LIVE FOOD IN *ACIPENSER PERSICUS* REARING PONDS

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Abstract

A study on live food in *Acipenser persicus* rearing ponds was carried out In four rearing ponds; two in the Shahid Beheshti hatchery and two ponds in the Yousefpour hatchery. Samples were collected from three points in each pond on a weekly basis. Samples were collected using plankton nets (mesh size 50 µm), Ruthner sampler and Ekman grab. Zooplankton and benthic samples were fixed in 4 % formalin solution for later analysis. Zooplankton species identified in water samples collected at all four ponds belonged mainly to two phyla; Arthropoda and Rotifera. Total abundance of zooplankton species was estimated 87576 individuals L^{-1} in the Yousefpour hatchery and 136626 individuals $^{L-}1$ in the Shahid Beheshti hatchery. Insect larvae, oligochaeta worms and mollusks were found in the sediment samples collected from the Yousefpour hatchery while sediment samples collected from the Shahid Beheshti hatchery contained only insect larvae and oligochaeta worms. The total abundance of benthic organisms was 0.343 g m^{-2} in the Yousefpour hatchery and 1.28 g m^{-2} in the Shahid Beheshti hatchery. Condition factor in fishes ranged from 0.29-0.54 in the Yousefpour hatchery and from 0.30-0.47 in the Shahid Beheshti hatchery.

***Key words**: Rearing ponds, sturgeon fry, planktons, benthic organisms, condition factor*

INTRODUCTION

Lack of the required environmental potential in the Sepidrud, Volga and Kura Rivers has posed problems to the natural reproduction of sturgeons in these rivers (Kuliyev and

Kasimov, 1989; Keyvan, 1994) to the extent that it is not observed in the Sepidrud River (Fadaee et al., 1998). With regard to the negative impacts of anthropogenic activities on the river ecosystem, artificial reproduction in sturgeons is on the increase and thus earthen rearing ponds in sturgeon hatcheries are of significant importance (Isa Ava & Kabacchova, 1989). At the end of the last century Russian scientists turned to artificial breeding programs in sturgeons as the only solution to sturgeon conservation. Although instructions for sturgeon culture were prepared in 1900, artificial breeding in these species commenced only in 1916 in the Volga River. With the increasing trends in artificial breeding programs today, the study of biotic and biotic factors in sturgeon rearing ponds is essential for the sustainable use of these valuable species.

An understanding of the different components in an aquatic ecosystem is essential for the quantitative and qualitative study of productivity in an aquatic ecosystem. Determination of biomass of zooplanktons and benthic organisms is necessary as it is directly related to condition factor in sturgeon fingerlings. Placed at the apex of the energy pyramid, phytoplanktons are of significance in every aquatic ecosystem. All other organisms in the food cycle depend on each other and also on phytoplanktons directly or indirectly (Davis, 1955). Zooplanktons in ponds include cladocerans, ephemeptera and crustaceans. The study of benthic communities and determination of biomass and secondary productivity of these organism is considered very essential. The objective of this study was to determine the biomass of plankton species and benthic organisms and to assess the suitability of growth in fingerlings.

MATERIAL AND METHODS

This study was conducted on two rearing ponds with a surface area of 4 hectares and a maximum depth of 2 m each in the Dr. Yousefpour Hachery (No. 9 and 16) and 2 rearing ponds with a surface area of 2 hectares each in the Shahid Beheshti Hatchery (No. 27 and 35). Samples were collected from three points in each pond; pond inlet, pond outlet and center of the pond. Sampling was carried out on a weekly basis. Water samples were collected between 9 and 11 hours in the morning using a Ruthner sampler.

At each sampling point two samples were collected to estimate zooplankton biomass, one from 0.5 m depths and the other from a depth of 20 cm above the pond bottom. Sampling at 0.5 m depths was done using a plankton net with a mesh size of 50 µm whereas samples collected 20 cm above the pond bottom were collected in a Ruthner sampler and filtered through a plankton net. The water sample remaining in the collected at the end of the plankton net was transferred to a plastic container. Samples were fixed in 4 % formalin solution (ASTM, 1996). Identification and counting of zooplanktons was done in a chamber under an invert microscope. The zooplankton number was calculated using the formula:

$$N= \frac{axc}{vxL}$$

where N= total number of zooplankton specimens m^{-3}, *a*= mean number of zooplankton specimens counted per sample, *c*=volume of sample in ml, *L*=volume of water (m^3), *v*=volume of counting chamber in ml.

Benthic organisms were collected using an Ekman grab with a surface area of 225 m^2. Sediments collected were washed over a sieve and the benthic organisms remaining on the sieve were collected and transferred to the laboratory in plastic containers (Holme & MacIntire, 1984).

To determine condition factor in sturgeon fry, fish samples (n=10) were collected from each pond on a weekly basis using trawl nets. Length, and weight of each fish was measured and recorded and condition factor was calculated following Sabrowski & Bachholz (1996) using the formula:

$CF = W \times L^{-3} \times 100$ where:

CF= Condition factor, W=weight of fish (g), L= Total length of fish (cm)

RESULTS

Water temperature during the study period ranged from 19 to 27 ºC in the Shahid Beheshti hatchery and from 19 to 25 ºC in the Yousefpour hatchery. Zooplankton species identified in water samples belonged to the genera *Cyclops, Daphnia*, and *Moina* of the phylum Arthropoda and the genera *Brachionus, Keratella, Pedalia* and *Polyarthra* of the phylum Rotifera. Rotifera belonging to the genera *Synchaeta* and were only observed in water samples from the Yousefpour ponds. Overall average zooplankton abundance and biomass in pond no. 27 was 120527 individuals L^{-1} (n=6) with copepoda showing the highest biomass. Cyclops sp. and its nauplius with a biomass of 90.3 g m^{-3} showed the highest abundance. The biomass of Daphnia sp. was 2.9 g m^{-3}. Zooplanktons in pond no. 35 belonged to 5 genera. Copepoda comprised 79 per cent of the zooplanktons. Daphnia sp. and Moina sp. with a mean biomass of 5.7 g m^{-3} (n=7) comprised 19.5 per cent of the zooplankton community. Abundance of zooplanktons in this pond was recorded as 54624 individuals L^{-1}. Zooplankton abundance in pond no. 9 was calculated as 63125 individuals L^{-1} with copepoda comprising 68 per cent of the zooplanktons. Cyclops sp. and nauplius of Cyclops were dominant species with a biomass of 44.9 g m^{-3}. Seven zooplankton genera were identified in pond no. 9 and in pond no. 16. Abundance in pond no. 16 was 210215 individuals L^{-1} with copepoda being the dominant species. Biomass of cladocera and ploima showed lower abundance. Seven genera of zooplanktons were identified in this pond. Zooplankton genera identified in the ponds under study are presented in Table 1. Mean biomass of zooplanktons in the ponds under study are presented in Fig. 1.

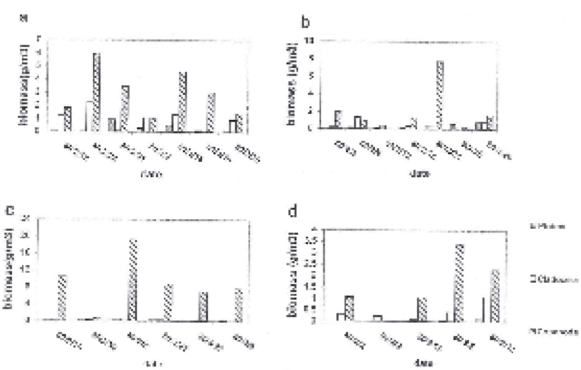

Figure 1. Comparison of zooplankton biomass (wet weight) found in the rearing ponds in the Yousefpour (a=Pond No. 9, b=Pond No. 16) and in the Shahid Beheshti (c=Pond No. 27, d=Pond No. 35) Hatcheries

Benthic organisms found in the sediment samples collected from the Yousefpour hatchery were mainly insect larvae, oligochaeta worms and mollusks whereas sediment samples collected from the Shahid Beheshti hatchery only contained insect larvae and oligochaeta worms (Table 1). The mean total biomass (n=7) of benthic organisms in pond nos. 9, 16, 27 and 35 was 1.53, 1.37, 2.9 and 2.2 g m^{-2}, respectively.

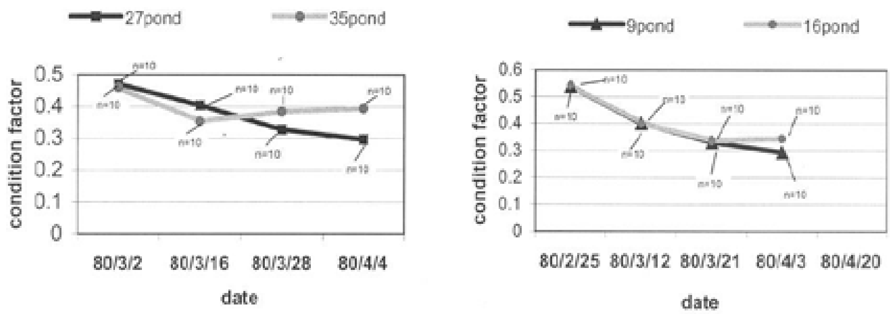

Figure 2. Condition factor of sturgeon fingerlings in a) The Yousefpour hatchery, b) The Shahid Beheshti hatchery

DISCUSSION

Percentage survival of fingerlings is to a great extent influenced by live food available in the pond. In the four ponds studied highest biomass values belonged to copepoda and while variations were observed in biomass of cladocera. According to Badenko and Bakhtenia (1962) long intervals between application of fertilizers results in irregular variations in zooplankton growth (Kohne Shahri and Azari Takami, 1974). 25-40 days sturgeon fingerlings feed on chironmomidae in addition to daphnia (Kohne Shahri and Azari Takami, 1974). In the present study chironomidae comprised only 6-15 % of the stomach contents of sturgeon fingerlings examined. Due to low biomass of chironnomidae in the rearing ponds sturgeon fingerlings feed more on daphnia in the ponds According to Strogonov (cited in Martyshev, 1983) benthic biomass of 7 g m^{-2} particularly that of chironomidae and oligochaeta is suitable for growth in sterlet fingerlings. Studies conducted in this regard indicate that this species feeds on benthic organisms (52.12 % of feeds consumed) mainly chironomidae. Condition factor of sturgeon fingerlings during early rearing was good, however showed decreasing trends towards the end of the rearing period. Mean condition factor for sturgeon fingerlings in the two hatcheries was <0.5. Condition factor in the range of 0.5-0.6 is considered intermediate for sturgeon fingerlings (Krupi, 1995). On the basis of studies conducted by Fadaee et al in 2001 (cited from Chubian et al., 2001) survival of sturgeon fingerlings in ponds 9 and 16 were 36.5 and 45.3 %, respectively. 62.5 % of fingerlings released from pond 9 and 80 % of fingerlings released from pond 16 were above 3 g in weight. Survival rate for fingerlings in ponds 27 and 35 were 77.1 and 54.2 %, respectively. 73.3 % of the fingerlings released from pond 27 and 86.7 % of fingerlings released from pond 35 were above 3 g in weight.

Information related to sturgeon fingerlings stocked in the ponds under study is shown in Table 3.

Table 3. Data on sturgeon fingerlings stocked in rearing ponds studied at the Yousefpour and Shahid Beheshti Hatcheries (N_1=number of fingerlings stocked; N_2= number of fingerlings released; W_1=Mean initial weight; W_2= mean final weight)

Hatchery	Pond No.	N_1	N_2	W_1 (mg) (n=10)	W_2 (g) (n=10)	Survival rate (%)
Dr. Yousefpour	9	415000	151720	73	3.8	36.5
	16	400000	181195	64.5	4.9	45.3
Shahid Beheshti	27	200000	154250	96	4.4	77.1
	35	200000	108450	86	5.5	54.2

Cited from Fadaee et al., 2001

It is evident from the results obtained that survival rates for fingerlings in the Shahid Beheshti hatchery were higher than those in the Dr. Yousefpour hatchery indicating suitable rearing conditions in the rearing ponds studied in this hatchery. Condition factor in sturgeon fry was satisfactory at the beginning of rearing and decreased gradually with decrease in food resources in the rearing ponds. Therefore sturgeon fry become weaker and weaker when the rearing period becomes prolonged. With regard to the role of life food in survival rates in sturgeon fry in rearing ponds it is necessary to improve live food production in rearing ponds through suitable fertilization. An alternative to this would be to decrease the stocking density of fry in rearing ponds.

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