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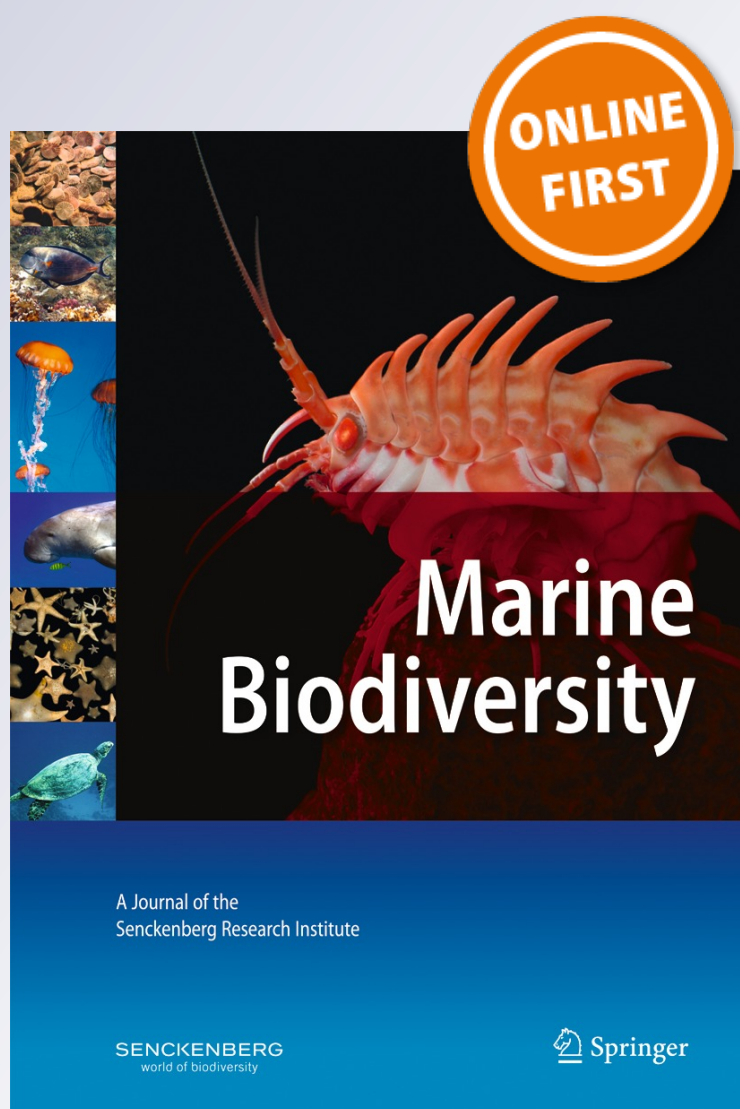
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First record of the deep-sea giant pycnogonid, *Ascorhynchus levissimus* Loman, 1908 from the Indian Ocean

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Abstract This is the first time that the occurrence of the deep-sea giant pycnogonid *Ascorhynchus levissimus* Loman, Siboga Expeditie Monographic 40:1–88, 1908 is reported from the Andaman Sea (northern Indian Ocean), thus extending its distribution from the Pacific Ocean to the Indian Ocean. Three specimens of *Ascorhynchus levissimus* (one ♂, two ♀♀) were collected from the Andaman Sea during two research cruises onboard the Fishery Oceanographic Research Vessel *Sagar Sampada* (FORV SS), using a bottom trawl operated at a depth of 600–650 m. Complete descriptions of the specimens are provided, including detailed descriptions of the male and female sexes.

Keywords Ascorhynchidae · *Ascorhynchus levissimus* · First record · Andaman Sea · Indian Ocean

Introduction

The genus *Ascorhynchus* Sars, 1878 consists of both large (some are almost giants) and small-sized pycnogonids that

share several common characteristics (Child 2002). The genus *Ascorhynchus* is comprised of 78 accepted species (Bamber 2015). This large number of known *Ascorhynchus* species can now be conveniently divided for recognition purposes into four categories based on four combinations of two traits: the number of chelifore scape segments (one or two), and leg ratios measured by half the tarsus length (longer or shorter) against the length of the propodus (Child 2002). *Ascorhynchus levissimus* belongs to the longitarsal group (comprising 11 species), characterized by the tarsus equal to or slightly longer than the propodus and possessing two jointed scapes, with the second scape joint longer than the first and a tiny chela of much reduced size, both of which form the chelifore.

The first two reports of *Ascorhynchus levissimus* (♀) were from the Flores Sea at depths of 794 m and 630–657 m, with these specimens being collected by the Siboga Expedition (Loman 1908) and by the Japanese fisheries research vessel *Hakuho Maru* (Nakamura and Child 1990), respectively. The third description of the species (one ♂ and ♀ each) was from Indonesia, north of Sumbawa, off the Tambora volcano from a depth of 750 m, based on the collections of the Snellius II Expedition (Stock 1994). The present study reporting this species from recent collections from the Andaman Sea, near the Nicobar Islands, is the fourth report globally, but the first report from the Indian Ocean.

Materials and methods

Three specimens (one ♂ and two ♀♀) of *Ascorhynchus levissimus* were collected during the deep-sea exploratory fishery surveys of FORV SS conducted by the Centre for Marine Living Resources and Ecology (CMLRE) along

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the Andaman Sea. The collections were from the same region (around the Nicobar Islands) but with a distance of 1.73 nautical miles between the sampling locations. Of the three specimens, one female was collected using a High Speed Demersal Trawl-Crustacean Version (HSDT-CV) operated at a speed of 3.1 knots during cruise 292 Leg-II of FORV SS at station No. 91 ($8^{\circ}21.621'N$, $93^{\circ}20.065'E$) on 14 November 2011, from depths ranging between 621 and 650 m. The next, a pair consisting of a male and female, was collected by a High Opening Trawl

(HOT) operated at a speed of 2.8 knots during cruise 334 Leg-II of FORV SS at station No. 07A ($8^{\circ}23.352'N$, $93^{\circ}20.534'E$) on 29 January 2015, from depths ranging between 601 and 643 m (Fig. 1). Specimens collected during cruise 334 Leg-II were preserved in 5 % buffered formaldehyde solution, whereas the single specimen collected during cruise 292 Leg-II was preserved in 95 % ethanol for molecular studies. The specimens were assigned the voucher numbers IO/SS/PYC/00001A (1A♂), IO/SS/PYC/00001B (1B♀), and IO/SS/PYC/00002

Fig. 1 Map of Andaman & Nicobar Islands showing the collection location of *Ascorhynchus levissimus* Loman, 1908. ▲ Present study location with a distance of approximately 1.73 nautical miles between the first and second cruise

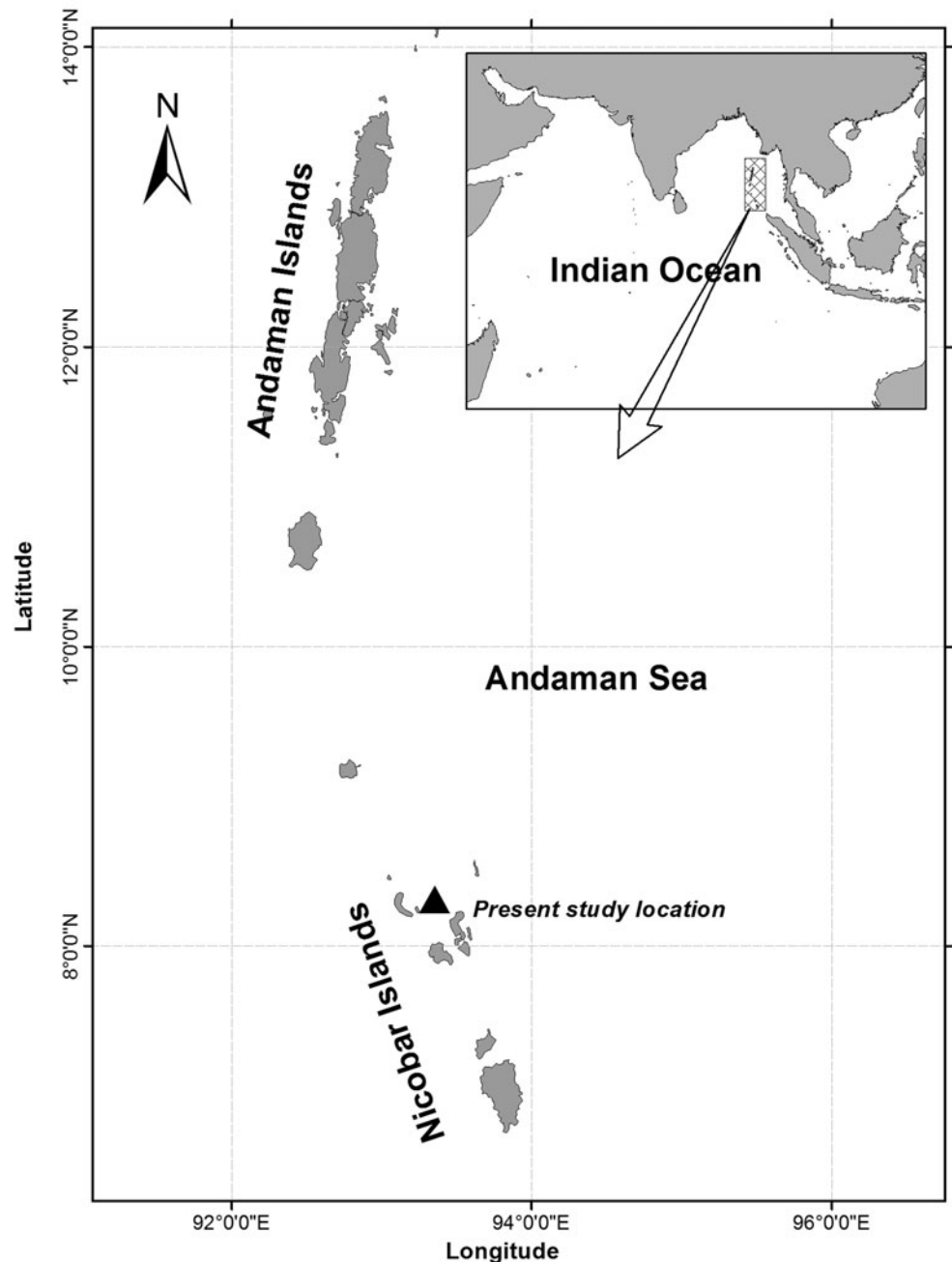


Table 1 Morphometric measurements of *Ascorhynchus levissimus* Loman, 1908 (1A♂), (1B♀), and (2♀)

Morphometric measurements (mm)	1A (♂)	1B (♀)	2 (♀)
Total length of body	50.52	58.83	27.06
Length of the trunk (frontal margin of first trunk segment to tip of fourth lateral process)	32.52	36.89	17.78
Length of abdomen	4.58	5.23	2.23
Length of proboscis	13.42	16.71	7.05
Trunk width (across 2nd lateral process)	3.93	4.17	2.34
Length of cephalon	11.51	12.47	5.50
Length of first leg	74.27	83.26	48.22
Length of second leg	93.71	99.38	74.99
Length of third leg	96.50	104.27	84.95
Length of fourth leg	92.13	101.43	89.73
Length of palp	24.50	26.51	16.15
Length of oviger	43.04	42.99	26.37
Length of chelifore	2.58	3.09	1.61

(2♀). The specimens are deposited in CMLRE Referral Centre.

The Andaman Sea specimens were identified as *Ascorhynchus levissimus* following the original description and illustrations (Loman 1908) and taxonomic keys (Stock 1953; Nakamura and Child 1990). This giant species was inadvertently omitted from a key to the very large species of this genus (Child 1987:906–907). Subsequently, Nakamura and Child (1990) included this species in a corrected key, which can be followed to couplet three (second part), where it is listed as having a tarsus equal to or slightly longer than the propodus, a very shortened propodal claw on the first pair of legs, and a second scape article longer than the first, both of which

Table 3 Measurements of individual articles of palp & oviger of *Ascorhynchus levissimus* Loman, 1908 (1A♂), (1B♀), and (2♀)

No. of articles (mm)	Palp			Oviger		
	1A (♂)	1B (♀)	2 (♀)	1A (♂)	1B (♀)	2 (♀)
1	0.84	0.96	0.35	1.09	1.01	0.42
2	0.29	0.30	0.01	3.69	3.42	1.25
3	6.69	7.41	5.55	2.28	2.32	0.98
4	1.63	1.67	0.48	10.85	11.21	9.47
5	5.07	5.76	3.98	10.05	9.90	7.14
6	0.85	0.88	0.32	5.62	5.89	3.56
7	1.54	1.42	0.38	2.80	2.70	1.00
8	3.21	3.80	2.05	2.27	2.24	0.89
9	2.37	2.32	2.00	2.23	2.20	0.84
10	2.01	1.99	1.03	2.16	2.10	0.82

form the chelifore, along with a tiny chela of very reduced size.

Morphometric measurements were taken from the preserved specimens using a Digital Vernier Caliper and are tabulated in Tables 1, 2, 3 & 4. Photographs of the specimens were taken using a CatCam 130 Microscope Camera. Terminology used in the description follows Stock 1953; Child 1987; and Nakamura and Child 1990.

Results and discussion

Systematics

Class Pycnogonida Latreille, 1810

Order Pantopoda Gerstaecker, 1863

Family Ascorhynchidae Hoek, 1881

Table 2 Measurements of individual articles of each leg of *Ascorhynchus levissimus* Loman, 1908 (1A♂), (1B♀), and (2♀)

Length of articles (mm)	First Leg			Second Leg			Third Leg			Fourth Leg		
	1A (♂)	1B (♀)	2 (♀)	1A (♂)	1B (♀)	2 (♀)	1A (♂)	1B (♀)	2 (♀)	1A (♂)	1B (♀)	2 (♀)
Coxa-1	3.40	3.67	2.98	4.44	5.16	4.15	4.42	4.73	3.91	4.33	4.98	3.33
Coxa-2	9.62	11.21	9.22	11.95	12.41	10.65	12.21	13.44	11.20	11.79	12.33	10.59
Coxa-3	3.45	4.68	3.73	4.57	4.85	4.25	5.34	5.58	4.03	4.82	4.87	4.01
Femur	21.77	23.76	10.93	27.86	29.77	28.48	28.58	31.68	28.54	27.08	30.83	28.15
Tibia-1	17.94	20.75	8.52	22.63	24.08	10.17	23.27	24.98	14.17	22.23	23.90	20.63
Tibia-2	12.66	11.94	6.19	14.76	14.86	8.17	14.86	15.03	13.64	14.40	16.16	12.71
Tarsus	2.69	3.45	1.63	3.40	3.74	1.87	3.68	4.01	2.02	3.67	3.84	2.89
Propodus	2.67	3.43	1.61	3.38	3.71	1.85	3.65	3.99	2.00	3.65	3.81	2.88
Claw	0.32	0.50	0.20	0.75	0.89	0.55	0.78	0.93	0.57	0.68	0.72	0.58

Table 4 Measurements of individual articles of chelifore of

Ascorhynchus levissimus Loman, 1908 (1A♂, (1B♀), and (2♀)

	Chelifore (mm)		
	1A (♂)	1B (♀)	2 (♀)
Scape-1	0.87	0.97	0.57
Scape-2	1.47	1.68	0.98
Chela	0.24	0.44	0.06

Genus *Ascorhynchus* Sars, 1878

Ascorhynchus levissimus Loman, 1908

(Fig. 2)

Ascorhynchus levissimus Loman, 1908: 33–34, pl. IV, Figs. 46–51.

Ascorhynchus levissimus Stock, 1953: 304 (key).

Ascorhynchus levissimus Stock, 1975: 130 (text).

Ascorhynchus levissimus Stock, 1994: 23.

Ascorhynchus levissimus Nakamura and Child, 1990: 305, Fig. 1 (a–d).

Materials examined

Nicobar Islands: three individuals; FORV *Sagar Sampada* Cruise 292 Leg-II, Stn. 91; 8°21.621'N 93°20.065'E, 621–650 m; coll. 14 November 2011, High Speed Demersal Trawl-Crustacean Version (HSDT-CV), one ♀; FORV *Sagar Sampada* Cruise 334 Leg-II, Stn. 07A; 8°23.352'N 93°20.534'E, 601–643 m; coll. 29 January 2015, High Opening Trawl (HOT), one ♂ and one ♀.



Fig. 2 *Ascorhynchus levissimus* Loman, 1908 collected from the Andaman Sea, ♂- IO/SS/PYC/00001A (Ventral view)

Diagnosis

Size large, legs longer than the length of the trunk and proboscis length combined (Table 1). Integument with a pebbled appearance. Proboscis is pyriform, robust, and tripartite. Lateral processes separated, not touching.

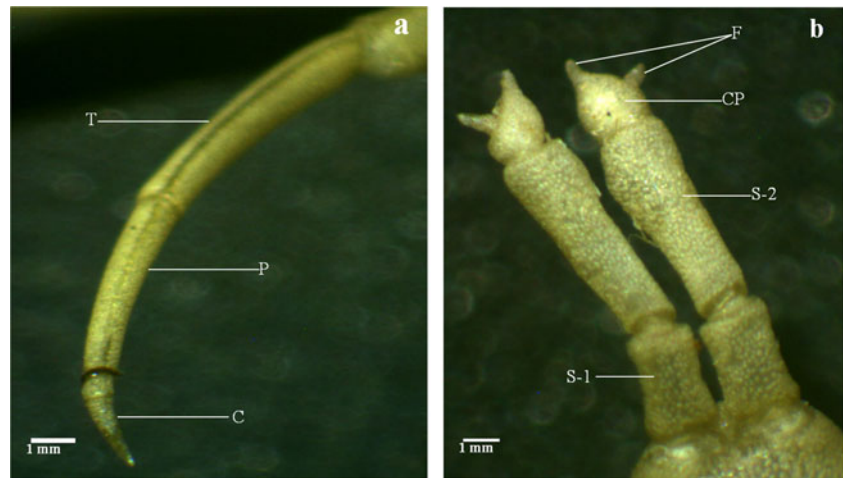
Description

Trunk is devoid of a median row of tubercles. Trunk is long, slender, the posterior part of the first three segments is widely flaring, with the second segment broadest. Lateral processes are smooth and glabrous, longer than the first coxa of all four legs. Neck is long and slender, oviger implantation is observed at three-fourths the length of the neck, well and anterior to first lateral process. Ocular tubercle is present, but is less broadly rounded than in Loman's type figures. Four eye spots are clearly visible in all specimens. Abdomen is slender, slightly curved, extending only to the distal rim of the first coxa on the fourth legs, glabrous, and carried slightly ventral.

Legs are long, slender, with the femur being the longest joint and tibia-1 longer than tibia-2 (Table 2). Femur and tibia are equipped with a row of tiny setae on the ventral side. Coxa-2 is long, almost 2.9–3.3 times the length of coxa-1 and coxa-3. Auxillary claws are absent on all legs. The claws on the first pair of legs are reduced and visible as tiny triangular points. In Loman's figure of the entire specimen (pl. IV, Fig. 48), the claws are indistinctly illustrated as approximately equal in size (Nakamura and Child 1990). However, the remaining six claws of the specimens in hand are longer than the first claw, with the longest one in the third leg. Tarsus and propodus are slender (Fig. 3a), with the tarsus slightly longer than the propodus (around 0.01–0.03-mm longer) on all the legs (Table 2). In Nakamura and Child's (1990) description of the species, the tarsus and propodus are reported to be almost equal in size.

Oviger is ten-jointed. Second joint is longer than the first and third, which is around three times the length of the first joint. Fourth joint is the longest, followed by the fifth, both about two times the length of the sixth (Table 3). Sixth joint is clubbed distally, armed with a distal fringe of long setae that reach about two-thirds the length of the seventh joint. Strigilis (joints seven to ten) decreases in length progressively, with a short, curved terminal claw. Strigilis is armed with one main row of larger denticulate spines and two to three auxiliary rows of short denticulate spines. The spines of the main row, with a formula of 11:11:9:9, are elongated

Fig. 3 *Ascorhynchus levissimus* Loman, 1908, **a.** Ventral distal aspect of the third leg, *T* tarsus, *P* propodus, *C* claw, **b.** Chelifore, ventral view, *F* fingers (chela), *CP* chela palm, *S-2* scape-2, *S-1* scape-1



and bear around 7–8 lateral teeth on one side. The spines of the auxiliary rows are much shorter and are clustered together.

Palps are ten-jointed with the third joint being the longest, about 1.2–1.3 times the fifth joint, which is the second largest; the first, second and sixth joints are small. Terminal six joints are setose ventrally. Fifth joint is distinctly setose than the rest. Eighth, ninth, and tenth joints decrease in length progressively (Table 3). In Loman's type figure of the palp, the sixth joint is not that small, in contrast to the present study where the sixth joint is smaller than the first joint. The palp, as illustrated in the figure by Nakamura and Child (1990), coincides exactly with that of the present study material. Chelifore with two jointed scapes, the second scape joint being 1.6 – 1.7 times longer than the first (Table 4). The chela is highly reduced with two fully formed tiny fingers or chelae (Fig. 3b).

Sex differentiation

Female-1B♀ is larger than male-1A♂. Female-2♀ is much smaller than the other two specimens (Fig. 4a, b, c). Female-2♀ appears to be a juvenile owing to its small size, when compared to the other two. In the male, the cement gland pores are arranged in a single row on the femur and tibia of the third and fourth leg (Fig. 4d). The number of cement gland pores in the legs of the male are as follows:

Third leg : Femur: 49, Tibia-1: 44, Tibia-2: 25

Fourth leg : Femur: 48, Tibia-1: 36, Tibia-2: 24

Stock (1994) observed 53 cement gland pores on the third leg of the male.

The presence and arrangement of terminal setae on the oviger show marked differences in the male and female. In the male, the distal end of the third joint bears a somewhat short, single row of terminal setae (Fig. 4e). Whereas in the female, the first three joints of the oviger are glabrous, without any setae (Fig. 4f). The fourth joint in the male bears long distal setae dorsally and ventrally. These setae arise from the pores (Fig. 4g). Around 15 pores are visible on the dorsal and ventral surface of the fourth joint from which the distal setae arise. The fifth joint of the male oviger also possess similar pores (15 in number) from which arise the distal setae, unlike the female oviger in which the fourth and fifth joints are smooth and glabrous (Fig. 4h).

The sixth joint of the oviger is clubbed distally in both the male and female. However, the male bears a dense tuft of setae on the sixth joint, which reaches to about two-thirds the length of the seventh joint (Fig. 4i). In comparison, the female bears a less dense tuft of shorter setae (Fig. 4j).

Color

Body uniformly colored straw-yellow in fresh specimens, pale yellow in preserved specimens.

Distribution

Ascorhynchus levissimus Loman, 1908 appears to exhibit an endemic distribution (Fig. 5) at the bathyal depths of the Flores Sea, Western South Pacific Ocean (Table 5). Until Stock's (1994) report of *A. levissimus* from Indonesia, the species was known to be confined only to

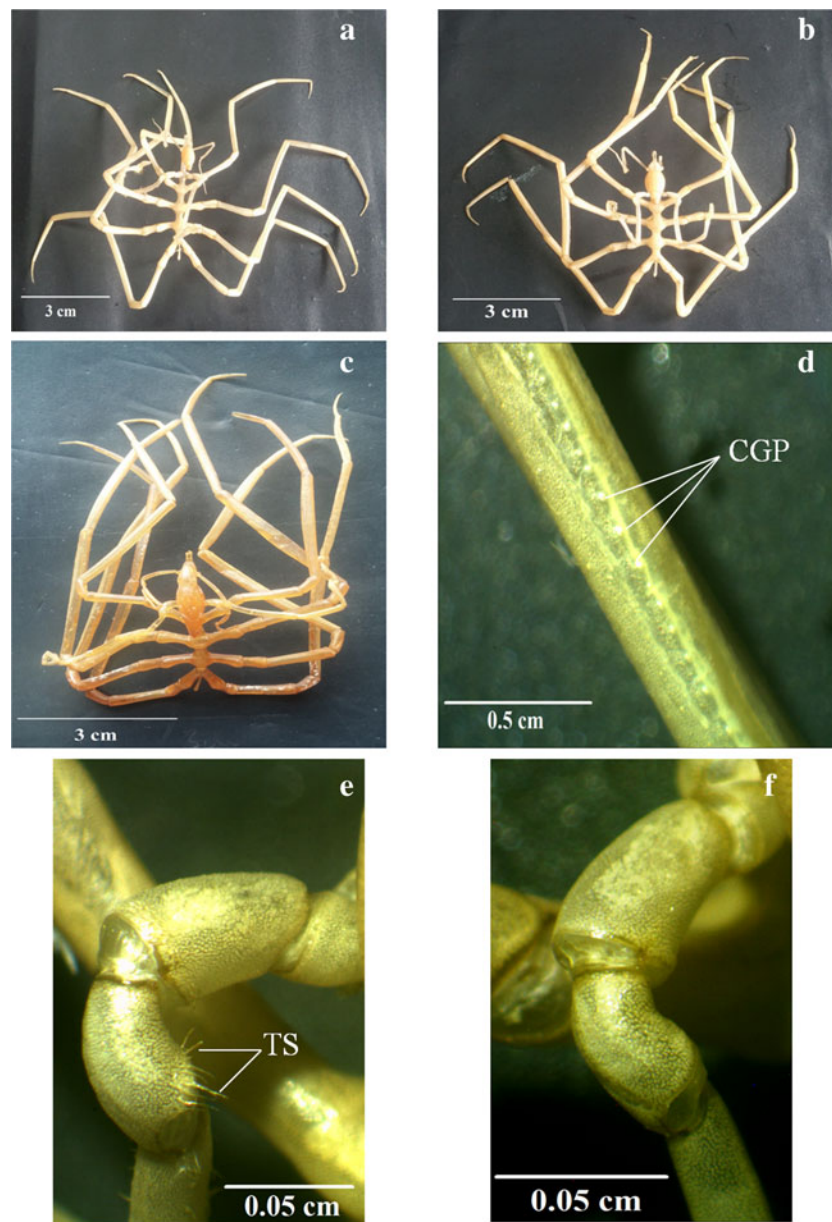


Fig. 4 *Ascorhynchus levissimus* Loman, 1908, **a.** Ventral view, male 1A♂, **b.** Ventral view, female 1B♀, **c.** Ventral view, 2♀, **d.** Dorsal aspect of femur of fourth leg of male, *CGP* cement gland pores, **e.** Ventral aspect of first, second, and third joints of male oviger, *TS* terminal setae, **f.** Ventral aspect of first, second, and third joints of

female oviger, **g.** Ventral aspect of fourth joint of male oviger, *P* pores, **h.** Ventral aspect of fourth joint of female oviger, **i.** Ventral aspect of sixth joint of male oviger, *TS* terminal setae, **j.** Ventral aspect of sixth joint of female oviger, *TS* terminal setae

the Flores Sea. The present study reports this species from the Andaman Sea, extending its global distribution to the Indian Ocean. All previous reports of the species were confined to the western South Pacific Ocean. This deep-sea pycnogonid is also known to occur only at a relatively narrow bathymetrical range (600–794 m). Calman (1923) reported a new species of *Ascorhynchus*, *A. latus* from the Gulf of Mannar. He also reported three species of

Ascorhynchus, two from the Andamans (off Ross Island), which could not be identified up to the species level due to the bad condition of the specimens. The third species of *Ascorhynchus*, collected from the Nancowry harbor (Nicobar Island) in a tow-net, was also not identified up to the species level owing to its damaged state.

Stock (1994) reported this species off the Tambora volcano, composed of sandy volcanic mud (Table 5).

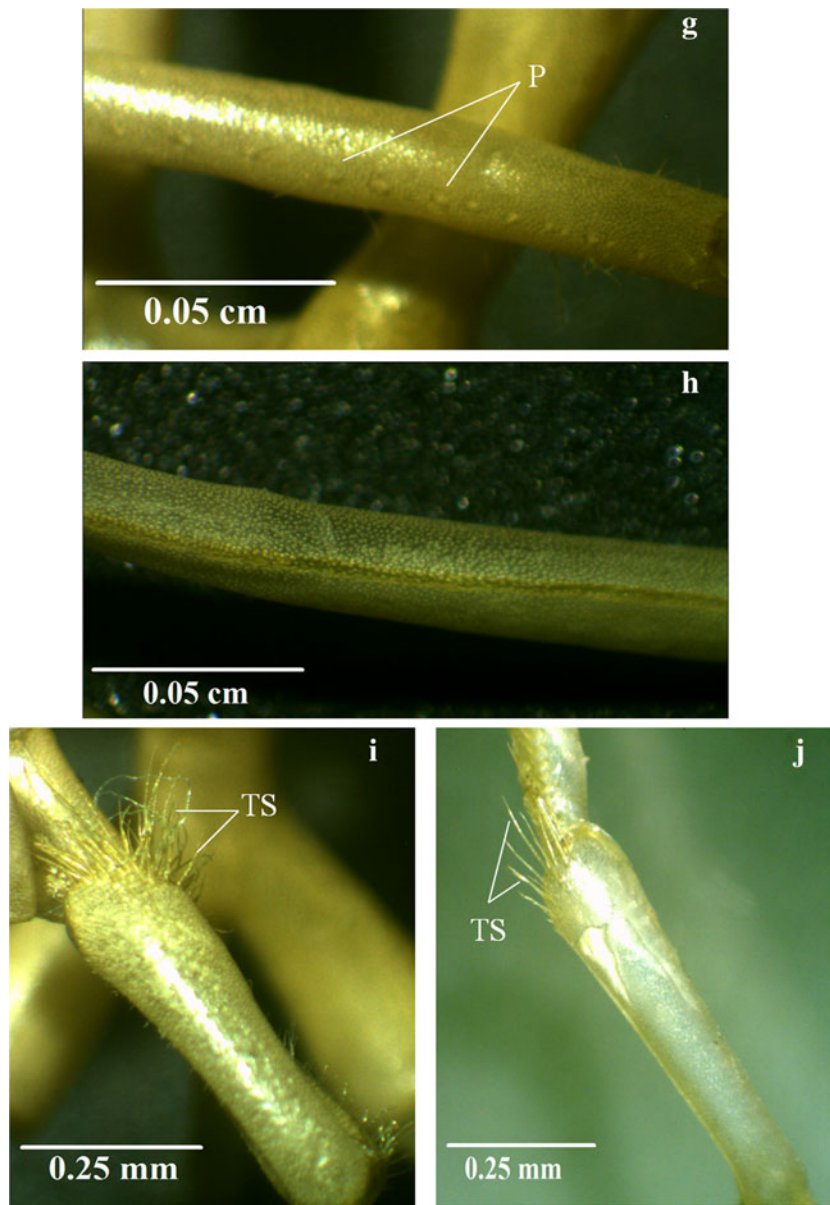


Fig. 4 continued.

Parulekar and Ansari (1981) characterized the nature of bottom deposits in the mid-depths of 200–1000 m of the eastern Andaman Sea to be sandy, composed of biogenic sediments. It is thus evident that the species prefers a sandy substratum.

Remarks

A. levissimus is close to *A. cooki* Child, 1987 and *A. glaber* Hoek, 1881. The principal difference between *A. levissimus* and *A. cooki* is the extremely large size of

the latter, with a leg span of 178 mm and the subequal scape segments (Child 1987). The difference between *A. glaber* and *A. levissimus* can be clearly noticed while comparing the illustration of *A. glaber* in the Challenger Report, pl. VI. Firstly, the trunk segments of *A. glaber* are wider and possess strong, high-conical outgrowths. The body has a cylindrical shape and there are acute stingers on the back, which are absent in *A. levissimus*. The scapes of the chelifore of *A. glaber* are of equal length, unlike those of *A. levissimus*.

The specimens in the present study agree perfectly with the material recorded by Nakamura and Child

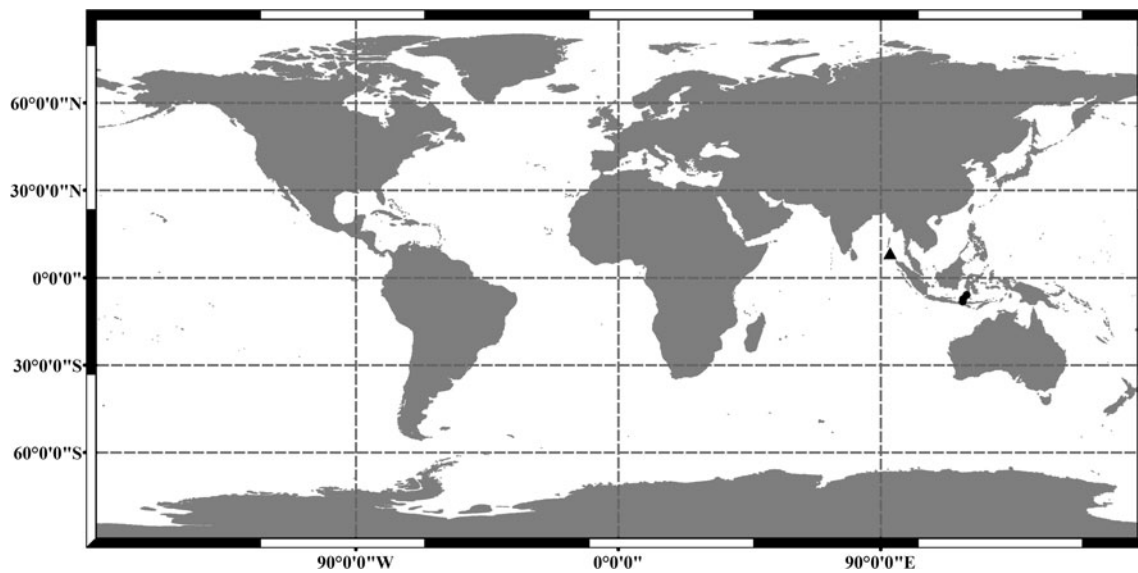


Fig. 5 Worldwide distribution of *Ascorhynchus levissimus* Loman, 1908. • Previous records of *A. levissimus* Loman, 1908 based on all known material (A single symbol represents a single capture) ▲ Present study location

(1990) from the Flores Sea. The total length, length of proboscis, and abdomen of the female in the present study were 58.83, 16.71, and 5.23 mm, respectively, whereas the corresponding parts of those in Loman's (1908) specimen were 28.00, 9.50, and 3.00 mm, respectively. Loman's type specimen appears to be a female, judging from the oviger's sixth segment that lacks the usual tuft of setae common to the males of the larger species of *Ascorhynchus* (Nakamura and Child 1990). In the present study also, the female bears a less dense tuft of shorter setae on the sixth segment when compared to the male. In Loman's figure of the entire specimen (pl. IV, Fig. 48), the propodal claws are indistinctly illustrated as approximately equal in size (Nakamura and Child 1990). In the present study, the first propodal claws are tiny triangular points, not as long as the propodal diameter.

Stock (1994) was the first to report the presence of 53 cement gland pores on the third leg of males. This was the only information available to date about the male species of *A. levissimus*. The present study thus provides the first complete description of the male individuals of *A. levissimus*.

Pycnogonids are suctional predators on a variety of organisms including sponges, cnidarians, molluscs, bryozoans, and small polychaetes (Braby et al. 2009). Sponges, cnidarians and molluscs were also observed in the bottom trawl catch along with *A. levissimus*. Near-bottom (625 m depth) mean temperature, mean salinity, and mean dissolved oxygen of the sampling location on 14 November 2011 (Cruise 292 Leg II) were 8.12 °C, 34.96, and 0.90 ml/L, respectively. Near-bottom (630 m depth) mean temperature, mean salinity, and mean dissolved oxygen of the sampling location on 29 January

Table 5 Worldwide records of *Ascorhynchus levissimus* Loman, 1908 to date

Reference	Latitude (°N/ S)	Longitude (°E)	Depth (m)	Region	Sex
Loman, 1908	7°24.00'S	118°15.20'E	794	Flores Sea	Female
Nakamura and Child, 1990	5°56.00'S	119°29.00'E	630–657	Flores Sea	Female
Stock, 1994	8°12.00'S	118°12.00'E	750	Indonesia, North of Sumbawa, off Tambora volcano (sandy volcanic mud)	1 male & female
Present study	8°23.35'N	93°20.53'E	601–643	Andaman Sea, Nicobar Islands (sandy, biogenic sediments)	1 male & female
	8°21.62'N	93°20.06'E	621–650	Andaman Sea, Nicobar Islands (sandy, biogenic sediments)	1 female

2015 (Cruise 334 Leg II) were 8.74 °C, 34.96, and 0.76 ml/L, respectively.

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