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The duck leech, *Theromyzon tessulatum* (Rhynchobdellida: Glossiphoniidae) in the Rivers Adda and Ticino: first important record from Italy

Abstract – A total of 36 adult specimens of *Theromyzon tessulatum* (Rhynchobdellida: Glossiphoniidae) were found in two northern Italian rivers: the Adda (17 specimens) and the Ticino (19 specimens). This is the second definite record of this species found in Italy up to now and the first one for the number of specimens. The zoogeographic importance of this finding is discussed.

Riassunto – *Theromyzon tessulatum* (Rhynchobdellida: Glossiphoniidae) nei Fiumi Adda e Ticino: primo cospicuo ritrovamento in Italia.

Viene segnalato il ritrovamento di 36 esemplari adulti di *Theromyzon tessulatum* (Rhynchobdellida: Glossiphoniidae) nelle acque dei fiumi Adda (17 individui) e Ticino (19 individui). La segnalazione del ritrovamento di esemplari di questa specie è la seconda certa in Italia e la prima per numero di individui, effettuata fino a oggi. L'importanza di questo ritrovamento viene discussa da un punto di vista zoogeografico.

Key words: Hirudinea, Glossiphoniidae, *Theromyzon*.

Introduction

Several samplings of macroinvertebrates have been carried out within the University of Milan Biology Department's program of monitoring and supervision of the River Adda. These have brought to light a widely diversified leech community whose composition appears to be qualitatively important especially in view of the discovery of several adult specimens of *Theromyzon tessulatum* (Rhynchobdellida: Glossiphoniidae).

This finding is of zoogeographic interest since it is the first massive record of the presence of this leech in Italy. One specimen of *Theromyzon tessulatum* was recorded as *Clepsine sanguinea* in 1837 in the River Ticino at Pavia (De Filippi, 1837) but there are some doubts about its identity; the second, also only one specimen, came from the River Po, at Caorso (Province of Piacenza) (Minelli & Mannucci Minelli, 1981). We found a first specimen in the River Adda at Brivio (Province of Lecco) in 1995 (Colombi, 1995) a total of 16 specimens were subsequently found in the two sampling

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stations situated upstream and downstream of the built-up area (Fig. 1). These records indicate that *Theromyzon tessulatum* is now a stable part of the river biocenosis, at least in this stretch. Meanwhile, the finding of 19 specimens in the Ticino river basin makes it increasingly likely that the species must be considered part of Italian fauna.

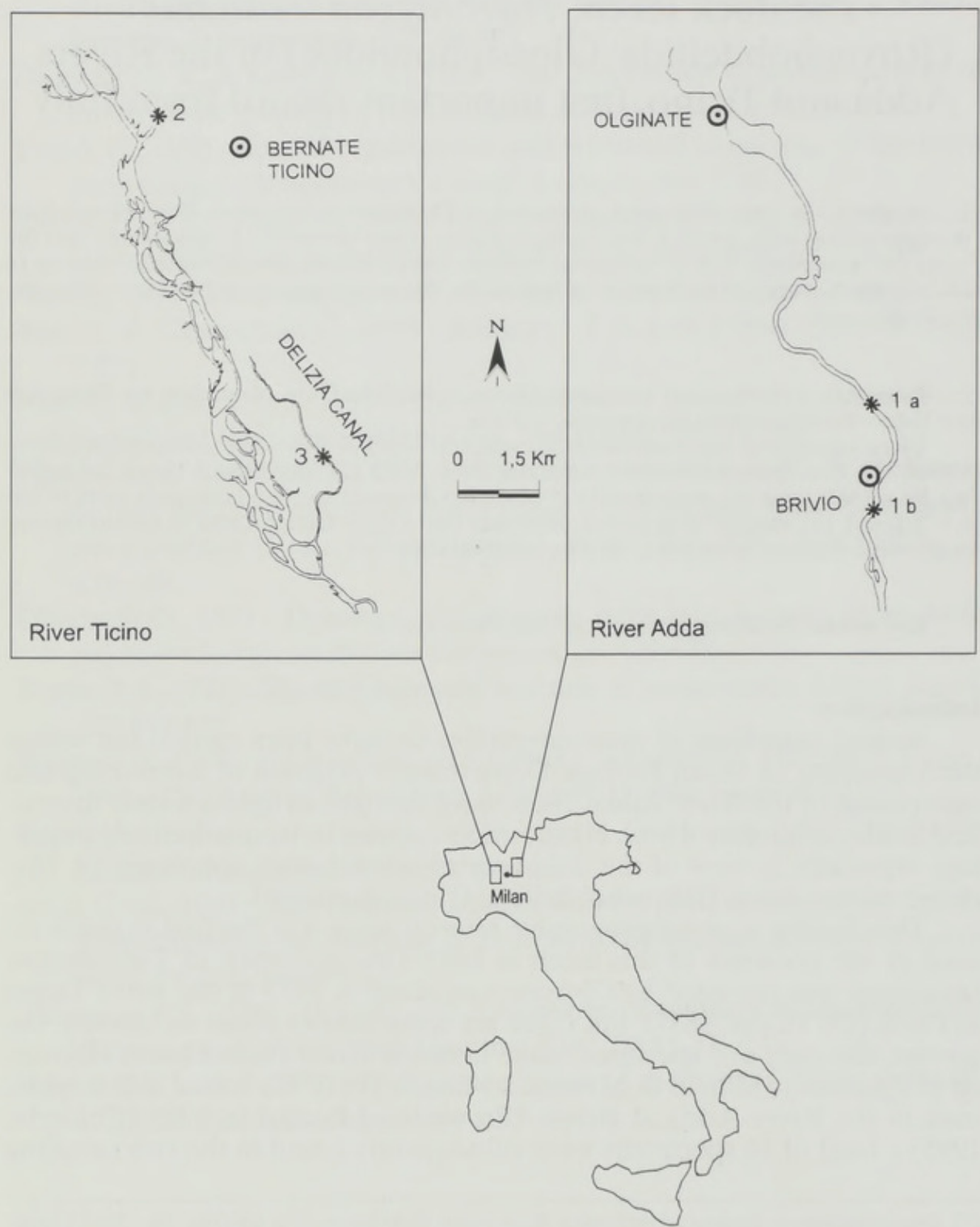


Fig. 1 - The location of the sampling stations along the two rivers.

Materials and methods

Sampling sites

The location of the sampling stations is shown in Fig 1. Sampling station 1 is near the town of Brivio and consists of two collecting sites, one upstream (1a) and the other downstream of the built-up area (1b). The relative proximity of Lake Lecco which serves as catchment basin, regulating the water flow, certainly favours the establishment of rich biocenotic communities. In fact, the EBI (Extended Biotic Index) has always been between 8 and 11 during the numerous samplings made in the last ten years using the method of Ghetti & Bonazzi (1981). These two values correspond, respectively, to quality classes II and I, indicative of high-quality water with limited effects of pollution.

At these two sampling sites, specimens were taken at a depth of 50-70 cm. In this stretch of the River Adda the current is weak, there are no falls, and the banks are natural, with shrubs and lakeside vegetation and a sandy/pebbly bottom. There have been waterfowls in the area for some time, including numerous specimens of the duck family: the mallard (*Anas platyrhynchos*), the mute swan (*Cygnus olor*) and some moor-hens (*Gallinula chloropus*), of the rail family.

The two sampling stations on the River Ticino were established with the help of the Ticino Park staff who showed us which areas were frequented most by waterfowls. Sampling station 2 is in a loop of the river, in the town of Bernate Ticino (Province of Milano), in a near-marshy zone and sampling station 3 is on the Delizia Canal in the town of Magenta (Province of Milano) and has distinctly lotic facies with abundant aquatic vegetation.

In each of the three stations, samples were collected by hand by picking up pebbles from the bottom of the river, together with twigs and other material. Leeches sticking to these pieces were then brought to the laboratory for examination.

Samplings in the Rivers Adda and Ticino between December 1995 and January 1997 resulted in, respectively, 17 and 19 adults of *Theromyzon tessulatum*.

Chemico-physical parameters

The few chemico-physical measurements made during each survey are reported in Table 1. The values vary widely in the two rivers, leading us to deduce that probably the biology of *Theromyzon tessulatum* is not influenced by these factors. Future studies will help clarify how the biology of this species might be affected by changes in these and others parameters.

Taxonomic account and discussion

Theromyzon tessulatum (O.F. Müller) presents a soft fleshy almost gelatinous body whose dimensions vary widely depending on how much the body of the living specimen is contracted. The total body length of the adult specimen ranges from 10 to 50 mm and the width is between 5 and 20 mm. Even the colour of living specimens is extremely variable, from dark green and brown to colourless and nearly transparent. When *Theromyzon tessulatum* is exposed to light it becomes darker: the body turns bright green or darker than before, almost brown. Specimens left in the dark tend to beco-

Table 1 - Physical and chemical measurements recorded at three sampling stations along the Rivers Adda and Ticino and the numbers of specimens collected.

Date	Water temperature	pH	Conductivity	Redox potential	Specimens collected	Station
10/12/1995	7 °C	-	-	-	1	1b
12/03/1996	-	-	-	-	1	1b
01/04/1996	-	-	-	-	2	1a
12/04/1996	-	-	-	-	1	1b
07/05/1996	-	-	-	-	1	1b
24/05/1996	14.4 °C	8.3	166 µS	131 mV	2	1a
03/06/1996	15.4 °C	8.4	170 µS	108 mV	1	1a
10/06/1996	19.6 °C	9.0	185 µS	142 mV	1	1b
19/06/1996	21.7 °C	7.9	382 µS	176 mV	8	2
19/06/1996	16.0 °C	7.6	314 µS	192 mV	11	3
19/08/1996	-	-	-	-	2	1b
17/09/1996	18.3 °C	8.6	195 µS	197 mV	1	1b
04/11/1996	-	-	-	-	4	1b

me lighter until they are almost completely diaphanous, and gut diverticula, full of blood, can be clearly distinguished through the body wall (Sawyer & Dierst-Davies, 1974).

The presence of three kinds of chromatophores explains the colour differences in each leech (Hotz, 1938), though we have observed individual differences in reaction to the same kind of light among specimens raised in the laboratory. During the "dark period", six longitudinal series of yellowish spots arranged in regular rows, are visible on the back. Four pairs of eyes, almost identical, are arrayed in pairs (Fig. 2), and the gonopores are separated by four annuli.

The reproductive cycle of *Theromyzon tessulatum* is usually completed by one year: before their gonads mature, the young must have three blood meals to achieve a weight of 150 mg. If this weight is not attained, a fourth meal is needed and so the life-cycle extends over two years (Wilkialis & Davies, 1980).

Coupling starts in the spring months and the yellow-greenish eggs are laid from 6 to 14 days later inside elongated cocoons (usually four) containing up to 100 eggs. The parents look after the cocoons, like other Glosiphoniidae, by making undulatory movements to ensure constant ventilation. Once the eggs hatch, the offspring are transported by their mother and remain attached to her ventral surface until they are ready to separate and become independent. They have to find a host within 50 days of separation, while the parent dies within a few days (Wilkialis & Davies, 1980). In our samples, from June to August some specimens had young on their ventral surface, in conformity with Wilkialis and Davies' description (1980). Other specimens were left to copulate in the laboratory where they were raised in

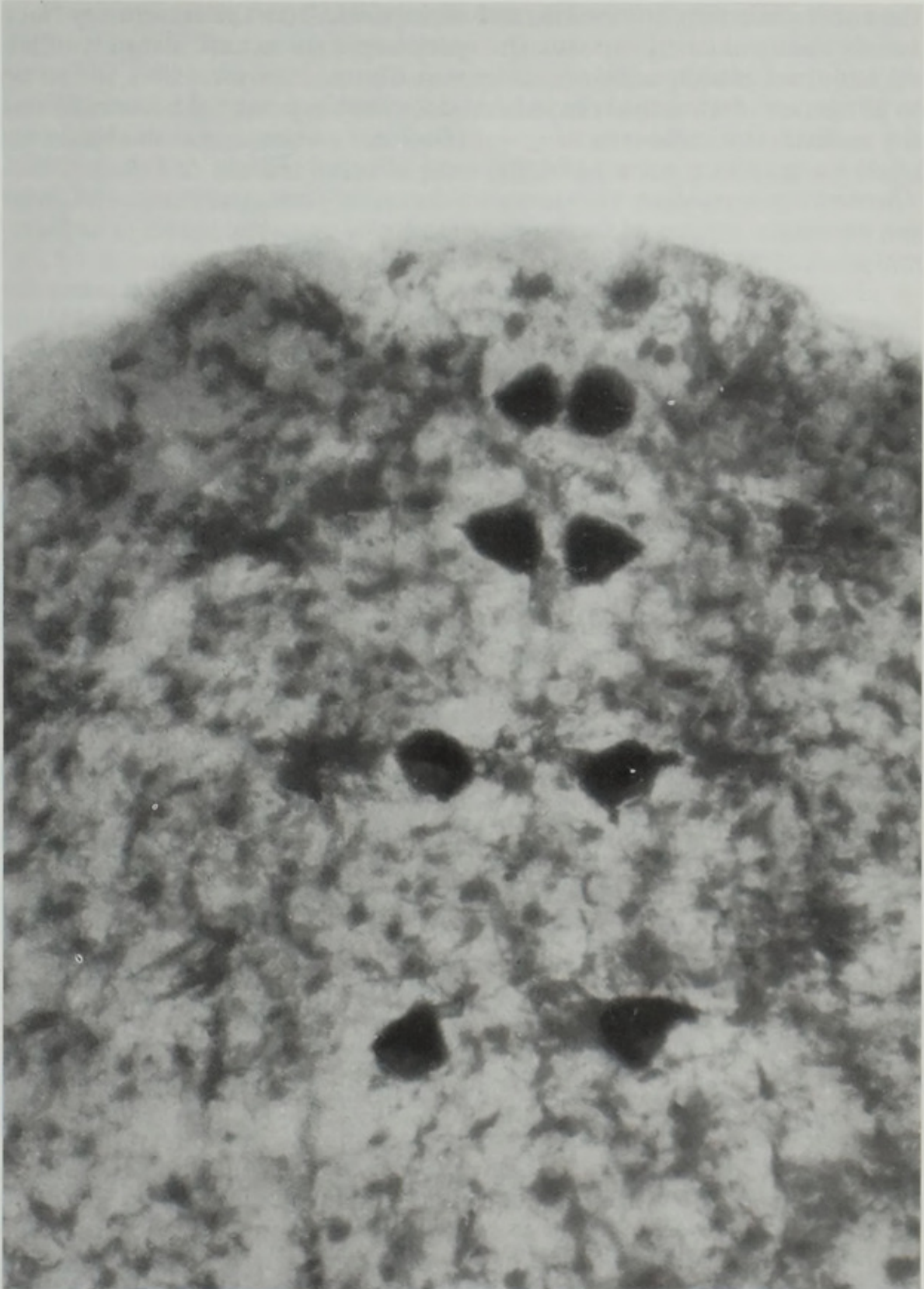


Fig. 2 - The typical arrangement of *Theromyzon tessulatum*'s eyes.

a thermostat at a temperature of 16 °C with a "seasonal" photoperiod. The last specimens which reproduced kept their young attached until the first week of September, while awaiting their first blood meal.

Theromyzon tessulatum is a parasite of waterfowls, entering through

the nares while they are feeding, and sucks blood from the respiratory tract, mainly the nasal cavity mucosa. The species appears to have a variety of hosts, and there is no specific one, at least in Europe (Sawyer, 1986). In fact up to 20 species of waterfowls have been described as potential hosts including the mallard, the great-crested grebe (*Podiceps cristatus*) and the bald-coot (*Fulica atra*) which seem to be the most afflicted (Elliott & Tullett, 1982). *Theromyzon tessulatum* also feeds on domestic geese and ducks and there are numerous reports of this leech being found in public ponds (Van Bemmel et al., 1960; Keymer, 1969).

The parasitism of *Theromyzon tessulatum* does not seem to cause the host much harm, although there are some reports of fatal attacks. In these cases death was attributed either to haemorrhage or, more often, to asphyxia due to obstruction of the respiratory tract (Rollinson et al., 1950; Lang, 1969; Seaby et al., 1991). At first analysis, however, it would not appear that this parasite helps regulate the density of anatids, especially in our areas where the concentration of these birds is relatively low. If an infestation occurred in duck farms or a high-density area, the problem could be different.

Theromyzon tessulatum is widely distributed across the whole Palaearctic Region which extends from Iceland to eastern Siberia. In Europe this leech is also widely distributed, being recorded in many countries including Belgium, the Caucasus Peninsula, the Czech Republic, Denmark, Estonia, France, Germany, Great Britain, Greece, Hungary, Iceland, Ireland, Latvia, Luxembourg, Netherlands, Norway, Poland, Romania, Slovakia, ex-Soviet Union (excluding the Baltic Republics), Spain, Sweden, Switzerland, Ukraine and ex-Yugoslavia (Sawyer, 1986).

The present finding makes *Theromyzon tessulatum* the third most widely spread species of Hirudinea in the Palaearctic Region; it comes after the *Glossiphonia complanata* and *Helobdella stagnalis*, being present now in 25 different countries (Sawyer, 1986).

Theromyzon tessulatum is likely to be a recent arrival in the River Ad-da; since 1988, in fact, we have been closely monitoring various sampling stations along this river, but this leech has never been collected before in the macroinvertebrate samples taken to assess the quality of the water through the EBI method. There are two possible sources of *Theromyzon tessulatum*: either anatids from infested breeding farms, released to repopulate the area, or waterfowl coming to Italy with the migration flow from other European areas. The second one is the most probable explanation, borne out by the finding in the Brivio area of some anatids from northeastern Europe (Viganò E., personal communication). This shows how important birds are in Italy, too, as vectors for the spread of various species of leeches. Our samplings, together with ornithological data regarding birds recaptured in these areas in recent years, besides explaining the mechanism of diffusion of *Theromyzon tessulatum*, also suggest it is a recent arrival. The few specimens found in our samples further confirm this.

In the River Ticino, one single specimen was found by the Coopeco Cooperative in 1992 while monitoring the Ticino's waters for the Park Authority (unpublished data). Five specimens were also found in three different samples by the PMIP (Presidio Multizonale di Igiene e Prevenzione)

of Parabiago (Province of Milano) in 1996 (Genoni P., personal communication). The 19 specimens found at our two sampling stations in 1996 illustrate the relatively abundant *Theromyzon tessulatum* population in the River Ticino. Unlike the case of the River Adda, no earlier data is available, so we cannot even guess when this leech appeared in the Ticino. However, it is presumably not a recent event in view of the fairly large number we found in one day and their presence at more than one sampling station.

The constant presence of this leech in the River Adda (Table 1) and the large number found both in the Adda and in the Ticino, indicate not only that it is clearly now a part of the Italian national fauna, but also a regular feature of the biocenosis.

The findings of *Theromyzon tessulatum* have always been made in sampling stations with a rich biocenosis as regards the number of Hirudinea specimens and species (Table 2). In fact, the Hirudinea found at the two sampling stations along the River Adda are representative of 67% of the species found in Italian freshwater so far, while those present in the River Ticino cover 50%. Such a rich range of species corresponds to high EBI values, always indicating the first-class quality of both rivers; in such habitats abundant, diversified communities are likely to settle.

Table 2 - Leeches collected in the Rivers Adda and Ticino.

Family	Species	River Adda	River Ticino
Glossiphoniidae	<i>Glossiphonia complanata</i> (L.)	+	+
	<i>Glossiphonia heteroclita</i> (L.)	+	
	<i>Helobdella stagnalis</i> (L.)	+	+
	<i>Batracobdella paludosa</i> (Carena)	+	+
	<i>Hemiclepsis marginata</i> (O.F. Müller)	+	+
	<i>Theromyzon tessulatum</i> (O.F. Müller)	+	+
Piscicolidae	<i>Piscicola geometra</i> (L.)	+	+
Hirudinidae	<i>Hirudo medicinalis</i> (L.)	+	
	<i>Haemopsis sanguisuga</i> (L.)	+	
Erpobdellidae	<i>Erpobdella octoculata</i> (L.)	+	+
	<i>Erpobdella testacea</i> (Savigny)	+	+
	<i>Dina lineata</i> (O.F. Müller)	+	+

In view of the very scanty previous records of *Theromyzon tessulatum* from Italy the new finding helps extending our knowledge about the distribution of this species.

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