Journal of Helminthology

www.cambridge.org/jhl

Fecampiid flatworms parasitic in a tanaidacean crustacean

K. Kakui[1], S. Shiraki[2] and N. Hookabe[3]

[1]Department of Biological Sciences, Faculty of Science, Hokkaido University, Sapporo 060-0810, Japan; [2]Department of Natural History Sciences, Graduate School of Science, Hokkaido University, Sapporo 060-0810, Japan and [3]Research Institute for Global Change, Japan Agency for Marine-Earth Science and Technology, Yokosuka 237-0061, Japan

Short Communication

Cite this article: Kakui K, Shiraki S and Hookabe N (2025). Fecampiid flatworms parasitic in a tanaidacean crustacean. *Journal of Helminthology*, **99**, e24, 1–4
https://doi.org/10.1017/S0022149X25000057.

Received: 30 October 2024
Revised: 08 January 2025
Accepted: 09 January 2025

Keywords:
Adiaphanida; Fecampiida; Platyhelminthes; Tanaidacea; Turbellaria

Corresponding author:
K. Kakui;
Email: kakui@eis.hokudai.ac.jp

Abstract

We report the first record of fecampiidan platyhelminths parasitic in tanaidacean crustaceans. Two fecampiidans (0.75 mm and 1.10 mm in length) were found in a female of *Pseudotanais* sp. (Pseudotanaidae; 1.75 mm in length) collected at 794 m depth off the southern coast of Japan, northwestern Pacific. Fresh individuals were yellow or light yellow, but completely faded in ethanol. In a maximum likelihood tree based on 28S rRNA sequences, the parasite was placed in a moderately-supported Fecampiidae clade, suggesting it is a member of Fecampiidae. The 28S sequence from the parasite was 25.0%, 32.6%, and 35.5% divergent in Kimura 2-parameter (K2P) distance from *Fecampia* cf. *abyssicola*, *Kronborgia* cf. *amphipodicola*, and *Kronborgia isopodicola* sequences, respectively.

Introduction

Fecampiida, a group of parasitic platyhelminths, comprises four families (Laumer and Giribet 2017; Tyler *et al.* 2006–2024). Notenteridae contains two species, the polychaete-parasitic *Notentera ivanovi* and the octopus-parasitic *Octopoxenus antarcticus* (Gordeev *et al.* 2022; Joffe *et al.* 1997; Raikova *et al.* 2017). Piscinquilinidae contains one fish-parasitic species, *Ichthyophaga subcutanea* (Syromjatnikova 1949). Urastomidae contains *Urastoma cyprinae*, parasitic on various bivalve species (Robledo *et al.* 1994). Fecampiidae is the most species-rich fecampiidan family, with four *Fecampia*, one *Glanduloderma*, and five *Kronborgia* species. Previously reported hosts for the family include myzostomids (Annelida), amphipods, barnacles, decapods, and isopods (Crustacea, Arthropoda); Sudo *et al.* (2021) suggested that helminth parasites found from sea slugs (Mollusca) may belong to this family (Supplementary Table S1; Kakui 2024b). In addition to the 14 named species, there are possibly more than 10 undescribed species in Fecampiida (e.g., Christensen 1981a, b, 1988; Fiege *et al.* 2007; Handl and Bouchet 2007; Sudo *et al.* 2011).

Tanaidacea is a group of small aquatic crustaceans, with about 1500 species (Anderson 2023). Most species are free living and inhabit benthic marine habitats. Tanaidaceans are widely distributed geographically (all oceans) and vertically (intertidally to about 9000 m deep), and occasionally occur at very high densities (e.g., 140,000 individuals/m^2 in *Allotanais hirsutus*; Delille *et al.* 1985). Given their broad distribution and high abundance, tanaidaceans might serve as hosts for many parasitic organisms in aquatic ecosystems, though they have received little attention in this context, with only a few works on tanaidacean parasites published in the past decade (Błażewicz *et al.* 2020; Boyko *et al.* 2021; Chatterjee *et al.* 2022; Chim and Bird 2021; Cortés *et al.* 2021; Jakiel *et al.* 2019; Kakui 2014, 2016; Kakui and Fujita 2024; Kakui and Shimada 2022).

In 2024, a tanaidacean containing vermiform organisms inside was collected around Japan. A 28S ribosomal RNA (28S) sequence determined from the parasite revealed that it is a fecampiidan flatworm, a group not previously been reported from tanaidaceans. Here, we describe the gross morphology of the fecampiidan and infer its phylogenetic position in Fecampiida based on 28S data.

Material and methods

The host tanaidacean was found in a mud sample collected with a suction sampler (slurp gun) from the deep submergence research vehicle *Shinkai 6500* (Japan Agency for Marine-Earth Science and Technology; JAMSTEC) at Station 1 (Shima Spur, 33°57.0212′N, 136°53.8682′E, 794 m depth), Dive 6K#1782, on 12 June 2024 during cruise YK24-09S of RV *Yokosuka* (JAMSTEC). The fresh tanaidacean was photographed and then fixed and preserved in 99% ethanol. Measurements were made from digital images of the fresh individual. Body length (BL) of the host was measured from the base of the antennules to the tip of the pleotelson, and body width (BW) at the widest portion of the cephalothorax. The BL of the parasites was measured from the anterior to posterior ends, and BW at the widest part. Part of one parasite

was removed from the host with sharpened needles for DNA extraction. The remaining part was deposited as a voucher specimen in the Invertebrate Collection of the Hokkaido University Museum (ICHUM), Sapporo, Japan, under catalog number ICHUM8960. DNA sequences (28S) were also determined for two cocoons of *Fecampia* cf. *abyssicola*, collected in the Kumano Sea (Stn D4: 33°59.7′N 136°56.9′E to 33°59.9′N 136°57.2′E; 802–812 m depth) on 27 June 2023 during cruise 2312 of the TRV *Seisui-maru* (Mie University).

DNA was extracted from one tanaidacean parasite and the two cocoons of *F.* cf. *abyssicola* by using a NucleoSpin Tissue XS Kit (Macherey–Nagel, Germany; tanaidacean parasite) or DNeasy Blood & Tissue Kits (Qiagen, Germany; cocoons). Primers 28S_1F (Álvarez-Presas *et al.* 2008) and Fe28R (newly designed; GTTTGGTTCATCCCACAGC) were used for PCR amplification (the portion containing expansion segments D1–D5 was amplified; cf. Gillespie *et al.* 2006), and 28S_1F, Fe28R, 300F, 300R (Lockyer *et al.* 2003), and 28S_b5F (Kakui and Tsuyuki 2024) for cycle sequencing (primer 300R was not used in sequencing the cocoons). PCR amplification conditions with KOD FX Neo (Toyobo, Japan) were 94°C for 2 min; 45 cycles of 98°C for 10 s, 60°C for 30 s, and 68°C for 1 min; and 68°C for 2 min (tanaidacean parasite); and with KOD One PCR Master Mix (Toyobo) were 94°C for 2 min; 35 cycles of 94°C for 40 s, 52°C for 75 s, and 72°C for 1 min; and 72°C for 7 min (cocoons). PCR products from the tanaidacean parasite were separated on a 2% agarose gel, excised with a micro spatula, and purified with a MagExtractor PCR & Gel Clean Up Kit (Toyobo) before cycle sequencing. All nucleotide sequences were determined with a BigDye Terminator Kit ver. 3.1 and a SeqStudio Genetic Analyzer (Thermo Fisher Scientific, USA; tanaidacean parasite) by KK or at FASMAC (Kanagawa, Japan; cocoons). Fragments were concatenated by using MEGA7 (Kumar *et al.* 2016). The sequences we determined were deposited in the International Nucleotide Sequence Database Collaboration (INSDC) participating databases through the DNA Data Bank of Japan (DDBJ), under accession numbers LC844707 (tanaidacean parasite), and LC847139 and LC847140 (cocoons).

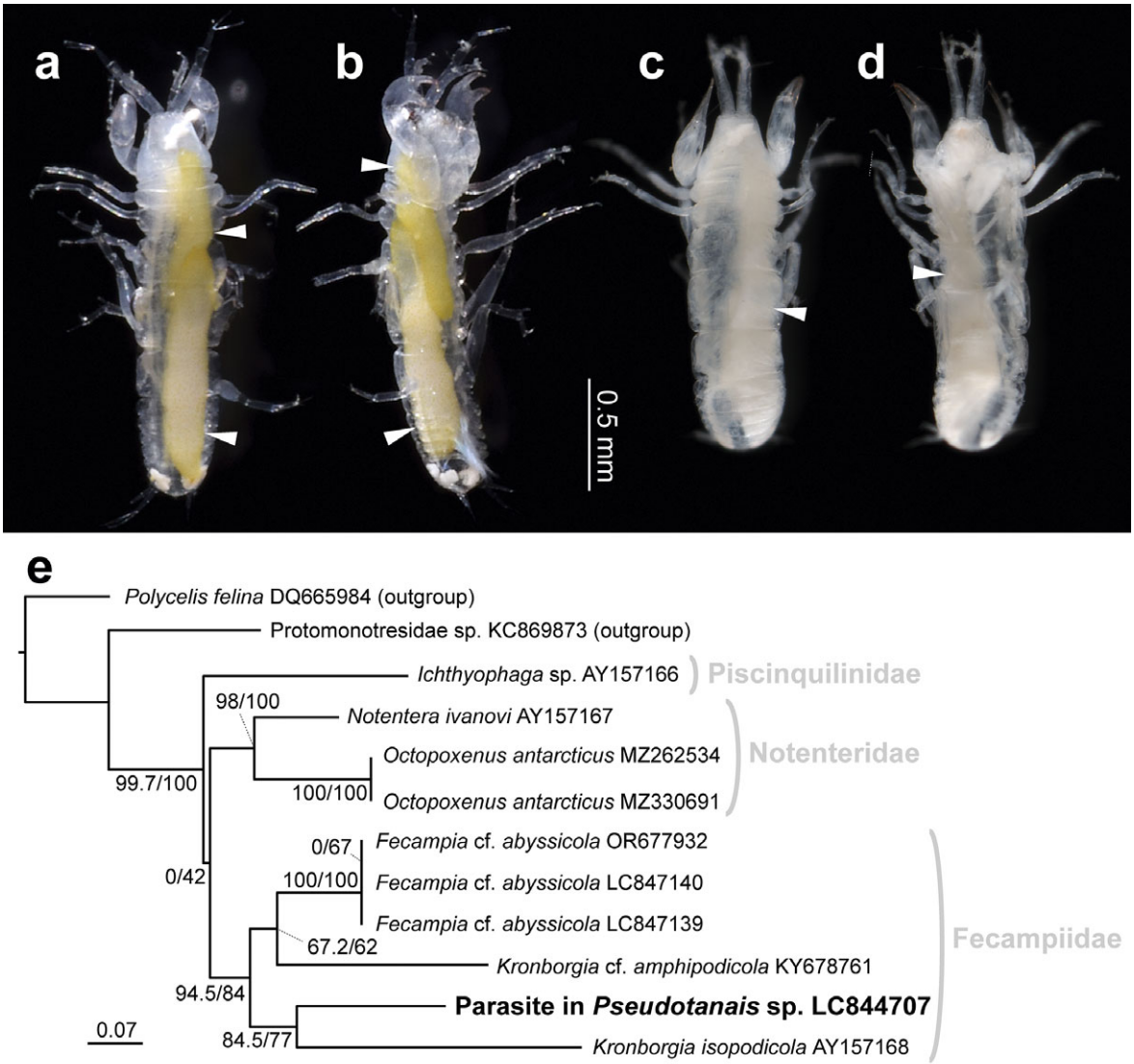

Figure 1. Fecampiida flatworms parasitic in a female of the tanaidacean *Pseudotanais* sp. (a–d) Parasites (arrowheads) in the host, fresh (a, b) and ethanol-fixed (c, d) specimens, dorsal (a, c) and ventrolateral (b, d) views; the border between two parasites was not distinguishable after ethanol fixation. (e) Maximum-likelihood tree for Fecampiida reconstructed from 28S sequences (868 positions); numbers near nodes are Shimodaira–Hasegawa-like approximate likelihood ratio test (SH-aLRT) / ultrafast bootstrap (UFBoot) values as percentages; the scale at the bottom indicates branch length in substitutions per site.

https://doi.org/10.1017/S0022149X25000057 Published online by Cambridge University Press

The 28S dataset for phylogenetic analysis included the three sequences we determined, and seven fecampiidan sequences and two outgroup sequences from the INSD (Álvarez-Presas *et al.* 2008; Gordeev *et al.* 2022; Hookabe *et al.* 2023; Laumer and Giribet 2014, 2017; Lockyer *et al.* 2003). The 28S sequences from *Urastoma cyprinae* (AJ313230, AY157165; Lockyer *et al.* 2003; Noren and Jondelius 2002) were excluded because they could be aligned with the other sequences only in a short region. The method for alignment was as described in Kakui (2024a); the aligned dataset contained 868 positions (Supplementary Files S1 and S2). Methods for selecting the optimal substitution model (GTR+F+I+R2), the maximum likelihood (ML) analysis, estimation of clade support (analyses of 1000 pseudoreplicates for both Shimodaira–Hasegawa-like approximate likelihood ratio tests [SH-aLRT] and ultrafast bootstraps [UFBoot]), and drawing the tree were as described by Shimada *et al.* (2023). Kimura (1980) 2-parameter (K2P) distances among the aligned sequences were calculated with MEGA7.

Results and discussion

Two fecampiidans were found in the body cavity of a single host tanaidacean (BL 1.75 mm, BW 0.35 mm) (Figure 1a–d). The host was identified as a preparatory female of *Pseudotanais* sp. in Pseudotanaidae (cf. Jakiel *et al.* 2019; Kakui *et al.* 2017). Both parasites were cylindrical. The larger one (BL 1.10 mm, BW 0.20 mm) was light yellow, with both ends slightly deeper in color. The smaller one (BL 0.75 mm, BW 0.15 mm) was yellow. Both were completely faded in ethanol and strongly shrunken, forming a single white mass. Since the part of the mass we used for DNA extraction was from the host pleon, the 28S sequence we determined was likely from the larger individual.

In the 28S-based ML tree (Figure 1e), the parasite lay in a moderately well supported (SH-aLRT/UFBoot = 94.5%/84%) Fecampiidae clade. Relationships among the taxa within the clade were unclear due to lack of high nodal support. The parasite was the sister taxon to *Kronborgia isopodicola*, though with low support (84.5%/77%). The parasite 28S sequence was 25.0%, 32.6%, and 35.5% divergent (K2P distance) from *Fecampia* cf. *abyssicola*, *Kronborgia* cf. *amphipodicola*, and *K. isopodicola* sequences, respectively. Although our analysis lacked urastomid sequences, and the anatomy and cocoon shape of our parasites were unknown, based on gross morphology (i.e., the cylindrical body typical of fecampiids) and the phylogenetic position in our tree, we concluded that the parasites belong in Fecampiidae.

With 73 valid species (WoRMS 2024), *Pseudotanais* tanaidaceans are highly diverse and abundant in the macrobenthos, have been reported from all oceans, and show a broad depth range from several meters to 6050 m (Błażewicz *et al.* 2021; Hansen 1913). They are probably epifaunal or burrowers in shallow sediment (Błażewicz *et al.* 2021) or inhabit a self-woven tube in sediment (cf. Bird and Holdich 1989). Their high abundance and broad distribution suggest *Pseudotanais* as a likely candidate host group for parasites, but only nematodes had been reported to date as parasites in this genus (Błażewicz *et al.* 2020). The fecampiids in the host tanaidacean were strongly deformed and had completely lost their color in ethanol (Figure 1c, d); the lack of previous records of fecampiidans from Tanaidacea may likely have been due to simple oversight. Parasites in or on small, inconspicuous, burrowing or tube-dwelling crustaceans have been poorly investigated. As a case in point, despite their high prevalence in hosts commonly found in such an easily accessible environment as a river estuary, trematodes were first reported in a burrowing isopod (*Cyathura muromiensis*) only in 2024 (Shiraki and Kakui 2024). Targeted examination of such understudied groups will likely detect additional unexpected host species for fecampiidans.

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/S0022149X25000057.

Acknowledgements. Captain Akihisa Tsuji and the crew of RV *Yokosuka*; Kazuhiro Chiba and the *Shinkai 6500* operation team; Hisanori Iwamoto from Nippon Marine Enterprises; Yoshihiro Fujiwara from the JAMSTEC; Dive-6K#1782 crew Takuma Onishi and Taeko Kimura; Captain Yoichi Maekawa and the crew of TRV *Seisui-maru*; and researchers aboard supported our collecting efforts. Taeko Kimura provided the opportunity for SS and NH to join TRV *Seisui-maru* cruise. Magdalena Błażewicz and Benny K. K. Chan helped in the literature survey. Matthew H. Dick reviewed the manuscript and edited our English. We are grateful to all. This study was supported by the Cooperative Research Program of the Atmosphere and Ocean Research Institute, The University of Tokyo (RV *Yokosuka*/DSV *Shinkai* 6500, Cruise YK24-09S: 'Metapopulation structure of seamount benthos: testing the hypothesis of the Kuroshio countercurrent source off the coast of Kumano', directed by NH).

Financial support. This study was supported by Grant-in-Aids for JSPS Fellows (JP23KJ0063 and JP23KJ2222) from the Japan Society for the Promotion of Science (JSPS).

Competing interest. The authors declare none.

References

Anderson G (2023) Tanaidacea—Recent Scholarship (2000–present). Available at https://aquila.usm.edu/tanaids30/6/ (accessed September 29, 2024).

Álvarez-Presas M, Baguñà J and Riutort M (2008) Molecular phylogeny of land and freshwater planarians (Tricladida, Platyhelminthes): From freshwater to land and back. *Molecular Phylogenetics and Evolution* **47**, 555–568. https://doi.org/10.1016/j.ympev.2008.01.032.

Bird GJ and Holdich DM (1989) Tanaidacea (Crustacea) of the north-east Atlantic: The subfamily Pseudotanainae (Pseudotanaidae) and the family Nototanaidae. *Zoological Journal of the Linnean Society* **97**, 233–298.

Błażewicz M, Jakiel A and Bird GJ (2021) *Pseudotanais* Sars, 1882 (Crustacea: Tanaidacea) from the SE Australian Slope: A gap in our knowledge. *Frontiers in Marine Science* **8**, 779001. https://doi.org/10.3389/fmars.2021.779001.

Błażewicz M, Stępień A, Jakiel A and Palero F (2020) Tanaidacean diversity in the NW Pacific—state of knowledge and future perspectives. In Saeedi H and Brandt A (eds), *Biogeographic Atlas of the Deep NW Pacific Fauna*. Sofia: Pensoft, 462–500.

Boyko C, Williams JD and Rhodes A (2021) First record of a tantulocaridan, *Microdajus* sp. (Crustacea: Tantulocarida), from the northwestern Atlantic. *Nauplius* **29**, e2021005. https://doi.org/10.1590/2358-2936e2021005.

Chatterjee T, Sautya S, Dovgal I and Gaikwad S (2022) Report of epibiont ciliate *Cothurnia* sp. (Ciliophora, Peritricha) on tanaids (Tanaidacea) from deep-sea at 4630 m depth of the Indian Ocean and notes on epibiont ciliates of tanaidaceans. *Cahiers de Biologie Marine* **63**, 345–350. https://doi.org/10.21411/CBM.A.FB77C25E.

Chim CK and Bird GJ (2021) Tanaidacean (Crustacea: Peracarida) assemblage collected during the South Java Deep-Sea (SJADES) Biodiversity Expedition with an overview of tanaid diversity in Indonesia. *Raffles Bulletin of Zoology* Supplement **36**, 78–94. https://doi.org/10.26107/RBZ-2021-0031.

Christensen AM (1981a) *Fecampia abyssicola* n. sp. (Turbellaria: Rhabdocoela) and five cocoon types of undescribed species of Fecampiidae from the deep sea. *Galathea Report* **15**, 69–77.

Christensen AM (1981b) The geographical and bathymetrical distribution of the Fecampiidae (Turbellaria, Rhabdocoela). *Hydrobiologia* **84**, 13–16.

Christensen AM (1988) Fecampiidae (Turbellaria, Neorhabdocoela) in Greenland waters. *Fortschritte der Zoologie/Progress in Zoology* **36**, 25–29.

Cortés JS, Campos NH and Bolaño-Lara M (2021) First register of the Tantulocarida order Boxshall and Lincoln, 1983 (Crustacea) in deep waters of the Colombian Caribbean. *Bulletin of Marine and Coastal Research* **50**, 171–178. https://doi.org/10.25268/bimc.invemar.2021.50.1.1007.

Delille D, **Guidi LD and Soyer J** (1985) Nutrition of *Allotanais hirsutus* (Crustacea: Tanaidacea) at Kerguelen Island. In Siegfried WR, Condy PR and Laws RM (eds), *Antarctic Nutrient Cycles and Food Webs*. Berlin: Springer, 378–380.

Fiege D, **Zibrowius H and Arnaud PM** (2007) New deep-water records of cocoons of undescribed species of Fecampiidae from Antarctica to the Bay of Biscay (Platyhelminthes, Turbellaria, Rhabdocoela). *Senckenbergiana Biologica* **87**, 1–6.

Gillespie JJ, **Johnston JS**, **Cannone JJ and Gutell RR** (2006) Characteristics of the nuclear (18S, 5.8S, 28S and 5S) and mitochondrial (12S and 16S) rRNA genes of *Apis mellifera* (Insecta: Hymenoptera): Structure, organization, and retrotransposable elements. *Insect Molecular Biology* **15**, 657–686. https://doi.org/10.1111/j.1365-2583.2006.00689.x.

Gordeev I, **Biserova N**, **Zhukova K and Ekimova I** (2022) The first report of a parasitic 'turbellarian' from a cephalopod mollusc, with description of *Octopoxenus antarcticus* gen. nov., sp. nov. (Platyhelminthes: Fecampiida: Notenteridae). *Journal of Helminthology* **96**, e73. https://doi.org/10.1017/S0022149X22000657.

Handl C and Bouchet P (2007) Mystery tubes coiled around deep-water tropical gorgonians: fecampiid cocoons (Platyhelminthes: Fecampiida) resembling Solenogastres (Mollusca). *Systematic Parasitology* **67**, 81–85.

Hansen HJ (1913) Crustacea, Malacostraca. II. IV. The Order Tanaidacea. *The Danish Ingolf Expedition* **3**, 1–145 + 12 pls.

Hookabe N, **Jimi N**, **Ogawa A**, **Tsuchiya M and Sluys R** (2023) The abyssal parasitic flatworm *Fecampia* cf. *abyssicola*: New records, anatomy, and molecular phylogeny, with a discussion on its systematic position. *The Biological Bulletin* **245**, 77–87. https://doi.org/10.1086/730857.

Jakiel A, **Palero F and Błażewicz M** (2019) Deep ocean seascape and Pseudotanaidae (Crustacea: Tanaidacea) diversity at the Clarion-Clipperton Fracture Zone. *Scientific Reports* **9**, 17305. https://doi.org/10.1038/s41598-019-51434-z.

Joffe BI, **Selivanova RV and Kornakova EE** (1997) *Notentera ivanovi* n. gen., n. sp. (Turbellaria, Platyhelminthes), a new parasitic turbellarian. *Parasitologya* **31**, 126–131 + pl. 2. (in Russian with English abstract)

Kakui K (2014) A novel transmission pathway: First report of a larval trematode in a tanaidacean crustacean. *Fauna Ryukyuana* **17**, 13–22.

Kakui K (2016) Descriptions of two new species of *Rhizorhina* Hansen, 1892 (Copepoda: Siphonostomatoida: Nicothoidae) parasitic on tanaidacean crustaceans, with a note on their phylogenetic position. *Systematic Parasitology* **93**, 57–68. https://doi.org/10.1007/s11230-015-9604-x.

Kakui K (2024a) *Nectonema* horsehair worms (Nematomorpha) parasitic in the Tanner crab *Chionoecetes bairdi*, with a note on the relationship between host and parasite phylogeny. *Diseases of Aquatic Organisms* **159**, 153–157. https://doi.org/10.3354/dao03815.

Kakui K (2024b) Fecampiids and their reported hosts ver. 20241113. Figshare. Available at https://doi.org/10.6084/m9.figshare.27313239 (accessed January 8, 2025).

Kakui K and Fujita Y (2024) Foettingeriidae (Ciliophora: Apostomatia) molecularly detected from Tanaidacea (Crustacea: Peracarida). *Protistology* **18**, 240–243. https://doi.org/10.21685/1680-0826-2024-18-3-6.

Kakui K, **Hayakawa Y and Katakura H** (2017) Difference in size at maturity in annual and overwintering generations in the tanaidacean *Zeuxo* sp. in Oshoro Bay, Hokkaido, Japan. *Zoological Science* **34**, 129–136. https://doi.org/10.2108/zs160134.

Kakui K and Shimada D (2022) Dive into the sea: First molecular phylogenetic evidence of host expansion from terrestrial/freshwater to marine organisms in Mermithidae (Nematoda: Mermithida). *Journal of Helminthology* **96**, e33. https://doi.org/10.1017/S0022149X22000256.

Kakui K and Tsuyuki A (2024) Flatworm cocoons in the abyss: Same plan under pressure. *Biology Letters* **20**, 20230506. https://doi.org/10.1098/rsbl.2023.0506.

Kimura M (1980) A simple method for estimating evolutionary rates of base substitutions through comparative studies of nucleotide sequences. *Journal of Molecular Evolution* **16**, 111–120. https://doi.org/10.1007/bf01731581.

Kumar S, **Stecher G and Tamura K** (2016) MEGA7: Molecular evolutionary genetics analysis version 7.0 for bigger datasets. *Molecular Biology and Evolution* **33**, 1870–1874. https://doi.org/10.1093/molbev/msw054.

Laumer CE and Giribet G (2014) Inclusive taxon sampling suggests a single, stepwise origin of ectolecithality in Platyhelminthes. *Biological Journal of the Linnean Society* **111**, 570–588. https://doi.org/10.1111/bij.12236.

Laumer CE and Giribet G (2017) Phylogenetic relationships within Adiaphanida (phylum Platyhelminthes) and the status of the crustacean-parasitic genus *Genostoma*. *Invertebrate Biology* **136**, 184–198. https://doi.org/10.1111/ivb.12169.

Lockyer AE, **Olson PD and Littlewood DTJ** (2003) Utility of complete large and small subunit rRNA genes in resolving the phylogeny of the Neodermata (Platyhelminthes): Implications and a review of the cercomer theory. *Biological Journal of the Linnean Society* **78**, 155–171. https://doi.org/10.1046/j.1095-8312.2003.00141.x.

Noren M and Jondelius U (2002) The phylogenetic position of the Prolecithophora (Rhabditophora, 'Platyhelminthes'). *Zoologica Scripta* **31**, 403–414. https://doi.org/10.1046/j.1463-6409.2002.00082.x.

Raikova OI, **Kotikova EA and Frolova TA** (2017) Nervous system and musculature of the parasitic turbellarian *Notentera ivanovi* (Plathelminthes, Fecampiida). *Doklady Biological Sciences* **475**, 169–171.

Robledo JAF, **Cáceres-Martínez, Sluys R and Figueras A** (1994) The parasitic turbellarian *Urastoma cyprinae* (Platyhelminthes: Urastomidae) from blue mussel *Mytilus galloprovincialis* in Spain: Occurrence and pathology. *Diseases of Aquatic Organisms* **18**, 203–210.

Shimada D, **Kakui K and Fujita Y** (2023) A new species of free-living marine nematode, *Fotolaimus cavus* sp. nov. (Nematoda, Oncholaimida, Oncholaimidae), isolated from a submarine anchialine cave in the Ryukyu Islands, southwestern Japan. *Zoosystematics and Evolution* **99**, 519–533. https://doi.org/10.3897/zse.99.109097.

Shiraki S and Kakui K (2024) Trematode metacercariae parasitic in the estuarine crustacean *Cyathura muromiensis* Nunomura, 1974 (Peracarida: Isopoda: Anthuroidea). *Parasitology International* **104**, 102973. https://doi.org/10.1016/j.parint.2024.102973.

Sudo K, **Hirano YJ and Hirano Y** (2011) Newly discovered parasitic Turbellaria of opisthobranch gastropods. *Journal of the Marine Biological Association of the United Kingdom* **91**, 1123–1133.

Syromjatnikova IP (1949) A new turbellarian parasitising fish, *Ichthyophaga subcutanea* nov. gen. nov. sp. *Doklady Academii Nauk USSR* **68**, 805–808. (in Russian)

Tyler S, **Artois T**, **Schilling S**, **Hooge M and Bush LF** (2006–2024) World List of turbellarian worms: Acoelomorpha, Catenulida, Rhabditophora. Fecampiida. Accessed through World Register of Marine Species. Available at https://www.marinespecies.org/aphia.php?p=taxdetails&id=416296 (accessed September 29, 2024).

WoRMS (2024) *Pseudotanais* Sars, 1882. Available at https://www.marinespecies.org/aphia.php?p=taxdetails&id=136246 (accessed October 22, 2024).