

Rapid Communication

Identification of *Gobio* populations in the northeastern Iberian Peninsula: first record of the non-native Languedoc gudgeon *Gobio occitaniae* (Teleostei, Cyprinidae)

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Received: 12 December 2012 / Accepted: 4 March 2013 / Published online: 6 March 2013

Handling editor: Vadim Panov

Abstract

All Iberian populations of the genus *Gobio* have been ascribed to *G. lozanoi* to date. In northeastern (NE) Iberian catchments, the *Gobio* populations are not native and several species may have been involved in the introductions. To identify the species present, specimens were collected in several Ebro River and NE Iberian catchments. Their identification revealed the presence of two species, *G. occitaniae* and *G. lozanoi*, the former being the first record in the Iberian Peninsula. *Gobio occitaniae* was reported from one Ebro tributary and three NE Iberian catchments. The possible negative effects caused by competitive interactions between introduced *Gobio* species and native fish may warrant management actions to control or eradicate introduced populations.

Key words: *Gobio lozanoi*; Spain; introduced fish

Introduction

The gudgeon *Gobio gobio* (Linnaeus, 1758) has long been considered to have a wide distribution in Europe (Banarescu et al. 1999), including the Iberian Peninsula (Doadrio 2001), until recent taxonomic research showed that, in fact, several species were involved (Doadrio and Madeira 2004, Madeira et al. 2005; Kottelat and Persat 2005; Kottelat and Freyhof 2007). All of the Iberian populations have been identified as Pyrenean gudgeon *Gobio lozanoi* Doadrio & Madeira, 2004, which is considered to be native in northern Spain (Bidasoa and Ebro basins) but whose presence in other drainages is the result of translocations (Madeira et al. 2005) and water transfers between basins (García de Jalón et al. 1992).

In the northeastern (NE) Iberian catchments, *Gobio* populations are considered non-native (Aparicio et al. 2000). Although they have been

reported as *G. lozanoi* (Maceda-Veiga et al. 2010), other *Gobio* species may have been involved in the introductions because of the proximity to southeastern France, where other species such as Languedoc gudgeon *G. occitaniae* Kottelat & Persat, 2005, are present (Kottelat and Persat 2005). These introductions might have gone unnoticed due to the morphological similarities of most *Gobio* species in Europe. The aims of this paper are to identify the *Gobio* species present in the Ebro River and NE Iberian catchments and to provide data on their distributions.

Methods

Gobio specimens were captured by electrofishing from May to August 2011, in 4 out of 10 localities sampled in NE Iberian catchments, and in 14 out of 19 localities sampled in the Ebro River basin (Figure 1; Table 1). Fish were

Figure 1. Map of the study area showing the sampling sites in the Ebro basin (uncoloured area) and northeastern Iberian catchments (grey area). Open circles are localities without *Gobio* species, filled circles are localities with *G. lozanoi*, and filled triangles are localities with *G. occitaniae* (the numbers correspond to the numbers in Table 1).

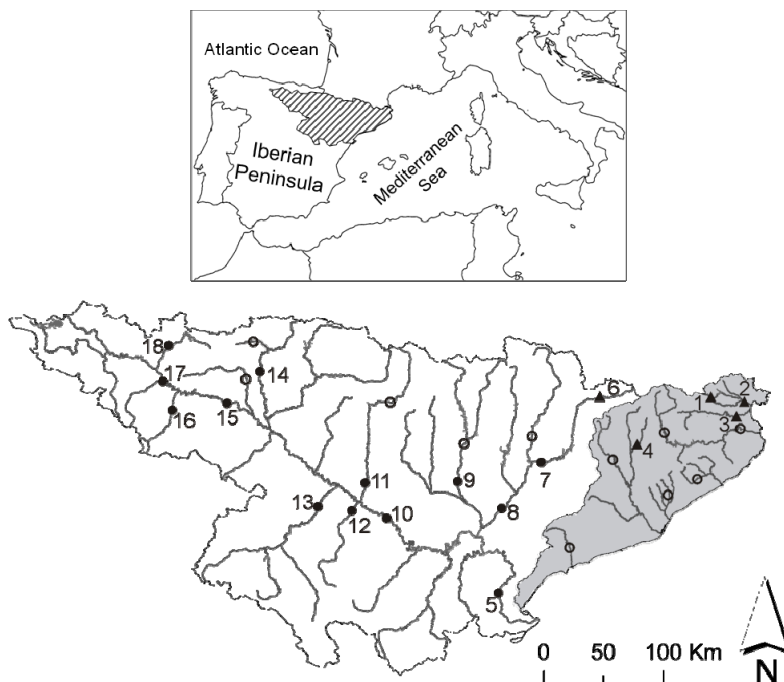


Figure 2. Specimen of *Gobio occitaniae* captured at the Fluvia river, northeastern Iberian Peninsula (Photograph by Enric Aparicio).



Table 1. List and geographic coordinates of sampling sites with the presence of *Gobio* species in 2011, with number of specimens collected (N) and species identified in each site.

Code	Basin	River	Locality	Latitude	Longitude	N	Species identified
1	Northeastern	Muga	Sant Llorenç	42°19'25"N	2°47'23"E	9	<i>Gobio occitaniae</i>
2	Northeastern	Muga	Perelada	42°17'43"N	3°01'08"E	6	<i>Gobio occitaniae</i>
3	Northeastern	Fluvià	Vilert	42°10'27"N	2°49'21"E	28	<i>Gobio occitaniae</i>
4	Northeastern	Merlés (Llobregat)	Santa Maria	42°00'34"N	1°58'55"E	25	<i>Gobio occitaniae</i>
5	Ebro	Ebro	Xerta	40°55'20"N	0°29'38"E	13	<i>Gobio lozanoi</i>
6	Ebro	Segre	Alàs	42°21'23"N	1°30'17"E	18	<i>Gobio occitaniae</i>
7	Ebro	Segre	Alós de Balaguer	41°54'33"N	0°58'08"E	17	<i>Gobio lozanoi</i>
8	Ebro	Segre	Torres de Segre	41°32'15"N	0°30'49"E	12	<i>Gobio lozanoi</i>
9	Ebro	Cinca	Monzón	41°55'53"N	0°10'17"E	12	<i>Gobio lozanoi</i>
10	Ebro	Ebro	Pina	41°29'49"N	0°32'32"W	7	<i>Gobio lozanoi</i>
11	Ebro	Gállego	Montañana	41°42'09"N	0°49'40"W	14	<i>Gobio lozanoi</i>
12	Ebro	Huerva	Zaragoza	41°33'53"N	0°57'23"W	3	<i>Gobio lozanoi</i>
13	Ebro	Jalón	Bárboles	41°42'41"N	1°11'30"W	10	<i>Gobio lozanoi</i>
14	Ebro	Arga	Puente de la Reina	42°39'56"N	1°49'39"W	14	<i>Gobio lozanoi</i>
15	Ebro	Ebro	Logroño	42°28'16"N	2°22'54"W	12	<i>Gobio lozanoi</i>
16	Ebro	Nájera	Nájera	42°25'31"N	2°43'57"W	13	<i>Gobio lozanoi</i>
17	Ebro	Ebro	Haro	42°35'22"N	2°49'17"W	14	<i>Gobio lozanoi</i>
18	Ebro	Zadorra	Agurain	42°52'01"N	2°25'42"W	9	<i>Gobio lozanoi</i>

anesthetized with 2-phenoxyethanol before fixation in 4% formaldehyde and taken to the laboratory, where they were transferred to 70% ethanol. The specimens were identified from morphological characters according the classification keys from Kottelat and Persat (2005) and Kottelat and Freyhof (2007). The main diagnostic characters were (1) the number of scales between the lateral line and the origin of the dorsal fin, (2) the number of scales between the lateral line and the origin of the pelvic fin, and (3) the distribution of the scales on the belly.

Results

Two species were identified in the collected samples: *G. occitaniae* and *G. lozanoi*. Specimens of *G. occitaniae* (Figure 2) were identified and differentiated from *G. lozanoi* by having the scales on the belly extending forward beyond the pectoral fins (*vs* extending at most to the posterior extremity of the pectoral-fin base); 4–4½ scales between the lateral line and pelvic-fin origin (*vs* 3–3½); and 6–6½ scale rows between the lateral line and dorsal-fin origin (*vs* 5–5½).

Gobio occitaniae was found in three NE Iberian catchments (Muga, Fluvià and Llobregat) and in the upper Segre River, Ebro basin. *Gobio lozanoi* was present in all of the Ebro basin samples except in the upper Segre River, and it was not found in samples from the NE Iberian catchments. In the Segre River both species were present: *G. lozanoi* was identified in the middle and lower reaches and *G. occitaniae* was present in the upper part of the river (Figure 1; Table 1).

Discussion

The presence of the genus *Gobio* in the Iberian Peninsula was initially regarded as a result of introductions in the nineteenth century (Lozano-Rey 1935; Lobón-Cerviá et al. 1991), but after the description of *G. lozanoi*, Doadrio and Madeira (2004) considered this species to be native from the northern Iberian Peninsula (Ebro and Bidasoa basins) and southwestern France. The first identification of *G. lozanoi* was undoubtedly in the Adour River in France in 1835, and in 1913 in Spain (Doadrio et al. 2011). However, some doubts remain on the native or introduced status of this species in the Iberian Peninsula and further genetic research is needed to clarify their origin (Madeira et al. 2005; Doadrio et al. 2011).

The present study is the first to record the presence of *G. occitaniae* in the Iberian Peninsula. The native range of *G. occitaniae* covers most of southern France (Kottelat and Persat 2005). In the NE Iberian catchments, the presence of *Gobio* populations has been known since the 1990s (Aparicio et al. 2000). These populations were initially reported as *G. lozanoi* (Maceda-Veiga et al. 2010), but this species was not found in our samples from this area, in which only *G. occitaniae* was identified. However, the presence of *G. lozanoi* or other *Gobio* species cannot be excluded because introductions may have occurred from multiple source populations elsewhere. The potential presence in the NE Iberian catchments of several species of *Gobio* with very similar appearance should urge confirmation of field identifications by examination of preserved specimens.

Although the information to support the introduced status of *G. occitaniae* in the NE Iberian catchments and the Segre River is scarce and some of the basins analyzed (e.g. Muga, Fluvià) share other native cyprinid species with French basins (e.g. *Squalius laietanus* Doadrio, Kottelat & de Sostoa, 2007, and *Barbus meridionalis* Risso, 1827), the absence of old records of *Gobio* sp. in this area and the invasive traits displayed by the current populations firmly suggest they are introduced. The origin of the introductions is unknown, but they are most likely related to its use as live bait for sport fishing (Madeira et al. 2005). The proximity between several southern French catchments inhabited by *G. occitaniae* and the NE Iberian catchments and Segre River may have facilitated such introductions, as has occurred with many other introduced fish species (Clavero and García-Berthou 2006).

The Segre River is the only basin where *G. occitaniae* and *G. lozanoi* were both present. The sampled locations where these species were found are separated by two large dams and several low head dams, so apparently both species were isolated and displayed an allopatric distribution. However, we only sampled three localities in this long river (>150 km) so a more detailed study on the distribution of both species along the Segre River would be needed to determine if they are in contact somewhere and if a possible hybridization could occur.

Introduced *Gobio* populations in the Iberian Peninsula tend to be invasive due to their high reproductive potential (Lobón-Cerviá et al. 1991). Negative effects have not been demonstrated to date, however, Leunda (2010) and Almeida and

Grossman (2012) suggested several potential impacts caused by translocated *G. lozanoi*, including trophic and habitat competition with native fish. *G. occitaniae* is likely to present the same potential threats. Therefore, management actions to control or eradicate introduced *G. occitaniae* and *G. lozanoi* populations should be conducted, along with educational programmes for anglers, to prevent or reduce their spread.

Acknowledgements

We thank Oriol Comas and Núria Valls (Associació de Defensa i Estudi de la Fauna i la Flora Autòctona-ADEFFA), and Tomasso Scanzio for field and laboratory assistance. Kathleen Fisch and two anonymous reviewers provided comments and suggestions that greatly improved the manuscript. GCC held a doctoral fellowship (BR2010/10) from the University of Girona during the preparation of the manuscript. Funding was provided by research grants to SP and ID (CGL2010-15231Bos).

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