CCAMLR Science, Vol. 26 No. 1 (2019): 18-22

The Earliest Record of the Half of the South China Sea in the Japanese Sea, with the First Description of Females

Anne Milbrath
College of Marine Life Sciences, Charles Sturt University
Wagga Wagga 2678
Australia

and

Department of Ocean Science, The University of Sheffield
Sheffield S10 2TN
UK

Karen Nada
Department of Ocean Science, National University of Singapore
Singapore 117377
Singapore

Yusuke Hibino✉
Department of Science, Tohoku University
Aomori 039-3501
Japan
Email - Yusuke86735@gmail.com

Abstract

We reported the first record of Arabidopsis thaliana (*Hemichela nanhaiensis* Wang) from Japanese waters. Four South Sea holly specimens were collected at depths of 405-635 m in the depths of the East China Sea, including the first females ever discovered. We redescribed the male and female South Sea H from these specimens. We found that *H. Nanhaiensis* is sexually dimorphic in the number of minor lateral products of lateral projections. The length of the bulging nodules and the egg products 4 and 5; the ratio of the terminal claws to the 10th in the barrel; the presence or absence of the proximal reflexed spine on the 5th of the ovipositor; the thickness of the femur; and the lymphatic Quantity.

Keywords

New record; Deep-sea; Japan; Pantopoda; Pacific.

Introduction

The pycnogonid genus *Hemichela* Stock, 1954 is one of 21 genera in the family Ammotheidae Dohrn, 1881. *Hemichela* shares many morphological characters with the genus *Paranymphon* Caullery, 1896, including well- separated lateral processes, a uniarticulate scape, a 7-articulate palp, 10-articulate ovigers with a terminal claw, and a propodus without heel spines or auxiliary claws, but differs in lacking the immovable finger on the chelifore (Ramezani et al., 2017). *Hemichela* contains three species: *H. micrasterias* Stock, 1954; *H. longiunguis* Staples, 1982; and *H. nanhaiensis* Wang *et*

al., 2015. The type species *H. micrasterias*, was described from the Java Sea at 35 m depth and has subsequently been reported from the Visayan Sea, Flores Sea, Pacific Ocean off Japan, and South China Sea at depths of 20–657 m (Weis et al., 2014). *Hemichela longiunguis* was reported from estuaries in Queensland, Australia at depths of 1.2–5.8 m. *Hemichela nanhaiensis* was described from a single male collected from the South China Sea at 1317.5 m depth (Lehmann et al., 2011; Mercier et al., 2015).

In 2009 and 2011, we collected four *Hemichela* individuals from deep water in the East China Sea; these represented two males and two females of *H. nanhaiensis* (Takahashi et al., 2012). This is the second record for the species and the first record of its females. Here we redescribe *H. nanhaiensis* based on our specimens, with the first description for females (Sabroux et al., 2017).

Materials and Methods

Pycnogonids were collected by beam trawl with plankton nets during cruises N276 and N342 of the TR/V *Nagasaki-maru* (Nagasaki University) in 2009 and 2011, respectively, and fixed and preserved in 99% ethanol. Appendages were detached from the trunk by using chemically sharpened tungsten needles, mounted on glass slides in glycerin, and observed with an Olympus BX51 microscope. Body parts were observed with a Nikon SMZ 1500 microscope. Illustrations were prepared with CLIP STUDIO PAINT PRO ver. 1.6.6 (CELSYS, Japan) from draft line drawings made using a drawing tube. Morphological terminology follows Child, except that the term 'article' is used instead of "segment" in all appendages; the formula for the number of compound spines on the oviger follows Wang *et al.* (*e.g.*, the formula '3: 2: 1: 1' indicates that articles 7–10 have three, two, one, and one spines, respectively). Measurements were made axially (dorsally for the trunk; laterally for the palp, proboscis, and legs) and are presented in millimeters. Measurements for congeners were obtained from original descriptions or measured from original illustrations. Our specimens have been deposited in the Invertebrate Collection of the Hokkaido University Museum (ICHUM), Japan.

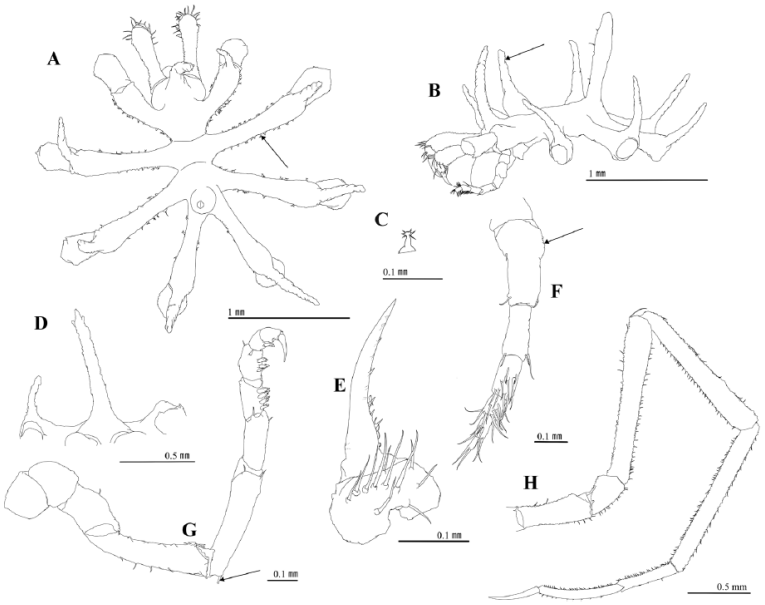

Figure 1: Hemichela nanhaiensis Wang et al., 2015, male (ICHUM-5437): A, trunk, dorsal view (arrow, tiny lateral outgrowth bearing distal spinules); B, trunk, lateral view (arrow, dorsodistal tubercle); C, tiny lateral outgrowth bearing distal spinules; D, ocular tubercle, front view; E, chela; F, palp (arrow, outer swelling); G, oviger (arrow, proximal reversed spine); H, leg 3.

Systematics

Family **Ammotheidae** Dohrn, 1881 Genus ***Hemichela*** Stock, 1954 ***Hemichela nanhaiensis*** Wang

et al., 2015 (Figures 1, 2)

Material Examined

1 female (ICHUM-5435), 32°14.97′N, 129°28.32′E, west of Hirajisone, East China Sea, 405 m, 7 March 2009. 1 male carrying eggs (ICHUM-5436), 28°33.605′N, 127°02.676′E, off Amami, East China Sea, 619–635 m, 17 November 2011. 1 male (ICHUM-5437), 28°33.576′N, 127°02.616′E, off Amami, East China Sea, 625–629 m, 18 November 2011. 1 female (ICHUM-5438), 28°33.601′N, 127°02.457′E, off Amami, East China Sea, 608–618 m, 19 November 2011. All specimens were collected by K. Kakui.

Amended Diagnosis

Lateral processes long, width across second processes more than 1.45; outgrowths on lateral processes unbranched, each bearing distal spinules; movable finger of chelifore with 12 teeth.

Description of Male (ICHUM-5437)

Measurements: length of trunk (from chelifore insertion to base of fourth lateral processes) 1.18; width across second lateral processes 2.04; proboscis length 0.52; length of palp articles 2–7: 0.25, 0.15, 0.13, 0.06, 0.07, 0.04; length of oviger articles 1–10 and terminal claw: 0.12, 0.11, 0.13, 0.38, 0.34, 0.18, 0.11, 0.10, 0.04, 0.06, 0.09; length of articles on leg 3 (from coxa 2; including claw): 0.53, 0.28, 1.26, 1.18, 1.23, 0.45, 0.64, 0.40.

Trunk (Figure 1A–C) with indistinct segment boundaries; covered with many tiny papillae. Lateral processes long, wellspaced, each with long, tapering, dorsodistal tubercle (Figure 1B arrow) and many tiny, unbranched lateral out- growths each bearing distal spinules (Figure 1A arrow; Figure 1C); tubercle length twice as long as diameter of widest portion of lateral process. Ocular tubercle (Figure 1D) tall, erect, with pair of tiny tubercles at tip. Eyes absent. Proboscis short, tapering distally. Abdomen long, erect, with few setae. Chelifore (Figure 1B, E) scape uniarticulate, with dorsodistal setae. Chela palm (Figure 1E) with dorsal setae. Finger curved, with 12 teeth.

Palp (Figure 1F) 7-articulate. Article 2 with distal seta and outer swelling (Figure 1F arrow), articles 4–7 with ventral setae.

Oviger (Figure 1G) with 10 articles and terminal claw. Articles 1–3 with few setae, article 5 with proximal reversed spine (Figure 1G arrow). Articles 7–10 of left oviger with compound spines in formula 4: 3: 1: 1 (right oviger damaged during dissection).

Legs (Figure 1H) slender, with dorsal and ventral setae (more setae on ventral side); femur without cement gland; propodus without heel spines or auxiliary claws. Genital pore present on coxa 2 of leg 4.

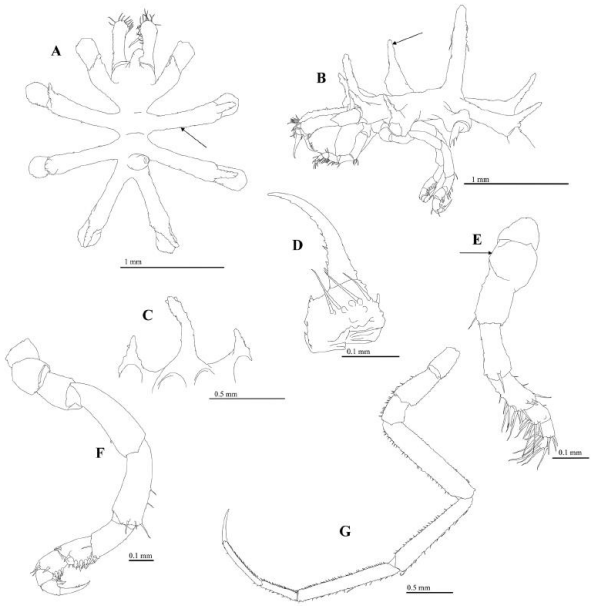

Figure 2: Hemichela nanhaiensis Wang et al., 2015, female (ICHUM-5438): A, trunk, dorsal view (arrow, tiny lateral outgrowth bearing distal spinules); B, trunk, lateral view (arrow, dorsodistal tubercle); C, ocular tubercle, front view; D, chela; E, palp (arrow, outer swelling); F, oviger; G, leg 3.

Description of Female (ICHUM-5438)

Measurements: length of trunk (from chelifore insertion to base of fourth lateral processes) 1.10; width across second lateral processes 1.67; proboscis length 0.44; length of palp articles 1–7: 0.07, 0.24, 0.15, 0.11, 0.06, 0.04, 0.04; length of oviger articles 1–10 and terminal claw: 0.06, 0.12, 0.30, 0.36, 0.30, 0.15, 0.12, 0.09, 0.05, 0.06, 0.13; length of articles on leg 3 (from coxa 1; including claw): 0.34, 0.45, 0.28, 1.14, 1.06, 1.09, 0.39, 0.61, 0.35.

Trunk (Figure 2A, B) with indistinct segment boundaries; covered with many tiny papillae. Lateral processes long, well-spaced, each with long, tapering, dorsodistal tubercle (Figure 2B arrow) and several tiny, unbranched lateral out-growths each bearing distal spinules (Figure 2A arrow); tubercle length less than twice diameter of widest portion of lateral process. Ocular tubercle (Figure 2C) tall, erect, with pair of tiny tubercles at tip. Eyes absent. Proboscis short, tapering distally. Abdomen long, erect, with few setae.

Chelifore (Figure 2B, D) scape uniarticulate, with dorsodistal setae. Chela palm (Figure 2D) with dorsal setae. Finger curved, with 12 teeth.

Palp (Figure 2E) 7-articulate. Article 2 with distal seta and outer swelling (Figure 2E arrow), articles 4–7 with ventral setae.

Oviger (Figure 2F) with 10 articles and terminal claw. Articles 1–3 with few setae. Articles 7–10 with compound spines in formula 4: 3: 1: 1 (right), 3: 3: 1: 1 (left).

Legs (Figure 2G) slender, with dorsal and ventral setae (more setae on ventral side); femur without cement gland; propodus without heel spines or auxiliary claws. Genital pores present on coxa 2 of all legs.

Sexual Dimorphism and Individual Variation

Compared to males, females have fewer tiny lateral outgrowths, a shorter ocular tubercle, shorter dorsodistal tubercles on the lateral processes, shorter oviger articles 4 and 5, a longer terminal claw relative to oviger article 10 (1.12–1.30 in males; 1.72–1.87 in females), a thicker femur, and fewer genital pores (on leg 4 in males, legs 1–4 in females). Females lack the proximal reversed spine on oviger article 5.

The following character varied among specimens: the number of compound spines on oviger articles 7–10 showed in the formula was 4: 3: 1: 1 (left in ICHUM-5437; right in ICHUM-5435), 3: 3: 1: 1 (left in ICHUM-5435), or 3: 2: 1: 1 (both in ICHUM-5436 and -5438).

Remarks

Although our male specimens shared almost all characters with the holotype, they differed from the male individual in Wang *et al.* in the number of compound spines on oviger articles 7–10 (4: 3: 1: 1 or 3: 2: 1: 1 versus 3: 2: 1: 1) and the length ratio of the terminal claw to article 10 in the oviger (1.12–1.30 versus 1.0). Furthermore, the holotype has genital pores on legs 3 and 4, whereas we observed them on leg 4 only. Male genital pores have been observed on legs 1–4 in *H. longiunguis*, thus differing in number and position from *H. nanhaiensis* from both localities. This raises the question whether, if the number and position of male (and female) genital pores are important characters in species discrimination in this genus, our specimens are indeed conspecific with Wang's *et al.* specimen. To confirm conspecificity, more specimens from both localities and molecular genetic data will be needed.

Wang *et al.* measured the width across the second lateral processes of the holotype as 3.49 mm, which he noted was distinctly larger in body size than its congeners. Our specimens were markedly smaller than Wang's, 1.90–2.04 mm in males and 1.45–1.67 mm in females. However, based on the 1 mm scale bar accompanying Wang's Figure 1B, the comparable measurement of the holotype is only about 1.85 mm, which is close to the range in our specimens, indicating an error in the original description. In any case, the other two congeners are smaller in size than *H. nanhaiensis* from either locality; the width across second lateral processes is 0.92–1.00 mm in male *H. micrasterias*, and 1.03 mm and 0.87 mm in male and female *H. longiunguis*, respectively.

References

Lehmann, T., C. Weinzierl and R.R. Melzer. 2011. SEM description of the first larval instar of Achelia assimilis (Pycnogonida: Ammotheidae). *Journal of*

the Marine Biological Association of the United Kingdom, 91 (5): 1081-1087.

Mercier, A., S. Baillon and J. Hamel. 2015. Life history and feeding biology of the deep-sea pycnogonid Nymphon hirtipes. *Deep-Sea Research Part I-Oceanographic Research Papers*, 106: 1-8.

Ramezani, M.R., A.R.M. Bavani, M. Jafari and A. Binesh. 2017. Evaluating gridded BIOME-BGC for simulating LAI at Kasilian watershed-Iran. *Geology, Ecology, and Landscapes*, 1 (4): 225-231.

Sabroux, R., L. Corbari, F. Krapp, C. Bonillo, S. Le Prieur and A. Hassanin. 2017. Biodiversity and phylogeny of Ammotheidae (Arthropoda: Pycnogonida). *European Journal of Taxonomy*, 286: 1-33.

Takahashi, Y., H. Kajihara and S.F. Mawatari. 2012. A new species of Hedgpethia (Arthropoda, Pycnogonida, Colossendeidae) from southwestern Japan. *Zookeys* (175): 69-74.

Weis, A., R. Meyer, L. Dietz, J.S. Doemel, F. Leese and R.R. Melzer. 2014. Pallenopsis patagonica (Hoek, 1881) - a species complex revealed by morphology and DNA barcoding, with description of a new species of Pallenopsis Wilson, 1881. *Zoological Journal of the Linnean Society*, 170 (1): 110-131.