



SWEDISH TAXONOMY INITIATIVE RESEARCH REPORT

Project period: 2009–2011

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ROTIFERS:

Species reality of bdelloid rotifers in Sweden: molecular phylogeny and geometric morphometrics of globally distributed “ancient asexuals”

Bdelloid rotifers are microscopic aquatic invertebrates of particular interest for two features of their lifestyles. First, they have persisted for over ~80 million years and diversified into nearly 450 recognized species, despite the apparent absence of meiosis and sex. Second, bdelloids can survive complete desiccation during any stage of their life by entering a dormant state, which can be dispersed easily.

My project in Sweden thus tried to provide evidence of ecological or geographic drivers in the distribution of bdelloids, through a focus on taxonomy, species identification with morphological and molecular approaches, molecular phylogeny and spatially explicit analyses of the resulting patterns.

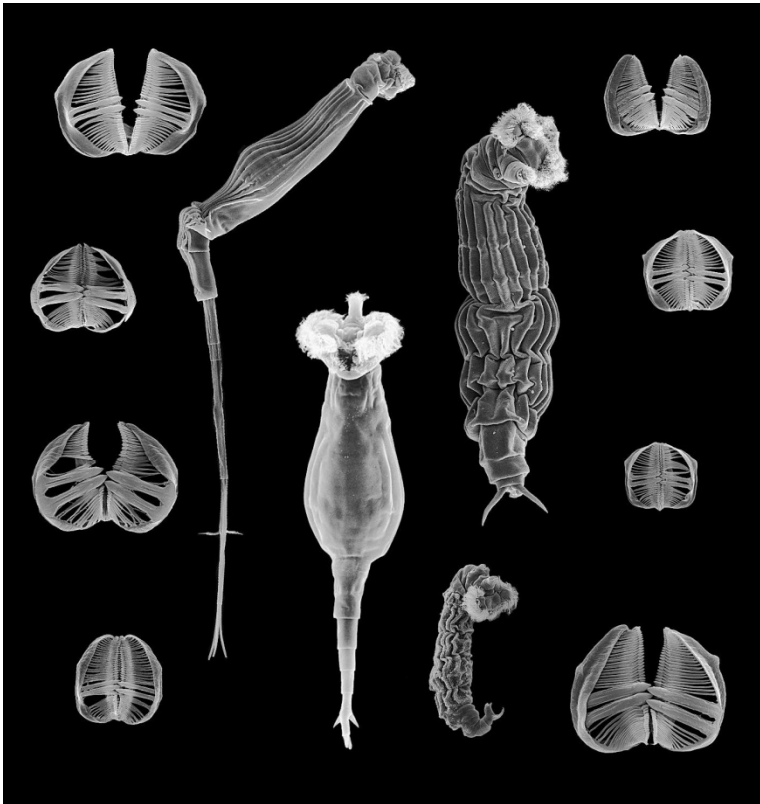
I sampled bdelloid populations and communities living in water bodies, lichens, mosses and soil in Sweden and Svalbard and performed phylogenetic, phylogeographic and ecological analyses.

As a result, I increased the species list for Sweden from 110 to 143 and for Svalbard from 37 to 55.

No nomenclatural changes were needed, as the hierarchical structure in bdelloids is rather stable.

I found several potentially new species for science, which are still being studied.

Most of the data gathered during my project have been used in scientific papers to answer questions in evolutionary ecology, for which bdelloids are a suitable interesting model. These topics included 1) the phylogenetic position of bdelloids within rotifers, 2) the amount of cryptic species in bdelloids, 3) the macroecological drivers of global species richness in rotifers, 4) the identification of spatial niche in epibiont rotifers, and 5) the identification of ecological niche in lichen-dwelling bdelloids.



Scanning electron micrographs showing morphological variation of bdelloid rotifers and their jaws. Foto: Diego Fontaneto

LITERATURE

- Fontaneto D. & Brodie J., 2009. Symposium summary. The importance of being small: does size matter in biogeography? One-day symposium at Systematics, the First BioSyst conference – Leiden, The Netherlands, 13th August 2009. *Frontiers of Biogeography* 1.2: 46-47.
- Fontaneto D. & Westberg M., 2009. Life in a lichen: apparent death and resurrection of bdelloid rotifers. *Fauna och Flora* 104.4: 20-24. [in Swedish]
- Fontaneto D., Kaya M., Herniou E.A. & Barraclough T.G., 2009. Extreme levels of hidden diversity in microscopic animals (Rotifera) revealed by DNA taxonomy. *Molecular Phylogenetics & Evolution* 53: 182-189.
- Kaya M., Herniou E.A., Barraclough T.G. & Fontaneto D., 2009. A faunistic survey of bdelloid rotifers in Turkey. *Zoology in the Middle East* 48: 114-116.
- Barbosa A.M., Fontaneto D., Marini L. & Pautasso M., 2010. Is the human population a large-scale indicator of the species richness of ground beetles? *Animal Conservation* 13: 432-441.

- Barbosa A.M., Fontaneto D., Marini L. & Pautasso M., 2010. Positive regional species–people correlations: a sampling artefact or a key issue for sustainable development? *Animal Conservation* 13: 446-447.
- Cantarello E., Steck C.E., Fontana P., Fontaneto D., Marini L. & Pautasso M., 2010. A multi-scale study of Orthoptera species richness and human population size controlling for sampling effort. *Naturwissenschaften* 97: 265-271.
- Fontaneto D. & Ambrosini R., 2010. Spatial niche partitioning in epibiont rotifers on the waterlouse *Asellus aquaticus*. *Limnology & Oceanography* 55: 1327-1337.
- Fontaneto D. & Brodie J., 2010. BioSyst symposium on the The importance of being small: does size matter in biogeography? *The Systematist* 31: 8-10.
- Kaya M., De Smet W.H. & Fontaneto D., 2010. Survey of moss-dwelling bdelloid rotifers from middle Arctic Spitsbergen (Svalbard). *Polar Biology* 33: 833-842.
- Kaya M., Fontaneto D., Segers H. & Altindag A., 2010. Temperature and salinity as interacting drivers of species richness of planktonic rotifers in Turkish continental waters. *Journal of Limnology* 69: 297-304.
- Leasi F., Fontaneto D. & Melone G., 2010. Phylogenetic constraints in the muscular system of rotifer males: investigation on the musculature of males versus females of *Brachionus manjavacas* and *Epiphanes senta* (Rotifera, Monogononta). *Journal of Zoology* 282: 109-119.
- Pecher C., Fritz S., Marini L., Fontaneto D. & Pautasso M., 2010. Scale-dependence of the correlation between human population and the species richness of stream macro-invertebrates. *Basic and Applied Ecology* 11: 272-280.
- Birky C.W., Ricci C., Melone G. & Fontaneto D., 2011. Integrating DNA and morphological taxonomy to describe diversity in poorly studied microscopic animals: new species of the genus *Abrochtha* Bryce, 1910 (Rotifera: Bdelloidea: Philodinavidae). *Zoological Journal of the Linnean Society* 161: 723-734.
- Fontaneto D. & Jondelius U., 2011. Broad taxonomic sampling of mitochondrial cytochrome c oxidase subunit I does not solve the relationships between Rotifera and Acanthocephala. *Zoologischer Anzeiger* 250: 80-85.
- Fontaneto D., Iakovenko N., Eyres I., Kaya M., Wyman M. & Barraclough T.G., 2011. Cryptic diversity in the genus *Adineta* Hudson & Gosse, 1886 (Rotifera: Bdelloidea: Adinetidae): a DNA taxonomy approach. *Hydrobiologia* 662: 27-33.
- Fontaneto D., Tommaseo Ponzetta M., Galli C., Risé P., Glew R.H. & Paoletti M.G., 2011. Differences in fatty acid composition between aquatic and terrestrial insects used as food in human nutrition. *Ecology of Food and Nutrition* 50: 351-367.
- Fontaneto D., Westberg M. & Hortal J., 2011. Evidence of weak habitat specialisation in microscopic animals. *PLoS ONE* 6(8): e23969.
- Gollner S., Fontaneto D. & Martínez Arbizu P., 2011. Molecular taxonomy confirms traditional classification of deep-sea hydrothermal vent copepods (Dirivultidae) and suggests broad physiological tolerance of species and frequent dispersal along ridges. *Marine Biology* 158: 221-231.
- Swanstrom J., Chen K., Castillo K., Barraclough T.G. & Fontaneto D., 2011. Testing for evidence of inefficient selection in bdelloid rotifers: do sample size and heterogeneity matter? *Hydrobiologia* 662: 19-25.
- Curini-Galletti M., Artois T., Delogu V., De Smet W.H., Fontaneto D., Jondelius U., Leasi F., Martínez A., Meyer-Wachsmuth I., Nilsson K.S., Tongiorgi P., Worsaae K. & Todaro M.A., 2012. Patterns of diversity in soft-bodied meiofauna: dispersal ability and body size matter. *PLoS ONE* 7: e33801.
- Fontaneto D., Barbosa A.M., Segers H. & Pautasso M., 2012. The 'rotiferologist' effect and other global correlates of species richness in monogonont rotifers. *Ecography* 35: 174-182.

Reviewed and approved: 2016-03-16