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Monitoring of fish species in the Lamone river: distribution and morphometric measures of the populations

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ABSTRACT - Fish samplings were carried out monthly from spring to autumn during 2008, on the Lamone river and the Campigno stream by an electrofishing, in order to verify the presence of fish populations and the most common species represented. Barb, *Barbus plebejus*, Blageon, *Leuciscus muticellus*, Chub, *Leuciscus cephalus*, South European Nase, *Chondrostoma genei* were identified. A small population of Brown trout, *Salmo trutta fario* was also recognized. Barb is the most represented species in all the sites. The samplings highlight that Lamone river presented conditions suitable to fully guarantee the life of the fish populations.

Key words: Fish, Morphometric measures, Lamone river.

Introduction - Italian rivers and their fishes population are afflicted by many problems often referable to wrong management methods. The larger part of the watercourses suffered an anthropical aggression modifying their structure and dynamics with a subsequent loss of biodiversity and land quality. Fish population are not only important for anglers, but they could be used both as a biological index of the environmental quality and as an integrating part of complex ecosystems in which the protection becomes strategic even considering the need linked to the management of the water resources (Zerunian, 2002; Forneris *et al.,* 1990).

Material and methods - The study was carried out in the Apennine area between the provinces of Firenze and Ravenna (commune of Marradi 340 m a.s.l.). The object of the study was the Lamone river (it flows into the Adriatic sea in the Ravenna province with a length of 115 km) and the Campigno stream that flows into the Lamone river near the village of Biforco. Samplings were carried out monthly from spring to autumn during 2008. Four different sites have been identified: two of them, Crespino and Campigno, with waters classified at Salmonids located upstream of Marradi; one site near the Biforco village and the last one downstream of Marradi (S. Adriano). The last two sites with waters classified at Cyprinids. The river bed in the different sites presents variable width ranging from 2 (Campigno) to 7 m (S. Adriano). Vegetational index of the banks, river bed characteristics, water temperature, dissolved oxygen (saturation %) and conductibility (µSiemens/cm) were recorded before each sampling. Samplings were carried out scouring 50 linear meters with two consecutive passages using a fish stunner (Scubla IG600). Captured animals were placed in a tank with water and anaesthetic (ethyl ammine benzoate at the concentration of 20 mg/l);then the identification of the species they were submitted to morphometrical measures of weight, total length, standard length, minimum and maximum circumferences. Condition Factor expressed by the ratio total weight/total length^3 has been also calculated. The sampled fishes were subsequently transferred in a tank with clear water

in order to regain consciousness and after that they were released in the river. Data were used to estimate population density of each identified species, using the method of consecutive passages reported by Zippin (1958). Population density measures were used to calculate the semi quantitative abundance index (A.I.) of Moyle (1970) and Moyle - Nichols (1973). Morphometric measures of each site have been submitted to the analysis of variance with the site as fixed effect employing the SAS statistical package.

Results and conclusions - *Crespino del Lamone*: The river bed is 2 m width and the ground is composed by pebbles and stones and the riparian vegetation is almost totally arboreal. On the whole 223 fishes were sampled and the following species were identified: Barb, *Barbus plebejus* (A.I. 3), Blageon, *Leuciscus muticellus* (A.I. 4), Chub, *Leuciscus cephalus* (A.I. 2), South European Nase, *Chondrostoma genei* (A.I. 4) and Brown trout, *Salmo trutta fario* (A.I. 2).

Biforco: The river bed in the sampling area is 4 m width with a maximum depth of 1m. The ground is composed by rocks and gravel sediments. On the whole 325 animals were sampled and the following species were recognized: Barb (A.I. 4), Blageon (A.I. 3), Chub (A.I. 4), South European Nase (A.I. 3), "Triotto", *Rutilus aula* (A.I. 2) and Brown trout (A.I. 2).

S. Adriano: The site showed scarce bank vegetation with a prevalence of shrubs. The river bed (at the end of the Spring) in the sampled area is 4-7 m width with a variable depth of 20-120 cm. The ground is composed by big stones with gravel sediments almost totally covered by epilithic algae. For this site 312 animals were captured recognizing the presence of Barb (A.I. 4), Blageon (A.I. 2), Chub (A.I. 4), South European Nase (A.I. 2), "Triotto" (A.I. 1) and Arno goby, *Padogobius nigricans* (A.I. 1).

Campigno: it flows from the Corella mountain ridge (1137 m a.s.l.) and its waters are classified at Salmonids. Eighty fishes were sampled for this site and they belong to the following species: Barb (A.I. 4) and Brown trout (A.I. 3). Morphometric data of the most represented species are reported in Table 1.

Table 1. Total length, weight and Condition Index of the different species found in the four different sites of sampling.

		Crespino		Biforco		S. Adriano		Campigno	
Species	Measure	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Barb	Tot. length (mm)	16.34^{bc}	4.92	19.08^{ab}	15.54	20.41^{a}	3.95	15.86^{c}	3.74
	Weight (g)	49.98^{bc}	44.76	70.47^{ab}	110.00	76.63^{a}	40.48	43.80^{c}	28.40
	Condition Factor	1.01^{a}	0.38	0.93^{ab}	0.38	0.87^{b}	0.27	0.97^{ab}	0.20
Blageon	Tot. length (mm)	11.19	2.52	11.88	2.38	12.20	1.95		
	Weight (g)	19.06	13.10	22.31	24.20	21.54	10.88		
	Condition Factor	1.24	0.34	1.43	1.80	1.07	0.41		
Chub	Tot. length (mm)	21.15^{a}	9.65	25.33^{a}	23.20	19.39^{b}	4.48		
	Weight (g)	153.27^{a}	186.90	124.36^{a}	119.38	87.38^{b}	63.78		
	Condition Factor	1.11^{a}	0.25	0.95^{b}	0.50	1.03^{a}	0.26		
South Eur.	Tot. length (mm)	13.11^{b}	4.14	28.39^{a}	42.73	15.04^{b}	3.39		
Nase	Weight (g)	31.07	33.35	38.44	19.82	38.47	25.66		
	Condition Factor	1.20	0.52	1.00	0.79	1.01	0.23		

$^{a, b, c}$*differ for P<0.05.*

Irrespective of the sites water temperature ranged from 22.0°C to 13.8°C in the warm and the cold season respectively. Diluted oxygen resulted always higher than 90% of saturation whereas the conductibility varied from 387 to 406 µSiemens which represented average values of salinity for the fresh water. The biological quality of the river, represented by the quality of the invertebrates community found in the river bed and in the banks, lowered sensibly going downstream, moving from good to poor with critical situations in some almost totally urbanized spots (Biforco: reduced riparian vegetation; S. Adriano: presence of industrial installations) (Nocita, 2002).

Barb is the most represented species at the Biforco, S. Adriano and Campigno sites. Especially at Biforco it resulted the most constant during all the 4 sampling periods (Table 2).

Furthermore Barb resulted of lower size in Crespino and Campigno sites and with different morphological shape as indicated by the Condition Factor (Table 1).

Table 2. Fish populations estimated over 50 m followed Zippin (1958).

	Crespino		Biforco		S Adriano		Campigno	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Barb	18.50	5.44	35.17	5.69	41.32	30.90	27.71	24.16
Blageon	43.30^{a}	26.50	16.06^{b}	6.60	2.63^{b}	3.09	3.50^{b}	2.33
Chub	4.30^{b}	4.45	40.00^{a}	14.80	47.10^{a}	22.34	-	-
South E.N.	23.52	25.89	10.79	7.37	9.53	4.44	-	-
Brown trout	3.25^{ab}	3.33	1.50 b	1.77	-	-	17.72^{a}	17.05

$^{a, b, c}$*differ for P<0.05.*

The other recognized species, Blageon, South European Nase and Chub, resulted less abundant than Barb. South European Nase showed the greater dimensions in the Biforco site at a parity of population abundance. Brown trout showed a slightly different habit compared to the other recognized species and its presence resulted highly moderate in all the sites and for S. Adriano site no animals of Brown trout were sampled. The significant presence of the Barb point out that the environments considered are especially suitable for the life of these animals which prefer deep water with high oxygen rate; furthermore the more or less constant presence of the Barb in the four sampled zones could be linked to the habit of the species that usually lives in large shoals.

The diversity of the recognized species indicates that Lamone river presented conditions suitable to fully guarantee the life of the fish populations. Therefore it is important to preserve and to improve such habitat in order to favor the conservation and, where possible, the increase of the fish species. Such species represented both an important feature of the territory and an integrating part of complex aquatic ecosystems which preservation become strategic even in relation to the need of the management of the water resources.

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