THE ROTIFER CONTRIBUTION TO THE DIET OF EUDIAPTOMUS GRACILIS (G. O. SARS, 1863) (COPEPODA, CALANOIDEA)

BY

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ABSTRACT

We studied potentially omnivorous feeding of the common limnetic calanoid copepod Eudiaptomus gracilis using feeding experiments with subsequent gut content analysis. Feeding experiments performed with a laboratory culture of the rotifer Brachionus calyciflorus established a daily feeding rate reaching up to 9.8 rotifers per day when a rotifer-only diet was offered. Addition of algae (Chlamydomonas sp.) to the calanoid diet decreased the ingestion rate of rotifers to near 0. Yet, gut content analysis regularly (though not very frequently) revealed the remains of a rotifer, B. calyciflorus, in the digestive tract of an E. gracilis. We thus proved the ability of E. gracilis to feed on rotifers, even when these were offered in a diet mixed with algae.

Key words. — Eudiaptomus gracilis, Brachionus calyciflorus, calanoid copepod, feeding, gut content analysis

RÉSUMÉ

Nous avons étudié la nutrition potentiellement omnivore du copépode calanoïde limnéto-commun Eudiaptomus gracilis en réalisant des expérimentations de nutrition suivies de l’analyse du contenu stomacal. Les expériences de nutrition menées avec une culture en laboratoire du rotifère Brachionus calyciflorus ont permis d’établir un taux de nutrition atteignant 9,8 rotifers par jour quand un régime exclusif de rotifères était offert. L’addition d’algues (Chlamydomonas sp.) au régime du calanoïde diminuait le taux d’ingestion des rotifères à presque 0. Cependant, l’analyse du contenu stomacal a révélé régulièrement (bien que peu fréquemment) les restes d’un rotifère, B. calyciflorus, dans le tube digestif de E. gracilis. Nous prouvons ainsi la capacité de E. gracilis à se nourrir de rotifères, même quand ces derniers sont proposés dans un régime où ils sont mélangés à des algues.

Mots clés. — Eudiaptomus gracilis, Brachionus calyciflorus, copépode calanoïde, nutrition, analyse du contenu stomacal

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INTRODUCTION

Feeding habits of calanoid copepods represent a wide spectrum of foraging techniques, enabling them to obtain, handle and utilize food particles. Therefore, calanoid feeding ecology is a widely studied topic in freshwater ecology (see, e.g., Kleppel, 1993; Brandl, 2005). Suspension feeding, the main method of collecting food particles from a water environment, is based on their concentration using feeding currents provided by high-speed synchronic movements of the mouth appendages (Koehl & Strickler, 1981; Bundy & Vanderploeg, 2002). On the other hand, a raptorial feeding (or predatory-feeding) mode is used to catch individual, often larger and moving, particles (Dussart & Defaye, 1995). There is a continuum from passive filtration to active predacious feeding with a variety of transitional states between both described modes (Greene, 1988).

For many years, smaller calanoid copepods have been considered as filter-feeding herbivores (e.g., Horn, 1985), with a low ability of selection, frequently connected to raptorial feeding (Lapesa et al., 2004). In the last few decades it became clear that food relations of limnetic calanoid copepods are more complex and many of them, including small species, are able to feed omnivorously (Sanders et al., 1996; Reissig et al., 2004).

Calanoid copepods of the genus *Eudiaptomus* are often dominant in European freshwater ecosystems. Since the pioneering observation of Fryer (1954), *Eudiaptomus gracilis* (G. O. Sars, 1863) has been known for its capability of gathering selected food items. Its ability to distinguish among inert particles and algal cells, as well as its ability to discriminate living and dead algal cells, is also known (DeMott, 1986, 1988). The early study by Fryer (1954) mentioned the single observation of rotifer trophi in the gut of *E. gracilis*. No other references considering rotifer contribution to the diet of *E. gracilis* were published until Berger & Maier (2001) showed how the plankton fraction containing rotifers can enhance *Eudiaptomus* life history parameters such as clutch size, production of eggs or longevity. They provided the comparison between a laboratory culture of *Chlamydomonas* and mixed natural food. Calanoids lived longer and produced significantly more clutches, as well as eggs per clutch, when fed on natural food. There is no experimental verification whether the enhancement was really caused by the presence of rotifers in the diet. Therefore, the aim of this study was to find the evidence for potential feeding on rotifers in terms of rotifer remains in their digestive tract.

MATERIAL AND METHODS

Evaluation of rotifer ingestion was done by feeding experiments with the subsequent direct inspection of the digestive tract (the gut content analysis). The set