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## Turbo-taxonomy: 21 new species of Myzostomida (Annelida)

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### Abstract

An efficient protocol to identify and describe species of Myzostomida is outlined and demonstrated. This taxonomic approach relies on careful identification (facilitated by an included comprehensive table of available names with relevant geographical and host information) and concise descriptions combined with DNA sequencing, live photography, and accurate host identification. Twenty-one new species are described following these guidelines: *Asteromyzostomum grygieri* n. sp., *Endomyzostoma scotia* n. sp., *Endomyzostoma neridae* n. sp., *Mesomyzostoma lanterbecqae* n. sp., *Hypomyzostoma jasoni* n. sp., *Hypomyzostoma jonathoni* n. sp., *Myzostoma debiae* n. sp., *Myzostoma eekhauti* n. sp., *Myzostoma hollandi* n. sp., *Myzostoma indocuniculus* n. sp., *Myzostoma josefinae* n. sp., *Myzostoma kymae* n. sp., *Myzostoma laurenae* n. sp., *Myzostoma miki* n. sp., *Myzostoma pipkini* n. sp., *Myzostoma susanae* n. sp., *Myzostoma tertiusi* n. sp., *Protomyzostomum lingua* n. sp., *Protomyzostomum roseus* n. sp., *Pulvinomyzostomum inaki* n. sp., and *Pulvinomyzostomum messingi* n. sp.

**Key words:** systematics, polychaete, marine, symbiosis, crinoid, asteroid, ophiuroid, parasite, taxonomic impediment

### Background

Estimations of Earth's biodiversity vary by orders of magnitude (e.g. Mora *et al.* 2011; Costello *et al.* 2012; Costello *et al.* 2013) and a proposed limitation to accurate assessments is a 'taxonomic impediment' (see Wheeler *et al.* 2004; Ebach *et al.* 2011). This impediment encompasses a range of constraints (e.g. training, people power, publication impact) that prevent timely description of new species. One advocated aid is the use of online repositories for taxonomic work that can be regularly updated and peer reviewed (Wheeler *et al.* 2004; Godfray, 2007; La Salle *et al.* 2009; Maddison *et al.* 2012; Page, 2013; Parr *et al.* 2012). Such a movement is beginning with an assortment of online tools available for taxonomists (SpeciesID-Zookeys, WORMS, EOL, BioNames). Yet, a formal taxonomic name is required to effectively link molecular data, geographic distributions, and other publications (Patterson *et al.* 2010).

The valid establishment of a new animal species name requires publication of the description in a print or online journal and fulfilling a series of requirements (ICZN 1999, 2012). The time required from collection of the specimens to a formal description involves the time for establishing that the species is new, fulfilling the International Code of Zoological Nomenclature, and publishing the description. The former is slowed by a requirement to find and interpret previous descriptions and potentially the need to study type material that often may be in poor condition. Once identified as new, descriptions may require detailed morphological information for publication, which requires a significant investment of time and money. With the goal in mind to provide accurate, assessable descriptions along with the ability to unambiguously distinguish related taxa, the only aspect where time can be reduced is eliminating superfluous details in the description. Shortened descriptions, though linked with appropriate DNA sequence data, have been used in a process coined 'turbo-taxonomy,' first implemented to describe 179 species of wasps (Butcher *et al.* 2012). This approach has also been used to name 101 weevil species, all of which are now online in wiki-format through incorporation with Species-ID via ZooKeys (Riedel *et al.* 2013a,b).

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