Revue suisse de Zoologie 111 (1): 121-137; mars 2004

Salaria economidisi, a new species of freshwater fish from Lake Trichonis, Greece, with comments on variation in *S. fluviatilis* (Teleostei: Blenniidae)

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***Salaria economidisi*, a new species of freshwater fish from Lake Trichonis, Greece, with comments on variation in *S. fluviatilis* (Teleostei: Blenniidae).** - *Salaria economidisi*, new species, is distinguished from *S. fluviatilis*, its hypothesised closest relative, in having a longer head, more teeth in both jaws, a simple orbital cirrus, a much shorter lateral line, and a distinctive colour pattern of 3-5 rows of bold black dots on the cheek.

Key-words: Blenniidae - Salaria - Greece - Lake Trichonis - taxonomy.

INTRODUCTION

The family Blenniidae includes a large number of small benthic fishes. The vast majority are marine and occur in tropical areas. A few species are known to enter brackish or fresh waters in Southeast Asia (e.g. *Phenablennius heyligeri* (Bleeker, 1859); see Springer & Smith-Vaniz, 1972: 70), India, Africa (*Omobranchus* species; see Springer & Gomon, 1975), and South America (e.g., *Lupinoblennius paivai* (Pinto, 1958); see Sazima & Carvalho-Filho, 2003). The genus *Salaria*, as usually recognised, includes 3 species of which *S. fluviatilis* (Asso, 1801) is known only from freshwaters. It has been recorded under a variety of synonyms (e.g., *Blennius vulgaris* Pollini, 1816, *Salarias varus* Risso, 1827, *B. cagnota* Valenciennes, 1836, *B. lupulus* Bonaparte, 1840, *B. alpestris* Blanchard, 1866; see Kottelat, 1997) from drainages around the northern Mediterranean shore from Israel to Portugal and in Morocco and Algeria.

Salaria fluviatilis inhabits portions of streams with swift water and rocks varying in size from small stones to large boulders (Freeman *et al.*, 1990); it also occurs on rocky shores of lakes (Elmiger, 2002). It spawns under stones and the male defends the eggs (Wickler, 1957). The larvae are pelagic (as are those of marine blennies) and the young settle in benthic habitats when they reach about 15 mm. The pelagic larvae apparently are one of the factors limiting the distribution of the species. Larvae from riverine populations are drifted by the current and need to reach a quiet section of the stream or a lake where they can spend their pelagic time, and then need

Manuscript accepted 03.11.2003

to be able to return to the riverine stretch. Although sometimes stated in the literature, there is no evidence that this pelagic period can be spent in estuaries or brackish water. In the Mediterranean climatic zone, streams and rivers severely shrink in summer, and many survive only as a succession of pools connected by trifles of water. Water in these pools is moving very slowly, probably providing suitable habitats for the larvae.

All freshwater populations of European blennies have been referred to *S. fluviatilis* (Kottelat, 1997; Perdices *et al.*, 2000), but they have rarely been compared. Examination of the population from Lake Trichonis (a large natural lake in western Greece) shows that it is a species with a distinctive morphology, colour pattern and ecology. The species is described here and some populations of *S. fluviatilis* are discussed.

The generic nomenclature of Bath (1977, 1996) is followed here. Bock & Zander (1986: 142) united the genera *Lipophrys* and *Salaria* and used *Lipophrys* Gill, 1896 as the valid name. As discussed by Kottelat (1997), *Salaria* Forsskål, 1775 is the oldest valid name. The argument of similarity of the generic names *Salaria* and *Salarias* Cuvier, 1816 is irrelevant to the discussion (ICZN art. 56.2 is explicit).

MATERIAL AND METHODS

All measurements were made point to point with a dial calliper. Standard length is measured from the tip of the upper lip to the end of the hypural complex, total length to the posteriormost point of the caudal fin, head length to the posterior most point of the opercle, pre-anal length to the origin of the first anal spine. Body depth is measured at the origin of dorsal fin, depth of caudal peduncle at the narrowest point of the caudal peduncle. Length of caudal peduncle is measured from the base of the last anal-fin ray to the end of the hypural complex, at mid-height. Snout length is measured from tip of upper lip to the nearest point of margin of orbit. Eye diameter is the greatest diameter of the eye ball. The eye-rictus distance is measured from the posterior extremity of upper lip to the nearest point of the orbit. Interorbital width is the width of the bony area. Terminology of cephalic lateral line canals is derived from that of Bath (1977). Lateral line pore count starts with the pore immediately posterior to the upper extremity of the gill opening. Sequence of description generally follows the template of Springer & Williams (1994). Notation for dorsal and anal fin ray counts follows Hubbs & Lagler (1947).

Examined material is in: MHNG, Muséum d'histoire naturelle, Genève; CMK, author's collection.

DESCRIPTION

Salaria economidisi sp. n. Figs 1-2

Holotype. MHNG 2641.89, 60.8 mm SL; Greece: Lake Trichonis east of Panetolio; 38°35'28.1"N 21°27'51.2"E; M. Kottelat & P. S. Economidis, 6-7 October 2001.

Paratypes. MHNG 2641.90, 10; CMK 16968, 158; 19.5-55.9 mm SL; same data as holotype. - CMK 13428, 5, 29.9-44.0 mm SL; Lake Trichonis; P. S. Economidis, 1 Nov 1996.

Diagnosis. *Salaria economidisi* is distinguished from the marine *S. pavo* (Risso, 1810) and *S. basilisca* (Valenciennes, 1836) in having XII-XIII,16-17 dorsal rays (vs. XII,22-25) and II,18-19 anal rays (vs. II,23-26; Bath, 1977; Whitehead *et al.*, 1986). It

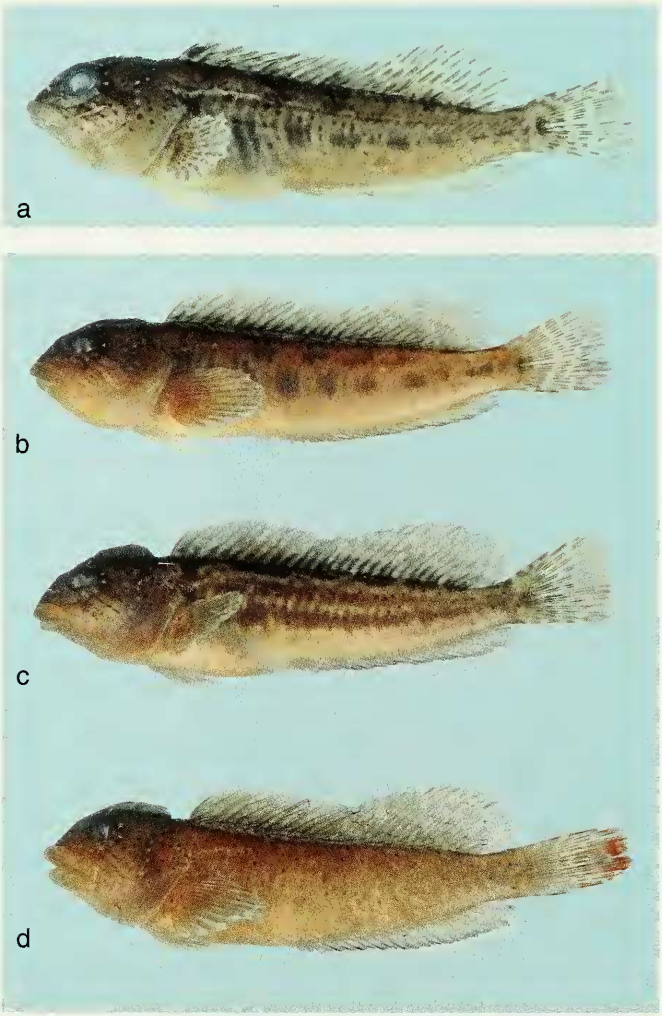

FIG. 1
Salaria economidisi; Greece: Lake Trichonis. a, paratype, female, 48.4 mm SL, CMK 16968; b, male, holotype, 60.8 mm SL, MHNG 2641.89; c, male, paratype, 50.9 mm SL, CMK 16968; d, male, paratype, 55.9 mm SL, CMK 16968.

FIG. 2
Salaria economidisi; Greece: Lake Trichonis, eastern end, at 2-3 m depth on gently sloping sand-gravel beach; August 1995 (photograph by U. Schliewen).

is distinguished from the freshwater *S. fluviatilis* in having a longer head (29.1-33.1 % SL, vs. 25.3-30.6), 25-30 teeth in the upper jaw (vs. 16-24), 20-27 in the lower jaw (vs. 16-20), orbital cirrus simple (vs. branched), anterior continuous canal of lateral line with 5-9 simple pores (vs. usually 12-22, rarely 6-8) continued by a series of 1-3 short bi-pore tubes (vs. 4-12), and a pattern of 3-5 rows of bold black dots on the cheek, running obliquely from eye backwards and downwards, the space between the lower two rows being greyish and spaces between the upper rows paler (vs. cheek with a broad diagonal band of tiny dots from lower edge of eye downwards backwards; Figs 3, 4a).

Description. Selected morphometric data of holotype and 9 paratypes in Table 1. Dorsal fin. XII-XIII,16-17 (XIII,16), modally XIII,16, total 28-30; XIV spines in a single specimen out of 31 specimens examined for this character. Spinous portion somewhat shallower than segmented-ray portion; posterior membranous attachment on dorsal edge of caudal peduncle anterior to caudal-fin base.

TABLE 1. Morphometric data of holotype (60.8 mm SL) and 9 paratypes of *Salaria economidisi*. M: males, F: females.

	M	M	M	M	M	M	M	M	F	F
SL (mm)	60.8	59.9	52.1	50.9	49.7	47.8	42.8	39.9	48.4	41.3
TL (mm)	73.7	69.2	63.4	62.4	60.2	59.0	52.0	43.9	58.5	50.7
in % of standard length										
Head length	29.1	29.4	30.5	31.0	30.0	33.1	32.7	32.3	31.2	29.5
Pre-Anal length	54.6	51.9	55.5	57.0	55.7	54.2	55.8	57.6	55.8	57.9
Body depth	24.3	23.0	25.5	26.3	23.1	22.6	24.5	23.1	24.8	23.7
Depth of caudal peduncle	9.4	9.7	10.4	9.6	8.2	9.2	8.9	8.8	9.7	11.4
Length of caudal peduncle	13.0	10.7	11.7	12.0	10.7	13.4	9.3	11.8	11.0	9.7
in % of head length										
Snout length	33.9	33.0	31.4	34.2	31.5	31.6	32.9	31.0	28.5	32.0
Eye diameter	22.6	21.6	20.1	24.7	23.5	18.4	25.7	22.5	23.2	24.6
Eye-rictus distance	22.6	22.7	22.6	22.8	23.5	22.8	20.7	22.5	21.9	25.4
Interorbital width	18.1	17.0	15.1	13.3	16.8	13.3	13.6	14.0	15.9	23.0

Anal fin II-III,17-19 (II,18), modally II,17, three spines in a single specimen. Posterior membranous attachment on ventral edge of caudal peduncle anterior to caudal-fin base. male with a large "ear or onion-like glandular formation" (sensu Bath, 1977: 208) on anterior face of each anal spine; "leaflet-shape" glands at tip of anal rays in specimens over 50-55 mm SL.

Pectoral-fin rays 13-14 (13), modally 14. Pelvic-fin segmented rays 3. Caudal-fin segmented rays 13, 9 branched.

Cirri. Orbital cirrus much shorter than eye diameter, simple (out of 40 specimens examined for this character, one 30 mm SL has a short side branch and one 36 mm SL has two short side branches); cirrus missing in specimens less than 30 mm SL. Anterior nostril with a short point along posterior margin, never developed as a cirrus.

Lateral line. Continuous canal anterodorsally with 5-9 simple pores, extending posteriorly to a point between vertical from bases of 3rd to 7th spine, then continuing posteriorly as a series of 1-3 short, disjunct, horizontally bi-pored tubes in skin; posteriormost tube in area between verticals from bases of 4th to 9th dorsal-fin spines.

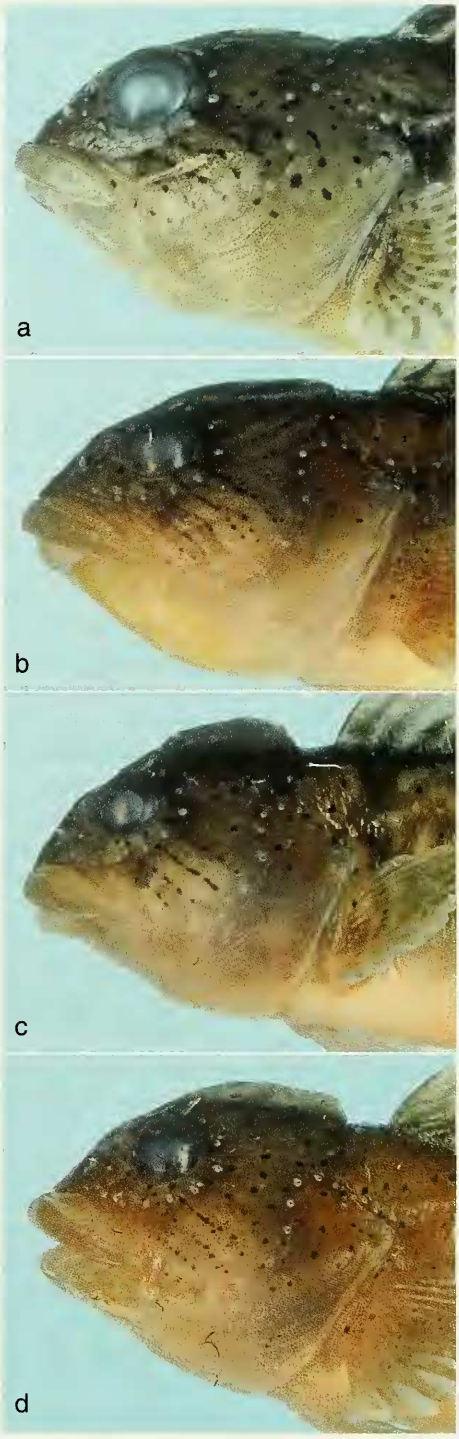

FIG. 3

Salaria economidisi; Greece: Lake Trichonis. Head pattern; a, paratype, female, 48.4 mm SL, CMK 16968; b, male, holotype, 60.8 mm SL, MHNG 2641.89; c, male, paratype, 50.9 mm SL, CMK 16968; d, male, paratype, 55.9 mm SL, CMK 16968.

Cephalic pores. Supratemporal canal with 3 pores. Preoperculo-mandibular canal with 11 pores. Orbital canal with 8 infraorbital pores (9 in two specimens) and 5 supraorbital pores.

Upper jaw with 25-30 teeth, posterior 1-2 (modally 1) on each side caniniform. Lower jaw with 20-27 teeth, posterior 1 (rarely 2) on each side caniniform.

Both sexes show indication of fleshy crest development on head at 25 mm SL. Only a few males have a well developed crest; in most it remains very low. Highest development (about 2 mm) in 49.7 mm SL specimen. In females, only as sharp ridge.

Coloration (Figs 1-2). Background pale yellowish brown. A mid-lateral row of 7-8 dark brown blotches, more or less rectangular, horizontally elongated, irregularly shaped, alternating with 5-6 dark brown saddles along dorsal body contour and on base of dorsal fin. In some individuals, an intermediate row of horizontally elongated, irregular, dark brown spots or blotches; in a few individuals, blotches of three rows fused to form 3 stripes (Fig. 1c). Numerous small, black spots on side, variably distributed over whole body or only anteriorly or dorsally, almost missing in a few individuals. A single individual plain pale yellowish brown, except for black dots (Fig. 1d). Striped pattern present in both sexes, already distinct in specimens 28 mm SL.

In individuals larger than about 30 mm SL, head yellowish brown, darker on top, with numerous small, black spots, some surrounded by a paler area (Fig. 4a). 2-3 parallel rows of 2-6 black spots from eye to posterior corner of crest, sometimes fused to form short lines; 2 rows sometimes marking edges of a darker band. Usually 4 (3-5) oblique rows of 4-8 black spots on cheek, slanted posteroventrally, 3rd (counted from dorsalmost) originating at lower margin of eye; area above upper row dark brown, between rows 1 and 3 pale yellowish brown, between rows 3-4 dark brown, and below row 4 pale yellowish brown. Sometimes a short additional row starting at posterior extremity of upper lip. Throat uniformly yellowish brown.

In specimens less than about 30 mm SL, bands on top of head more contrasty and a faint pale stripe from eye to tip of snout. Dark band on cheek distinct, but rows of spots absent. A darker patch at tip of lower lip, and a diffuse darker triangular patch on each side of throat.

Dorsal fin with dark blotches or band along base; remainder of fin, in males more or less plain greyish brown, in females with 2-3 rows of dark brown spots on rays of segmented-ray portion. A black botch between anterior 2 spines, conspicuous in females and juveniles, faint to indistinct in males. Anal fin plain greyish brown, with a white distal and a dark brown subdistal bands. Caudal fin with a dark brown blotch continuing mid-lateral row on flank; 3-4 vertical rows of dark brown spots on rays, less contrasty in adult males. Pectoral-fin rays with several dark brown patches (tessellated) and a few black spots equivalent to those on head and flank. Pelvic hyaline.

Distribution. Definitively known only from Trichonis Lake (Fig. 5). The species possibly occurs in some or all of the other lakes of the Acheloos drainage (Lysimachia, Ozeros, Amvrakia), but this remains to be confirmed.

Habitat and biology. Lake Trichonis is 18.1 x 7.5 km large, up to 57 m deep, oligotrophic and drains to Acheloos River through lake Lysimachia. It has a late Pliocene origin (Economidis & Miller, 1990: 147, 166). The only other fish species endemic to Lake Trichonis is the miniature gobiid *Economidichthys trichonis* Econo-

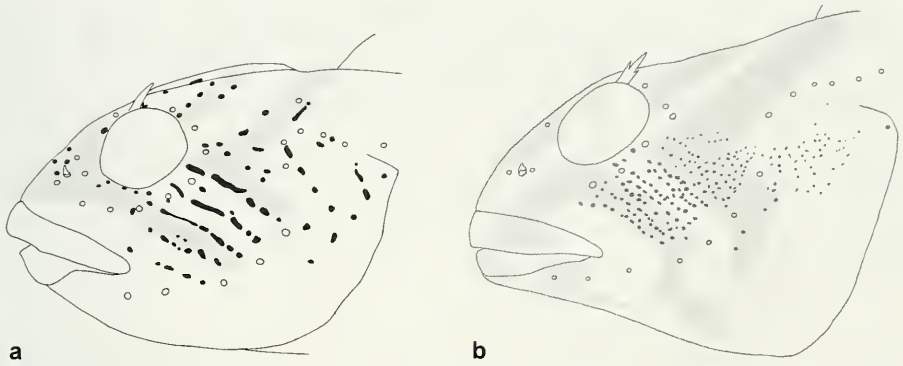

FIG. 4

Head pattern and cirrus of: a, *Salaria economidisi*, male, CMK 16968, 49.7 mm SL; b, *S. fluviatilis*, female, CMK 17000, 63.4 mm SL.

midis & Miller, 1990, but several other species are endemic to either the Acheloos drainage, or the lakes of the lower Acheloos drainage.

On 6-7 October 2001, I observed and collected the species in Lake Trichonis east of Panetolio. The species was not seen in a small stream entering the lake, neither on sandy-muddy nor on gravely to stony substrate. It was observed only in the lake itself, at depths of at least 0.4 m. The area was a shallow strand, mostly sandy, but with large patches of underwater vegetation (mostly clumps of *Sagittaria* (?) sp.). *Salaria economidisi* was observed only in these clumps; it was not seen over the sand or on or near stones even with the use of an electric fish-shocker. Other fish species collected in these clumps were the gobies *Knipowitschia* cf. *caucasica* (Berg, 1916), *Economidichthys pygmaeus* (Holly, 1929) and occasionally the loach *Cobitis trichonica* Stephanidis, 1974. However, P. S. Economidis informs me that he has observed the species on stony and gravel bottoms in other parts of the lake, especially at Pantanassa, about 10 km east of Panetolio.

The reproduction and larvae are described in Economou *et al.* (1994). Eggs are laid in May-July. Early larvae are planktonic and settle at 14-15 mm. In October 2001, I observed large numbers of individuals 15-30 mm SL, probably young of the year. The largest collected male is 60.8 mm SL and the largest female 48.4.

Etymology. Named for Panos Stavros Economidis, in appreciation for his help during several field trips in Greece, stimulating discussions, encouragement, and being a unique historical, gastronomic and oenological cicerone.

DISCUSSION

The blenny from Lake Trichonis has long been identified as *S. fluviatilis*, a species recorded from freshwaters all along the northern shore of the Mediterranean, from Israel to Portugal (Guadiana drainage) and Algeria and Morocco, including Sardinia, Corsica and Creta (Mouslih, 1984; Doadrio, 2001; Steinitz, 1950; Goren, 1974). When I first encountered it in the field, I immediately suspected *S. economidisi* was distinct from *S. fluviatilis* because of habitat, behaviour, general coloration and patterning on the head.

I have observed *S. fluviatilis* in riverine habitats in Greece and France, and it was always observed among stones, usually preferring the deepest parts with fast currents. This is also the habitat reported in the literature (e.g., Freeman *et al.*, 1990; Hernandez *et al.*, 2000). In lacustrine habitat, I observed it in Lake Maggiore, where it was found under stones, in at least 0.5 m depth. This is also the habitat described by Elmiger (2002). I have never observed the species over sandy bottom under vegetation, the habitat in which *S. economidisi* was collected in Lake Trichonis. The largest examined individual of *S. economidisi* is 60.8 mm SL, while the largest *S. fluviatilis* is 111.8 mm SL, and larger sizes are reported in the literature (up to 150 mm; Persat, in Keith & Allardi, 2001).

The colour pattern of *S. fluviatilis* varies, depending on sex, size, sexual activity and 'mood' of the individual fish (e.g., Wickler, 1957), but there is no published information on geographic variation. I have seen too few specimens (or more precisely, most samples I have seen include too few specimens) to venture into a detailed interpopulation comparison, and such a comparison would probably better be based on live specimens observed over an extended period of time, in order to account for seasonal variation. It is a sad reality that research on European fishes is made very difficult if not impossible for reasons which have nothing to do with sciences (Kottelat, 1997) and that access to fresh material badly needed for taxonomic revisions often is simply impossible to competent taxonomists. But the following generalities can be made.

I have not seen geographic variation in the colour pattern of *S. fluviatilis*. The following common features are shared by the examined populations. In juveniles, females and small males, the body has a mid-lateral series of about 7-10 irregularly squarish dark blotches, more or less alternating or connected with similar blotches along the dorsum (e.g., Fig. 6b, f). Small black dots may be present on the body, usually on the dorsal half. In larger females (over 60 mm SL), the blotches tend to become more vertically elongated, more irregular, often dissociated to form a marmorated pattern. In larger males, the blotches become less contrasty, and the body might vary from marmorated to plain dark brown to black or plain olive brown (e.g., Fig. 6c, e). In *S. economidisi*, 7-8 squarish blotches are present in most adults. In some individuals, they may fade out or fuse to form midlateral stripes. I have not observed plain dark brown males. The general background colour is yellowish brown in all individuals, paler than in any *S. fluviatilis*.

Salaria fluviatilis exhibits a conspicuous and distinctive colour pattern on the head (Figs. 4b, 7), which typically includes: a) a dark brown band from eye to posterior extremity of the crest, margined anteriorly and posteriorly by pale grey to yellowish bands; b) a pale band from eye to tip of snout, margined posteriorly by a dark band; c) from the upper extremity of this last band (under the eye), a conspicuous dark band extends posteroventrally, margined above and below by pale bands, and below by a narrow dark line along the edge of the posterior part of the upper lip; d) ventral side of head with a blackish blotch at tip of lower jaw, an elongated blotch on each side of jaw, and an oblique band connected or not with band (c). These bands are usually filled with tiny black dots and are never margined by rows of larger black dots or black lines.

This pattern is variously developed in all examined specimens. It is often partly or wholly obscured, especially in large dark males. I have seen it in material from

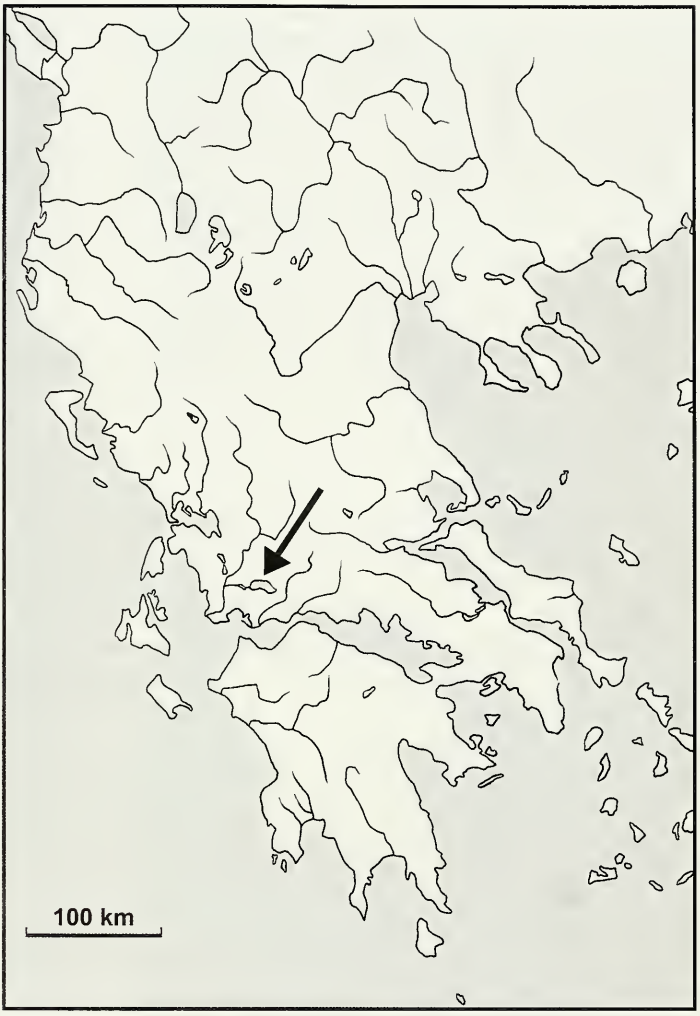

FIG. 5
Greece and western Balban Peninsula; arrow indicates Lake Trichonis, type locality of *Salaria economidisi*.

Spain (Ebro drainage), France (Tech, Rhône and Var) and Switzerland (Lake Maggiore). It is figured in material from France (Keith & Allardi, 2001), Sicily (Zava & Violani, 1991), Garda Lake (Wickler, 1957), Lake Maggiore (Elmiger, 2002), Spain (Doadrio, 2001) and Slovenia (Povz & Sket, 1990). This pattern is also obvious in photographs of live specimens from Turkey (from Kirandere near Iznik Lake [40°25'N 29°43'E], and from Aksu Köprüsu) provided by R. Wildekamp. From Greece, I have examined only 5 specimens from Pinios drainage (Peloponnese), which includes a large 111.8 mm SL black male in which no cephalic pattern can be distinguished any-

more; in the four smaller specimens, only a faint indication of the dark cheek bar can be recognised. It is also present in material from Lake Kinneret (Israel) which is discussed below.

In *S. economidisi* over about 30 mm SL, elements (b) and (d) are missing. The throat is finely dotted by very regularly set melanophores. Elements (a) are very poorly contrasted; instead, there are 2-3 rows of black dots in positions corresponding to the limits between the pale and dark bands. Elements (c) are replaced by 3-5 (usually 4) rows of conspicuous black dots, with the space between the lower two rows usually slightly darker than between the other rows. In specimens less than about 30 mm SL, elements (b) are usually distinct, and the jaw markings of (d) are distinct; there are no rows of black spots in elements (a) and (c) which have an appearance similar to that of *S. fluviatilis* (suggesting that the *S. fluviatilis* pattern is probably the plesiomorphic condition).

Besides colour pattern, *S. economidisi* is distinguished from *S. fluviatilis* in having a longer head (29.1-33.1 % SL in specimens 39.9-60.8 mm SL, vs. 25.3-30.6 in specimens 37.8-111.8; Fig. 8), more and smaller teeth (25-30 in the upper jaw, vs. 16-24; 20-27 in the lower jaw, vs. 16-20; I have not observed variation associated with size or sex). The orbital cirrus is simple, while it is branched in most examined specimens of *S. fluviatilis* larger than 38 mm SL. The lateral line is much less developed, with only 5-9 pores (vs. usually 12-22, rarely 6-8, see below) in the continuous anterior canal, followed by 1-3 bi-pored tubes (vs. 4-12), the last one located between verticals through base of 4th to 9th dorsal-fin spine (vs. between vertical through base of 9th spinous to 13th segmented ray), on the anterior arched portion of the lateral line (vs. on the posterior horizontal portion).

The larvae of *S. economidisi* are described by Economou *et al.* (1994) who compared their observations with those of Cipria (1936) on the larvae of *S. fluviatilis* from northern Italian lakes. They report that *S. economidisi* differs from *S. fluviatilis* in the absence (vs. presence) of a large melanophore between the end of the ventral row of melanophores and the end of the notochord.

The synonymy of *S. fluviatilis* includes 12 nominal species (Kottelat, 1997) and the question arises whether some of these synonyms could be *S. economidisi* or could be valid species masquerading under the name *S. fluviatilis*.

Blennius fluviatilis Asso, 1801 was described from the river Ebro in Zaragoza (Spain) and *B. frater* Bloch, in Schneider, 1801 was based on an earlier description of Asso's Zaragoza material and thus represents the same species. *Blennius inaequalis* Valenciennes, in Cuvier & Valenciennes, 1836 was described on the basis of material from Sète (southern France), *B. cagnota* Valenciennes, in Cuvier & Valenciennes, 1836 on the basis of material from Toulon (southeastern France; type locality restricted by Kottelat, 1997, by lectotype designation) and *S. varus* Risso, 1827 on the basis of material from river Var (southeasten France). I have examined material from Ebro and Var drainages as well as from Tech drainage (in intermediate geographic position); I have not seen differences among these populations and conclude that they represent a single species.

I have not seen material from the Tyrrhenian coast of Italy, Sicilia, Sardinia and Corsica. *Blennius fluviatilis* Rafinesque Schmaltz, 1810 (an homonym of *B. fluviatilis*

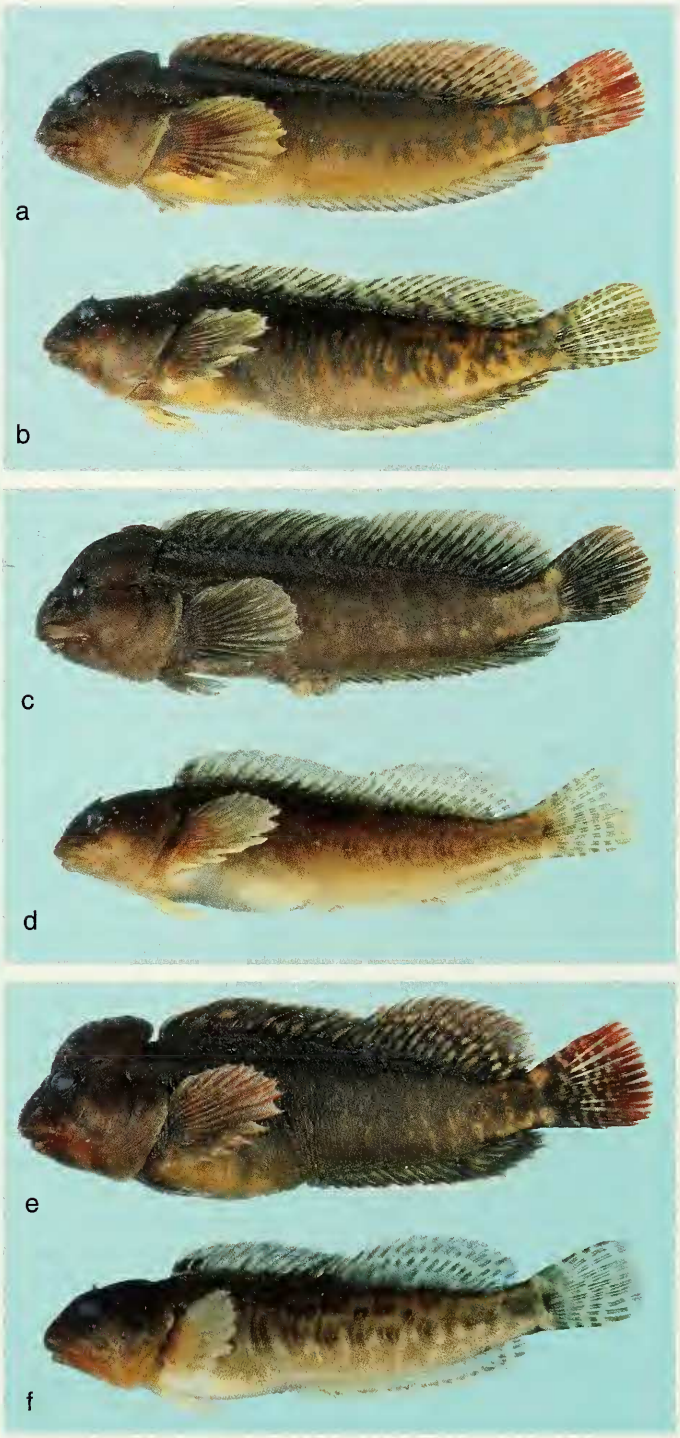

FIG. 6
Salaria fluviatilis; a-b, male 83.0 mm SL and female 71.2 mm SL, CMK 17568; France: River Tech; c-d, male 111.8 mm SL and female 53.1 mm SL, CMK 17305; Greece: Peloponnese: River Pinios; e-f, male 74.4 mm SL and female 37.8 mm SL, CMK 16844; France: stream Leysse.

Asso, 1801) was described from Sicilia, *B. lupulus* Bonaparte, 1840 from Toscana and Romana, and *B. anticolus* Bonaparte, 1840 from the surroundings of Roma. There does not seem to be differences between the fishes on the published photographs of populations from the Tyrrhenian basin (Zava & Violani, 1991) and the material I examined from Spain and southern France.

Blennius petteri Heckel & Kner, 1858 is a nomen nudum based on material from Split, Croatia. Besides the account and photograph in Povz & Sket (1990) there is no published information specifically dealing with the populations of streams draining to the Adriatic basin. Little can be said on the sole basis of a photograph.

The situation with populations of subalpine lakes is different. South of the Alps, *S. fluviatilis* has long been known from Lake Garda, from where it was described as *B. vulgaris* Pollini, 1816 (*Ichthyocoris pollinii* Bonaparte, 1846 is an unnecessary replacement name); the species is also known at least from Lakes Maggiore and Lugano. North of the Alps, the species is known from Lake Bourget (from where it was described as *B. alpestris* Blanchard, 1866) and the Rhône drainage. As discussed below, there are slight morphological differences between the Bourget population and those from coastal drainages. Unfortunately, I have not been able to examine material from the Rhône mainriver and my sample from Lake Bourget is quite small.

I have not seen material from Lake Garda, but have examined material from Lake Maggiore. Here again, there are slight morphological differences between the Lake Maggiore population and those from coastal drainages of southern France and Spain. It need to be clarified whether these differences are shared with populations from other Insubrian lakes and those from peri-Adriatic coastal drainages. Interesting is that the morphological traits that distinguish the Lake Maggiore and Lake Bourget populations from the riverine ones are identical.

While all populations referred to *S. fluviatilis* apparently have the same head colour pattern, there is some variability in shape and development of the lateral line. The material from Lake Maggiore and Leysse have a longer head (27.7-30.6 and 28.6-29.6 % SL, respectively; Fig. 8) than those from the Ebro, Tech, Var and Pinios (25.3-28.6, with a single specimen 30.1) and the Leysse one has a deeper body (22.0-26.5 % SL, vs. 21.3-23.8 in Pinios, 21.4-24.4 in Tech, Var and Ebro, and 20.9-24.0 in Lake Maggiore). The sample sizes from the various localities are, however, too small to reach reliable conclusions on the value of these morphometric differences. The Lake Maggiore specimens have an unbranched orbital cirrus. The Leysse males have a much higher crest (Fig. 6e), even in a 37.8 mm SL male. Both Leysse and Lake Maggiore populations have about 1/3 of the specimens with 14 spinous dorsal rays, while specimens from all other samples have 13 (except one from Tech). In both Leysse (L) and Lake Maggiore (M), the lateral line is shorter, the anterior canal has 8-16 (L) and 6-8 (M) pores and extends posteriorly below base of 9-11th (L) and 3-6th (M) dorsal spine, continued by a series of 4-12 (L) and 5-8 (M) bi-pored tubes, extending to below base of 13th spine to 6th segmented (L) and 9-13th spine (M). Noteworthy is that the Lake Maggiore population is purely lacustrine and the Leysse population is from a tributary of Lake Bourget (the swiftest habitat where I collected blennies) about 2 km from the lake; these populations are possibly partly isolated from the riverine populations and occur in much colder habitats, at higher elevations.

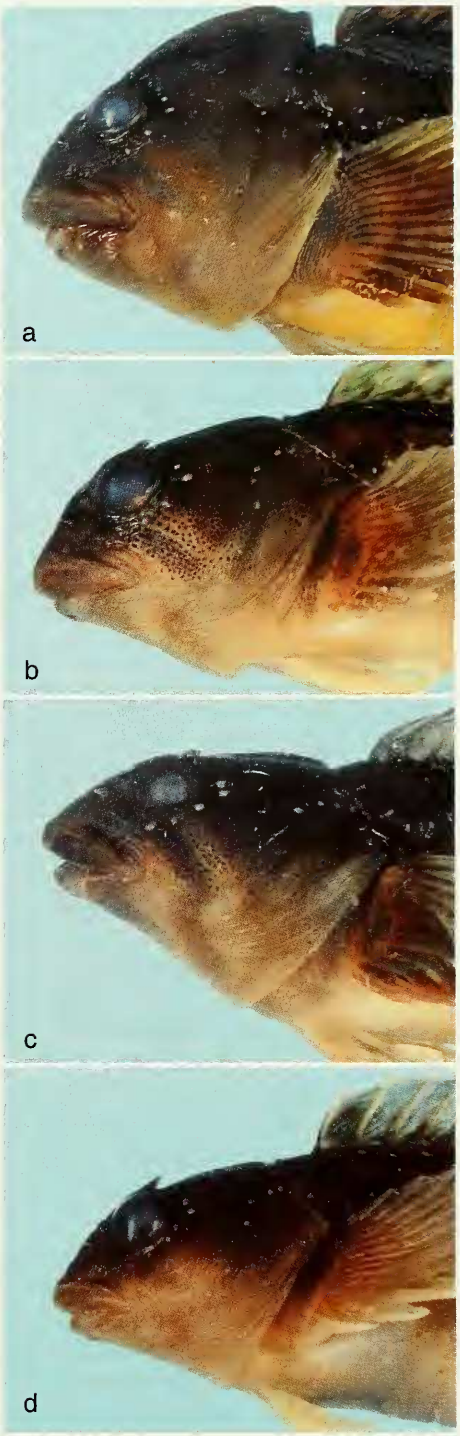

FIG. 7

Salaria fluviatilis; head pattern; a-b, male 83.0 mm SL and female 76.6 mm SL, CMK 17568; France: River Tech; c, female 63.4 mm SL, CMK 17000; Spain: Ebro; d, female 53.1 mm SL, CMK 17305; Greece: River Pinios.

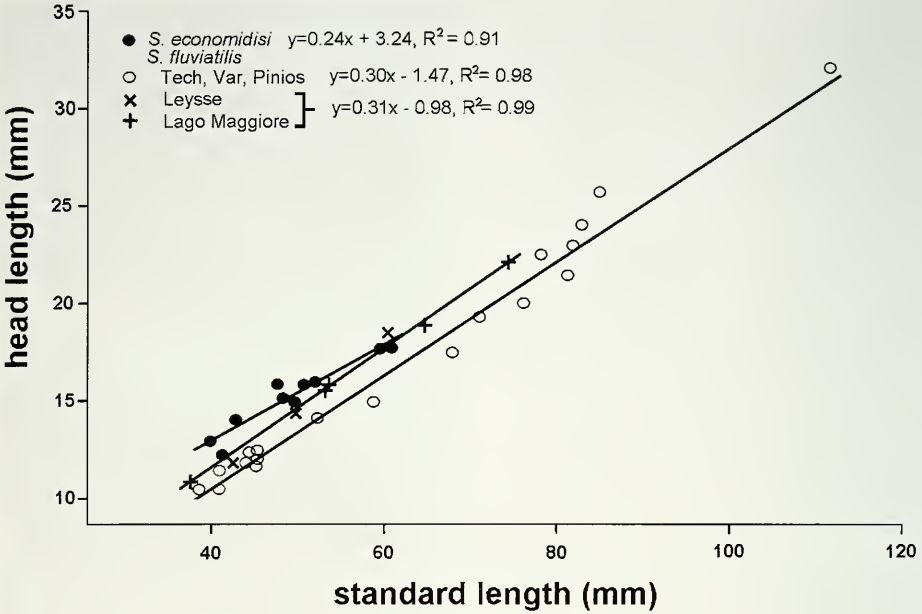

Fig. 8
Relationships between standard length and head length in *Salaria economidisi* and *S. fluviatilis*.

A population of *Salaria* has been known from Lake Kinneret (= lake Galilee or Tiberias) in Israel since Günther (1864; see also Lortet, 1883; Steinitz, 1950; Krupp & Schneider, 1989). Lake Kinneret is part of the endorheic Jordan drainage and the local population must have been isolated from the peri-Mediterranean ones since lower Pleistocene (Krupp & Schneider, 1989: 350), which creates a suspicion that it could be specifically distinct. Externally the Kinneret population is only minimally distinguished from the other populations I have examined. It has XIII-XIV dorsal spines (modally XIV, vs. XII-XIII, modally XIII) and usually a poorly contrasted cephalic colour pattern. But in individuals in which the pattern is contrasted, it is identical to what is observed in peri-Mediterranean coastal streams. The only difference possibly is the presence (vs. absence) of a blackish spot in juveniles at about 1/3 of length of pectoral fin and grayish lower fourth of pectoral.

A tentative conclusion is that the coastal populations are apparently all conspecific, while some of the lacustrine ones might represent distinct species.

Salaria economidisi is definititely recorded only from Lake Trichonis; it possibly also occurs in the other lakes of the lower Acheloos drainage. The presence of *S. fluviatilis* in riverine habitats of the Acheloos drainage should be expected; it might even be present in the lakes along rocky shores.

Perdices *et al.* (2000) investigated allozyme systems in 5 populations of *S. fluviatilis* from Spain and 3 from Greece. This limited sampling and the absence of geo-

graphic spectrum significantly reduces the significance of the conclusions derived from the study. But of interest here is that the authors probably included *S. economidisi* in their analysis (their Trichonis sample). All their phenograms show *S. economidisi* as the sister group to a cluster including all other Greek and Spanish populations, a pattern congruent with my conclusion that it is a distinct species.

Further, the two other Greek populations (Miras drainage and Doiran Lake) cluster together as sister group to all but one (Ruidera Lakes) Spanish populations. The Ruidera population comes out as sister group to all other *S. fluviatilis* populations. Perdices et al. do not mention any non-allozymic character. The branching sequence among their populations of *S. fluviatilis* is largely what is expected considering the vast geographic distance between the Spanish and Greek populations and the absence of material from intermediate areas. Inclusion of material from Mediterranean islands, various lacustrine populations, Turkey and North Africa would be a valuable addition to their study.

Nevertheless, the puzzling position of the Ruidera population would justify that its identity be critically re-examined. Ruidera Lake is a system of small lakes in the upper Guadiana drainage, one of the few Atlantic drainages where *S. fluviatilis* is recorded. Speculations on the evolution of the European freshwater blennies is premature before their diversity, variation and distribution are documented and a robust phylogeny has been hypothesised.

COMPARISON MATERIAL

Salaria fluviatilis: CMK 17305, 5, 44.7-111.8 mm SL; Greece: Peloponnisos: River Pinios at bridge 3 km west of Simopoulo, on road to Efira; 37°50'48"N 21°32'07"E; M. Kottelat, M. Stoumboudi & R. Barbieri, 14 May 2002. - CMK 5432, 9, 18.2-60.5 mm SL; Switzerland: Ticino: Lago Maggiore at Locarno; 46°09'30"N 8°48'20"E; M. Kottelat, 25 Aug 1985. - CMK 17648, 11, 58.8-85.0 mm SL; France: Alpes-Maritimes: River Var at Pont Napoléon III in Nice, about 1 km from sea; J.-M. Foissy & CSP team; 3 October 2002. - CMK 16844, 6, 37.8-74.4 mm SL; France: Haute-Savoie: stream Leysse (tributary of Lake Bourget) at bridge at Le Tremblay, west of Chambéry; M. Kottelat & H. Persat, 20 July 2001. - CMK 17568, 11, 38.6-83.0 mm SL; France: Pyrénées-Orientales: River Tech about 3 km upriver of bridge on road N114, south of Elne; 42°35'02"N 2°58'13"E; M. Kottelat & CSP team, 6 September 2002. - CMK 17000, 2, 53.2-63.4 mm SL; Spain: Ebro drainage; B. Elvira, October 2001.

Salaria pavo: CMK 16978, 2, 60.7-81.2 mm SL; Greece: Kleisova Lagoon at Mesologgi, east of port, at beginning of road to Turlida; 38°21'39.5"N 21°25'38.9"E; M. Kottelat & P. S. Economidis, 8 October 2001.

Salaria sp.: CMK 17016, 35, 21.0-70.9 mm SL; Israel: Lake Kinneret; M. Goren, 13 May 1993. - CMK 17017, 25, 20.4-70.8 mm SL; same locality; M. Goren, 10 June 1993.

ACKNOWLEDGEMENTS

I am pleased to thank Panos Economidis, Maria Stoumboudi, Roberta Barbieri, Dominique Beaudou, Jean-Michel Foissy, Philippe Théate and Henri Persat for assistance in obtaining freshwater blennies, Menachem Goren and Benigno Elvira for the gift of material, Uli Schliewen for making available figure 2, Ruud Wildekamp for providing photographs of live individuals, Victor G. Springer and Panos Economidis for commenting on the manuscript.

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