Zeitschrift: Mitteilungen der Schweizerischen Entomologischen Gesellschaft = Bulletin de la Société Entomologique Suisse = Journal of the Swiss Entomological Society

Herausgeber: Schweizerische Entomologische Gesellschaft

Band: 69 (1996)

Heft: 1

Artikel: The genus Taeniopteryx in Italy : biochemical and morphological data with the description of Taeniopteryx mercuryi n. sp. (Plecoptera ; Taeniopterygidae)

Autor: Fochetti, Romolo / Nicolai, Paolo

DOI: https://doi.org/10.5169/seals-402619

MITTEILUNGEN DER SCHWEIZERISCHEN ENTOMOLOGISCHEN GESELLSCHAFT
BULLETIN DE LA SOCIÉTÉ ENTOMOLOGIQUE SUISSE
69, 95 – 106, 1996

The genus *Taeniopteryx* in Italy: biochemical and morphological data with the description of *Taeniopteryx mercuryi* n. sp. (Plecoptera; Taeniopterygidae)

ROMOLO FOCHETTI [1] & PAOLO NICOLAI [2]

[1] Dipartimento di Scienze Ambientali, Università della Tuscia, v. S. Camillo de Lellis, I-01100 Viterbo, Italia
[2] ENEA, Dip. Ambiente, C.R.E. Casaccia, I-00100 Roma, Italia

Taeniopteryx mercuryi, a new species of Taeniopterygidae (Plecoptera) from Central Italy is described. Results of a study conducted by means of allozyme analysis on four populations belonging to three species of the genus *Taeniopteryx* (*T. kuehtreiberi, T. stankovitchi, T. mercuryi* n. sp.) are reported. Allozymic data support the validity of the new species and relate it to *T. stankovitchi,* being *T. kuehtreiberi* genetically more distant. On the basis of morphological comparisons, considerations on the relationships among the European species of the genus *Taeniopteryx* are made. It is expressed the hypothesis that *T. stankovitchi* is synonym of *T. schoenemundi.*

Keywords: Systematics, Stoneflies, Isozymes, Running Waters, Italy

INTRODUCTION

The genus *Taeniopteryx* includes typical winter species, with a flight period that goes from January to April, according to the altitude. It is probably a very ancient genus and its disjunct West-Palaearctic - Northamerican distribution supports this hypothesis. AUBERT (1959) maintains that it can be related to Mesozoic ancestors, in particular the fluvial or low altitude species, but this is questionable, due to the winter emergence that would not have been a feature of Mesozoic forms. Larvae and adults show several autoapomorphic characters, i.e. dorsal apophyses on the abdominal terga, protrusion on the nota and telescopic segmented coxal gills. However, it should be noted that Northamerican species possess coxal gills, but do not have abdominal apophyses. Therefore, the latter character would be an evolutionary novelty of Palaearctic species while the former would be a plesiomorphic one, dating back before the splitting of the two lineages. Species identification within the genus is often very difficult. In several species often only female show reliable characters.

The genus *Taeniopteryx* shows a Holarctic distribution and there are eight species in Europe: *T. araneoides* KLAPALEK, 1902, *T. auberti* KIS & SOWA, 1964, *T. hubaulti* AUBERT, 1946, *T. kuehtreiberi* AUBERT, 1950, *T. fusca* IKONOMOV, 1980, *T. nebulosa* (LINNAEUS, 1758), *T. schoenemundi* MARTENS, 1923, *T stankovitchi* IKONOMOV, 1978. Some of these species are extinct or have disappeared from most of their former range, because of their strict stenoecy and of the growing pollution of lowland rivers. Such is the case of *T. araneoides,* described in 1902 and collected only a few times before its extinction at the beginning of the century, and of *T. schoenemundi,* which has disappeared from most of the rivers in Germany, where

it was once common (ZWICK, 1992). The situation in Italy is not much different (see RAVIZZA & NICOLAI, 1983) and can be summarized as follows.

AUBERT first (1954) recorded unidentified larvae of *Taeniopteryx* for Calabria (Southern Italy). CONSIGLIO (1960) cited specimens of *T. nebulosa* from Romagna (Central Italy) collected between 1936 and 1956. The same author (1963) recorded *T. kuehtreiberi* from a few localities of Veneto and Abruzzo (North and Central Italy) and mentioned one single male of *Taeniopteryx* from Calabria that he ascribed with doubt to *nebulosa* (we attribute it to *schoenemundi* in this paper). Again CONSIGLIO (1966) cited one male and one female of *T. schoenemundi* from the river Adige (North-East Italy). *T. kuehtreiberi* has been then recorded for several Italian regions (CONSIGLIO, 1980; RAVIZZA DEMATTEIS & RAVIZZA, 1983; FOCHETTI & NICOLAI, 1985; RAVIZZA & RAVIZZA DEMATTEIS, 1986; FOCHETTI & NICOLAI, 1988; RAVIZZA & RAVIZZA DEMATTEIS, 1993; ZANOLIN, 1993). NICOLAI & FOCHETTI (1983) finally quoted *T. stankovitchi,* Transadriatic stonefly, from Latium (Central Italy). This species is also present in the Magra river (Tuscany, Central Italy) and in the rivers Metramo and Garga (Calabria). Summarizing, four species are present in Italy: *T. kuehtreiberi,* locally common but known only for few localities; *T. nebulosa,* recorded almost forty years ago (5 specimens in total) and since then never collected again; *T. schoenemundi* found only once in 1964 and now probably extinct in Italy; *T. stankovitchi,* of which are known only four populations.

We have recently discovered an isolated population of *Taeniopteryx* in the Central Apennines that, for its peculiar morphological and ecological features, is a new species. We undertook a biochemical and morphological study on material collected by ourselves or lent by colleagues or institutions with the aim to clarify the phylogenetic relationships among the species of *Taeniopteryx* that occur in Italy. The results of the biochemical and morphological approaches together with the description of the new species are the subject of the present paper.

In the following description, AUBERT's (1950) terminology has been adopted.

DESCRIPTION

Taeniopteryx mercuryi n. sp.

Diagnosis

Male: length of body 8-9 mm. Head and thorax brown, antennae longer than body length, legs long, the posterior ones overtaking abundantly the abdomen end. Pronotum flat, with rectilinear external margins (Fig. 1). Marked micropterism, the posterior wings reaching at most the IV abdominal tergum. Tergites of abdominal segments I-III with small whitish basal spots. Femoral thorn on hind legs absent. Ventral plate of abdominal sternite IX longer than large, with distal margin showing two slight hollows; ventral vesicle (titillator) spatula-shaped, about as long as 1/3 of the IX sternite ventral plate (Fig. 2b). Epiproct cylindrical, in dorsal view thinner than cerci, with a median dorsal sclerification pointed on the apex (Fig. 2c, d). Cerci ovoidal, as large as paraprocts.

Female: length of body 11-12 mm. Length of forewing 12-13 mm. Pronotum with slight dorsal prominences. Femurs of hind legs without thorn. Cerci of 4 segments, vulval lobes ending at right angle, slightly smoothed (Fig. 2a). Median lobe triangular, with margins slightly concave. IX sternite faded at centre, with hind margin rectilinear.

Larva (Fig. 1): length of last-instar exuvia 4-5 mm (male), 8-9 mm (female). Abdomen with 9 finger-shaped apophyses (Fig. 1a). Such appendices are longer

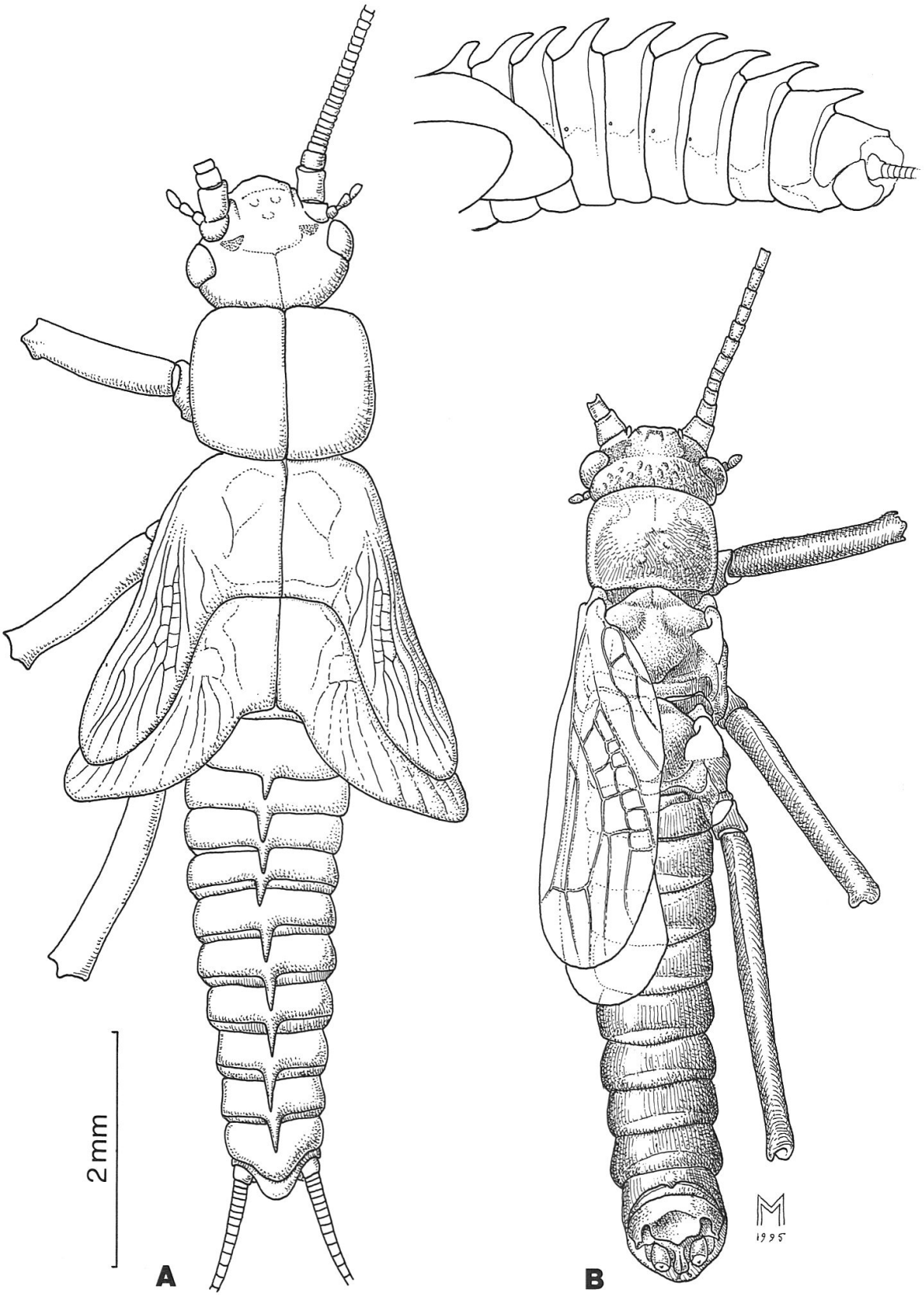

Fig. 1. *Taeniopteryx mercuryi* n. sp. Habitus of the nymph, with detail of the abdomen in lateral view (a); adult male (b) (right wings removed).

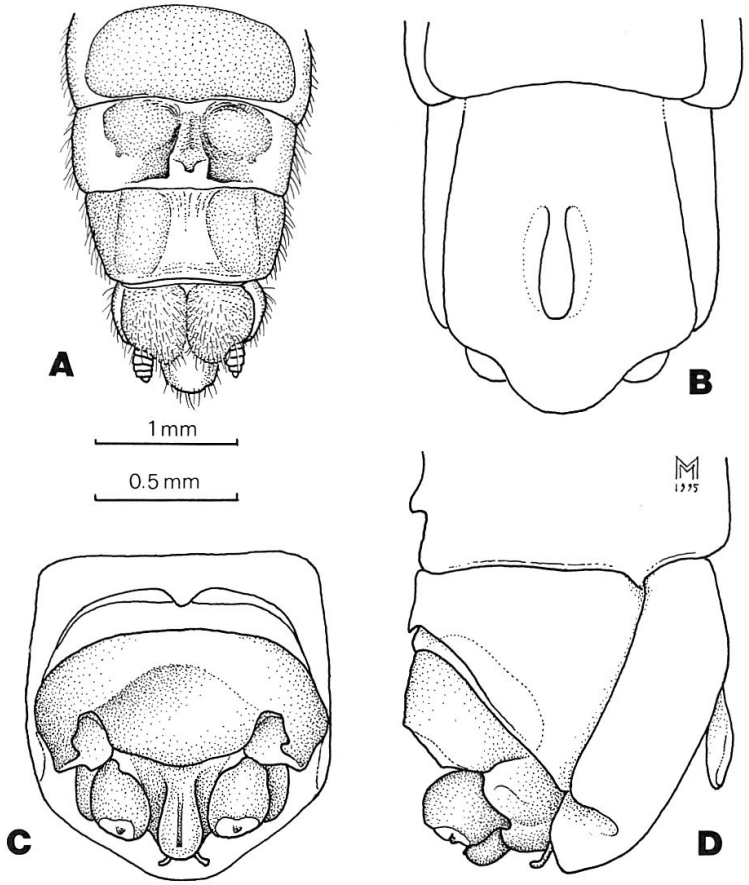

Fig. 2. *Taeniopteryx mercuryi* n. sp. Tip of the abdomen of the female in ventral view (a) and of the male in ventral (b), dorsal (c) and lateral (d) view

than in *T. stankovitchi* and *T. schoenemundi* larvae. Coxal gills shorter than in the two above-mentioned species. Pronotum flat, without prominences, unlike these two species where it is slightly in relief. Femur of hind legs with two very small thorns.

Affinities

The adult male resembles both *T. schoenemundi* and *T. stankovitchi,* but can be easily distinguished from them by the small body dimensions, marked micropterism, shorter ventral vesicle and also, from *T. stankovitchi,* by the constant absence of the femoral thorn on the hind legs. It must be noted that the wing polymorphism, even if fairly diffuse in Plecoptera, is rare in the genus *Taeniopteryx*, being present only in some populations of *T. nebulosa.* In the female, the genital plate and the hind margins of vulval lobes are close to those of *T. kuehtreiberi,* from which it can be easily distinguished by the lower number of cercal segments (4 versus 8 in the last one).

Examined material

Central Apennines (Abruzzo, Italy), Vera spring (left tribut. Aterno river), 650 m., Paganica (L'Aquila): holotype ♂ 24.I.1985. Paratypes, same locality, same

date: 15 ♂, 17 ♀, 2 larvae, 3 exuviae. Other paratypes, same locality, 1.VII.1984: 1 ♂; 25.XI.1984: 14 ♀; 24.I.1985: 14 ♂, 25 ♀; 28.II.1985: 7 ♂; 26.III.1985: 11 ♂, 4 ♀ 20.IV.1985: 15 ♂, 4 ♀; 3.VI.1985: 2 ♂, 1 ♀; 30.X.1985: 1 ♀; 30.XI.1985: 11 ♀; 30.XII.1985: 2 ♂, 2 ♀. Holotype and paratypes are deposited in the collection of the Museo di Zoologia (Dipartimento di Biologia Animale e dell'Uomo, Università di Roma "La Sapienza"), except for 2 ♂ and 2 ♀ paratypes in collection ZWICK (Schlitz), 2 ♂ and 2 ♀ in collection RAVIZZA (Milano) e 2 ♂, 2 ♀ in collection Museo Civico di Zoologia di Roma.

Ecology.

Until now, *Taeniopteryx mercuryi* has been collected only in a spring system in the southern slope of the massif of Gran Sasso (2914 m a. s. l.) at 650 m of altitude. Water temperature, measured monthly for one year, was constantly 8 °C with variations less than 1 °C. Adult specimens have been collected on the snow, at 1 °C air temperature (in February), and 30 °C air temperature (in July). *T. mercuryi* shows a peculiar adult phenology, emerging all year round, except in August and September, while normally the *Taeniopteryx* species emerge in the second half of winter within a period of 1-2 months. This exceptionally long flight period seems to be a common feature in species living in springs with constant water temperature (ZWICK, pers. comm.). The adult phenology of *T. mercuryi* and the other Plecoptera species living in the Vera Springs is described and discussed by NICOLAI *et al.* (1988).

Ethymology

The discoverer of this species (P. NICOLAI) wishes that it will be named after the great singer and artist Freddie MERCURY, leader of the famous "Queen" band, who died prematurely in London in 1991. Dr. NICOLAI, in such way, wishes to pay homage to him and to his musical work, with the certainty of awarding a kind of honour that Freddie has not yet received.

MATERIAL AND METHODS

Biochemical analysis

Three populations belonging to *T. kuehtreiberi* and *T. stankovitchi* and one population of *T. mercuryi* n.sp. were analyzed. Hereafter, the list of the material used in the study with the code of the locality (in parentheses) and the number of specimens employed are reported.

Taeniopteryx kuehtreiberi: Marche, Tenna river, 1000 m, Gole dell'Infernaccio, Montefortino (AP), 3.IV.1992 (TENNA, 39 ind.).

T. stankovitchi: Lazio, Mignone river, 350 m., Canale Monterano (RM), 8.III.1992 (MIGNONE, 24 ind.); Lazio, Olpeta river, 400 m, upstream to the confluence with the Fiora river, 21.II.1992 (FIORA, 27 ind.).

Taeniopteryx mercuryi: Abruzzo, Vera river spring, 650 m, Paganica (AQ), 15.III.1992 (VERA, 20 ind.).

Horizontal starch-gel electrophoresis was conducted on the crude homogenate of the whole body. Experimental conditions are those reported in FOCHETTI (1994). Only adults were employed in this study. The following isozymes gave results for all populations after a preliminary screening conducted on a large number of them:

Acph, Ada, Ao, Aph, Ca, Est, G6pd, aGpdh, Hbdh, Hk, Lap, Ldh, Mpi, Pep, Pgm, Phi, To-1, To-2, Xdh.

Alleles at each locus were divided following their electrophoretic mobility. The fastest allele was called A and, decreasing, B, C, D etc. Nei's genetic distance and identity were calculated (D and I; NEI, 1978). On the D distance matrix a UPGMA cluster analysis (SNEATH & SOKAL, 1973) was performed and the relative dendrogram drawn.

Morphological analysis

List of the material examined:

Taeniopteryx auberti. Romania, Cluj, F. Somes, 20.III.1971. 3 ♂, 3 ♀ (B. KIS leg.).

Taeniopteryx hubaulti. France, Llipodère, 1600 m., 2 ♂, 1 ♀, 1 exuvia, 9.IV.1993. (G. VINÇON leg.)

Taeniopteryx kuehtreiberi. Italy, F. Adige, Verona, 8.III.1962 (S. RUFFO leg.), 1 ♀ (CONSIGLIO det.); Tenna river, Gole dell'Infernaccio, 12.II.1984, 1 ♀, 3 exuviae; same locality, 30.III.1985, 16 ♂, 11 ♀.

Taeniopteryx nebulosa. Italy, Forli, 30 m, 6.VIII.1933, 1 ♀; II.1938, 1 ♀; 18.III.1947, 1 ♀; III.1947, 1 ♀; 4.III.1951, 1 ♀. Campigna, brooklet in beech-wood, 1100 m, 27.VII.1956, 1 ♀. (Collection ZANGHERI, Museo Civico di Storia Naturale di Verona). France, Conesnon à Mézières, 2.IV.1985, 2 ♀, 1 ♂, 1 exuvia, (G. VINCON leg.).

Taeniopteryx schoenemundi. Italy, Calabria, Sila, 19-20.III.1963, 1 ♂ (RIVOSECCHI leg.; det. *Taeniopteryx ? nebulosa* by C. CONSIGLIO, 1963). Adige river, Verona, 28.II.1964, 1 ♂, 1 ♀ (S. RUFFO leg.). Germany, Hessen, Geisbach Bad Hessfeld, 14.III.1969, 2 ♂, 2 ♀, 1 larva (P. ZWICK leg.). Spain, Gudar Camarena, 1000 m, 23.XII.1992, 2 ♂, 2 ♀ (G. VINCON leg.).

Taeniopteryx stankovitchi. Macedonia, Vardar river, Radusa, 20.III.1978, 2 ♀, 2 ♂, 1 exuvia (P. IKONOMOV leg.). Macedonia, Kozuv-gebirge, Stragarnica R., 15.II.1979, 1 ♀, 1 ♂, 1 exuvia (P. IKONOMOV leg.). Macedonia, Vardar river, Tetovo, 28.II.1982, 2 ♀, 12 exuviae; 1.III.1982, 28 ♂, 4 exuviae; 2.III.1982, 17 ♂, 5 ♀, 1 exuvia (NICOLAI leg.). Mignone river, Canale Monterano, 14.II.1981, 10 ♀, 34 ♂. Bardine stream (left trib. Magra river), Aulla (MS), 17.XI.1984, 1 larva (G. SANSONI leg.). Italy, F. Olpeta (left trib. Fiora river), 21.II.1992, 3 ♂, 2 ♀, 8 exuviae, 1 larva. Metramo river, Galatro, 150 m, 3.II.1989, 1 larva. Garga river, Silvana Mansio, 700 m, 3.XII.1994, 15 larvae (SIRGIOANNI leg.).

Taeniopteryx mercuryi . Italy, Vera river, Paganica (Aq.), 24.I.1985, 17 ♀, 16 ♂, 2 larve, 3 exuviae.

RESULTS AND DISCUSSION

Biochemical analysis

In spite of the nearly thirthy years of the use of the electrophoretic techniques of analysis in systematics (see NEI, 1987), it is only recently that a few contributions on the biochemical systematics of Plecoptera have been published (LEES & WARD, 1987; FUNK & SWEENEY, 1990; WRIGHT & WHITE, 1992; FOCHETTI, 1994).

Seven of the 19 loci analyzed resulted monomorphic and fixed for the same allele in all populations (Acph, Ada, Aph, Hbdh, To-1, To-2, Xdh). Seven resulted

Tab. 1. Matrix of the genetic distances (D: NEI, 1978) in the four populations examined (see text for the initials).

	1	2	3	4
TENNA	****	0.539	0.538	0.553
MIGNONE	0.618	****	1.000	0.835
FIORA	0.619	0.000	****	0.838
VERA	0.593	0.180	0.177	****

monomorphic but fixed for different alleles (Ao, Est, G6pdh, aGpdh, Hk, Lap, Ldh), and five were polymorphic at least in one of the populations examined. Genetic distance values range from D=0.618 *(T. kuehtreiberi - T. stankovitchi)* to D=0.593 *(T. kuehtreiberi - T. mercuryi)* to D=0.178 *(T. stankovitchi - T. mercuryi).* Distance value between the two populations of *T. stankovitchi* is D=0. The above mentioned relationships as expressed by cluster analysis can be seen in the dendrogram of Fig. 3.

Taeniopteryx mercuryi shows a distance of D=0.178 from the morphologically closest species, *T. stankovitchi,* with respect to which it has two fixed alternative alleles at two loci (Ao; aGpdh) and one fixed allele (Pep) that is instead polymorphic in *T. stankovitchi. T. mercuryi* shows a common allele at the locus Ca that the two populations of *T. stankovitchi* do not have. On the contrary, the latter populations have a common (FIORA) or fixed allele (MIGNONE) to the same locus Ca, not shown by *T. mercuryi.* Moreover *T. mercuryi* possesses a rare allele (Pgm) that the two mentioned populations of *T. stankovitchi* do not show, while the latter have rare alleles (Pgm and Phi loci) not shown by the former.

T. kuehtreiberi shows high distance values as well, if compared with *T. stankovitchi* or with *T. mercuryi.* This is in agreement with both morphological and ecological analyses. *T. kuehtreiberi* can be easily distinguished from the other

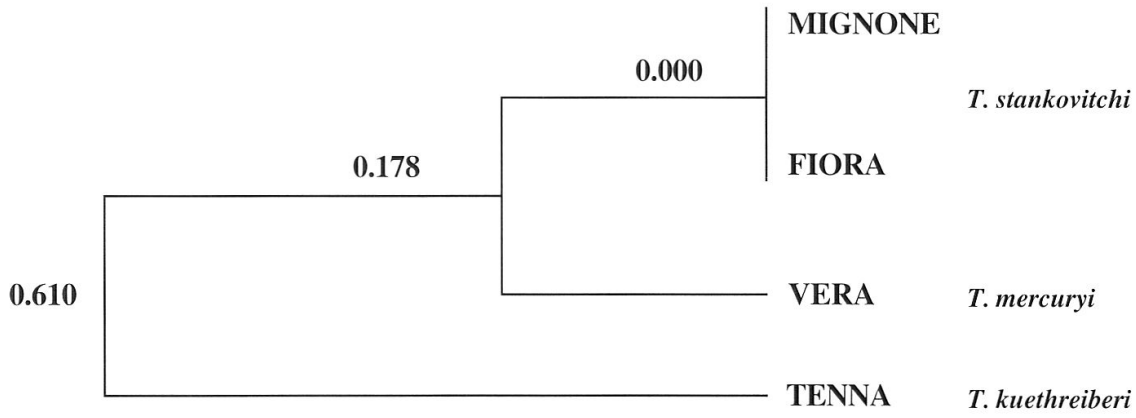

Fig. 3. Dendrogram (Cluster analysis UPGMA) of genetic similarity in the four populations examined of the genus *Taeniopteryx.*

species of the genus and is a reophile-orophile species, while the other species found in Italy are confined to lowland rivers. Phylogenetic reationships derived from electrophoretic data are generally similar to those based on morphology: *T. stankovitchi* and *T. mercuryi* form a closely related group, while *T. kuehtreiberi* represents a distinct lineage within *Taeniopteryx.*

The percentage of observed heterozygosity seems to be very low in Plecoptera. This aspect has been treated in depth by FOCHETTI *et al.* (1995) and discussed with respect to the niche/width variability hypothesis (NEVO *et al.,* 1984) and to the other theories on the correlation between genetic variability and environmental stability.

Genetic data such as distance values and diagnostic alleles confirm the peculiarity of morphological and autoecological data of *Taeniopteryx mercuryi* n.sp. As far as genetic values recorded in the present study are concerned, the lowest value (I=0.83) between *T. mercuryi* and the closest species, *T. stankovitchi,* is similar to those observed by FUNK AND SWEENEY (1990), two species of American *Taeniopteryx* well distinguished both morphologically and ecologically (I=0.80). According to RICHARDSON *et al.* (1986) differences at the 10-15 % of the scored loci would be sufficient to separate two populations assumed to be conspecific, and two fixed alternative alleles to distinguish cryptic and sympatric species. THORPE (1982) suggests that taxa with identity value less than 0.85 must be considered valid species. The same author states that 97 % of the identity values among species are less than 0.85. STUDEMANN *et al.* (1994) consider values of I=0.88 and I=0.94 to be good for morphologically distinct species of European Ephemeroptera, demonstrating the great variability that these values can have in different groups.

Morphological analysis

Some considerations should be given here to the *Taeniopteryx* species present in Italy and to the other two *Taeniopteryx* European species *(T. hubaulti* and *T. auberti*), whose material was available for comparison. Such considerations deal with diagnostic characters cited in literature for this genus, summarized in Tab. 2, including the other two European species of which no comparative material was found.

Tab. 2. Outline of the main characters utilized in the taxonomy and in reconstructing the phylogeny in the nine European species of the genus *Taeniopteryx.*

	micropterism ♂	femoral thorn ♂	cerci ♀	apophyses larva	tergal spots ♂	ventral vesicle ♂
T. araneoides	yes(apterous)	?	?	?	?	?
T. auberti	no	yes	short	long	I-V	long
T. hubaulti	no	no	short	long	I-V	medium
T. kuethreiberi	no	yes	long	thorn-shaped	I-II	short
T. fusca	no	yes	short	thorn-shaped	?	short
T. mercuryi	yes	no	short	short (9)	I-III	short
T. nebulosa	variable	no	long	short (7)	I-II	short
T. schoenemundi	no	no	short	short (9)	I-V	long
T. stankovitchi	no	yes (var.)	short	short (9)	I-V	long

T. auberti. Rheophilous species (350-1160 m). Male with a robust femoral thorn on hind legs, which can be also rather long and bent; white spots on abdominal tergites I-II and white notches on tergites III-V; ventral vesicle long, without narrowings. Larva with characteristic thoracic (also in the adult) and abdominal apophyses (9, very long and finger-shaped).

T. hubaulti. Rheophilous species (320-1600 m) with a mid-european distribution. Male without femoral thorn, but sometimes with a slight prominence; white bands on abdominal tergites I-II and white notch on tergites III-V; ventral vesicle of intermediate length in comparison with the above mentioned species, short, with subapical narrowing. Female with short cerci. Distinctive larva, with very long apophyses on thorax and abdomen (9), remaining also on the adult notum.

T. kuehtreiberi. Rheophilous species, generally at high-medium altitudes, with alpine-apenninic distribution. Male with a femoral thorn on hind legs; abdominal tergites I-II with whitish spot; ventral vesicle short and subapically narrowed. Female showing cerci with 8 segments. Wing polymorphism in this species is unknown. Larva with abdominal apophyses similar to the thorns of a rose.

T. nebulosa. Fluvial species, rarely at high altitudes, with a mid-european-siberian distribution. Male without femoral thorn on hind legs, with abdominal tergites I-II showing a whitish spot, ventral vesicle very short, subapically narrowed. Larva with seven small dorsal apophyses finger-shaped. Female with cerci of 8-9 segments. Males micropterous in France and sometime also in England. No data about wing polymorphism in Italy are available because the only 5 specimens collected were females.

T. schoenemundi. Fluvial species, rarely at high altitudes, with mid-european distribution. Male without femoral thorn on hind legs, pronotum slightly in relief; the withish spots on tergites reaching the fifth abdominal tergite. Ventral vesicle long, thin and narrowing. Larva with 9 abdominal finger-shaped apophyses. Female with short cerci of 3-4 segments. Wing polymorphism unknown in this species.

T. stankovitchi. Low altitude species, with transadriatic distribution. All the males collected in Macedonia (Vardar river) show a strong femoral thorn, while those from Italy show a strong variability, the thorn being sometimes present, absent or of small dimension. Abdominal tergites I-V with whitish spots, ventral vesicle as in *schoenemundi.* Larva with 9 abdominal finger-shaped apophyses. Female with short cerci. Wing polymorphism never observed.

T. mercuryi. Species collected only at medium altitude (650 m). Male micropterous, with small body dimension; femoral thorn absent, abdominal tergites I-III with spots (on the III tergite the spot is reduced). Ventral vesicle short, club-shaped. Larva with 9 abdominal, finger-shaped apophyses. Female with short, 4-segmented cerci.

AUBERT (1950) divided the European species of the genus *Taeniopteryx* into two groups, i.e. *schoenemundi* and *nebulosa.* The first one was characterized by the female cerci composed by 4 segments, the second one by female cerci with 8-9 segments. Besides this the spots on the abdomen of the male are on tergites I-V in the *schoenemundi* group and limited at tergites I-II in the *nebulosa* group. On the basis of such characters, *T. hubaulti* would be a member of the *schoenemundi* group, while *T. araneoides* and *T. kuehtreiberi* would be part of the *nebulosa* group. In ZWICK's opinion (pers. comm.), who was able to examine the holotype of *T. araneoides*, this species should constitute a separate group, since the male shows a strong tooth on the cerci and genitalia clearly different from those of the other species of the genus, in addition to the uniform black colour. Unfortunately, the

females of this species are unknown. IKONOMOV (1978, 1980) did not support such grouping in describing *T. stankovitchi* and *T. fusca* from ex-Yugoslavian Macedonia. He concluded that these two species formed a group together with *T. kuehtreiberi* and *T. auberti* (described in 1964 as a member of the *schoenemundi* group) on the basis of the femoral thorn presence in the male. However, using only one character, one would separate two species, i.e. *T. auberti* and *T. hubaulti,* whose larvae are extremely similar, sharing long, finger-shaped abdominal apophyses and high notal protrusions.

In fact, as shown in Tab. 2, different partitions can be obtained according to the different characters chosen as discriminants, highlighting the still incomplete knowledge of this genus and the impossibility of a phylogenetic reconstruction. Indeed, if larval characters, length of female cerci or the presence of a thorn in male hind legs are considered, a coherent and significantly parsimonious grouping cannot be obtained, particularly without considering the wing polymorphism on which ecological constraints could act.

Thus, based on the previous comment, there is the suspicion that *T. stankovitchi* may be a synonym of *T. schoenemundi.* The marked variability shown by the femoral thorn (as demonstrated by the Mignone river population), the only character that allows the morphological discrimination between the two species, does not seem to support their distinction at the species level. The presence of intraspecific variability of the femoral thorn has been found and discussed in *T. maura* and *T. burski* populations in the United States (RICKER & ROSS, 1968). These two species have been distinguished on the basis of dimension of the femoral thorn. Their real distinction at the species level is, however, still in discussion (FULLINGTON & STEWART, 1980). Besides, STEWART *et al.* (1995) suggest that some *T. burski* populations can show a great variability in the length of the femoral thorn. Nevertheless, these populations display a similar drumming behaviour pattern, being in Plecoptera a primary reproductive isolation factor.

The present study allows us to confirm the assigning to *T. nebulosa* of the specimens collected in Romagna and to confirm the presence in Italy of this species, at least in the recent past. However, its real distribution must be verified, since this Centroeuropean-siberian species does not seem to be present in the Alps, in the Pyrenees, in the Dinars and in Greece. A single male collected in Calabria in 1963 (Sila Mountains, locality not specified) and identified with doubt as *T. nebulosa* (CONSIGLIO, 1963) is here abscribed to *T. schoenemundi.* It was not possible to check old records of *T. nebulosa* (in CONSIGLIO, 1967) that RAVIZZA & NICOLAI (1983) considered to be doubtful and maybe referable to *T. schoenemundi.*

The analysis of further material of *Taeniopteryx* would contribute to a better understanding of the real status and the distribution of *Taeniopteryx* species in Italy. An electrophoretic study should be carried out between the species analyzed here and European populations of *T. nebulosa* and *T. schoenemundi,* because of their probable extinction in Italy. This could allow us to highlight the phylogenetic relationships within the genus and to clarify the distinction between *T. stankovitchi* and *T. schoenemundi.* This task is pressing before the growing pollution of the Italian and European lowland rivers solves the problem by simply causing the extinction of the remaining populations of these two species.

ACKNOWLEDGEMENTS

We would like to thank Prof. P. ZWICK (Schlitz, Germany), Dr. G. VINÇON (Grenoble, France), Dr. G. SANSONI (U.S.L.- Massa) for kindly providing us with some study material, and the Civic Museum

of Natural History of Verona (Dr. M. DACCORDI) for the loan of the specimens of *T. nebulosa*. S. J. GORZULA (Tennessee, U.S.A.) has kindly corrected and smoothed the English text. Prof. P. ZWICK also read and commented an early version of this paper, giving valuable advices.

RIASSUNTO

Viene fornita la descrizione di *Taeniopteryx mercuryi* n. sp. Vengono riportati inoltre i risultati di uno studio condotto per mezzo dell'analisi elettroforetica dei sistemi gene-enzima su quattro popolazioni centroappenniniche del genere *Taeniopteryx,* due appartenenti a *T. stankovitchi*, una a *T. kuehtreiberi* insieme a una popolazione della nuova specie. I dati di distanza genetica confermano la validità specifica della nuova entità e la apparentano con *T. stankovitchi,* mentre *T. kuehtreiberi* risulta isolata, confermando le sue peculiarità autoecologiche. Sono infine espresse alcune considerazioni in merito all'inquadramento sistematico interno al genere *Taeniopteryx.*

REFERENCES

AUBERT, J. 1950. Note sur les Plécoptères européens du genre *Taeniopteryx* et sur *Capnia vidua. Mitt. schweiz. ent. Ges. 23(3):* 303-316.

AUBERT, J. 1954. Nouvelle contribution à l'étude des Plécoptères de Calabre. *Ann. Ist. Mus. Zool. Univ. Napoli 6:* 1-18.

AUBERT, J. 1959. *Plecoptera.* Insecta Helvetica Fauna 1, 140 pp.

CONSIGLIO, C. 1960. Fauna di Romagna (Collezioni Zangheri). Plecotteri. *Mem. Soc. Ent. It. 39:* 36-40.

CONSIGLIO, C. 1963. Plecotteri invernali d'Italia. *Boll. Soc. Ent. It. 93:* 150-155.

CONSIGLIO, C. 1966. Plecotteri dell'Adige a Verona. *Mem. Mus. Civ. St. Nat. Verona 14:* 503-506.

CONSIGLIO, C. 1967. Lista dei Plecotteri della regione Italiana. *Fragm. Entomol. 5(1):* 1-66.

CONSIGLIO, C. 1980. *Plecotteri.* Guide per il riconoscimento delle specie animali delle acque interne Italiane. C.N.R. AQ/1/77 n.9.

FOCHETTI, R. 1994. Biochemical systematics and biogeographical patterns of the Italian and Corsican species of the *Protonemura corsicana* species group. *Aquatic Insects 16(1):* 1-15.

FOCHETTI, R. & NICOLAI, P. 1985. Plecotteri primaverili del Friuli-Venezia Giulia. *Atti Mus. Civ. St. Nat. Trieste 37(2):* 211-217.

FOCHETTI, R. & NICOLAI, P. 1988. I Plecotteri dell'alta valle del Fiume Tenna. *Boll. Ass. Rom. Entomol. 42 (1987):* 9-18.

FOCHETTI, R., DE MATTHAEIS, E., COBOLLI, M. & OLIVERIO, M. 1996. Allozyme variation in the genus *Isoperla* in some Mediterranean Islands with remarks on genetic data on stoneflies. *In:* LANDOLT, P. & SARTORI, M. (eds), Proc. VIII Int. Conf. Ephemeroptera XII Int. Symp. Plecoptera, (in press).

FULLINGTON, K. E. & STEWART, K. W. 1980. Nymphs of the stonefly genus *Taeniopteryx* of North America. *J. Kansas Entom. Soc. 53(2):* 237-259.

FUNK, D.H. & SWEENEY, B.W. 1990. Electrophoretic analysis of species boundaries and phylogenetic relationships in some taeniopterigyd stoneflies. *Trans. Am. Entomol. Soc. 116(3):* 727-751.

IKONOMOV, P. 1978. Nouvelles espèces de Plécoptères de Macedoine. *Fragm. Balcanica 10(11):* 83-97.

IKONOMOV, P. 1980. Nouvelles espèces de Plécoptères de Macedoine. II. *Fragm. Balcanica 11(4):* 19-31.

LEES, J.H. & WARD, R.D. 1987. Genetic variation and biochemical systematics of British nemouridae. *Bioch. Syst. Ecol. 15(1):* 117-125.

NEI, M. 1978. Estimation of average heterozigosity and genetic distance from small numbers of individuals. *Genetics 89:* 583-590.

NEI, M. 1987. *Molecular evolutionary genetics.* Columbia Univ. Press, New York, 512 pp.

NEVO, E., BEILES, A. & BEN-SHLOMO, R. 1984. The evolutionary significance of genetic diversity: ecological, demographic and life history correlates. Evolutionary dynamics of genetic diversity. *Lect. Notes. Biomath. 53:* 13-213.

NICOLAI, P. & FOCHETTI, R. 1983. Faunistica, fenologia ed ecologia dei Plecotteri dei Monti della Tolfa. *Fragm. Entomol. 17(1):* 51-84.

NICOLAI, P., FOCHETTI, R. & MARINI, R. 1988. Dinamica fenologica dei Plecotteri di alcune sorgenti abruzzesi. *Atti XV Congr. naz. ital. Ent., L'Aquila:* 137-143.

RAVIZZA, C. & NICOLAI, P. 1983. I Plecotteri minacciati di estinzione nella regione italica. *Boll. Soc. Ent. It. 115:* 70-78.

RAVIZZA, C. & RAVIZZA DEMATTEIS, E. 1986. Les Plécoptères du Grana. *Boll. Mus.Reg. Sc. Nat. Torino 4(2):* 311-339.

RAVIZZA, C. & RAVIZZA DEMATTEIS, E. 1993. Zoogeographical aspects of the Plecoptera population of the Biellese mountains. *Boll. Soc. ent. ital. 125(1):* 6-22.

RAVIZZA DEMATTEIS, E. & RAVIZZA, C. 1983. Elenco dei Plecotteri dell'alta valle del Po. *Atti Soc. ital. Sci. nat. Museo civ. Stor. nat. Milano 124(3-4):* 291-294.

RICHARDSON, B.J., BAVERSTOCK, P.R. & ADAMS, N. 1986. *Allozyme electrophoresis.* Acad. Press Australia, 410 pp.

RICKER, W. E. & ROSS, H. H. 1968. North American species of *Taeniopteryx. J. Fish. Res. Bd. Canada 25(7):* 1423-1439.

SNEATH, P.H.A. & SOKAL, R.R. 1973. *Numerical taxonomy.* W.H. Freeman and Co., San Francisco, 573 pp.

STEWART, K. W., ABBOTT, J. C., KIRCHNER, R. F. & MOULTON, S. R. 1995. New descriptions of North American Euholognatan stonefly drummming and first Nemouridae ancestral call discovered in *Soyedina carolinensis. Ann. Entomol. Soc. Am. 84:* 201-206.

STUDEMANN, D., LANDOLT, P. & TOMKA, I. 1994. Biochemical investigations of Siphlonuridae and Ameletidae. *Arch. Hydrobiol. 130(1):* 77-92.

THORPE, J. P. 1982. The molecular clock hypothesis: biochemical evolution, genetic differentiation and systematics. *Ann. Rev. Ecol. Syst. 13:* 139-168.

WRIGHT, M. & WHITE, M.M. 1992. Biochemical systematics of the North American *Pteronarcys. Biochem. Syst. Ecol. 20(6):* 515-521.

ZANOLIN, B. 1993. Studio ecologico sulle comunità di macroinvertebrati bentonici in stazioni fisse di quattro corsi d'acqua del Friuli-Venezia Giulia. *Gortania, Atti Museo Friul. Storia Nat. 15:* 135-222.

ZWICK, P. 1992. Stream habitat fragmentation - a threat to biodiversity. *Biodiv. Conserv. 1:* 80-97.