Zootaxa 3802 (1): 075–084
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3802.1.6
http://zoobank.org/urn:lsid:zoobank.org:pub:6626D3C4-75B2-42DB-8824-657C0AB2125E

A new species of *Streptocephalus* (Crustacea: Anostraca: Streptocephalidae) from the Western Ghats, India, with a key to the Asian species

D. CHRISTOPHER ROGERS[1,2,5] & SAMEER PADHYE[3,4]

[1]*Kansas Biological Survey/Natural History Museum (Biodiversity Institute), Kansas University, Higuchi Hall, 2101 Constant Avenue, Lawrence, KS 66047-3759 USA. E-mail: Branchiopod@gmail.com*
[2]*University of New England, Armidale, 2351, Australia; droger20@une.edu.au*
[3]*Department of Zoology, Modern College, Shivajinagar, Pune, 411005, India*
[4]*1256 Sadashiv Peth, Suvidya Apts, Pune, 411030, India*
[5]*Corresponding author*

Abstract

We present and describe the fairy shrimp *Streptocephalus sahyadriensis* **sp. nov**. from the Western Ghats of India. This species is most similar to *S. simplex* Gurney, 1906 and *S. dichotomus* Baird, 1860 sharing similar basic antennal appendage morphology. However, *S. sahyadriensis* **sp. nov**. differs in the form of the ornamentation on the peduncle and the arrangement and form of spines on the antennal appendage. The three species also have different egg surface morphologies. The Asian species of *Streptocephalus* are discussed and a key to species is provided.

Key words: *Streptocephalus sahyadriensis* **sp. nov**., insular endemic species, identification key

Introduction

Streptocephalus is the largest anostracan genus comprised of 64 valid species (Rogers 2013), with most occurring in Africa and North America (Belk & Brtek 1995; Daniels *et al.* 2004). Nine species have been reported from Asia to date, with five occurring on the Indian subcontinent (Belk & Brtek 1995; Belk & Esparza 1995; Velu & Munuswamy 2005; Rogers *et al.* 2013), with *Streptocephalus dichotomus* Baird, 1860 being the most commonly encountered.

One of us (SP) conducted surveys in northern portions of India's Western Ghats and discovered a previously undescribed *Streptocephalus* species occurring in pools in lateritic outcroppings. The Western Ghats are the steep western edge of an elevated plateau (Prasad *et al.*, 2009 and references therein) and are amongst the 25 primary biodiversity hotspots in the world (Myers *et al.* 2000). The Ghats provide shelter to an (under) estimated 1,146 species of freshwater animals (Molur *et al.* 2011). The northern part of Western Ghats lies in the states of Maharashtra and Goa. This part has a longer dry period (Daniels 1992) and different geology than the southern Western Ghats (Mani 1974, Watve 2013). The northern Western Ghats average 1000 m in elevation (Mani 1974). We present the 65th species of *Streptocephalus*, the sixth from India, and a key to the Asian members of the genus.

Methods

One of us (SP) surveyed potential large branchiopod habitats across the northern region of the Western Ghats (Maharashtra and Goa states) during the monsoon seasons of 2012 and 2013. Surveys were conducted by sampling potential habitats during the wet season with a long handled dip net with 300 µm mesh. Specimens were preserved in 70% ethyl alcohol. Additional material was provided by other collectors (see data below, and Acknowledgements).

Accepted by M. Alonso: 4 Apr. 2014; published: 23 May 2014

8' Antennal appendage anterior ramus without an anterior projection, anterior surface of ramus smooth; India . . . . . *Streptocephalus longimanus* Bond, 1934

9(7) Antennal appendage posterior ramus ("finger") with major spines of the longitudinal spine row not tumid basally 10

9' Antennal appendage posterior ramus ("finger") with major spines of the longitudinal spine row tumid basally and aciculate distally; India. . . . . *Streptocephalus sahyadriensis* **sp. nov**.

10(9) Second antenna distal antennomere with a subtending fleshy protuberance ("wart"); Cambodia, Laos, Thailand . . . . . *Streptocephalus sirindhornae* Sanoamuang *et al.* 2000

10' Second antenna distal antennomere lacking a subtending fleshy protuberance; India, Myanmar, Pakistan . . . . . *Streptocephalus dichotomus* Baird, 1860

Acknowledgments

We are especially grateful to Modern College, Shivajinagar, Pune and Dr. Hemant Ghate for providing the lab facilities to S.P., the Council of Scientific and Industrial Research (CSIR) for the scholarship provided to S.P., Dr. Hemant Ghate for giving suggestions for the large branchiopod work of S.P., Prof. Nirmala Kulkarni, Centre for Advanced Studies in Sanskrit (CASS), University of Pune for her help in validating the Sanskrit part of the name, Mr. Shriraj Jakhalekar for collecting the material from Chalkewadi in 2012, Mr. Siddharth Kulkarni, Mr. Mihir Kulkarni, Ms. Shruti Paripatyadar and Ms. Sayali Sheth for collecting material from Mhavshi in 2013, Dr. Yugandhar Shinde and Dr. Avinash Vanjare for helping in collections on Tableland in 2012 and Dr. Aparna Watve and BIOME for suggestion of the Chalkewadi locality and helping in travel to Chalkewadi in 2012. We also want to thank Dr. Brian V. Timms for his very helpful comments on the first draft of this manuscript, and Lynda Beladjal and Nicolas Rabet for their detailed comments on our initial submitted manuscript.

References

Baird, W. (1860) Description of two new species of entomostracous crustaceans from India. *Proceedings of the Zoological Society of London*, 28, 445–446.

Belk, D. & Brtek, J. (1995) Checklist of the Anostraca. *Hydrobiologia*, 298, 315–354. http://dx.doi.org/10.1007/bf00033826

Belk, D. & Esparza, C.E. (1995) Anostraca of the Indian subcontinent. *Hydrobiologia*, 298, 287–293. http://dx.doi.org/10.1007/bf00033823

Bond, R.M. (1934) Report on phyllopod Crustacea (Anostraca, Notostraca and Conchostraca) including a revision of the Anostraca of the Indian Empire. *Memoirs of the Connecticut Academy of Arts and Sciences*, 10, 29–62.

Brendonck., L., Rogers, D.C., Olesen, J., Weeks, S. & Hoeh, W.R. (2008) Global diversity of large branchiopods (Crustacea: Branchiopoda) in freshwater. *Hydrobiologia*, 595, 167–176. http://dx.doi.org/10.1007/s10750-007-9119-9

Brtek, J. (1974) Zwei *Streptocephalus* Arten aus Afrika und einige Notizen zur Gattung *Streptocephalus*. *Annotationes Zoologicae et Botanicae*, 96, 1–9.

Brtek, J. (2002) Taxonomical survey of the Anostraca, Notostraca Cyclestherida, Spinicaudata and Laevicaudata. *Zbornik Slovenského Národneho Músea (Acta Rerum Naturualium Musei Nationalis Slovaci, Bratislava)*, 48, 49–59.

Daniels, R.J.R. (1992) Geographical distribution patterns of amphibians in the Western Ghats, India. *Journal of Biogeography*, 19, 521–529. http://dx.doi.org/10.2307/2845771

Daniels, S.R., Hamer, M., & Rogers, D.C. (2004) Molecular evidence suggests an ancient radiation for the fairy shrimp genus *Streptocephalus* (Branchiopoda: Anostraca). *Biological Journal of the Linnaean Society*, 82, 313 – 327. http://dx.doi.org/10.1111/j.1095-8312.2004.00359.x

Dumont, H.J., De Walsche, C., & Mertens, J. (1991) Distribution and morphological variation of *Streptocephalus torvicornis* (Waga, 1842) in Northern Africa. *Hydrobiologia*, 212, 203–208. http://dx.doi.org/10.1007/bf00026002

Dumont, H.J., Mertens, J. & Maeda-Martínez, A. (1995) Historical biogeography and morphological differentiation of *Streptocephalus torvicornis* (Waga) since the Würm III-glaciation. *Hydrobiologia*, 298, 281–286. http://dx.doi.org/10.1007/978-94-011-0291-9_26

Ghate, H.V. & Shetty, N (1997). Record of Triops (Crustacea: Branchiopoda: Notostraca) from Pune, Maharashtra. *Journal of the Bombay Natural History Society*, 94, 588–589.

Ghauri, A.A. & Mahoon, M.S. (1980) *Streptocephslau lahorensis*, sp. nov. *Biologia Lahore*, 26, 269–271.

Gurney, R. (1906) On some freshwater Entomostraca in the collection of the Indian Museum, Calcutta. *Journal of the Asiatic Society, Bengal*, 2, 273–281.

IUCN (International Union of Conservation of Nature and Natural Resources) (2000) *Red List of Threatened Species, compiled by Craig Hilton-Taylor*. IUCN-The World Conservation Union Species Survival Commission.

Hamer, M. & Brendonck, L., Coomans, A. & Appleton, C. (1994a) A review of the African Streptocephalidae (Crustacea: Branchiopoda: Anostraca) Part 1: south of Zambezi and Kunene rivers. *Archiv für Hydrobiologie,* Suppl. 99, 235–277.

Hamer, M. & Brendonck, L., Coomans, A., & Appleton, C. (1994b) A review of the African Streptocephalidae (Crustacea: Branchiopoda: Anostraca) Part 2: north of Zambezi and Kunene rivers. *Archiv für Hydrobiologie*, Suppl. 99, 279–311.

Li, J.-J., Ko, F.-C. & Li, J.-J. (2010) Crustaceans on Siaolanyu Isle of Taiwan. *Platax*, 7, 1–11.

Maeda-Martínez, A., Belk, D., Obregón-Barboza, H., & Dumont, H.J. (1995) A contribution to the systematics of the Streptocephalidae (Branchiopoda: Anostraca). *Hydrobiologia*, 298, 203–232. http://dx.doi.org/10.1007/978-94-011-0291-9_19

Mani, M. S. (1974) *Ecology and biogeography in India*. W. Junk Publishers, The Hague, pp. 647.

Molur, S., Smith, K.G., Daniel, B.A. & Darwall, W.R.T. (2011) *The Status and Distribution of Freshwater Biodiversity in the Western Ghats, India*. IUCN, and Coimbatore, Cambridge, UK and Gland, Switzerland & Zoo Outreach Organization, India, 117 pp.

Myers, N., Mittermeier, R.A., Mittermeier, C.G., da Fonseca, G.A.B. & Kent, J. (2000) Biodiversity hotspots for conservation priorities. *Nature*, 403, 853–858.

Nation, J.L. (1983) A new method using Hexamethyldisilazane for preparation of soft insect tissues for scanning electron microscopy. *Stain Technology*, 58 (6), 347–351.

Pai, L. (1958) On the post embryonic stages of phyllopod crustaceans, *Triops* (*Apus*), *Streptocephalus* and *Estheria*. *Proceedings of the Indian Academy of Science*, 48B, 229–250.

Prasad, V., Farooqui, A., Tripathi, S.K.M., Garg, R. & Thakur, B. (2009) The Western Ghats are thus, precipitous western edge of an elevated Plateau, Evidence of Late Palaeocene-Early Eocene equatorial rain forest refugia in southern Western Ghats. *Indian Journal of Biosciences*, 34, 777–797. http://dx.doi.org/10.1007/s12038-009-0062-y

Rogers, D.C. (2013) Anostraca Catalogus. *Raffles Bulletin of Zoology*, 61, 525–546.

Rogers, D.C., Thaimuangphol, W., Saengphan, N. & Sanoamuang, L. (2013) Current knowledge of the Southeast Asian large branchiopod Crustacea (Anostraca, Notostraca, Laevicaudata, Spinicaudata, Cyclestherida). *Journal of Limnology*, 72, 69–80. http://dx.doi.org/10.4081/jlimnol.2013.s2.e5

Sanoamuang, L., Murugan, G., Weekers, P.H.H. & Dumont, H.J. (2000a) *Streptocephalus sirindornae*, new species of freshwater fairy shrimp (Anostraca) from Thailand. *Journal of Crustacean Biolo*gy, 20, 559–565. http://dx.doi.org/10.1163/20021975-99990073

Sanoamuang, L., Sanoamuang, N., Saengphan, N., Chusing, R., Athibai, S. & Lekchan, S. (2000b) *Species diversity and distribution of fairy shrimps in Thailand*. Faculty of Science, Khon Kaen University, Khon Kaen, Thailand, 19 pp.

Sanoamuang, L. & Saengphan, N. (2006) A new species of *Streptocephalus* fairy shrimp (Crustacea, Anostraca) with tetrahedral cysts from Central Thailand. *International Review fur Hydrobiologie*, 91, 250–256.

Thiele, J. (1904) Über eine von Herrn O. Neumann gefundene Phyllopoden-Art. *Zoologischen Jahrbüchen: Abtheilung für Systematik Geographie und Biologie der Thiere*, 20, 371–374.

Thiéry, A. (1996) Large branchiopods (Crustacea: Anostraca, Notostraca, Spinicaudata, Laevicaudata) from temporary inland waters of the Arabian Peninsula. *Fauna of Saudi Arabia*, 15, 37–98.

Velu, C.S. & Munuswamy, N. (2005) Updated diagnoses for the Indian species of *Streptocephalus* (Crustacea: Branchiopoda: Anostraca). *Zootaxa*, 1049, 33–48.

Watve, A. (2008) Special habitats: rock outcrops in northern Western Ghats. Special Habitats and threatened plants of India, Wildlife and Protected Areas. *Envis*, 11, 147–153.

Watve, A. (2013) Status review of Rocky plateaus in the northern Western Ghats and Konkan region of Maharashtra, India with recommendations for conservation and management. *Journal of Threatened Taxa*, 5, 3935–3962. http://dx.doi.org/10.11609/jott.o3372.3935-62