

New record of two isopods *Alitropus Typus* and *Tachaea Spongillicola* from riverine freshwater fishes in western India

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Abstract

The present paper deals with the infestation of freshwater fishes *Labeo boggut*, *Oreochromis niloticus*, *Systomus sarana*, and *Xenentodon cancila* by the parasitic isopods *Alitropus typus* and *Tachaea spongillicola* in Tapti, a westward freshwater flowing river of India. It is the first record of the infestation of parasitic isopods *Alitropus typus*, and *Tachaea spongillicola* in the freshwater fishes of river Tapti with new hosts' species *Labeo boggut*, *Oreochromis niloticus*, and *Systomus sarana*.

Introduction

Alitropus typus H. Milne Edwards, 1840 a Malacostraca under the order Isopoda and family Aegidae is distributed in both fresh and brackish water ecosystems. *Tachaea spongillicola* Stebbing, 1907 under the order Isopoda, suborder Cymothoidea and family Corallanidae is distributed in freshwater ecosystems only. Isopod parasites are common in many commercially important species and cause various levels of damages (Sethi 2012). Isopods are dorsoventrally flattened crustaceans with approximately 10 000 species distributed in a wide range of habitats, of which 4500 are marine, and 500 are freshwater (Kensley & Brusca 2001). The cymothoid isopods well inhabit in freshwater, brackish water as well as in marine environments. They are generally observed on the body, buccal cavity, and gill cavity of the host species (Trilles and Bariche 2006). Most of the cymothoids are considered to be highly host and site-specific (Rameshkumar et al. 2013).

River Tapti is also known as Tapi, is one of the two crucial westerly flowing rivers of peninsular India, originates from the Vindhya mount of the Satpura range from Madhya Pradesh and culminates into the Gulf of Cambay of the Arabian Sea at Surat, Gujarat. The total length of the river is 724 km and flows westwards, draining Madhya Pradesh, Maharashtra, and Gujarat. The main tributaries are rivers Purna, Girna, Panzara, Waghur, Bori, and Aner. The upper stretch of the river Tapti is highly rocky and scattered with boulders. The lower stretch is sandy, dispersed with pebbles (Karamchandani and Pisolkar 1967; Meetei et al. 2020). River Tapti harbours a rich diversity of fishes. However, no published literature is so far available on the parasitic isopod infestation on the freshwater fishes of the rivers. The present findings confirmed the occurrences of parasitic isopods *Alitropus typus* and *Tachaea spongillicola* from the freshwater fishes of river Tapti with information of some new hosts.

Materials And Methods

During the study of finfish diversity from four landing centers namely Savkheda (21⁰08'58.8" N, 75⁰14'01.7" E), Sarangkhedha (21⁰25'41.1" N, 74⁰31'48.6" E), Singalkanch (21⁰15'38.2" N, 73⁰35'02.1" E) and Kamrej (21⁰15'38.6" N, 73⁰34'45.3" E) in the middle and lower stretch of river Tapti, covering Maharashtra and Gujarat states, we found isopod infestations in freshwater fishes from stations Singalkanch and Kamrej of Gujrat (Fig. 1). Fish samples were collected seasonally from all the centers from November 2018 to December 2019, and in two seasons (post-monsoon and pre-monsoon) during June 2019 and January 2020, we came across freshwater fishes were infested with parasitic isopods A.

typus and *T. spongillicola*. The local fishers captured the fishes mainly with dragnet (zero mesh), gill nets (20–80 mm), scoop net (zero mesh) during night time, and we collected the fish specimens in early morning (5.0–6.0 am). The isopods *Alitropus typus* H. Milne Edwards, 1840 and *Tachaea spongillicola* Stebbing, 1907 were identified with the taxonomic keys of Milne Edwards (1840) and Stebbing (1907), respectively. Both species are new records from the Gujrat state. The present communication aims to report the isopods from Gujarat state in addition to the two species of fishes recognized as new hosts of *A. typus* and one fish species that of *T. spongillicola*. Both the isopod specimens have been deposited in the ZSI, Kolkata, West Bengal as a voucher specimen with ZSI reg. No. C8295/1 and C8295/2, for *A. typus* and *T. spongillicola*, respectively.

Results

During the study period, we recorded 20 finfish species from Singalkanch and 17 from Kamrej, respectively, and out of those, 4 species, namely *Labeo boggut*, *Oreochromis niloticus*, *Systomus sarana* and *Xenentodon cancila* were found infested with parasitic isopods (Fig. 2). The percentage of occurrence rate by both the isopods on fishes is provided in Table 1. The highest occurrence rate was recorded in *O. niloticus* (40%) and lowest in *S. sarana* (12.22%) for *A. typus*. Isopod *T. spongillicola* infested only a single specimen of *S. sarana* with occurrence rate of 2.53%.

The size of *A. typus* was measured 19–23 mm in length and 9.5–12.0 mm in breadth, respectively. The species was identified as *A. typus* by its reduced coxae on perionites 5–7; frontal lamina small, mandibular palp greater than mandible, maxillule has one broad and two slender terminal spines; maxilla with two hooked spines on endopod; exopod with one spine, palp of maxilliped with three articles, terminal article with five hooked spines; first pleopod with peduncle nearly as long as wide; rami subequal in length, pleopods 3–5 with partial suture on exopod (Figs. 3 and 4). The isopod *A. typus* is distributed in the Bay of Bengal, Sri Lanka, Sumatra, Thailand, Borneo and China (Milne-Edwards 1840). In India, it has been recorded in the states of Odisha and Kerala. It is found in freshwater tanks, coastal waters, brackish water lakes, freshwater rivers. The size of the isopod specimen *T. spongillicola* was 8.0 mm in length and 3.5 mm in breadth. The specimen was found to agree with the description of Stebbing (19.7) (Fig. 5). It is a freshwater isopod, and in India, it is reported to be distributed in West Bengal and Tamil Nadu.

Discussion

A perusal of literature reveals that isopod fauna is represented by only 4 species from Gujarat state. So far, no freshwater isopod species were known from this state. Considering the habitat ecology of these species, it is fascinating to find these specimens from the river Tapti, as the occurrence of *A. typus* in the freshwater riverine ecosystem is very limited (Fang-Hua et al. 2008; Mitra and Dev Roy 2011; Ahmad et al. 2016). Most important of the present investigation is to record three new host fishes for *A. typus* and one species for *T. spongillicola*. A list of the entire hosts recorded for both the isopods species are given in Table 2.

Alitropus typus was first reported from Shastancotta, a freshwater lake of Kerala, India (Stebbing 1911). Subsequently, Chilton (1926) reported it as *Rocinella simplex* from Chilka Lake, whereas Pillai (1967) describes a new species, *Alitropus dimorphus* from Travancore (Kerala); both the species are now synonymised as *Alitropus typus* (Bruce 1983). *Alitropus typus* has a wide range of distribution (Australia, Borneo, Sumatra, Thailand, Sri Lanka, India and China) and a wide habitat choice (freshwater to brackish water), the occurrence of this species in freshwater riverine ecosystem was, however, only reported by Wang et al. (2008) from He-river of China; Mitra and Dev Roy (2011) from Damodar river, a tributary of River Hooghly of West Bengal, India; Ahmad et al. (2016) in Chasma Lake of Pakistan.

The isopod *T. spongillicola* was described by Stebbing (1907) from a freshwater sponge from Kolkata of West Bengal, India. After an extended period, Mariappan et al. (2003) reported this species from three locations along the course of the river Cauvery from Tamil Nadu with the host *Macrobrachium* spp. Roy and Mitra (2014) also reported this species from the Hooghly river from freshwater prawn *Macrobrachium nobilii*. As per the records, the infestation of *T. spongillicola* was restricted to freshwater prawns only. Though, we could found a low occurrence rate of isopod *T. spongillicola* on *S. sarana* (2.53%), a similar kind of low percentage of occurrence (1.06–1.61%) also been reported in three *Macrobrachium* spp. by Mariappan et al. (2003) from river Cauvery, India.

As per Baer (1952), the parasitic isopods were considered as absolute host-specific and each species of the host was assumed to harbor a distinctive species of parasite. But, in the present observation it was found that both the isopods were associated with new hosts and infestation mainly depended on the availability of fish species in the respective environment and distinct ecological conditions, which also supported the work of Nair et al. (1981); Ahmad et al. (2016). The infestation of *T. spongillicola* from a freshwater fish *S. sarana* is the first report of its kind from the freshwater species from the riverine ecosystem in India.

Conclusion

For the first time, infestation of parasitic isopods *A. typus* was recorded in freshwater fishes of river Tapti with new hosts' species *L. boggut*, *O. niloticus*, and *S. sarana*. The infestation of *T. spongillicola* from a freshwater fish *S. sarana* is the first report of its kind from the freshwater species from the riverine ecosystem in India.

Declarations

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Conflicts and interests

None of the authors has conflicts of interest.

Availability of data and materials

Data is available with the first author and shall be provided as and when required.

Code availability

“Not applicable” for that section.

Authors' contributions

DB- specimen collection, manuscript writing; BKD- conceptualization, editing; SPK- data entry and analysis; SKD- review & editing; SS- review & editing; SM- Isopod identification, photograph.

Ethical Approval

All applicable international, national, and/or institutional guidelines for the care and use of animals were followed. All animals in this study were wild-caught and in accordance with the guidelines set out in the animal welfare laws of India. The study was undertaken with the approval of the statutory authorities of the ICAR-Central Inland Fisheries Research Institute, Barrackpore, India (AN ISO 9001: 2015).

Consent to participate

“Not applicable” for that section.

Consent for publication

All authors gave their consent for publication.

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Tables

Table 1 Infestation rate of isopods in freshwater fishes of river Tapti, India

Fish species / Isopods	Total Nos. of fishes collected	Number of fishes infected	Occurrence of isopod (Nos.)	Occurrence rate (%)
Isopod- <i>Alitropus typus</i>				
<i>Labeo boggut</i> (Sykes, 1839)	47	8	13	17.02 (8/47)
<i>Systemus sarana</i> (Hamilton, 1822)	90	11	14	12.22 (11/90)
<i>Oreochromis niloticus</i> (Linnaeus, 1758)	05	2	9	40 (2/5)
<i>Xenentodon cancila</i> (Hamilton, 1822)	35	7	8	20 (7/35)
Isopod- <i>Tachaea spongillicola</i>				
<i>Systemus sarana</i> (Hamilton, 1822)	79	2	1	2.53 (2/79)

Table 2 Fish species recorded as a host of *Alitropus typus* and *Tachaea spongillicola* reported from different water bodies

Host	Family	Locality/Habitat	References
Isopod- <i>Alitropus typus</i>			
<i>Mugil</i> sp.	Mugilidae	Wivenhoe dam & Elimbah creek Southern Queensland/ Brackishwater	Bruce, 198
<i>Channa striata</i> (Bloch, 1793)	Channidae	Tamil Nadu /Brackish water	Nair and Nair 2003
<i>Cirrhinus molitorella</i> (Valenciennes, 1844)	Cyprinidae	He river, Guangdong, China/ Fresh water river	Fang-Hua et al. 2008
<i>Oreochromis mossambicus</i> (Peters, 1852)	Cichlidae	Tamil Nadu, Vellar estuary/ Brackish water	Rameshkumar and Ravichandran 2010
<i>Badis badis</i> (Hamilton, 1822)	Badidae	Damoder river / Fresh water river	Mitra and Deb Roy 2011
<i>Labeo calbasu</i> (Hamilton, 1822), <i>Labeo rohita</i> (Hamilton, 1822), <i>Cyprinus carpio</i> Linnaeus, 1758, <i>Labeo gonius</i> Hamilton, 1822), <i>Crossocheilus latius</i> (Hamilton, 1822), <i>Cirrhinus mrigala</i> (Hamilton, 1822)	Cyprinidae	Chasmama Lake, Pakistan/ fresh water Lake	Ahmad et al. 2016
<i>Wallago attu</i> (Bloch & Schneider, 1801), <i>Ompok pabda</i> (Hamilton, 1822)	Siluridae		
<i>Sperata sarwari (seenghala)</i> (Sykes, 1839)	Bagridae		
<i>Channa marulius</i> (Hamilton, 1822)	Channidae		
<i>Notopterus notopterus</i> (Pallas, 1769)	Notopteridae		
<i>Chanda (Parambassis) baculis</i> (Hamilton, 1822)	Ambassidae		
<i>Gudusia chapra</i> (Hamilton, 1822)	Clupiedae		
<i>Puntius sophore</i> (Hamilton, 1822)	Cyprinidae		
<i>Xenentodon cancila</i> (Hamilton, 1822)	Belonidae		
<i>Labeo boggut</i>	Cyprinidae	Tapti river/ Freshwater	Present record

<i>Oreochromis niloticus</i>	Cichlidae		
<i>Systomus sarana</i>	Cyprinidae		
<i>Xenentodon cancila</i>	Belonidae		
Isopod-<i>Tachaea spogillicola</i>			
<i>Eunapius carteri</i> (Bowerbank, 1863)	Spongillidae	Indian museum tank, Kolkata / fresh water	Dev Roy and Mitra 2014
<i>Macrobrachium lamarrei</i> H. Milne Edwards, 1837	Palaemonidae	Cauvery river	Mariappan et al. 2003
<i>Macrobrachium malcolmsonii</i> Milne Edwards, 1844			
<i>Macrobrachium nobilii</i> (Henderson & Matthai, 1910)			
<i>M. nobilii</i>	Palaemonidae	Damodar river, West Bengal / fresh water	Roy and Mitra 2014
<i>Systomus sarana</i>	Cyprinidae	Tapti river/ Freshwater	Present record

Figures

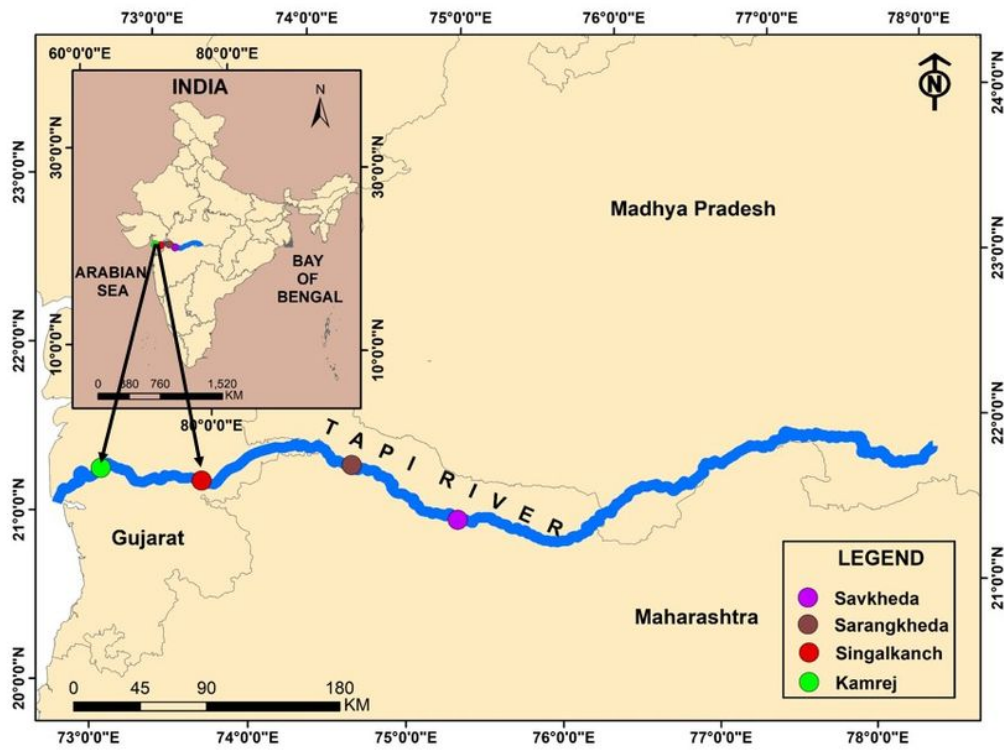


Figure 1

Map showing the collection sites of isopods infested fishes from river Tapti. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or bbnhjr of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.



Figure 3

Alitropus typus female (dorsal view)



Figure 4

Alitropus typus male (dorsal view)



Figure 5

Tachaea spongillicola female (dorsal view)