Redescription and molecular characterisation of the predatory isopod Tachaea spongillicola Stebbing, 1907 (Isopoda: Corallanidae) infesting the freshwater fish Pangasius silasi fro...

Article *in* Journal of Natural History · October 2021

DOI: 10.1080/00222933.2021.1983060

CITATIONS
0

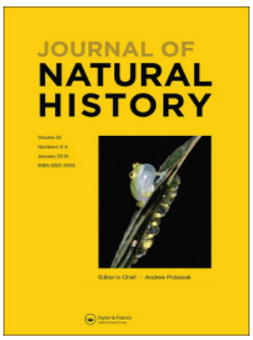
READS
42

4 authors, including:

P. Vigneshwaran
Annamalai University
17 PUBLICATIONS **41** CITATIONS
SEE PROFILE

T.T. Ajith Kumar
National Bureau of Fish Genetic Resources
189 PUBLICATIONS **1,931** CITATIONS
SEE PROFILE

Kuldeep Kumar Lal
Network of Aquaculture Centers in Asia-Pacific
228 PUBLICATIONS **1,839** CITATIONS
SEE PROFILE



Journal of Natural History

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tnah20

Redescription and molecular characterisation of the predatory isopod *Tachaea spongillicola* Stebbing, 1907 (Isopoda: Corallanidae) infesting the freshwater fish *Pangasius silasi* from India

P. Vigneshwaran, T.T. Ajith Kumar, S. Ravichandran & Kuldeep K. Lal

To cite this article: P. Vigneshwaran, T.T. Ajith Kumar, S. Ravichandran & Kuldeep K. Lal (2021) Redescription and molecular characterisation of the predatory isopod *Tachaea spongillicola* Stebbing, 1907 (Isopoda: Corallanidae) infesting the freshwater fish *Pangasius silasi* from India, Journal of Natural History, 55:37-38, 2419-2437, DOI: 10.1080/00222933.2021.1983060

To link to this article: https://doi.org/10.1080/00222933.2021.1983060

JOURNAL OF NATURAL HISTORY
2021, VOL. 55, NOS. 37–38, 2419–2437
https://doi.org/10.1080/00222933.2021.1983060

Taylor & Francis
Taylor & Francis Group

Redescription and molecular characterisation of the predatory isopod *Tachaea spongillicola* Stebbing, 1907 (Isopoda: Corallanidae) infesting the freshwater fish *Pangasius silasi* from India

P. Vigneshwaran [a], T.T. Ajith Kumar[b], S. Ravichandran[a,c] and Kuldeep K. Lal[b]

[a]Centre of Advanced Study in Marine Biology, Annamalai University, Parangipettai, Tamil Nadu, India; [b]ICAR – National Bureau of Fish Genetic Resources, Lucknow, Uttar Pradesh, India; [c]Government Thirumagal Mills College, Gudiyatham, Tamil Nadu, India

ABSTRACT

Tachaea spongillicola Stebbing, 1907 has not been widely reported and no case is recorded of its potential predation of freshwater fish. The present study reports the occurrence of *T. spongillicola* preying on freshwater fish *Pangasius silasi* Dwivedi et al., 2017 (Pangasiidae) and causing detectable mortalities in its new host. The general morphology and appendages of the non-ovigerous female and male specimens of *T. spongillicola* are redescribed based on the specimens collected from *P. silasi*. The important characters to distinguish *T. spongillicola* from other species of the genus include: body less than 2 times as long as wide; pleonite 4 with posterolateral margins extending beyond pleonite 5; terminal segment of maxilliped more elongated; lacinia mobilis of mandible with three-spined lobe, incisor of the mandible with two cusps; inferior distal margin of carpus of pereopods 1–3 extended to propodus, pereonite 1 is as long as pereonite 2. Additionally, we have generated mitochondrial gene sequences (COI) for the isopod and the morphological findings were confirmed with significant genetic divergences and phylogenetic analysis. *Tachaea spongillicola* may be a potential threat to the upscaling of intensive cage culture to promote aquaculture production.

ARTICLE HISTORY
Received 11 September 2020
Accepted 14 September 2021

KEYWORDS
Tachaea; predatory isopod; new host; *Pangasius*; morphological description; phylogenetic analysis; India

Introduction

The superfamily Cymothooidea Leach, 1814 is a paraphyletic taxon that includes all micropredatory, parasitic, bloodsucking or scavenging isopods (Brandt and Poore 2003; Ravichandran et al. 2019). The micro-predator cymothooids include the aegids, barybrotids, corallanids and tridentellids (Smit et al. 2014). The family Corallanidae Hansen 1890 is frequently reported from cryptic habitats, and its members are often found living on or in corals, calcareous sponges, ascidians, bryozoans, gorgonians, coralline algae, tubeworms, scyphozoans and tube-building snails (Delaney 1989). Corallanids emerge from these cryptic habitats and associations to temporarily parasitise or prey on fish, rays, shrimp and turtles, as well as to prey on micro-crustaceans such as mysids

CONTACT T.T. Ajith Kumar ttajith87@gmail.com

Published online 28 Jan 2022

Acknowledgements

The authors are thankful to the Director, Indian Council of Agricultural Research (ICAR) – National Bureau of Fish Genetic Resources, Authorities of Annamalai University and Government Thirumagal Mills College, Gudiyatham Tamil Nadu, for the facilities, support and encouragement. We also extend our gratitude to ICAR for financial support through the CRP – Agro-Biodiversity programme. Further, we gratefully acknowledge the effort made by the two anonymous reviewers in their critical review of the manuscript and making valuable suggestions for its improvement.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by ICAR [grant number 1008519].

ORCID

P. Vigneshwaran http://orcid.org/0000-0002-4966-5316

References

Boyko CB, Bruce NL, Hadfield KA, Merrin KL, Ota Y, Poore GCB, Taiti S, Schotte M, Wilson GDF (Eds). 2008. World Marine, Freshwater and Terrestrial Isopod Crustaceans database. Gnathia Leach, 1814. http://marinespecies.org/aphia.php?p=taxdetails&id=118437[2020-08-13] .

Brandt A, Poore GCB. 2003. Higher classification of the flabelliferan and related Isopoda based on a reappraisal of relationships. Invertebr Syst. 17:893–923. doi:10.1071/IS02032.

Bruce NL. 1982. On the genus Corallana Dana, 1852 (Isopoda, Corallanidae) with description of a new species from Western Australia. Crusta. 241–249.

Bruce NL, Brusca RC, Delaney PM. 1982. The status of the isopod families Corallanidae Hansen, 1890, and Excorallanidae Stebbing, 1904 (Flabellifera). J Crustacean Biol. 2(3):464–468. doi:10.2307/1548061.

Bruce NL. 1983. Aegidae (Isopoda: Crustacea) from Australia with descriptions of three new species. J Nat Hist. 17(5):757–788. doi:10.1080/00222938300770591.

Caldwell E, ed. 1879. Zoological record. Vol. 16 (nonconsecutive pagination).

Chinabut S. 2002. A case study of isopod infestation in tilapia cage culture in Thailand. In: Arthur JR, Phillips MJ, Subasinghe RP, Reantaso MB, MacRae IH, editors. Primary aquatic animal health care in rural, small-scale, aquaculture development. *FAO Fisheries and Aquaculture Technical Paper*, 406; p. 201–202.

Chu K, Muhamad ZJ, Bruce NIEL. 2010. *Corallana nodosa* (Schioedte and Meinert, 1879)(Crustacea: Isopoda: Corallanidae), attacking freshwater fish at the Durian Tunggal Dam, Melaka, Malaysia. Asian Fish Sci. 23(1):116–124. doi:10.33997/j.afs.2010.23.1.010.

Coleman CO, Lowry JK, Macfarlane T. 2010. DELTA for beginners: an introduction into the taxonomy software package DELTA. ZooKeys. 45:1–75. doi:10.3897/zookeys.45.263

Delaney PM. 1989. Phylogeny and biogeography of the marine isopod family Corallanidae (Crustacea: Isopoda: Flabellifera). Contrib Sci Nat Hist Mus Los Angeles County. 409:1–75.

Delaney PM, Brusca RC. 1985. Two new species of *Tridentella* Richardson, 1905 (Isopoda: Flabellifera: Tridentellidae) from California, with a rediagnosis and comments on the family, and a key to the genera of Tridentellidae and Corallanidae. J Crustacean Biol. 5(4):728–742. doi:10.2307/1548249.

Dwivedi AK, Gupta BK, Singh RK, Mohindra V, Chandra S, Easawarn S, Jena J, Lal KK. 2017. Cryptic diversity in the Indian clade of the catfish family Pangasiidae resolved by the description of a new species. Hydrobiologia. 797(1):351–370. doi:10.1007/s10750-017-3198-z.

Folmer O, Black M, Hoeh W, Lutz R, Vrijenhoek R. 1994. DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. Mol Mar Biol Biotechnol. 3:294–299.

Guzman HM, Obando VL, Brusca RC, Delaney PM. 1988. Aspects of the population biology of the marine isopod *Excorallana tricornis occidentalis* Richardson, 1905 (Crustacea: Isopoda: Corallanidae) at Cano Island, Pacific Costa Rica. Bull Mar Sci. 43(1):77–87.

Hall TA. 1999. BioEdit: a user-friendly biological sequence alignment editor and analysis program for Windows 95/98/NT. In Nucleic acids symposium series (Vol. 41, No. 41, pp. 95–98); Jan; London: Information Retrieval Ltd. p. c1979–c2000.

Hansen HJ. 1890. Cirolanidae et familiae nonnulae propinquae Musei Hauniensis. Det Kongelige Danske Videnskabernes Selskab Skrifter. Naturvidenskabelige Og Mathematisk. 6(3):237–426.

Hasegawa M, Kishino H, Yano TA. 1985. Dating of the human-ape splitting by a molecular clock of mitochondrial DNA. J Mol Evol. 22(2):160–174. doi:10.1007/BF02101694.

Ho JS, Tongutha K. 1992. Flabelliferan isopods (Crustacea) parasitic on freshwater fishes of Thailand. Syst Parasitol. 21:203–210. doi:10.1007/BF00009700

Kabata Z. 1985. Parasites and diseases of fish cultured in the tropics. London and Philadelphia: Taylor & Francis; p. 318. doi:10.1017/S0031182000062880

Kumar S, Stecher G, Li M, Knyaz C, Tamura K. 2018. MEGA X: molecular evolutionary genetics analysis across computing platforms. Mol Biol Evol. 35(6):1547–1549. doi:10.1093/molbev/msy096.

Mariappan P, Balasundaram C, Trilles JP. 2003. Infection of the isopod *Tachaea spongillicola* on freshwater prawns *Macrobrachium* spp. in southern India. Dis Aquat Organ. 55(3):259–260. doi:10.3354/dao055259.

Nierstrasz HF. 1917. Die Isopoden Sammlung im Naturhistorischen Reichsmuseum zu Leiden. II. Cymothoidae, Sphaeromidae, Serolidae, Anthuridae, Idotheidae, Asellidae, Janiridae, Munnopsidae. Zoologische Mededeelingen-Deel III. Rijks Mus Natuurlijke Hist. 3:87–120.

Nierstrasz HF. 1931. Isopoda genuina. II. Flabellifera. In: Weber M, De Beaufort LF, editors. *Die Isopoden der Siboga–Expedition*. Siboga Expeditie (Uitkomsten op Zoölogisch, Botanisch, Oceanographisch en Geologisch Gebied verzameld in de Oost-Indische 1899-(1900 aan boord H.M. Siboga onder commando van Luitenant ter zee 1e kl. G.F. Tydeman). Leiden: E.J. Brill; p. 123–233.

Nierstrasz HF, De Marees van Swinderen JW. 1931. Susswasser-Isopoden der *Limnolo gischen* Sunda-Expedition. Archiv Fur Hydrobiolgie. 9:394–402.

Ota Y. 2019. Habitat utilization and seasonal occurrence of *Tachaea chinensis* (Isopoda: Corallanidae) infesting freshwater shrimps in Lake Biwa, central Japan. Crustacean Res. 48:133–143. doi:10.18353/crustacea.48.0_133

Ravichandran S, Vigneshwaran P, Rameshkumar G. 2019. A taxonomic review of the fish parasitic isopod family Cymothoidae Leach, 1818 (Crustacea: Isopoda: Cymothooidea) of India. Zootaxa. 4622(1):1–99. doi:10.11646/zootaxa.4622.1.1.

Riek EF. 1953. A corallanid isopod parasitic on freshwater prawns in Queensland. Proc Linn Soc N S W. 77:259–261. https://biostor.org/reference/68484 .

Riek EF. 1967. A new corallanid isopod parasitic on Australian freshwater prawns. Proc Linn Soc N S W. 91:176–178.

Roy MK, Mitra S. 2014. *Tachaea spongillicola* (Cymothoida: Corallanidae) from West Bengal, India. Taprobanic J Asian Biodivers. 6(1):46. doi:10.4038/tapro.v6i1.7084.

Schioedte JC, Meinert F. 1879. Symbolae ad monographium Cymothoarum crustaceorum isopodum familiae. Naturhistorisk Tidskrift Ser. 3(1):2321.

Shen CJ. 1936. The freshwater isopods of Peiping. Bull Fan Memorial Inst Biol. 7:1–31.

Smit NJ, Bruce NL, Hadfield KA. 2014. Global diversity of fish parasitic isopod of the family Cymothoidae. Int J Parasitol Parasites Wildl. 3:188–197. doi:10.1016/j.ijppaw.2014.03.004

Stebbing TRR. 1893. A history of Crustacea. Recent Malacostraca. New York: Appleton and Company; p. 466. doi:10.5962/bhl.title.53964

Stebbing TRR. 1904a. Gregarious Crustacea from Ceylon. Spolia Zeylanica. 2:1–26.
Stebbing TRR. 1904b. Marine crustaceans. XII. Isopoda, with description of a new genus. In: Gardiner JS, editor. Fauna and geography of the maldive and laccadive archipelagoes. Vol. 2. Cambridge: University Press; p. 699–721.
Stebbing TRR. 1907. A freshwater isopod from Calcutta. Zool J Linn Soc. 30:39–41. doi:10.1111/j.1096-3642.1907.tb02121.x
StebbingTRR. 1908. Crustacea. A note on the isopod genus. *Tachaea.* Rec Ind Mus. 2:107.
Tattersall WM. 1921. Zoological results of a tour in the far east. Mysidacea, Tanaidacea and Isopoda. Mem Asiat Soc Bengal. 6:403–433.
Thielemann M. 1910. Beiträge zur Kenntnis der Naturgechichte Ostasiens. Herausgegeben von F. Doflein. Band II. No. 9. Beiträge zur Kenntnis der Isopodenfauna Ostasiens. Abhandlungen der Matemathetisch-Naturwissenschaftlichen Klasse der K. Bayer. Akademia Wiss. 2(suppl):1–109.
Thompson JD, Higgins DG, Gibson TJ. 1994. Clustal W: improving the sensitivity of progressive multiple sequence alignment through sequence weighting, position-specific gap penalties and weight matrix choice. Nucleic Acids Res. 22(22):4673–4680. doi:10.1093/nar/22.22.4673.
Weber M. 1892. Die Susswasser-Crustaceen des Indischen Archipels. Zoologische Ergebnisse einer Reise in Niederlandisch Ost-Indien 2; p. 528–571.
Xu W, Han Z, Xing Y, Li X, Zhao Y, Chen Q, Li Y. 2019. Distribution of the parasitic isopod *Tachaea chinensis* in China. Sci Rep. 9(1):1–7. doi:10.1038/s41598-019-56402-1.