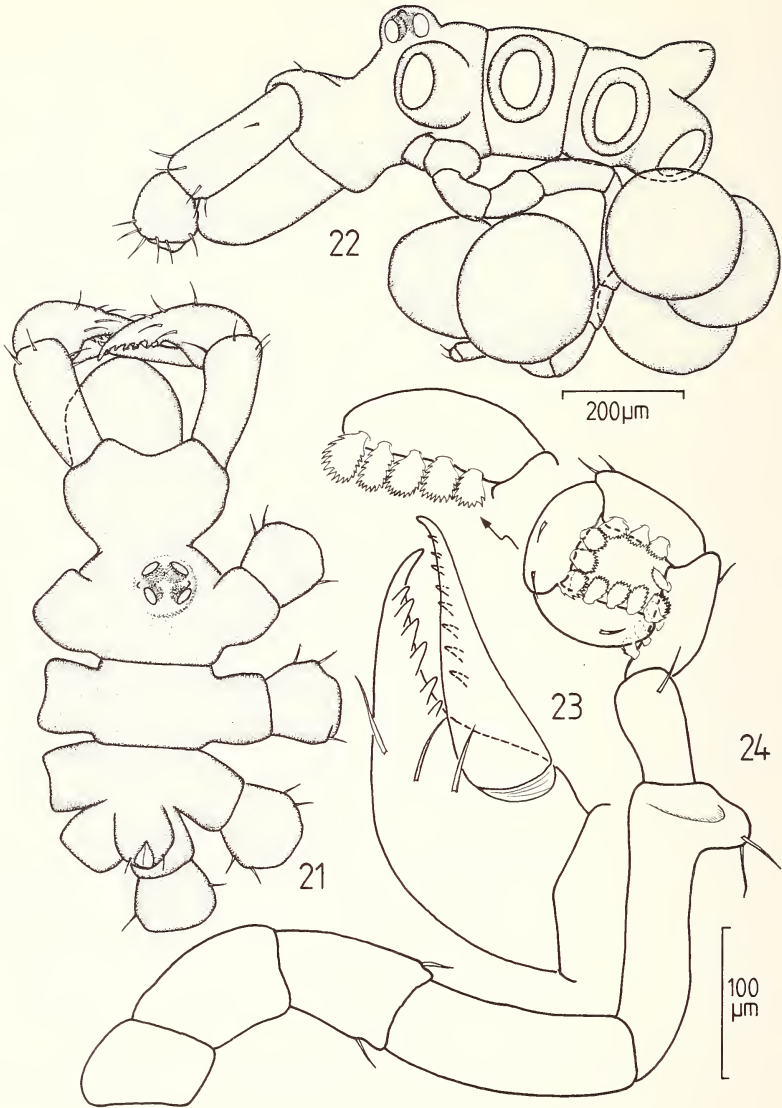
Proboscis broad-oval, almost parallel-sided in proximal half, of $\frac{1}{3}$ trunk length.

Abdomen a short, distally rounded stump with 2 short distal setae; abdomen not reaching beyond fourth lateral processes.

Chelifore scape moderately robust, 2.7 times longer than wide, armed with some short setae mainly near distal margin. Chela fingers longer than palm; movable finger armed with 8, immovable finger with 6 strong teeth; additionally the immovable finger with three setae near its base.

Oviger relatively robust, 10-segmented; first segment shortest; second and third subequal in length; fifth segment longest, slightly longer than 4th, with rounded distal apophysis bearing 2 short setae; strigilis segments subequal in length with row of denticulate, leaflike spines in the formula 4 : 3 : 3 : 5. Eggs of very large size, 8 times larger than strigilis segments diameter.

Legs moderately short and robust, cement glands not evident; few short setae mainly on lateral and dorsal surface of femur, tibiae and propodus; coxae 1 and 3 subequal in length; coxa 2 about 1.6 times longer than first or second coxa; femur more robust than other segments, subequal in length to tibia 2, slightly longer than tibia 1; tarsus very short, about $\frac{1}{5}$ of propodus length, bearing 3 short ventral setae; propodus slightly curved, without distinct heel; sole armed with 3 strong spines in proximal third and 4 smaller spines in two distal thirds; main claw robust, moderate-

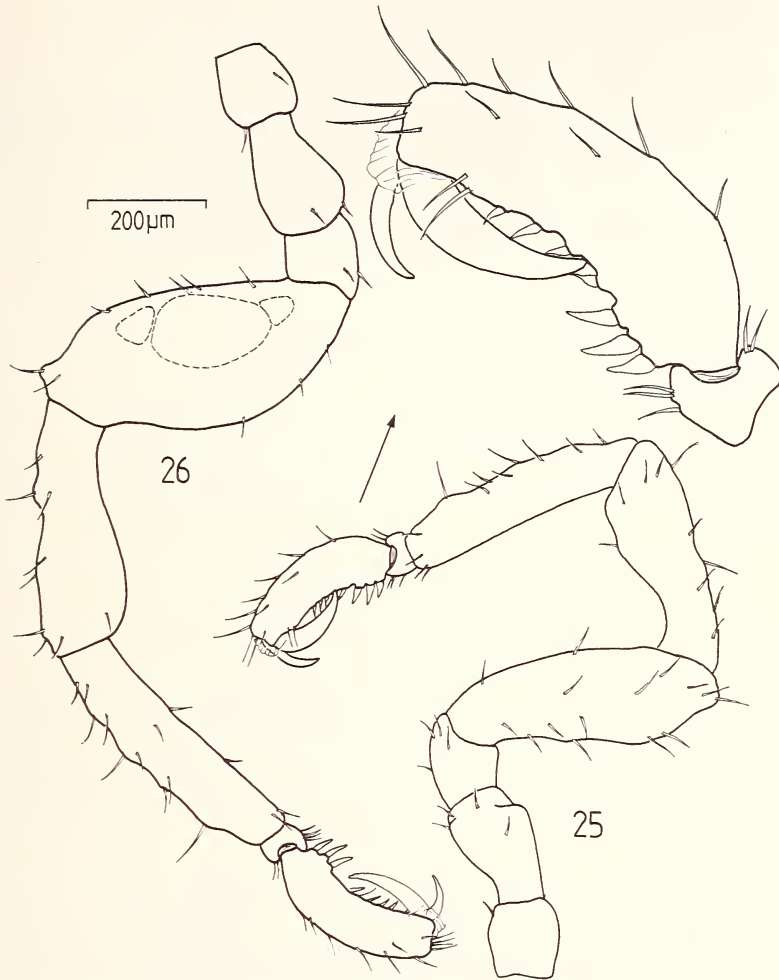


Figs 21–24: *Callipallene kenyensis* n. sp., ♂ holotype: 21) dorsal view; 22) lateral view; 23) chela; 24) oviger.

ly curved, of half propodus length; auxiliaries curved, about half length of main claw.

Measurements (mm):

Length of trunk (anterior margin of cephalic segment to posterior edge of 4th lateral processes)	0.74
Width of trunk (across first lateral processes)	0.41
Length of proboscis	0.24
Length of abdomen	0.11



Figs 25—26: *Callipallene kenyensis* n. sp.: 25) ♂ holotype, 3rd leg; 26) ov. ♀ paratype, 3rd leg.

Third leg:

Coxa 1	0.13
Coxa 2	0.20
Coxa 3	0.13
Femur	0.41
Tibia 1	0.38
Tibia 2	0.39
Tarsus	0.05
Propodus	0.27
Main claw	0.15
Auxiliaries	0.08

♀: similar in its general features to male, with femora somewhat broader for accommodation of eggs.

Etymology: The specific name derives from the country of the type locality, Kenya.

Distribution: Kenya.

Remarks: I hesitate to add another species to that difficult genus which is greatly in need of revision. The present species may be more closely related to *Callipallene dubiosa* Hedgpeth, 1949 from the Indo-West-Pacific. In *C. kenyensis* n. sp. the chelifore-fingers are armed with much stronger teeth and the propodal sole bears only 3 large and 4 smaller spines, no row of setae as in *C. dubiosa* (see Stock 154 b: 42, fig. 17).

Pigrogromitus Calman, 1927

Pigrogromitus timsanus Calman, 1927

Material: 9 adult specimens, 10 juv. (ZFMK), Sri Lanka; near Moragalla, south of Beruwala; reef-flat near outer reef-edge, from barnacles, intertidal, 7–16 May 1989.

A common, pantropical shallow-water species (Child 1988 a: 21). It is first recorded from Kenya.

Phoxichilidiidae

Anoplodactylus Wilson, 1878

Anoplodactylus anarthrus Loman, 1908

Material: 1 ♂ (SMF 1620), Kenya; near Watamu, south of Malindi; dead corals covered with algae, 0–0.5 m, exposed locality, 24 July–7 August 1989.

A. anarthrus is first reported from the Indian Ocean. It was known only from Timor and the Fiji Islands. A redescription of that species is given in Müller (in press, a).

Anoplodactylus glandulifer Stock, 1954

Material: Sri Lanka; near Moragalla, south of Beruwala. — 1 ♂ (ov.), 1 ♀, 1 juv. (SMF 1621); reef-flat, from algae and sediment in rockpools, 11 May 1989. 2 ♂ (1 ov.), 1 ♀, 2 juv. (ZFMK); reef-flat, seagrass, 7–16 May 1989.

A common shallow-water species in the tropical Indo-Pacific. It has already been found in Kenya (Stock 1968: 49).

Anoplodactylus krappi n. sp. (Figs 27–33)

Holotype: ♂ (SMF 1622), Kenya; near Watamu, south of Malindi; dead corals covered with algae, 0–0.5 m, exposed locality, 24 July–7 August 1989.

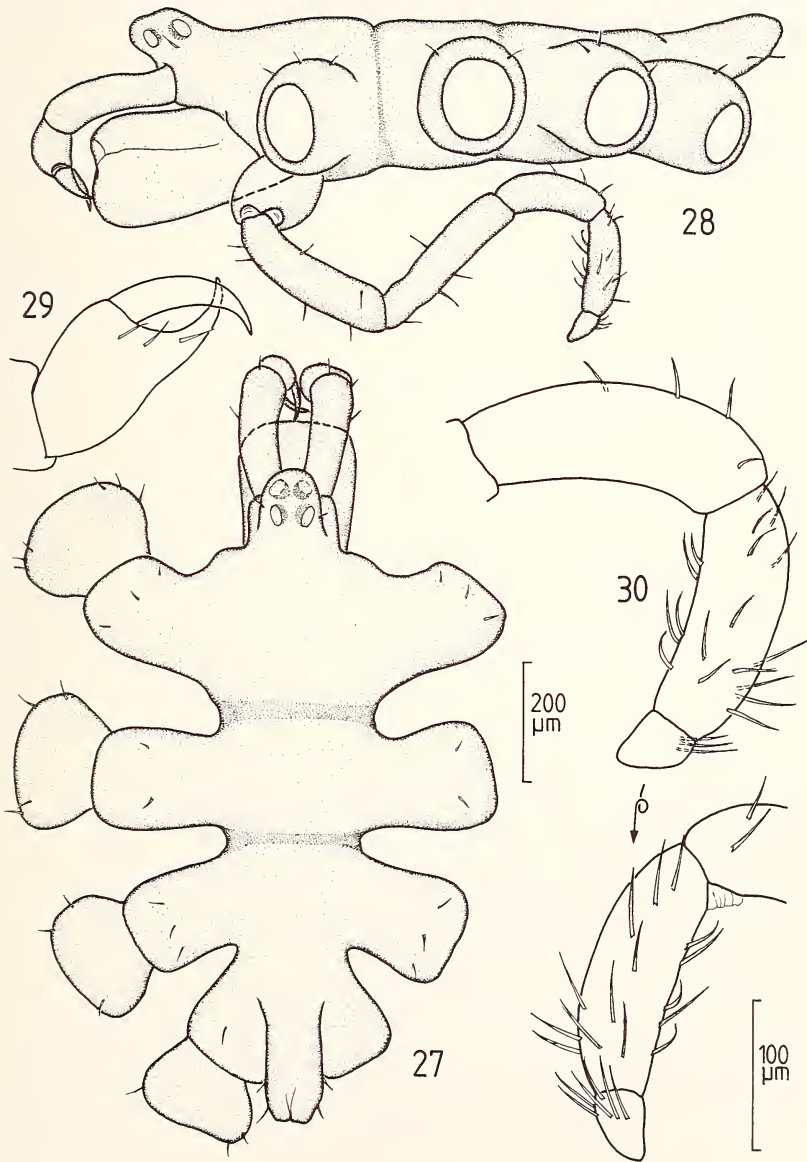
Diagnosis: *Anoplodactylus* with body smooth, all trunk somites fused and lateral processes separated by almost half their diameters. Cement-gland an elongate, curved tube of about $\frac{1}{2}$ length of femur. Propodal sole with single proximal spine on tubercle and very long lamina over almost entire length of sole. Auxiliary claws lacking.

Description (♂): Outline of trunk oval, robust and glabrous. Specimen moderately small with all trunk somites fused. Lateral processes slightly broadened distally

with few short, dorsodistal setae; lateral processes separated by almost half their diameters. Ocular tubercle wider than long, distally blunt, with short lateral seta near base; ocular tubercle projecting well forward over ocular segment and proboscis.

Eyes large, oval and well pigmented.

Proboscis cylindrical, robust and smooth, almost twice as long as wide.

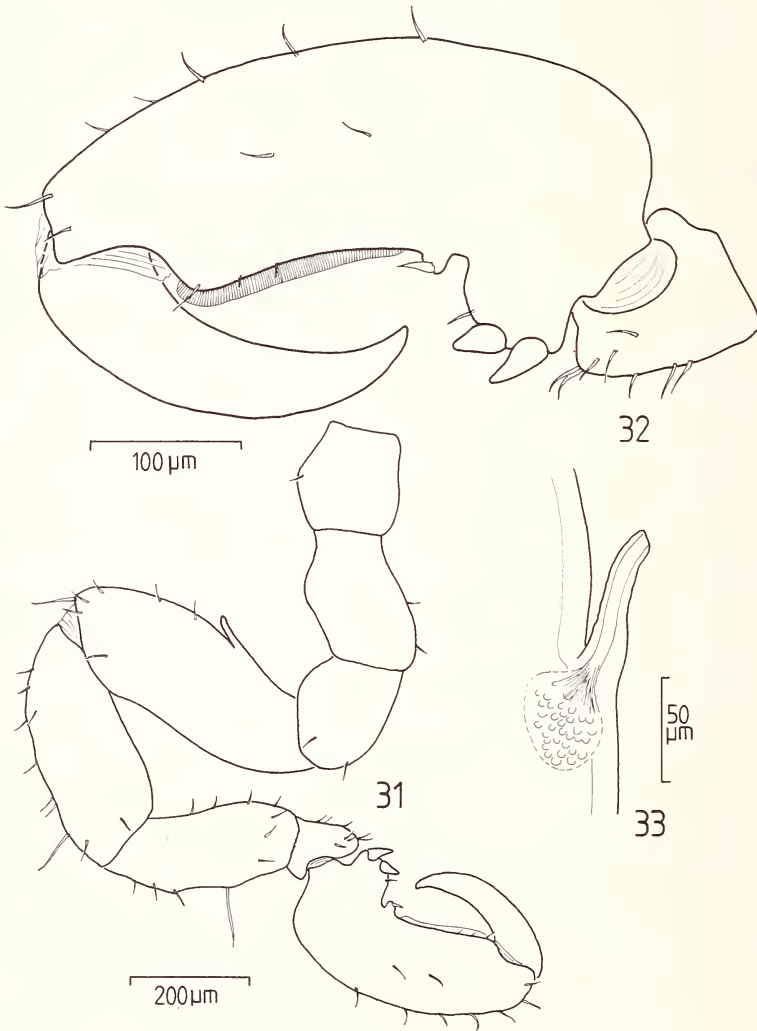


Figs 27–30: *Anoplodactylus krappi* n. sp., ♂ holotype: 27) dorsal view; 28) lateral view; 29) chela; 30) distal oviger segments, viewed from different angles.

Abdomen reaching beyond proximal half of first coxae of fourth lateral processes, tapering distally, with about 4 short setae.

Chelifores slender, scape relatively short, reaching beyond apex of proboscis. Chela slender, palm ovoid, somewhat longer than slender fingers; fingers well curved, without any teeth; immovable finger with three short setae in proximal half.

Oviger typical for genus, 6-segmented, relatively long; basal segment much broader than others, about half length of second; second and third segment subequal



Figs 31—33: *Anoplodactylus krappi* n. sp., ♂ holotype: 31) 3rd leg; 32) 3rd leg, tarsus and propodus; 33) cement gland.

in length, both armed with few short setae; fourth and fifth segment subequal in length, together about as long as third segment; 6th segment shortest, cone-shaped, about $\frac{1}{3}$ length of 5th segment; 5th and 6th segment more strongly setose than others.

Legs fairly short and robust, armed with few short setae, mostly dorsal and ventral. Coxae 1 and 3 subequal in length, second coxae slightly longer than first and third; femur the longest segment, 2.2 times longer than wide. Femoral cement gland tube near dorsal midpoint of segment, slender and curved, near apex dorsally directed; first tibia 1.2 times length of second tibia; tarsus very short, of about $\frac{1}{3}$ propodus length, armed with 8 short, ventral setae; propodus robust, well curved, with strong heel bearing 2 short robust spines and short seta; sole with short, distally directed proximal spine on tubercle; propodal lamina extending for almost entire sole length; claw stout, well curved, without trace of auxiliaries.

Measurements (mm):

Length of trunk (anterior margin ocular tubercle to tip of abdomen)	1.08
Width of trunk (across first lateral processes)	0.70
Length of proboscis	0.34
Length of abdomen	0.20
Third leg:	
Coxa 1	0.17
Coxa 2	0.23
Coxa 3	0.18
Femur	0.41
Tibia 1	0.35
Tibia 2	0.28
Tarsus	0.11
Propodus	0.42
Claw	0.26

♀: Unknown.

Etymology: Dedicated to Dr. Franz Krapp, Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, for his valuable contribution in pycnogonid taxonomy.

Distribution: Kenya.

Remarks: The new species may be more closely related to *Anoplodactylus calliopus* Staples, 1982 from Australia. In agreement with *A. krappi* n. sp. that species has a relatively robust trunk with lateral processes not touching, a robust and cylindrical proboscis, a slender (but longer) cement gland tube, a strong propodal heel, a long sole lamina and no trace of auxiliary claws. However, the longer ocular tubercle, strongly toothed chelifore fingers and the shape of the femoral cement gland separate *A. calliopus* easily from *A. krappi* (see Staples 1982: 459, fig. 3).

Anoplodactylus pycnosoma (Helfer, 1938)

Material: Kenya; near Watamu, south of Malindi. — 3 ♂ (2 ov.), 2 ♀, 5 juv. (ZFMK); dead corals covered with algae, 0–0.5 m, exposed locality, 24 July–7 August 1989. 2 ♂ (SMF 1623); dead corals covered with algae, 0–0.5 m, near reef slope, strongly exposed, 24 July–7 August 1989.

A very common species widely distributed in the Indo-West-Pacific. A redescription is given in Müller (in press, b), based on specimens from La Réunion. At the African coast it was known only from Tanzania (Stock 1975: 132).

Anoplodactylus tarsalis Stock, 1968

Material: Kenya; near Watamu, south of Malindi. — 1 ♂, 1 ♀ (ZFMK); dead corals covered with algae, 0–0.5 m, 24 July–7 August 1989. 1 ♂, 1 ♀ (SMF 1624); dead corals covered with algae, 0–0.5 m, near reef-slope, strongly exposed, 24 July–7 August 1989.

A. tarsalis was known only from the Philippines (Child 1988 a: 20, Stock 1968: 52) and is newly recorded from the Indian Ocean. Specimens from Kenya agree well in all features mentioned in the original description.

Acknowledgments

My thanks are due to Dr. C. A. Child, National Museum of Natural History, Washington, who loaned some specimens of *Tanystylum tubirostrum*.

Zusammenfassung

Es wird über 15 Arten von Flachwasser-Pantopoden berichtet, die der Verfasser in Kenia und Sri Lanka gesammelt hat. *Ammothella stauromata* Child, 1982, *Tanystylum tubirostrum* Stock, 1954, *Anoplodactylus anarthrus* Loman, 1908 und *Anoplodactylus tarsalis* Stock, 1968 werden erstmals für den Indischen Ozean nachgewiesen. 3 Arten, *Ammothea watamu* n. sp., *Callipallene kenyensis* n. sp. und *Anoplodactylus krappi* n. sp. erwiesen sich als neu für die Wissenschaft.

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