



## FIRST RECORD OF A SELF-SUSTAINING POPULATION OF ALPINE CHARR *SALVELINUS UMBLA* (LINNAEUS, 1758) (ACTINOPTERYGII, SALMONIDAE) IN SPAIN

Enric Aparicio\*

\*Institute of Aquatic Ecology, University of Girona, E-17071 Girona, Spain. [enric.aparicio@gmail.com](mailto:enric.aparicio@gmail.com)

### ABSTRACT

This work reports for the first time in Spain the presence of the non-native salmonid Alpine charr, usually included into *Salvelinus alpinus*, but recently revised to *Salvelinus umbla*. The species was found in a high mountain lake in the Pyrenees belonging to the Garonne catchment (Lake Obago, Val d'Aran, province of Lleida). This is probably not a recent introduction since the presence of one species of *Salvelinus* in some lakes of the Val d'Aran has been known among anglers for a long time, but the species identification was lacking. The distribution of *S. umbla* in the Val d'Aran appear to be restricted to a very few lakes and it has not spread downstream.

**Key words:** introduced species; Salmonidae; lakes; Pyrenees.

### RESUMEN

#### Primera cita de una población naturalizada de salvelino alpino *Salvelinus umbla* (Linnaeus, 1758) (Actinopterygii, Salmonidae) en España

En este trabajo se cita por primera vez en España la presencia del salvelino alpino, generalmente incluido en *Salvelinus alpinus*, pero recientemente revisado como *Salvelinus umbla*. La especie fue encontrada en un lago de alta montaña de los Pirineos perteneciente a la cuenca del Garona (Estany Obago, Val d'Aran, Lleida). Probablemente no se trata de una introducción reciente ya que la presencia de una especie de *Salvelinus* en algunos lagos del Valle de Arán ya era conocida entre los pescadores durante mucho tiempo, pero la identificación de la especie no se había realizado. La distribución de *S. umbla* en el Valle de Arán parece estar restringida a unos pocos lagos y no se ha extendido a los tramos de río aguas abajo.

**Palabras clave:** especies introducidas; Salmonidae; lagos; Pirineos.

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### Introduction

Arctic charr *Salvelinus alpinus* (Linnaeus, 1758) is a stenotherm salmonid restricted to cold water habitats, living from arctic to temperate climate regions of the Holarctic (Klemetsen *et al.*, 2003). The systematics of *S. alpinus* in Europe is under review because this species exhibits a complex mosaic of variability in morphology and ecology throughout its range (Kottelat &

Freyhof, 2007). Populations of Arctic charr present in Alpine and subalpine lakes in Italy, France, Switzerland, Germany and Austria were usually included into *S. alpinus* (Maitland, 1995), but recently were revised to Alpine charr *Salvelinus umbla* (Linnaeus, 1758) (Kottelat & Freyhof, 2007). *Salvelinus umbla* has been widely introduced in numerous high altitude lakes of Europe because of its value as a sport fish. For example, *S. umbla* is native to only two lakes in France, but it is

currently introduced in more than 130 lakes, about 38% of them in the French Pyrenees (Machino, 1995).

In Spain, the information available on the possible presence of introduced populations of *Salvelinus* spp. is rather vague. Holčík (1991) reported that there were attempts to introduce *S. alpinus* in Spain (unknown waters), but the species was not established. Machino (1999) reviewed charr introductions in southern Europe and left open the possibility that *S. umbla* (referred in the original article as *S. alpinus*) was present in Pyrenean lakes of the Huesca and Lleida provinces. However, to date there are no confirmed records of the presence of *S. umbla* in natural waters of Spain (Machino, 1999 and references therein; Doadrio, 2002; Doadrio *et al.*, 2011; Miró & Ventura, 2013). The only *Salvelinus* species known to be present in Spain is the brook trout *Salvelinus fontinalis* (Mitchill, 1814), which was stocked in several lakes by government agencies in the 1970s and, as a consequence, self-sustaining populations currently exist in some lakes (Sostoa & Lobón-Cerviá, 1989; Doadrio *et al.*, 2011; Miró & Ventura, 2013).

Val d'Aran is a Pyrenean valley situated at the headwaters of the Garonne catchment (Atlantic basin). Many glacial lakes exist in this area, which are regularly stocked with brown trout *Salmo trutta* Linnaeus, 1758, for angling purposes. Besides *S. trutta*, in a few of these lakes the occurrence of one species of *Salvelinus* has been known among anglers for a long time, but up to now, the identification of the species was lacking. The goal of this work was to collect some specimens of *Salvelinus* sp. inhabiting in one of these lakes to identify the species they belong to.

## Materials and methods

The study lake was Lake Obago (Lat. 42°36'50"N, Long. 0°56'33"E), situated in the Val d'Aran, Lleida province (Catalonia region) (Fig. 1). The lake is 640 m long and 345 m wide, with a total surface area of 13.4 ha. At 2,236 m above sea level, the maximum depth of the lake is 27.1 m. Lake Obago is dimictic and covered with ice for 6-7 months a year.

Fish were collected by angling at Lake Obago in July 2015. Collected specimens of *Salvelinus* sp., after being photographed, were killed with a lethal dose of anaesthetic (MS-222) and frozen to be examined in the laboratory. One of the specimens has been deposited at the Fish Collection of the Museo Nacional de Ciencias Naturales (MNCN\_ICTIO 290.843) (Madrid, Spain).

## Results

A total of 12 fish were captured. Three fish were identified as *Salvelinus umbla* (Fig. 2) and the rest were *S. trutta*. Another fish species observed to be present in the lake was the European minnow *Phoxinus* sp. (Linnaeus, 1758).

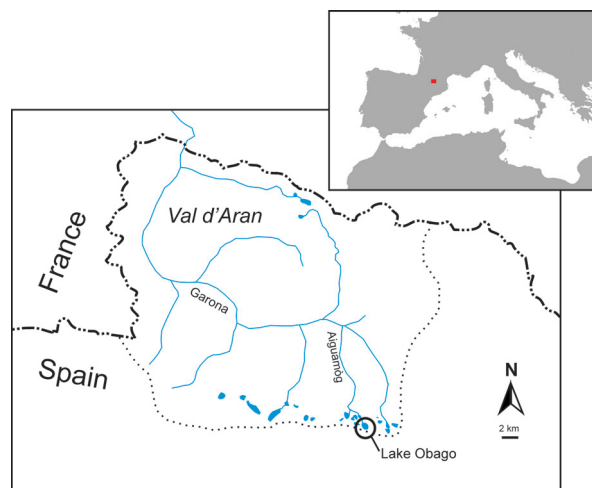


Fig. 1.— Geographical situation of Lake Obago in the Val d'Aran, province of Lleida.

Fig. 1.— Situación geográfica del Lago Obago en el Valle de Aran, provincia de Lleida.

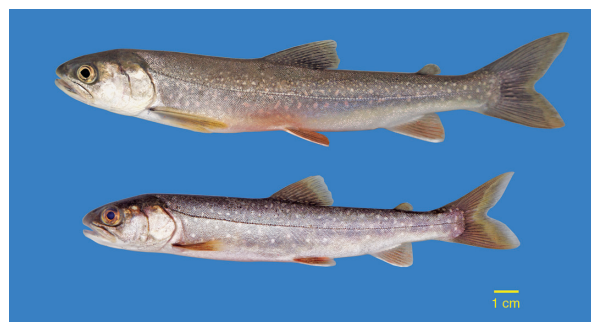


Fig. 2.— Specimens of *Salvelinus umbla* captured in Lake Obago in July 2015. Photographs by E. Aparicio.

Fig. 2.— Ejemplares de *Salvelinus umbla* capturados en el Lago Obago en Julio de 2015. Fotografías de E. Aparicio.

The three specimens of *S. umbla* measured 165, 197 and 234 mm fork length. They were identified by the following characters: elongated body covered by small scales; soft spots on the body sides (whitish or pale pink colour) on a darker background; absence of a marbled pattern (vermiculated) on the back (typical of *S. fontinalis*); forward edge of pectoral, pelvic and anal fins with a white margin; caudal fin deeply forked; colouration bluish-gray on body flanks, whitish or rosy in the ventral part. Other characters useful to diagnose *S. umbla* are a terminal to subterminal mouth, lower jaw not included in upper jaw, and the presence of 25-31 gill rakers (Kottelat & Freyhof, 2007).

## Discussion

The current study confirms for the first time the presence of *S. umbla* in natural waters of Spain. They are present at least in Lake Obago, but according to personal communications from local fishermen,

*S. umbla* may be present in two other lakes of Val d'Aran: Mar (Lat. 42°37'40"N, Long. 0°50'34"E) and Restanca (Lat. 42°38'3"N, Long. 0°51'11"E). The presence of *S. umbla* in Lake Obago is probably not a recent introduction because local fishermen regularly reported catches of *Salvelinus* sp. in this lake at least since the 1980s. This would also indicate that the population is self-sustaining (i.e. maintained by natural reproduction). The late confirmation of the presence of *S. umbla* in Spain could be attributed to its restricted range and the remote areas it inhabits.

The origin of the population of *S. umbla* in Lake Obago is unknown. Miró & Ventura (2003) reported written records from Capdella hatchery (Province of Lleida) which indicated an introduction of *S. fontinalis* in Lake Obago in 1973. The possibility that the stocking records were wrong and the species stocked was *S. umbla* is unlikely, since other lakes stocked with *S. fontinalis* from the same hatchery and similar dates currently hold populations of this latter species (Miró & Ventura, 2003). The most probable explanation of the origin of *S. umbla* in Lake Obago, according to interviews with local fishermen, is an introduction performed by the Catalonia Angling Federation (representative of angling clubs) at the beginning of the 1980s, with specimens presumably obtained from some french hatchery.

*Salvelinus umbla* in Lake Obago lives in sympatry with *S. trutta* and *Phoxinus* sp. All three species are introduced in this lake since most lakes in the Pyrenees are originally empty of fish due to natural barriers that prevented natural colonization of fish from downstream (Miró & Ventura, 2013). Therefore, threats to other fish due to predation or competitive interactions caused by *S. umbla* in Lake Obago are not relevant from a conservation point of view, but the streams draining Lake Obago (Aiguamòg and Garona) support native populations of *S. trutta* and the endangered *Cottus hispaniolensis* Bacescu-Mester, 1964. Therefore, the possibility that *S. umbla* may invade downstream riverine habitats is a risk. However, this risk seems to be negligible since this species rarely thrives in running waters (Klemetsen *et al.*, 2003), as is demonstrated by the fact that it is still confined to the lakes where it was introduced 30 years ago. On the other hand, *S. umbla* and other introduced fish could threaten the biodiversity of native amphibians and invertebrates in high mountain lakes through predation (e.g. Brancelj, 2000; Knapp *et al.*, 2001). The magnitude of possible impacts should be assessed and remedial action taken if needed.

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