



First record of males of *Encentrum mucronatum* Wulfert, 1936 and *Encentrum martes* Wulfert, 1939 (Rotifera: Dicranophoridae) including notes on males across Rotifera Monogononta

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Abstract

A detailed description is given of the males of *Encentrum mucronatum* Wulfert, 1936 and *Encentrum martes* Wulfert, 1939. The degree of miniaturisation relative to the corresponding females is assessed and compared to males in selected planktonic rotifers. Different degrees of miniaturisation are related to differences in population dynamics.

Key words: Dwarf males, miniaturisation, glycogen inclusions

Introduction

Rotifers are very small, aquatic microinvertebrates that can be found in almost any aquatic habitat sustaining metazoan life. While the majority are freshwater species, there are also a considerable number of marine rotifers. According to the most recent phylogenetic analysis combining morphological and molecular data (Sørensen & Giribet 2006), Rotifera comprises Hemirotifera (*Seison*, epizoic on marine crustacean *Nebalia*, Bdelloida and the parasitic, highly derived Acanthocephala) and Monogononta as sister taxa with different modes of reproduction (see Ruppert et al. 2004). Reproduction in *Seison* is strictly bisexual with males and females being roughly of the same size. Acanthocephalans reproduce bisexually as well and are characterised by a highly specialised mode of female gametogenesis involving ovarian balls floating freely in the body cavity. In bdelloid rotifers, reproduction is purely parthenogenetic. No males have been recorded. Parthenogenetic females either lay eggs or give birth to living offspring (Ruppert et al. 2004, Wallace et al. 2006).

Within Monogononta, a heterogenetic reproductive cycle has evolved with periods of parthenogenetic and bisexual reproduction alternating (Koste 1978, Wallace et al. 2006). Males in Monogononta are generally smaller than the corresponding females and often anatomically reduced (Wesenberg-Lund 1923, Wallace et al. 2006). Such dwarfism in rotifer males has been suggested to be the result of selection on females to produce a high number of males in a short period of time (Serra & Snell 1998). However, the degree of miniaturisation and anatomical reduction is different in different species. While in *Rhinoglena frontalis* males are almost as large as females and have retained a functional gastric tract including mastax jaw elements (Melone 2001), they are considerably smaller than females in other monogonont species, no longer feed and are little more than rapidly swimming containers of spermatozoa. With the exception of few species that can easily be reared in the laboratory, males are generally only encountered by accident and in very small numbers. Therefore for many taxa within Monogononta, our knowledge of males is extremely limited to non-existent.

The large monogonont taxon Dicranophoridae comprises more than 200 species (De Smet 1997, Segers 2007), many of which have not been recorded since their original description. For dicranophorid rotifers of