PRELIMINARY ASPECTS CONCERNING ZOOPLANKTON STRUCTURE IN ECOSYSTEMS OF THE FISH FARMS

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Abstract

This paper presents information about the structure and dynamics of zooplankton during vegetative season in three Romanian cyprinids production farms. The technical differences among the studied fish farms are represented by the source of ponds water supply and the size of the ponds. To establish the structure and the dynamics of the zooplankton, there were collected two sets of biological samples, at the beginning and at the end of vegetative season. The zooplankton was analysed from a qualitative (identification, until species level, of organisms from each systematic group) and quantitative (the numerical density, the numerical abundance and biomass) point of view. The zooplankton was representative in all sampling stations during the entire vegetative season. The small number of species evidences a reduced biodiversity of animal plankton during the studied period.

Key words: zooplankton, species, density, abundance, biomass

INTRODUCTION

The main goal of the paper is to give a general picture on the status of zooplankton structure from the fish ponds and its evolution during the vegetative season of year 2009 in three Romanian cyprinids production farms.

Zooplankton represents an important link of the aquatic ecosystems trophic chain, being the primary producer of organic substance for the planktonophag fish species [1], [8].

The succession of zooplankton development is as follows: in spring, rotifers and copepods appear first, in summer, cladocerans grow abundantly, and in early autumn, when temperatures are lower, rotifers and copepods grow again [4].

MATERIAL AND METHODS

The development of the vegetal plankton was analysed in three different ponds, belonging to three cyprinids farms: Carja 1 farm (Vaslui Country), Malina farm (Galati Country) and Sarinasuf farm (Tulcea Country). The largest pond is located in Carja 1 farm (297 ha), followed by the pond from the Sarinasuf farm (56 ha) and pond of the Malina farm (30 ha). Each analyzed pond has different water supply sources. Carja 1 farm receives water from the Prut River, Malina farm receives water from the Siret River and Sarinasuf farm receives water from a Danube Delta channel, named Lipoveni channel.

For the three Romanian cyprinids production farms taken in to study, 5 points were considered critical for sampling in tanks and other two critical points in intake canal respective discharge canal. The sampling critical points were kept constant during the study by uses of the Garmin GPS 72 navigation system. The zooplankton samples were immediately fixed with Lugol solution in a ratio of 1:100 (1 ml of solution for 100 ml of sample).

Qualitative analysis of zooplankton from these samples determined their identification till species level for rotifers, caldocerans and copepods. The determination of main taxonomic groups was made after Godeanu, 2002 [5] for rotifers, after Negrea, 1983 [6], Black and others, 1999 [7] for caldocerans, Dussart and Defaye, 2001 [2], [3] for the copepods.

Quantitative analysis of zooplankton abundance is given by numerical assessment,

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the number of organisms and also their weight in a given water volume. This was made by the methods presented in Florea, 2007 [4]. Reporting the results can be performed separately, by taxonomic groups, or by total zooplankton.

RESULTS AND DISCUSSIONS

At the **Sarinasuf fish farm**, the zooplankton was present with 16 species in the first set of experiments (May).

The most numerous are the caldocerans with 7 species (*Moina branchiata, Cydhorus sphaericus, Daphnia longispina, Bosmina longilostris, Scapholeberis mucronata, Alona costata, Ceriodaphnia quadrangula*), the copepods with a number of 5 species (*Cyclops strenus, Ectocyclops phaeleratus, Canthocampus staphylinus, Eudiaptomus vulgaris, Macrocyclops fuscus*) and the rotifers are represented by 4 species (*Brachionus angularis, Keratella quadrata, Keratella cochlearis, Filinia longiseta*).

In the second set of experiments (October) there were 12 species out of which 11 was rotifers and 1 copepods. The maximum number of examples was registered by the rotifers with the following species (*Brachionus angularis, Brachionus calyciflorus, Keratella quadrata, Keratella cochlearis, Trichocerca tigris, Colurella obtusa, Polyartha remata, Ascomorpha ovalis, Asplanchna priodonta, Filinia longiseta, Monommata longiseta*). The copepods are isolated along with *Cyclops strennus* species.

From a quantitative point of view, the numerical density varies between 350-2464ex/l, the biomass varies between 5677.73-119320.67µg in the first set of experiments (spring) and 73-590ex/l respectively 68.59-2866.90µg in the autumn experiments (figures 1 and 2). In the first set of experiments, the numerical abundance of rotifers varies between 20-38%, the number of caldocerans varies between 3-57% and the number of copepods varies between 5-76% (figure 3). In the second set of experiments, the numerical abundance of rotifers varies between 59-100%, the number of cladocerans varies between 0 - 41% and the number of copepods varies between 0 - 9% (figure 4).

At the **Malina fish farm** the zooplankton is represented by a small number of species (23 species in the spring experiments and 20 species in the autumn experiments). From a quantitative point of view, the numerical density varies between 333-9235ex/l, the biomass varies between 5436.92-387212.16µg in the first set of experiments (spring) and 48-627ex/l respectively 21.53-1022.20 µg in the autumn experiments (figures 1 and 2) In the first set of experiments, the numerical abundance of rotifers varies between 0-91%, the numerical abundance of cladocerans 0-81% varies between and the number of copepods varies between 9-52% (figure 3). In the second set of experiments, the numerical abundance of rotifers varies between 69-100%, the numerical abundance of cladocerans and copepods varies between 0-15% (figure 4).

For the spring experiments, the cladocerans are dominant and constant with the following species: *Sida cristalina, Scapholeberis mucronata, Ceriodaphnia reticulata, Cydhorus sphaericus, Bosmina longilostris, Daphnia longispina, Daphnia cristata, Daphnia magna, Daphnia pulex, Daphnia cuculata, Diaphanosoma brachiurum* in the structure of the animal kenosis. The frequent species of rotifers were: *Brachionus angularis, Brachionus urceolaris, Filinia longiseta, Trichocerca tigris, Trichocerca porcellus, Asplachna priodonta, Polyarthra remata, Keratella quadrata, Notholca acuminata.*

The copepods are numerically predominant in station number 3, represented by *Cyclops strennus* and *Canthocampus staphylinus* species.

For the second set of experiments, the zooplankton is dominated by rotifers 17 species (*Brachionus urceolaris, Brachionus angularis, Keratella cochlearis, Keratella ticinensis, Monommata longiseta, Trichocerca tigris, Trichocerca brachiura, Filinia longiseta, Cephalodella catellina, Notholca foliacea, Polyartha remata, Testudinella mucronata, Synchaeta pectinata, Colurella obtusa, Lophocharis*

salpina, Ascomorpha ecaudis, Kellicottia longispina) and isolated examples of cladocerans (*Chidorus shaericus*) and copepods (*Cyclops strennus*).

At the **Carja 1 fish farm**, the zooplankton is poorly represented from a quantitative point of view in both sets of experiments, with 13 species in the spring experiments and 18 species in the autumn experiments. The number of rotifers was more important in both sets of experiments. The cladocerans were evidenced in the first experiments from stations 3-5 with the following species *Cydhorus sphaericus, Ceriodaphnia reticulata, Bosmina longilostris, Sida cristalina*. The copepods are isolated along with *Cyclops strennus* species for all the experiments.

For the second set of experiments, the zooplankton is evidenced 5 examples of cladocerans *(Alonella nana, Alonella globulosa, Cydhorus sphaericus, Moina branchiata, Diaphanosoma brachiurum)* and 2 copepodes *(Cyclops strennus, Bryocamtus pygmaeus)*.

From a quantitative point of view, the numerical density varies between 582-1635 ex/l, the biomass varies between 3524.76-13951.43µg in the first set of experiments (spring) and 415-1737ex/l respectively 3141.83-11437.61µg in the autumn experiments (figures 1 and 2). In the first set of experiments, the numerical abundance of rotifers varies between 61-94%, the number of cladocerans varies between 0-10% and the number of copepods varies between 6-31% (figure 3). In the second set of experiments, the numerical abundance of rotifers varies between 43-62%, the number of cladocerans varies between 12-30 % and the number of copepods varies between 21-27% (figure 4).

In these three fish farms studied, were recorded also ontogenetic pre-adults stages of copepods and cladocerans, in both samples (May and October). Given that taxonomic identifications are impossible at these stage levels, they were recorded and analyzed as they were**.** A particular situation was found in October samples taken from Sarinasuf farm, when cladocerans were found only in egg stage.

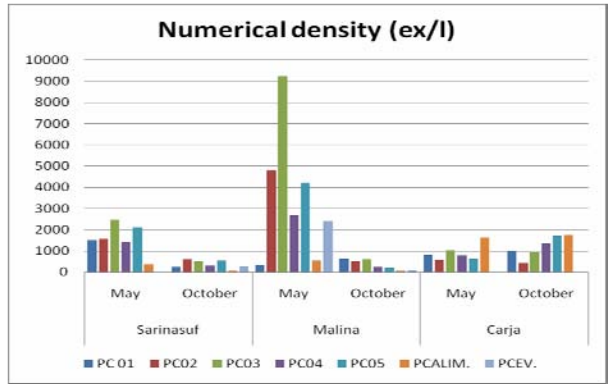

Figure 1 The zooplankton's numerical density (ex/l) for three Romanian cyprinids production farms

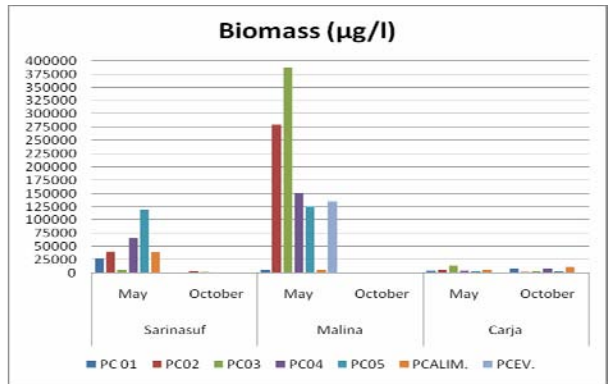

Figure 2 The zooplankton's biomass (µg/l/l) for three Romanian cyprinids production farms

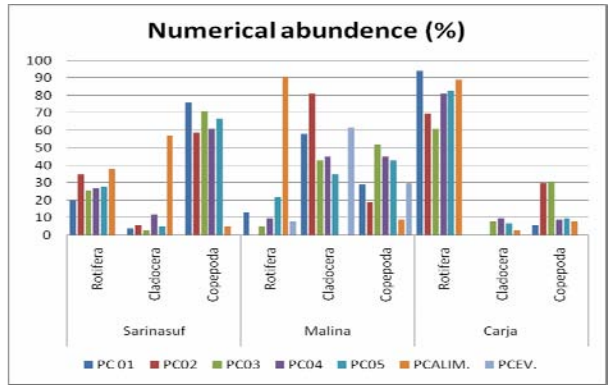

Figure 3 The zooplankton's numerical abundance (%)
in May for three Romanian cyprinids production farms

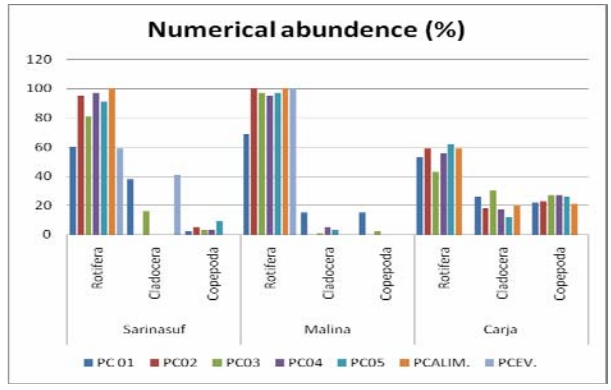

Figure 4 The zooplankton's numerical abundance (%)
in October for three Romanian cyprinids production farms

CONCLUSIONS

The qualitative analysis of zooplankton from all three aquatic ecosystems revealed the presence of three taxonomic groups: rotifers, cladocerans and copepods. From those, rotifers are best represented as number

of species, followed by copepods in nauplius form, copepodite, adults and cladocerans in forms of eggs, nauplius, juveniles and adults.

The low temperatures favour the development of rotifers and copepods; these are more developed in early spring and autumn period, whereas in summer, at high temperature, high cladocerans are abundant. In conclusion, cladocerans are totally missing from water in winter and they cross this period as preserving eggs and get out only in spring.

A water rich in organic substance permits abundant growth of zooplankton; especially Daphnia sp. species are the ones which develops in water concentrated in organic substance. In strong flowering waters cladocerans are reducing and rotifers, copepods are dominant. In high flowering waters, the number of large cladocerans decrease and small forms cladoceran are dominant (*Bosmina*, *Moina* etc.).

The qualitative and quantitative analysis performed on fish farms ponds zooplankton reveals low level of biodiversity in samples collected at the first part of the vegetative season and also at the end of the season.

Also, to the end of the season the biological potentials of the pond, mainly of the zooplankton it was significantly reduced.

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