

Further data on the fish fauna catalogue of the Natural Park of Ruidera Lakes (Guadiana River basin, central Spain)

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Introduction

The Ruidera Lakes, the Peñarroya Reservoir and the adjacent area (about 3772 ha) were declared a Natural Park in 1979. Fish fauna was formerly reviewed by ELVIRA & GARCÍA-UTRILLA (1991) after the study of references found in the available literature. Original fish assemblage is common with that of the Guadiana River basin, and belonging to the Andalusian subsector of the biogeographical areas proposed by DOADRIO (1988). This report presents the preliminary results of a research project actually carried out to determine its accurate fish catalogue.

Methods

The study area consists of fourteen lakes (Conceja, Tomilla, Tinaja, San Pedro, Redondilla, Lengua, Salvadora, Santos Morcillo, Batana, Colgada, Rey, Cueva Morenilla, Coladilla and Cenagosa) and a reservoir (built in 1959), joined by streams, placed along 28 km from S.E. to N.W. in a limestone valley. Water, supplied by aquifers, runs in so short distance through a slope of about 150 m high.

From September 1991 to August 1992 we sampled fishes monthly in the study area using electrofishing and nets of different size. Physico-chemical analyses of surface water were also made, monthly from November 1991 onwards, in thirteen lakes (Redondilla Lake dried out on that date) and in the Guadiana River. Temperature, oxygen and pH profiles were determined in situ.

Results

Table 1 shows the mean seasonal variation in physico-chemical composition of Ruidera waters. Surface water temperature ranged from 3 to 26 °C, with a monthly average of about 14 °C. Dissolved oxygen levels varied narrowly, representing near-saturation conditions; a feature which determines the oligotrophic lakes, also characterized by small levels of nutrients and algae.

The pH is slightly alkaline. Conductivity levels show a high seasonal decrease after winter, due to the spring rains. Chemical Oxygen Demand has the characteristic values of unpolluted water.

Ionic valance shows the high calcium and bicarbonate dominance, maybe related with the calcareous nature of sediments. The cationic order was Ca^{2+} (65 % of cations) \gg Mg^{2+} (19 %) $>$ Na^+ (15 %) \gg K^+ (2 %); while for anions was HCO_3^- (57 % of anions) \gg SO_4^{2-} (25 %) \gg Cl^- (13 %) \gg NO_3^- (5 %).

Provisional catalogue of fishes and localities where they were found are listed in Table 2. Present fish fauna consists of 16 species belonging to seven families; nine species are native and seven exotic. Additionally, a specimen of eel, *Anguilla anguilla*, was caught near locality no. 19 on April 15, 1985 (after the news published in a regional newspaper). Its presence could be owed to an artificial stocking.

Some remarkable changes with regard to the former list (ELVIRA & GARCÍA-UTRILLA 1991) must be highlighted. Two additional species are now reported, *Oncorhynchus mykiss* and *Gobio gobio*; while two species have changed their taxonomical status, *Barbus bocagei* and *Cobitis paludica*.

Rainbow trout, *O. mykiss*, and brown trout, *Salmo trutta*, were introduced in several lakes of Ruidera some years ago. We could find only one specimen of *O. mykiss* in the Ossero watermill, upstream the Conceja Lake. Water features, mainly temperature (see Table 1), of Ruidera Lakes are inadequate for trouts, which surely will extinguish in a few years after stocking by man.

Gobio gobio is an exotic species in the Guadiana River basin, where was firstly reported by DOADRIO & ELVIRA (1986). Gudgeon is not rare in the Guadiana River, downstream the Ruidera Lakes and near the Peñarroya Reservoir, where it surely was introduced by anglers since it is commonly used as live bait to fish pike, *Esox lucius*.

Table 1. Seasonal chemical composition (range, mean and standard deviation) of Ruidera waters (in mg liter⁻¹, conductivity in $\mu\text{ohms cm}^{-1}$, Chemical Oxygen Demand in mg liter⁻¹ of oxygen).

	T°C air	Dissolved O ₂ air	T°C water	Dissolved O ₂ water	pH	Conduc- tivity	C.O.D.	Total solids	Na ⁺	K ⁺
Autumn	8-12	9.9-11	10-13	7-12.2	7.82-8.06	392-663	0.8-4.8	333-564	2.2-25.2	0.8-2.9
	10.4	10.3	11.7	10.1	7.92	546.9	2.3	468.2	16.3	1.7
	1.65	0.45	0.85	1.14	0.085	69.72	1.37	58.37	7.51	0.62
Winter	5-10.5	10.4-11.8	3-12.5	7-14	7.24-8.28	452-698	0.4-6.4	385-606	7-32.2	0.7-6.6
	7.6	11.1	7.6	11.3	7.91	595.7	3.0	506.3	17.9	2.4
	1.00	0.24	1.53	0.17	0.101	21.32	1.95	17.95	7.11	0.99
Spring	16-20	8.5-9.2	10-20	8.5-14	7.63-8.22	275-519	1.5-3.1	234-441	7.1-49	0.8-8.6
	18.5	8.7	15.8	9.9	7.88	411.9	2.3	351.0	17.0	1.9
	0.03	0.03	4.67	0.79	0.073	66.75	1.17	55.58	1.14	0.61
Summer	25-30	7-7.7	20.5-26	7.3-11	7.37-8.97	414-766	0.4-9.2	352-651	9-30	1-3
	26.9	7.4	23.0	8.7	7.95	585.5	2.5	497.6	17.9	2.1
	0.68	0.05	2.42	0.99	0.170	14.35	0.30	12.44	5.89	0.18
	Ca ²⁺	Mg ²⁺	Cl ⁻	SO ₄ ²⁻	CO ₃ ²⁻	HCO ₃ ⁻	NO ₃ ⁻	NO ₂ ⁻	NH ₄ ⁺	PO ₄ ³⁻
Autumn	56.7-106.5	16.4-27	27.2-79.6	62.4-109.8	0	141-241.5	7.9-43.1	0.006-0.019	0.088-1.133	0.05-0.364
	79.6	22.9	46.8	86.3	0	196.8	17.0	0.013	0.242	0.111
	14.18	2.97	13.09	13.86	0	35.9	9.27	0.0043	0.2800	0.0786
Winter	45.4-112.5	21-25	30.8-55	67.9-120.9	0	142.5-308.5	3.4-39.2	0.010-0.470	0-1.059	0-1.020
	85.9	23.4	42.3	89.4	0	228.2	16.4	0.076	0.168	0.106
	11.18	0.48	1.57	2.60	0	13.74	3.07	0.0333	0.0610	0.1052
Spring	28.4-73.4	12-22	18.5-53.5	33.3-108.2	0	74.8-197	1.8-27.5	0.005-0.222	0-0.705	0-0.177
	54.8	17.6	35.3	69.0	0	143.5	11.6	0.079	0.088	0.027
	14.51	1.51	3.37	20.90	0	22.02	4.90	0.0125	0.0150	0.0378
Summer	40.5-121.9	20.2-29.6	37-57.5	80.7-116	0-12	74.3-312.4	2.6-41.9	0.002-0.178	0-2.572	0-0.037
	82.6	23.7	45.8	92.5	0.9	204.2	20.2	0.100	0.171	0.004
	1.49	3.10	1.36	1.31	2.69	2.44	1.41	0.0191	0.1510	0.0056

Table 2. Species distribution along the 20 selected sections. Upstream to downstream: 1 La Cagurria Spring, 2 El Osseo Watermill, 3 Conceja Lake, 4 Tomilla Lake, 5 Ringurrina Stream, 6 Tinaja Lake, 7 San Pedro Lake, 8 Redondilla Lake, 9 Lengua Lake, 10 Salvador Lake, 11 Santos Morcillo Lake, 12 Batana Lake, 13 Colgada Lake, 14 Rey Lake, 15 La Cubeta Watermill, 16 Cueva Morenilla Lake, 17 Coladilla Lake, 18 Cenagosa Lake, 19 Guadiana River, 20 Peñarroya Reservoir.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Fam. Salmonidae																				
<i>Oncorhynchus mykiss</i>		+																		
Fam. Esocidae																				
<i>Esox lucius</i>											+		+		+				+	+
Fam. Cyprinidae																				
<i>Barbus bocagei</i>																				
<i>Barbus comiza</i>																				
<i>Barbus microcephalus</i>																				
<i>Chondrostoma polylepis willkommii</i>																				
<i>Cyprinus carpio</i>																				
<i>Gobio gobio</i>																				
<i>Leuciscus pyrenaicus</i>																				
<i>Rutilus lemmingii</i>																				
<i>Tropidophoxinellus alburnoides</i>																				
Fam. Cobitidae																				
<i>Cobitis paludica</i>																				
Fam. Poeciliidae																				
<i>Gambusia holbrooki</i>																				
Fam. Centrarchidae																				
<i>Lepomis gibbosus</i>																				
<i>Micropterus salmoides</i>																				
Fam. Blenniidae																				
<i>Blennius fluviatilis</i>																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

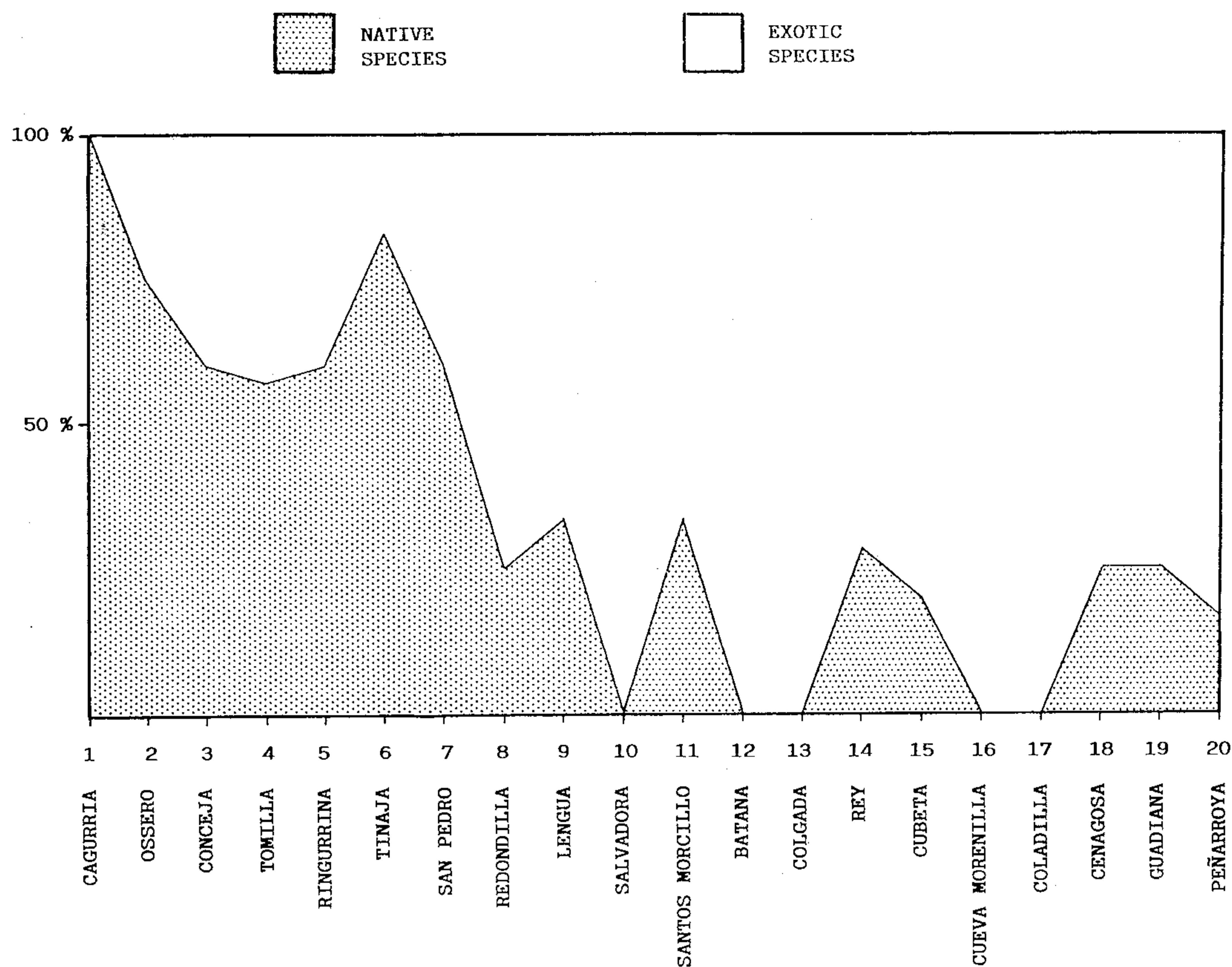


Fig. 1. Native-exotic species relationships along the 20 selected sections. Numbers as in Table 2.

After DOADRIO et al. (1987), *Barbus bocagei sclateri* lives in the Guadiana River basin. Recently, DOADRIO et al. (1991) stated that *Barbus sclateri* only inhabits the middle and lower sections of that basin. We found in the study area three species of barbels: *Barbus comiza*, *B. microcephalus* and *B. bocagei*. On this account, *B. bocagei* is firstly reported for the Guadiana River basin, where after our own data (B. E.) it also lives in the Gigüela River.

Cobitis maroccana was accepted to be the loach occurring in the Guadiana River basin (DOADRIO et al. 1988, 1991). Nevertheless, taxonomical status of Iberian loaches has recently changed (see BLANCO & GONZÁLEZ 1992). For this reason, loaches of Ruidera must be named *Cobitis paludica*.

Discussion

Eight of the nine native species are Iberian endemisms (ELVIRA 1990), while *Blennius fluviatilis* is en-

demetic of the circum-mediterranean region. This fish assemblage represents the potential community of the area (DOADRIO et al. 1991).

Nevertheless, a high degree of alteration in fish community presently occurs after the introduction of seven exotic species; six of them with standing populations in Ruidera. Fig. 1 shows, in percentage of presence, the native-exotic species relationships along the 20 selected sections. Studies of interactions between allochthonous and autochthonous fish fauna are still rare in Spain (ELVIRA in press). In any case, occurrence of potential fish predators like *Esox lucius*, *Lepomis gibbosus* and *Micropterus salmoides* is an evident danger for native species. In fact, original assemblages are now restricted to the higher sections, where *E. lucius* is absent (Fig. 1 and Table 2).

Conservation status of Spanish freshwater fishes was firstly reported by ICONA (1986) and recently reviewed (BLANCO & GONZÁLEZ 1992). According to the new classification, five threa-

tened species live in Ruidera: *Barbus microcephalus* and *Rutilus lemmingii* (considered as rare), *Barbus comiza* and *Cobitis paludica* (vulnerable) and *Blennius fluviatilis* (endangered). *B. comiza*, *B. microcephalus* and *C. paludica* are still common in the middle and higher lakes and streams. *B. fluviatilis* is also present in the lower streams of Ruidera. Finally, *R. lemmingii* seems to be the fish species most threatened in the area, since it was only found in small number in one locality.

Summary

The fish list of the Natural Park of Ruidera Lakes was compiled from September 1991 to August 1992. This lacustrine system includes fourteen lakes joined by short streams. Limnological routine tests were monthly made together with the fish samplings. The current catalogue consists of nine native (mainly rheophilic) species: *Barbus bocagei*, *B. comiza*, *B. microcephalus*, *Chondrostoma polylepis willkommii*, *Leuciscus pyrenaicus*, *Rutilus lemmingii*, *Tropidophoxinellus alburnoides*, *Cobitis paludica* and *Blennius fluviatilis*. Furthermore, seven exotic (mostly limnophilic) species were found in the area: *Oncorhynchus mykiss*, *Esox lucius*, *Cyprinus carpio*, *Gobio gobio*, *Gambusia holbrooki*, *Lepomis gibbosus* and *Micropterus salmoides*. In spite of the undesirable occurrence of exotic species, the presence of endemisms including some threatened fishes like *B. microcephalus* and *R. lemmingii* (rare), *B. comiza* and *C. paludica* (vulnerable) and *B. fluviatilis* (endangered), makes Ruidera Lakes one of the most valuable inland wetland for fishes in Spain.

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