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Comments on the diet of *Asplanchna priodonta* (Gosse, 1850) in the Dobczycki dam reservoir on the basis of field sample observations

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Abstract

During a monitoring programme the diet composition of *Asplanchna priodonta* was studied. Samples were collected every month from the deepest part of the Dobczycki dam reservoir (Southern Poland). The diet of *A. priodonta*, which included colonial cyanobacteria, diatoms, dinoflagelates and protozoa, indicated that it is both a grazer and a predator. These results support the hypothesis that *A. priodonta* is an opportunistic feeder. Additionally these results include the first observations of the protozoan *Tintinnopsis* sp. as a food source of *Asplanchna*.

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INTRODUCTION

Asplanchna priodonta (Gosse, 1850) is a cosmopolitan rotifer, and is one of the biggest planktonic predators (200-1500 μm). It lives in freshwater lakes, reservoirs and occasionally in brackish waters. Comparative studies on different populations of the widespread *A. priodonta* have demonstrated enormous plasticity in its diet, ranging from exclusively zoophagous populations, through omniphagous, to exclusively phytophagous populations (Guiset 1977; Hofmann 1983, 1985; Kappes et al. 2000; Wilk-Woźniak et al. 2001). *A. priodonta* has been reported to feed on other rotifers, such as *Keratella cochlearis* (Gosse) and on certain cladocerans (Ejsmont-Karabin 1974; Guiset 1977; Salt 1977; Hofmann 1983, 1985; Iyer and Rao 1996; Kappes et al. 2000). However, planktonic crustaceans usually do not form a significant part of *Asplanchna*'s diet, as was illustrated by a study of 17 populations in Spain (Guiset 1977). Nevertheless, they have occasionally been reported as food items, e.g. a head capsule of an infant *Bosmina longirostris* (Kapper et al. 2000) and a mandible of *Daphnia* (Hofmann 1985). These rare ingestion events may be a result of the well established escape behaviour of cladocerans or from a spatial avoidance between *Asplanchna* and *Bosmina*, as evidenced by Dumont (1972).

Kapper et al. (2000) noted that the diet of *A. priodonta* contained: diatoms, euglenophytes, dinophytes, green algae, desmids. The food source used by *Asplanchna* appears to be determined by the abundance of potential prey organisms of suitable sizes. It might be expected that *Asplanchna* would prefer algae as a source of food, since phytoplankton usually provide more abundant potential food resources than zooplankton (Kappes et al. 2000). In this short paper we present the field observations of the typical and atypical diets of *A. priodonta*.

MATERIALS AND METHODS

Samples were collected during the Monitoring Programme of the Dobczyce dam reservoir, which is an ongoing programme conducted every month. The sampling site has been described in numerous publications (e.g. Amirowicz 1998, 2000; Mazurkiewicz 1988; 2000). Samples of zooplankton were collected for analysis between April and October 2007 from the epilimnion, metalimnion and hypolimnion in the central and deepest part of the Dobczyce Reservoir (30 m deep). Samples for taxonomic and quantitative analyses were collected using a 5 l sampler (Bernatowicz type). The samples were concentrated with a plankton net (# 50 μm) and fixed in 4% formalin, after which sub-samples (5 from each sample) were analyzed under a microscope (magnification 10 – 20×) in a 0.5 cm^3 chamber. 2 l zooplankton samples were analysed.

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Taxonomic analyses of zooplankton were conducted according to the following keys: Dussart 1967, 1969; Flößner 1972; Ejsmont-Karabin et al. 2004; Rybak, Błędzki 2005; Voight, Koste 1978a, 1978b. Quantitative analyses of zooplankton were completed according to standard methods used in hydrobiological studies (Wetzel 1991).

The samples for taxonomic and quantitative analyses of algae were preserved with Lugol's solution and concentrated to 25 ml by sedimentation from 1 l. Cyanoprokaryotes and eukaryotic algae were counted using a chamber of 0.4 mm height and 22 mm diameter. Algal analyses were undertaken using a Jenaval microscope.

The most interesting observations were made in samples collected in October 2007.

RESULTS AND DISCUSSION

The rotifer *A. priodonta* was present in all samples collected from April to October. Maximum densities (46 ind. l^{-1}) were seen in the epilimnion in October. The average length of *A. priodonta* in the samples was 500-600 µm.

Although the potential prey, *Keratella cochlearis,* was present in samples with *A. priodonta,* and reached high densities (ranged from 11 ind. l^{-1} in March to 312 ind. l^{-1} in July), no *Keratella* were observed in *A. priodonta*'s stomach. Another potential prey, the cladoceran *B. longirostris*, was also present in the samples containing *Asplanchna. Bosmina*'s density ranged from 1 ind. l^{-1} (Febuary) to 43 ind. l^{-1} (July), but was not observed in *Asplanchna*'s stomach in any samples.

As expected, the sources of food for *Asplanchna* in the Dobczyce reservoir were algae and protozoa. In the stomach contents we found protozoa of the genus *Tintinnopsis* sp., which is usually present in the reservoir. This is the first reported observation of this protozoan as a potential food of *A. priodonta*. The average size of the *Tintinnopsis* was calculated as 54 µm long and 40 µm wide (Fig. 1).

Other than the protozoa, *Asplanchna* used algae as its food source. In samples collected in August and September 2007 *Ceratium hirundinella* (dinophyte) was observed in *Asplanchna*'s stomachs (Fig. 1). *C. hirundinella* was codominant with *Asterionella formosa* (diatom) and *Cryptomonas* spp. (Cryptophyte). In samples collected in October *Woronichinia naegeliana* (Cyanobacteria) and centric diatoms were observed in the *Asplanchna*'s stomachs (Fig. 2). The size of the *Woronichinia* observed in the stomachs ranged from 22 µm to 64 µm, and the max size of diatoms was 11 µm deep and 32 µm diameter. In October samples *Woronichinia naegeliana* (Cyanobacteria) and *Cryptomonas* spp. (Cryptophytes) were dominant among

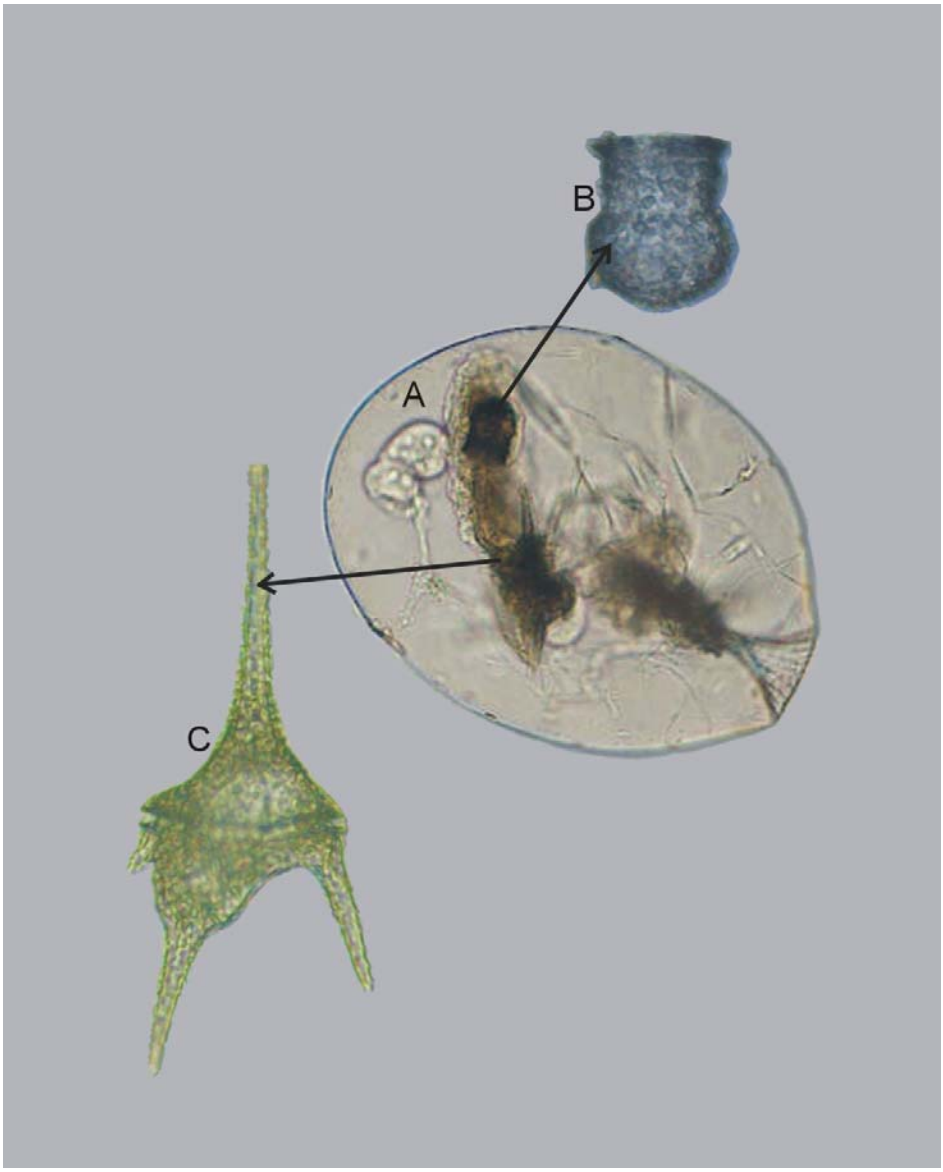


Fig. 1. *Tintinnopsis* sp. (A and B) and *Ceratium hirundinella* (A and C) in the stomach of *Asplanchna.*

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Fig. 2. *Woronichinia naegeliana* in the stomach of *Asplanchna.*

the phytoplankton. Kapper et al. (2000) showed that the two colonial algae *Gomphosphaeria* sp. (Cyanobacteria) and *Botryococcus terribilis* (Chlorophyceae: Chlorococcales) accounted for 99% of food and also for 99% of algae sampled by a 55 µm-net plankton. We suppose that *Gomphosphaeria,* mentioned by Kapper et al. (2000), was in fact *Woronichinia* sp. (Komarek and Anagnostidis 1999). Our observations show that *Asplanchna* uses *Woronichinia neagelina* as a food source.

It is clear from these results that *Asplanchna* may change dietary preferences depending on the availability of food.

In the Dobczyce reservoir in 2007, the *A. priodonta* population seems to be almost entirely phytophagous, although some predation of zooplankton was also observed. This is in agreement with the hypothesis of opportunistic nutrition, as the frequency of food items was closely related to the corresponding composition of the plankton community. *Asplanchna* was seen to consume quite large 'components' of the phytoplankton population, notably potentially toxic species (Cyanobacteria). As a result its grazing capabilities may make it an important species for keeping the waters of the reservoir in good condition.

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