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Two new fishes for the fauna of Spain: *Leuciscus* (= *Telestes*) *soufia* Risso, 1826 and *Leuciscus leuciscus* (Linnaeus, 1758)

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I. *Leuciscus soufia* Risso, 1826

1. According to BERG (1932) *Leuciscus soufia* has the following distribution:

“Nebenflüsse der Donau in Bayern, Inn. Rheingebiet: Hochrhein, Aare, Vierwaldstätter See, Züricher See, Walensee, Thuner See, Bieler See, Neuenburger See; fehlt im Bodensee, ist aber bei Basel vorhanden; fehlt dem Oberrhein etwa von Breisach ab sowie dem ganzen Mittel- und Niederrhein, ist aber im oberen Neckar vorhanden. Rhonegebiet: Saone, Lac du Bourget, Lac d'Annecy, fehlt im Genfer See. Var bei Nizza. Soll nach Knauth [(Teiche zu Silsterwitz, Kreis Schweidnitz). Zweifelhaft!] im Odergebiet, bei Zobten, in Westschlesien vorkommen.”

For the subspecies *Leuciscus soufia muticellus* Bonaparte, 1837 (1838) BERG (1932) mentions: “Vairone. Nord- und Mittelitalien: von Isonzo, Etsch und Po bis Arno und Tiber.”

In “Los Peces Fluviales de España” (1935), LOZANO Y REY does not mention *Leuciscus soufia* from Spain.

DOTTRENS (1952) calls *Leuciscus soufia* (*Telestes agassizii* Valenciennes) an “espèce méridionale surtout”, but under distribution he only mentions “Bassin du Rhône sauf bassin du Léman, sud-est de la France, Italie, bassin supérieur du Rhin, bassin du Danube” and not Spain.

SPILLMANN (1961) does not mention either *Leuciscus soufia* from Spain.

2. THIENEMANN (1950) has used this distribution pattern as an argument for *Leuciscus soufia* being a southeastern invader in Central Europe, that passed from Danube to Rhine and from Rhine to Rhône and Doubs.

Danube and Rhine would have been connected during the pliocene, perhaps by means of melting water. THIENEMANN (p. 592): “Zu diesen Urströmen tritt als Wanderstrasse aus dem Südosten die Donau, die im grossen und ganzen in der Postglazialzeit ihrem jetzigen Lauf folgte. Doch trat sie, was

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[1]

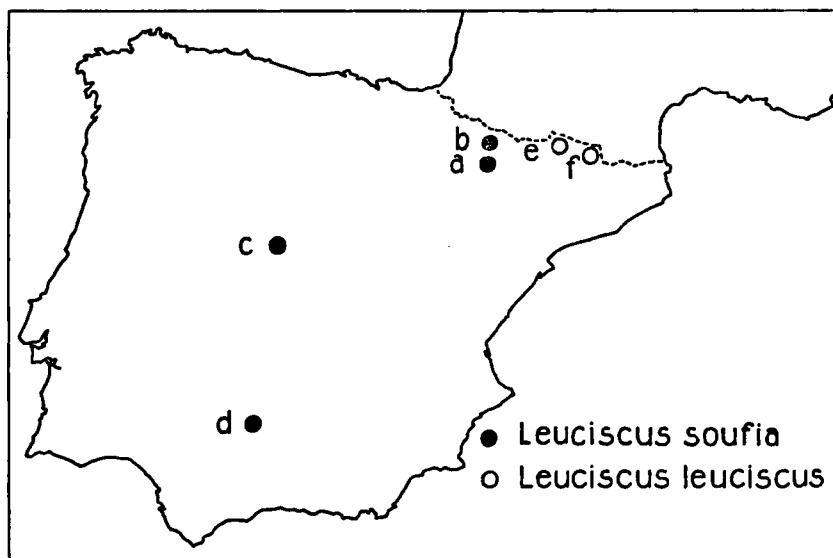


FIG. 1. Spanish localities where *Leuciscus soufia* and *Leuciscus leuciscus* were found: a, Huesca; b, Jaca; c, Avila; d, Cordoba; e, Sierra Montroig; f, Orgaña. (Drawing J. A. Mastro).

biogeografisch von besonderer Bedeutung ist, in ihrem obersten Laufe in engste Beziehung zu Rhein und Rhone, . . . so dass südöstliche Einwanderer die Möglichkeit bekamen, sowohl nach Süden ins Rhonegebiet als auch nordwärts ins Rheingebiet zu gelangen. Man braucht dabei keineswegs, wie ZSCHOKKE (1919, S. 183) betont, weite offene Stromstrassen zwischen Donau und Rhein zu fordern: "für den biologischen Vorgang der Tierwanderung und für sein Ergebnis, die heutige Tierverbreitung, genügt es vielleicht, ein zwischen Donau und Rhein geflochtenes Netz von Schmelzwässern zu fordern".

As to the connection of Rhine and Rhône (THIENEMANN p. 594): "Noch im Pliocän wandte sich der Hochrhein durch die Burgundische Pforte nach Westen und floss durch den Doubs und die Saone in die Rhone. Erst im Mitteldiluvium wurde er durch eine Hebung der Burgundische Pforte abgelenkt und folgte zunächst längere Zeit dem Oberlaufe der Ill . . ."

3. On several occasions I found *Leuciscus soufia* in Spain (see fig. 1):

- a. At Huesca, 12 August 1959. One specimen, total length 7.29 cm ¹⁾.
- b. At Jaca, in a small river along the road to Sabiñanigo, 23 July 1963. Two specimens, of which one still alive and one preserved, total length 6.98 cm.
- c. At Avila, found dead on the mud of the Rio Adaja, 10 June 1957. Three specimens, total lengths 7.50 cm; 6.04 cm; 4.89 cm.
- d. At Cordoba, in a rivulet along the road to Badajoz, 11 August 1964. Six specimens, of which five still alive and one preserved, total length 7.19 cm. See fig. 2.

These are all rather small specimens, a result of the improvised net I used.

¹⁾ The "total length" is measured from the snout to the end of the tail.

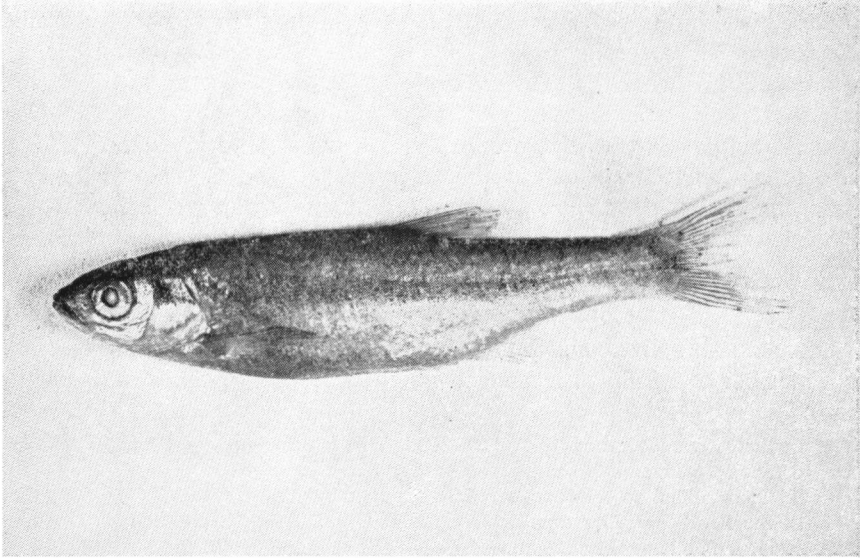


FIG. 2. *Leuciscus soufia* Risso from a small rivulet near Cordoba (locality d in fig. 1). (Photograph H. H. Mittelberg).

In general *L. soufia* is larger. For instance in the rivulet at Cordoba the water was so clear that one could easily recognize these fishes and estimate their size, 12—15 cm long. But these larger specimens I could not catch. They swam in schools of 50 specimens or more. The water is about 150 cm broad, at the most 50 cm deep. I did not measure the temperature, but I estimate it at 20° C., which is rather high to live in for such a typical inhabitant of running waters.

CONCLUSION

The occurrence of *Leuciscus soufia* in four localities, of which three widely separated, in Spain, destroys the thesis of this fish being a southeastern invader in Europe. Especially the occurrence near Cordoba suggests that *Leuciscus soufia* has been living here since long before the ice-ages.

The slightly discontinuous total distribution: Spain, southeastern France, Italy, upper Rhine, Donau etc. confirms the suggestion: the present distribution of *Leuciscus soufia* is a relict of the tertiary distribution. SPILLMANN (1962) speaks of isolated populations of *Leuciscus soufia*, which originated since "l'érection de la chaîne alpine". So most of the present distribution and most of the present characters would have existed in the time before the alpine chains were formed, that is somewhere before the tertiary began. *Leuciscus soufia* would then be a pretty old species, unbelievably old when we consider the slight degree of difference that exists among the populations. According to THIENEMANN two species of fish had profited by the eventual connection of Danube via Rhine with the Rhône, in enlarging their distribution. It is clear that this hypothesis does not hold for *Leuciscus soufia*, so that only *one* species would have come from the Danube to the Rhine and further

to the Rhône, in the pliocene: *Aspro streber* (+ *A. apron*). I think this rather improbable. My suggestion is that *Aspro streber* and *Aspro apron* belonged to one species before the cold separated them in an eastern and a western branch, which in isolation developed to respectively *Aspro streber* and *Aspro apron*. Comparable distribution patterns can be found for instance in *Salamandra salamandra salamandra* and *Salamandra salamandra terrestris*, *Pelodytes punctatus* - *Pelodytes caucasicus* and many other amphibians.

So the glacial period did not bring about a connection between east and west, but on the contrary, the connection that eventually existed was broken.

II. *Leuciscus leuciscus* (Linnaeus, 1758)

LOZANO Y REY, BERG and THIENEMANN do not mention *Leuciscus leuciscus* as a member of the Spanish fauna. I found *Leuciscus leuciscus* in Spain (see map):

- e. In the Sierra Montroig, 18 August 1959. Three specimens, total lengths 8.55 cm; 6.75 cm; 6.85 cm.
S. Daan added to this one specimen, caught by him:
- f. In the Rio Segre, Gargante de Orgaña, at Orgaña, near Seo de Urgel, 6 August 1964. Total length 13.20 cm.

The discovery of *Leuciscus leuciscus* in Spain has less consequence for theories of distribution. THIENEMANN regarded it to belong to the "glazialen Mischfauna", "aus den von Norden und von den Alpenhöhen herabgedrängten Formen, die sich mit den Arten, die sich in diesem Mischgebiet halten konnten, vergesellten . . ." Although THIENEMANN stated this for Central Europe, there is no reason why this would not hold too for the region close to the Pyrenees.

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