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Tube-constructing paratanaoidean tanaidaceans (Crustacea: Peracarida): a brief review

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Abstract

This study summarizes previous reports of tubes constructed with thread or mucus by paratanaoidean tanaidaceans. A literature survey found 34 genera in 14 extant families to contain species with for which information exists on tubes, whereas five families (Akanthophoreidae, Heterotanoididae, Paranarthrurellidae, Pseudozeuxidae, and Teleotanaidae) lacked any records of tube-use.

Key words: benthos; Paratanaoidea; Tanaidacea; Tanaidomorpha; thread; tube dweller

Tanaidacea is an order of benthic crustaceans that contains about 1500 described species worldwide (Anderson 2020) and comprises five superfamilies (Apseudoidea, Cretitanaoidea, Neotanaoidea, Paratanaoidea, and Tanaidoidea) in three suborders (Anthracocaridomorpha, Apseudomorpha, and Tanaidomorpha) (Kakui et al. 2011; Heard et al. 2020). Many tanaidaceans construct tubes with thread or mucus in bottom sediments and on biotic or abiotic substrata (Larsen 2005; Kakui 2016; hereafter 'tube-dwellers'); in some groups, one or both ends of tubes can be sealed (Hassack and Holdich 1987). Although a few tube-dwelling species are known in Apseudoidea (Kakui and Hiruta 2014, 2017), most known tube dwellers belong to Paratanaoidea or Tanaidoidea and use a thoracic gland system (Kaji et al. 2016) to construct their tubes.

Paratanaoidea comprises more than 170 genera in one extinct and 19 extant families (Anderson 2020; Heard et al. 2020). Paratanaoideans are almost exclusively tube dwellers (Larsen et al. 2015), but actual observations of their tubes have been restricted to a few groups. Hassack and Holdich (1987), in a review that included previous records of tube construction in Tanaidacea as well as new observations from fixed samples, found that twelve paratanaoidean genera included tube-constructing species. Several papers subsequently reported additional paratanaoideans having tubes.

My literature survey detected 34 genera in 14 extant families that contain species for which information exists on tubes (Table 1); Fig. 1 shows two examples of paratanaoidean tubes. Several previous studies have included photos or illustrations of paratanaoidean tubes or threads (e.g., Bückle Ramírez 1965; Greve 1967; Lang 1973; Heard 1982; Bird and Holdich 1985; Hassack and Holdich 1987; Sieg and Zibrowius 1988; Krasnow and Taghon 1997; Larsen and Cunha 2006; Blazewicz-Paszkowycz et al. 2012; Gellert and Błażewicz 2019). There are no records of tube use in the remaining five extant families in Paratanaoidea (Akanthophoreidae, Heterotanoidi-



Fig. 1. Two examples of paratanaoidean tubes. A, tube of *Tanaella kommritzia* Larsen and Shimomura, 2007 (Tanaellidae), with an individual inside. B, tube of *Nesotanais* cf. *ryukyuensis* Kakui et al., 2010 (Nototanaidae).

dae, Paranarthrurellidae, Pseudozeuxidae, and Teleotanaidae).

Several previous studies found no tubes in limited groups; for example, Bird (2004: p. 1381) noted, "No tube has been definitively associated with any of the *Paratyphlotanais* species reported here." Failure to observe tubes is often interpreted to mean that tubes were broken or lost during sample processing and fixation (Bird 2004; Larsen 2005; Błażewicz-Paszkowycz 2007). There may be validity to this, as tubes of *Paranarthrura*, which had not been reported by 1989 (Bird and Holdich 1989a), were reported later (Bird 2010), and Błażewicz-Paszkowycz (2007) observed that the tubes of *Nototanais antarcticus* disintegrated during sample processing. Or, it may imply the possibility that there may be groups constructing tubes only for limited periods in their life (e.g., as a brood-nursery). On the other hand, several researchers have suggested that tube construction occurs in relatively few paratanaoidean groups (see Larsen 2005). Uncertainty remains because observations of both tubes and thread-producing glands are very limited for paratanaoideans. To understand the taxonomic distribution of tube building members in Paratanaoidea, further reports are badly needed.

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Table 1. List of paratanaoidean groups in which tubes have been observed.

Family	Genus	Species	Source
Agathotanaidae	*Agathotanais*	*A. ingolfi*	Bird (2010)
	Paranarthrura	*P. insignis*	Bird (2010)
Anarthruridae	*Anarthrura*	*A. simplex*	Hassack and Holdich (1987)
	Macilenta	*M. ewae*	Gellert and Błażewicz (2019)
	Anarthruropsis	*A.* sp.	Reidenauer and Thistle (1985)
	Waki	*W. australiensis*	Gellert and Błażewicz (2019)
Colletteidae	*Collettea*	*C. cylindrata*	Hassack and Holdich (1987)
	Haplocope	*H. angusta*	Greve (1967)
	Nematotanais	*N. mirabilis*	Bird and Holdich (1985)
Cryptocopidae	*Cryptocopoides*	*C. arcticus*	Hassack and Holdich (1987)
Leptocheliidae	*Chondrochelia*	*C. dubia*, *C. savignyi*	Lang (1973); Holdich and Jones (1983); Krasnow and Taghon (1997)
	Hargeria	*H. rapax*	Heard (1982)
	Heterotanais	*H. oerstedi*, *H.* sp.	Bückle Ramírez (1965)
	Konarus	*K. straddi*	Bamber (2013)
	Parakonarus	*P. kopure*	Bird (2011)
	Poorea	*P. nobbi*	Bamber (2005)
Leptognathiidae	*Leptognathia*	*L. breviremis*, *L. tenella*	Greve (1967); Hassack and Holdich (1987)
Mirandotanaidae	*Mirandotanais*	*M. vorax*	Sieg (1986)
Nototanaidae	*Nesotanais*	*N. lacustris*, *N.* cf. *ryukyuensis*	Shiino (1968); this study
	Nototanais	*N. antarcticus*, *N. dimorphus*	Oliver and Slattery (1985); Błażewicz-Paszkowycz (2007)
Paratanaidae	*Bathytanais*	*B. culteriformis*	Larsen and Wilson (1998)
	Paratanais	*P. hamulus*	Bird and Bamber (2013)
	Pseudobathytanais	*P. gibberosus*	Larsen and Heard (2001)
Pseudotanaidae	(not mentioned)	(not mentioned)	Bird and Holdich (1989b)
Tanaellidae	*Tanaella*	*T.* sp., *T. kommritzia*	Larsen and Heard (2004); this study
Tanaissuidae	*Tanaissus*	*T. lilljeborgi*, *T. psammophilus*	Siewing (1953); Heard et al. (2004)
Tanaopsiidae	*Tanaopsis*	*T. graciloides*	Bamber (1986)
Typhlotanaidae	*Obesutanais*	*O. sigridi*	Larsen and Cunha (2006); Larsen et al. (2006)
	Peraeospinosus	*P. magnificus*	Kudinova-Pasternak (1969)
	Pulcherella	*P. pulcher*	Hassack and Holdich (1987)
	Typhlotanais	*T. aequiremis*, *T. assimilis*, *T. brevicornis*, *T. solidus*, *T. spinicauda*, *T. trispinosus*	Greve (1967); Hassack and Holdich (1987)
	Typhlotanoides	*T.* spp.	Hassack and Holdich (1987)
(incertae sedis)	*Bifidia*	*B. scleractinicola*	Sieg and Zibrowius (1988)
	Exspina	*E. typica*	Hassack and Holdich (1987)

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