Zootaxa 3918 (2): 273–284
www.mapress.com/zootaxa/

Article

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

http://dx.doi.org/10.11646/zootaxa.3918.2.8
http://zoobank.org/urn:lsid:zoobank.org:pub:5FFF0A8B-839E-45E3-A510-0E7D32C9D8AA

Two new freshwater eutardigrade species from Sicily

GIOVANNI PILATO, GIORGIO SABELLA & OSCAR LISI
Department of Biological, Geological and Environmental Sciences, University of Catania, Via Androne 81, 95124, Catania, Italy. E-mail: pilato@unict.it

Abstract

Two new species of freshwater Eutardigrada are described from Sicily: *Isohypsibius rusticus* **sp. nov.** and *Isohypsibius zappalai* **sp. nov.** The former species has eye spots, ornamented body surface with many, variously sized tubercles; bucco-pharyngeal apparatus of the *Isohypsibius* type; pharyngeal bulb with apophyses and two rod-shaped macroplacoids; microplacoid absent; claws, of the *Isohypsibius* type, well developed, with long and thin common basal portion; main branches of all claws without free accessory points; very thin lunules present; cuticular bars on the legs absent.

Isohypsibius zappalai **sp. nov.** has eye spots; entire body surface with small tubercles rounded in shape, fairly uniformly sized and tending to form transverse lines; bucco-pharyngeal apparatus of the *Isohypsibius* type, pharyngeal bulb with apophyses and two macroplacoids; microplacoid absent; claws of the *Isohypsibius* type, well developed, with long common basal portion and both main and secondary branches with a wide proximal portion. Main branches of all claws with accessory points; small, flexible lunules present; cuticular bars on the legs absent.

Key words: Tardigrada, Sicilian freshwater fauna, *Isohypsibius rusticus* **sp. nov**., *Isohypsibius zappalai* **sp. nov**.

Introduction

Up to now, 40 species of tardigrades are recorded from Sicilian freshwater environments: the heterotardigrade: *Carphania fluviatilis* Binda, 1978 and 39 species of eutardigrades belonging to the following genera: *Macrobiotus* (4 species); *Xerobiotus* (1 species); *Paramacrobiotus* (1); *Murrayon* (1); *Macroversum* (1); *Dactylobiotus* (2); *Isohypsibius* (13): *Doryphoribius* (1); *Thulinius* (2); *Pseudobiotus* (2); *Hypsibius* (3); *Eremobiotus* (1); *Mixibius* (1); *Diphascon* (1); *Adropion* (2), *Pilatobiotus* (1), *Itaquascon* (1) and *Bertolanius* (1) (Pilato, 1971a, b, 1973, 1974; Binda, 1978; Pilato *et al*., 1982; Pilato & Catanzaro, 1988, 1989; Pilato *et al*., 1989).

In 1974 two samples of sediment were collected from two Sicilian rivers by our Departmental technician, Mr. Angelo Zappalà, and we found two specimens each belonging to a new species. While Mr. Zappalà probably stored the examples intending to find additional specimens, unfortunately he passed away and today we have only the two original specimens. Describing a new species on the basis of only one specimen is perhaps not best practice. However, Eutardigrada have a low intraspecific variability and, finding exactly the same collection site microenvironment after 40 years, in order to obtain further specimens, has proved extremely difficult. We therefore think it opportune, in this exceptional case, to describe the new species even though based on single specimen, as not describing the new species might represent a loss of knowledge.

Material and methods

All the studied specimens were mounted in polyvinyl lactophenol. Measurements, given in micrometers (μm), and photomicrographs were made under x100 oil immersion, using a Leica Phase Contrast Microscope equipped with "Canon S40" digital camera and using Adobe Photoshop Elements digital imaging software. The *pt* index is the percent ratio between the length of a structure and the length of the buccal tube measured from the medio-dorsal transverse ridge of the buccal armature to the base of the pharyngeal apophyses (Pilato, 1981).

Accepted by S. McInnes: 18 Dec. 2014; published: 11 Feb. 2015

is more dense and regular with all tubercles of almost the same size); the stylet supports are inserted on the buccal tube in a more cephalic position (*pt* = 71.0 in *I. zappalai* **sp. nov.** 76.0 in *I. rusticus* **sp. nov.**); apparently, lower *pt* value relative to the first macroplacoid (Table 1) and lower *pt* value relative to the entire macroplacoid row (Table 1); the claws are shaped differently with clearly wider proximal portion of the branches (Figs. 5D, E and 2A–C).

Etymology. The specific name is in honour to Mr. Angelo Zappalà who collected the sample from which the new species was found.

Conclusions

As stated above, describing new species on the basis of single examples is not best practice and requires very careful and stringent analysis of exceptionally good specimens. In this case we felt the two new species were so clearly different from congeners that publication would be acceptable. We have re-sampled the original habitat for these two taxa but, despite several attempts, finding the exact microhabitat appears to have proved elusive. This may reflect changes in the stream environment over the time scale of forty years. Equally, we may be observing a cyclical population that would require a detailed, long term study to prove.

With the addition of the results from this study, i.e. the description of two new species (*Isohypsibius rusticus* **sp. nov.** and *Isohpsibius zappalai* **sp. nov.**), 42 species of tardigrades are recorded from Sicilian freshwater environments: 1 heterotardigrade and 41 eutardigrades. An interesting peculiarity of the Sicilian freshwater environments is that the majority of the species (15) belong to the genus *Isohypsibius.* Only four species (*Macrobiotus*) or fewer belong to the other 17 recorded genera. Very few Sicilian rivers have been investigated and therefore further research is opportune as the faunistic knowledge of riverine tardigrades is surely incomplete.

Acknowledgements

We thank V. Biserov who kindly sent us a paratype of *Isohypsibius gilvus*, and B. Węglarska who kindly sent us the specimens from which *Isohypsibius barbarae* was described by Pilato & Binda (2002). We also thank Sandra McInnes who very kindly improved the English.

References

Bertolani, R., Guidetti, R., Marchioro, T., Altiero, T., Rebecchi, L. & Cesari, M. (2014) Phylogeny of Eutardigrada: New molecular data and their morphological support lead to the identification of new evolutionary lineages. *Molecular Phylogenetics and Evolution*, 76, 110–126.
http://dx.doi.org/10.1016/j.ympev.2014.03.006

Binda, M.G. (1978) Risistemazione di alcuni Tardigradi con l'istituzione di un nuovo genere di Oreellidae e della nuova famiglia Archechiniscidae. *Animalia*, 5, 307–314.

Biserov, V.I. (1986) Terrestrial water bears from the North Caucasus. 2. Eutardigrada. *Zoologicheskiĭ zhurnal*, 65 (7), 981–993.

Dastych, H. (1997) Redescription of *Isohypsibius sculptus* Ramazzotti, 1962 (Tardigrada). *Entomologische Mitteilungen aus dem zoologischen Museum Hamburg,* 12 (155), 163–167.

Doyère, L.M.F. (1840) Memoire sur les Tardigrades. I. *Annales des Sciences Naturelles, Paris,* Series 2 (14), 269–362.

Mihelčič, F. (1971) Beobachtungen an Tardigraden Osttirols. (1). *Veröffentlichungen des Museum ferdinandeum,* 51, 110–140.

Mihelčič, F. (1971/72) Ein beitrag zur Kenntnis des Süsswassertardigraden Nordeuropas. *Verhandlungen des Zoologische-Botanischen Gesellschaft in Wien,* 110/111, 37–45.

Murray, J. (1905) The Tardigada of the Scottish Lochs. *Transactions of the Royal Society Edinburgh*, 41 (27), 677–698.

Pilato, G. (1971a) Tardigradi delle acque dolci siciliane. Nota prima. *Bollettino delle Sedute dell'Accademia Gioenia di Scienze Naturali, Catania,* S. IV. 11, 126–134.

Pilato, G. (1971b) Su una nuova specie di *Doryphoribius* (Eutardigrada, Hypsibiidae) e considerazioni sulla posizione filogenetica del genere. *Bollettino di Zoologia*, 38, 145–149.
http://dx.doi.org/10.1080/11250007109436964

Pilato, G. (1973) Tardigradi delle acque dolci siciliane. Nota seconda. *Bollettino delle Sedute dell'Accademia Gioenia di Scienze Naturali, Catania,* S. IV, 12, 177–186.

Pilato, G. (1974) Tardigradi delle acque dolci siciliane. Terza nota. *Animalia*, 1, 235–244.

Pilato, G. (1981) Analisi di nuovi caratteri nello studio degli Eutardigradi. *Animalia*, 8, 51–57.

Pilato, G., Bertolani, R. & Binda, M.G. (1982) Studio degli *Isohypsibius* del gruppo *elegans* (Eutardigrada, Hypsibiidae) con descrizione di due nuove specie. *Animalia*, 9, 185–198.
Pilato, G. & Binda, M.G. (2002) *Isohypsibius barbarae*, a new species of eutardigrade from Vietnam. *Bollettino delle Sedute dell'Accademia Gioenia di Scienze Naturali, Catania*, 35 (361), 637–642.
Pilato, G. & Catanzaro, R. (1988) *Macroversum mirum* n. gen. n. sp., nuovo Eutardigrado (Macrobiotidae) dei Monti Nebrodi (Sicilia) *Animalia*, 15, 175–180.
Pilato, G. & Catanzaro, R. (1989) Tardigradi delle acque dolci siciliane. IV. *Isohypibius tubereticulatus* e *Isohypsibius verae*, due nuove specie di Eutardigradi dulcacquicoli di Sicilia. *Animalia*, 16, 81–88.
Pilato, G., Catanzaro, R. & Binda, M.G. (1989) Tardigradi delle acque dolci siciliane. V Nota. *Animalia*, 16, 121–130.
Pilato, G., Costa, G., Conti, E., Binda, M.G. & Lisi, O. (2007) Morphometric analysis of some metric characters of two *Macrobiotus* species (Eutardigrada, Macrobiotidae). *Journal of Limnol*ogy, 66 (suppl. 1), 26–32.
http://dx.doi.org/10.4081/jlimnol.2007.s1.26
Ramazzotti, G. (1962) Tardigradi del Cile, con descrizione di quattro nuove specie e di una nuova varietà. *Atti della Società italiana di Scienze naturali e Museo civico di Storia naturale di Milano*, 101, 275–287.
Ramazzotti, G. & Maucci, W. (1983) Il Phylum Tardigrada. *Memorie dell'Istituto Italiano di Idrobiologia Marco De Marchi*, 41, 1–1012.
Sands, C.J., McInnes, S.J., Marley, N.J., Goodall-Copestake, W., Convey, P. & Linse, K. (2008) Phylum Tardigarda: an "individual" approach. *Cladistics*, 24, 1–18.
http://dx.doi.org/10.1111/j.1096-0031.2008.00219.x
Schuster, R.O., Nelson, D.R., Grigarick, A.A. & Christenberry, D. (1980) Systematic criteria of the Eutardigrada. *Transactions of the American Microscopical Society*, 99, 284–303.
http://dx.doi.org/10.2307/3226004
Thulin, G. (1928) Über die Phylogenie und das System der Tardigraden. *Hereditas*, 11, 207–266.
http://dx.doi.org/10.1111/j.1601-5223.1928.tb02488.x