

REICHENBACHIA

Staatliches Museum für Tierkunde Dresden

Band 33

Ausgegeben: 22. März 1999

Nr. 22

Life strategies of Auchenorrhyncha species on river floodplains in the northern Alps, with description of a new species: *Macropsis remanei* sp. n. (Hemiptera)

With 24 Figures and 1 Table

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Abstract. Data are presented on faunistics, phenology, habitats and food plants of some little known Auchenorrhyncha species living in scattered vegetation on frequently flooded river banks in the Bavarian and Tyrolian Alps. A considerable proportion of these species is univoltine, monophagous and stenotopic with small distribution ranges, although commonly accepted concepts of life strategies in disturbed and temporary habitats predict the opposite. Furthermore, a new species is described, *Macropsis remanei* sp. n., living on Olive Willow (*Salix eleagnos*) along brooks and rivers in the Bavarian Alps.

1. Introduction

River banks along mountain streams hold only small numbers of species, due to frequent disturbance by inundation and sedimentation. Regarding species composition and individual numbers, communities are dominated by predators, mainly Carabidae, Staphylinidae, Araneae, Gamasina and Saldidae. Saprophagous and mycetophagous taxa, such as Collembola, Oligochaeta and some species of Staphylinidae und Carabidae, are present in lower numbers. Phytophagous groups are even less abundant, due to shortage of living plant biomass. Among communities of plants and animals, a considerable proportion of species is known to be confined to this type of habitat (BOUMEZZOUGH 1983, DIETERICH 1996, KÜHNELT 1943, MÜLLER 1995, PLACHTER 1986).

Little is known about the fauna of Auchenorrhyncha in this habitat, due to insufficient knowledge of this group in general and their extremely low densities in these situations. Published data are mainly on faunistics, e.g. MOOSBRUGGER (1946) on the Auchenorrhyncha fauna of the Rhine and Ache valley in Vorarlberg (Austria) and FISCHER (1972) on the fauna of the Lech valley in Bavaria (Germany). As with most alpine rivers, these localities have been regulated since, their natural dynamics having been lost. REMANE & FRÖHLICH (1994) were the first to draw attention to some highly stenoeious species living on almost bare gravel banks with very low densities of plants. They also pointed out that some of these species have only a very limited distribution range.

The author made a preliminary and non-quantitative survey of Auchenorrhyncha species in several localities in Bavaria and Tyrol (floodplains of upper Isar between Mittenwald and Wolfratshausen; Vorderriss, Rissbach floodplains; Reutte, Lech floodplains). This paper presents data on distribution.

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food plants and phenology of some little known species, including the description of a new species, and briefly discusses their life strategies. Specimens were collected by sweep-netting and directly searching on food plants. All of them are in the author's collection, if not otherwise stated (ZMS = Zoologische Staatssammlung München, MTD = Staatliches Museum für Tierkunde Dresden). The nomenclature of plants follows OBERDORFER (1994).

2. Results

Pentastiridius beieri (WAGNER, 1970)

Bavaria: Vorderriss, Isar floodplains, 800 m a.s.l., 23. VI. 1997, 1 ♂, 1 ♀, and 04. VI. 1998, 11 ♂♂, 7 ♀♀, on bare gravel banks on tumbled and almost dead bushes of Purple and Olive Willow (*Salix purpurea* and *S. eleagnos*).

The species was described by WAGNER (1970) from northern Italy (Vintschgau), Lower Austria and the surroundings of Vienna. There have been only few records since, namely from the Polish Tatra, the Ukrainian Carpathians, the Engadin (Switzerland), the Provence (France) and the Lech Valley near Reutte (Tyrol). It is confined to banks of unregulated mountain rivers. Adults have been collected from end of May to the end of July on *Salix*, *Alnus* and *Myricaria* (GÜNTHART 1987a, NAST 1977, REMANE & FRÖHLICH 1994).

Chloriona stenoptera (FLOR, 1861)

Tyrol: Pinswang (near Reutte), 830 m a.s.l., 30. VI. 1997, 1 ♂ along a small brook in a meadow; Bavaria: Vorderriss, Isar floodplains, 800 m a.s.l., 04. VI. 1998, 3 ♂♂ in undergrowth of *Salix* thickets on gravel banks.

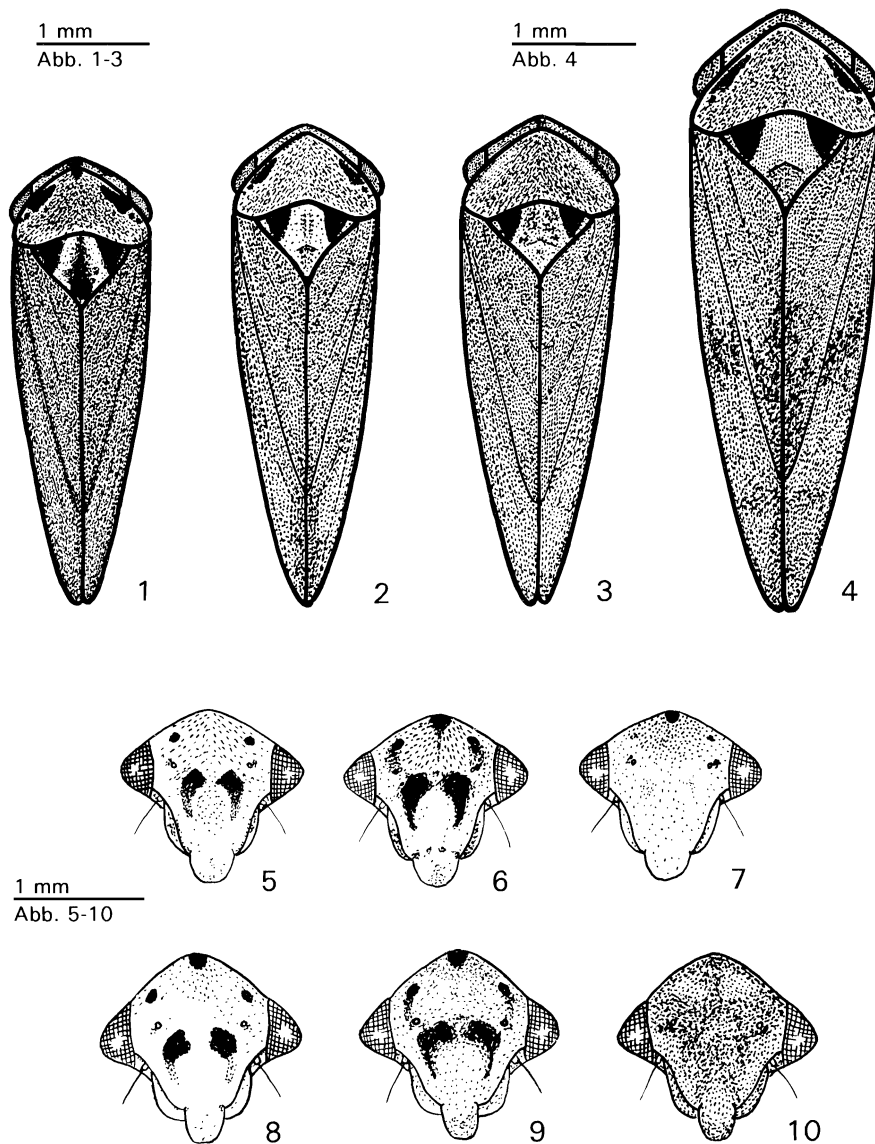
The species was described from Lithuania and has been recorded only a few times in Europe: two more localities in Lithuania (VILBASTE 1974), three from Estonia (VILBASTE 1971), two in Central Europe: Eastern Poland: Bialowieza, 09. VI. 1949, 1 ♂, und 21. VII. 1949, 4 ♂♂, 15 ♀♀, in a light and peaty forest of spruce, pine and birch (NAST 1958) and south-western Germany: Horrheim near Stuttgart, 07. VI. 1983, 1 ♂, 3 ♀♀, in "non-flooded stands of reed" (HELLER 1987). Furthermore, it is reported from Kazakhstan (MITJAEV 1971). Like the other *Chloriona* species, it lives on reed (*Phragmites australis*), but no more details are known on its habitat requirements.

Pseudodelphacodes flaviceps (FIEBER, 1866)

Bavaria: Vorderriss, Isar floodplains, 780 m a.s.l., 26. VIII. 1996, 2 ♂♂, 7 ♀♀, and 23. VI. 1997, 1 ♀; Krün, Isar floodplains, 880 m a.s.l., 27. VIII. 1996, 1 ♂; Vorderriss, Rissbach floodplains, 790 m a.s.l., 26. VIII. 1996, 3 ♀♀; Fall, Isar floodplains (above Sylvenstein Reservoir), 750 m a.s.l., 04. VI. 1998, 25 ♂♂, 27 ♀♀.

The species is known only from a few records in the Alps, although its taxonomic position towards *Calligypona tricolorata* DLABOLA, 1961, described from Tadshikistan, and *Proscopus fenestratus* (EMELJANOV, 1972), described from Kazakhstan, is not yet clear.

In Germany, it is very rare and only known from the Lech floodplains near Augsburg, 15. IV. 1936, i.e. before drainage (FISCHER 1972), and along the upper course of the river Isar: 1961 and 1994, few macropterous ♂♂ near Ascholding and Wallgau (REMANE pers. comm., FRÖHLICH 1996). The citation of "Vorarlberg" (HAUPT 1935, MOOSBRUGGER 1946) probably refers to 2 brachypterous ♂♂ collected along the Rhine near Lustenau, 14. VII. 1918 (coll. H. HAUPT, now MTD). The only record from Switzerland is the holotype, but FIEBER (1866) gives no information on the type locality. NAST (1987) also mentions the former Yugoslavia and probably refers to MELICHAR's record (1899) from a bare and stony hill northwest of Trieste (now Italy), which – according to circumstances mentioned – may be unreliable. *P. flaviceps* (FIEB.) lives on sparsely vegetated, sometimes almost bare sand and gravel

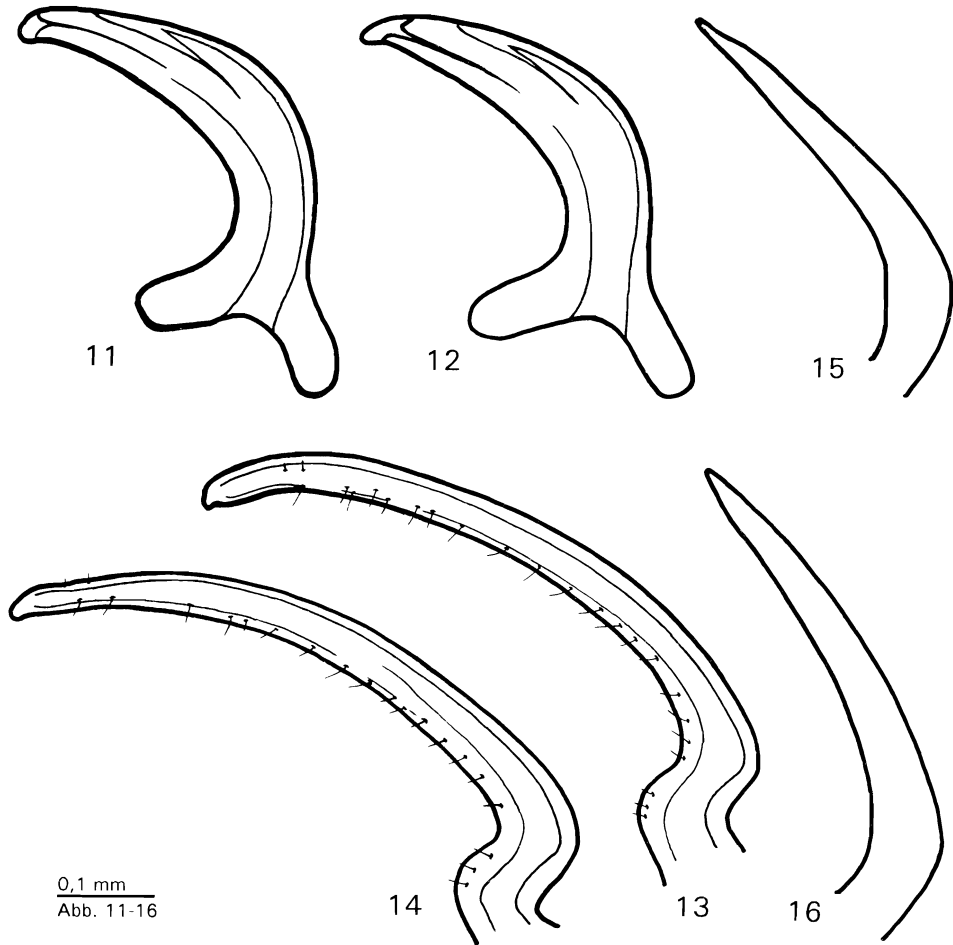


Figs. 1–10: *Macropsis remanei* sp. n.: 1, 2, 3 – ♂♂; 4 – ♀; 5, 6, 7 – face, different ♂♂; 8, 9, 10 – face, different ♀♀.

banks. Specimens found by the author were exclusively collected on Bank Reedgrass (*Calamagrostis pseudophragmites*); proportions of macropterous and brachypterous individuals were approximately equal. Adults occur between mid April and the end of August. Accordingly, there should be two generations per year. Overwintering probably takes place in the larval stage.

Javesella stali (METCALF, 1943)

Bavaria: Fall, Isar floodplains (above Sylvenstein Reservoir), 750 m a.s.l., 04. VI. 1998, 1♂, 7♀, all macropterous, on a sand bank in stands of Field Horsetail (*Equisetum arvense*).

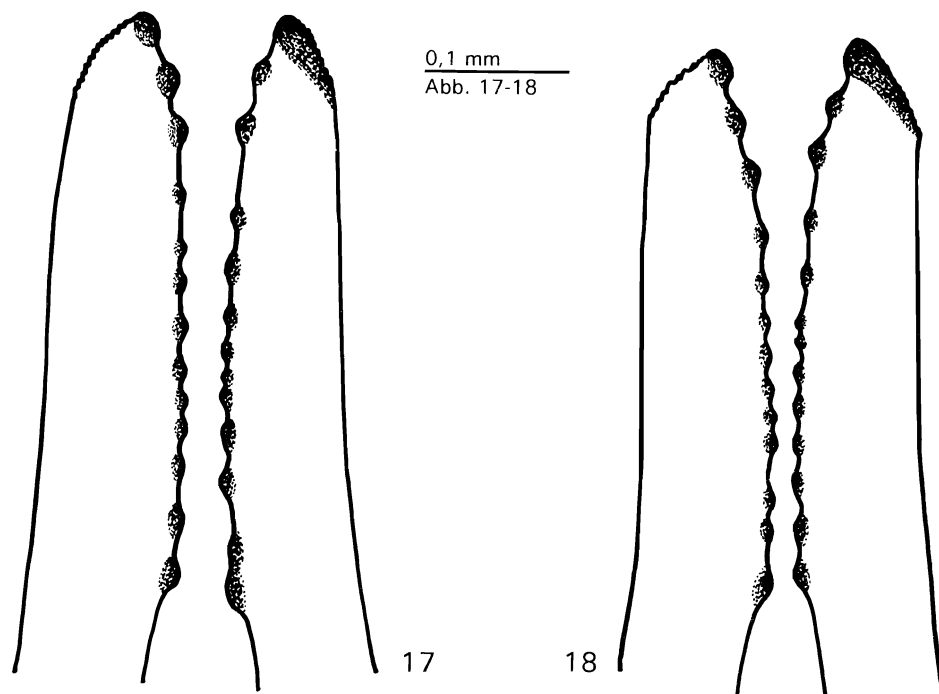


Figs. 11-16: *Macropsis remanei* sp. n.: 11, 12 – aedeagus, different ♂♂; 13, 14 – genital style, different ♂♂; 15, 16 – pygofer appendage, different ♂♂.

The species is known to occur from Eastern Siberia to Sweden, Germany, France and Austria (ANUFRIEV & EMELJANOV 1988, NAST 1987). There are only few records from Central Europe (e.g. REMANE & DELLA GIUSTINA 1993, SCHIEMENZ 1987, NICKEL & REMANE 1996); little is known about its life history. In recent years, the author collected it in several localities in southern and eastern Germany (Rhine Valley, Kaiserstuhl, Palatinate Hills, Main valley, Spreewald). It lives there as a pioneer species in sand pits, along fringes of fields, on fallow fields, and was even found in a Botanical garden, mainly on sandy, sometimes also loamy soils. Specimens were exclusively collected on *Equisetum arvense*, sometimes in stands covering only few square meters and appearing to be strongly isolated. *J. stali* (METC.) has two generations per year and overwinters in larval stage. Brachypterous individuals predominated in most localities.

***Macropsis remanei* sp. n.**

General appearance: Body shape resembling *M. cerea* (GERM.) and *M. infuscata* (J. SHLB.), but appearing more slender, head medially more angularly produced (Fig. 1, 2, 3, 4). Body length highly variable, ♂♂: 4.0–4.6 mm (n = 40); ♀♀: 4.5–5.2 mm (n = 29).

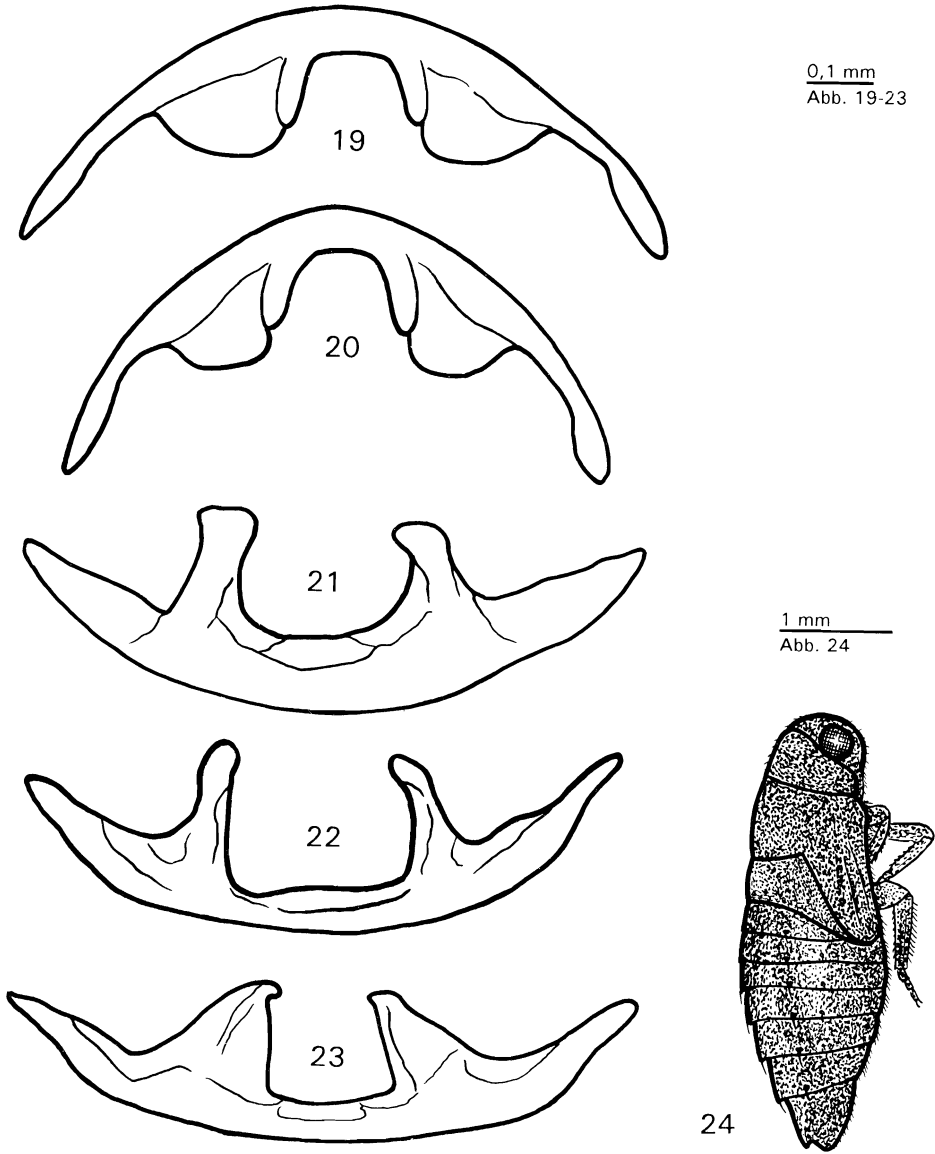


Figs. 17-18: *Macropsis remanei* sp. n.: second valvulae of ovipositor, different ♀♀.

Colouration: Golden to sordid brownish, stronger pigmented specimens sometimes blackish brown. Plates of thorax, tergites and sternites often blackish with light fringes. Fore and middle femora and tibiae often, hind femora and tibiae always with black longitudinal streaks. Face usually with strong black markings (terminology after WAGNER 1950): Apical, thyridial, ocellar and discoidal spots usually present, the pair of the latter merging to an arc in strongly pigmented specimens. Apical and ocellar spots may be reduced, in few cases completely without facial spots. Marginal and scutellar markings usually present. Formula of markings (see WAGNER 1950) in most specimens O: 1 1; F: 1 1 1/2 1 or F: 1 1 0 1 (Fig. 6, 8, 9); sometimes ♂♂ F: 0 1 0 1 or F: 1 1/2 1/2 0 (Fig. 5, 7). ♀♀ F: 1/2 1 0 1 or F: 0 0 0 0 (Fig. 10). Scutellum in strongly pigmented specimens with irregular black median streak, pronotum along fore border with small median and lateral black spots (Fig. 1). Fore wings dark yellowish brown to blackish, pigmentation often being stronger along apical and fore border, sometimes with two incomplete transverse dark bands across middle and subapical parts (Fig. 4).

Genital and song apparatus: Aedeagus in side view comparatively slender, the basal part being narrower than the median part (Fig. 11, 12), genital styles as in Fig. 13, 14 (not depressed under cover-glass), pygofer processes as in Fig. 15, 16. Second valvulae of ovipositor with two or three apical teeth respectively (as in most *Macropsis* species), subapically with a more or less regular row of 9 to 11 smaller teeth (Fig. 17, 18). Tergal apodemes of ♂♂ lobiform to semi-oval, apically broadly rounded (Fig. 19, 20). Sternal apodemes narrow and parallel-sided to triangular, the area enclosed by their inner margins forming an open rectangle or an open ellipse (Fig. 21, 22, 23).

Nymphs: Closely resembling those of *M. cerea* (GERM.) and not yet distinguishable (Fig. 24, see WAGNER 1950): reddish to blackish brown, tergites sometimes on both sides with two diffuse lighter brown longitudinal bands. Ridges of posterior tergites also light brown, those of anterior tergites blackish. Dorsal lobes of tergites in side view only little pronounced. Whole body densely covered with strong hairs.



Figs. 19–24: *Macropsis remanei* sp. n.: 19, 20 – 2nd tergite, different ♂♂; 21, 22, 23 – 2nd sternite, different ♂♂; 24 – 5th instar. [1–23 – specimens from Ramsau, Wimbachtal; 24 – specimen from Vorderriss].

Differential diagnosis: Typically coloured specimens can be distinguished from other species by the markings on face, pronotum and scutellum and by the almost uniform brown to blackish tinge on fore wings without light commissural border. Untypical specimens are not always distinguishable from *M. cerea* (GERM.) and *M. infuscata* (J. SHLB.). Host plants are quite different: *M. remanei* sp. n. lives monophagously on Olive Willow (*Salix eleagnos*), while *M. infuscata* (J. SHLB.) lives on Goat Willow (*S. caprea*) in most parts of Central Europe, and also on Dark-leaved Willow (*S. myrsinifolia*) in the Austrian and Bavarian Alps. *M. cerea* (GERM.) lives on several species of willows and sallows, in Central European lowlands mainly on Osier (*S. viminalis*), Almond Willow (*S. triandra*), Crack

Willow (*S. fragilis*), Grey Willow (*S. cinerea*) and Goat Willow (*S. caprea*), in higher altitudes (above 500 m a.s.l.) mainly on Eared Willow (*S. aurita*), Purple Willow (*S. purpurea*) and Dark-leaved Willow (*S. myrsinifolia*), although more detailed studies (e.g. on morphometrics and bioacoustics) might reveal different species on different host plants. Another similar species is *M. impura* (BOH.), showing an almost identical pattern of spots, but being much smaller (with only slight overlap). It lives on Creeping Willow (*Salix repens*) and – after WAGNER (1950) – also Eared Willow (*S. aurita*). All four species occur sympatrically in the Bavarian Alps and may live in the same habitats, but on different host plants. According to TISHECHKIN (in litt.), *M. remanei* sp. n. also resembles *M. flavida* VILBASTE, 1982, described from Tuva and redescribed from the Amur and Ussuri region by TISHECHKIN (1998). The new species may be closely related to *M. cerea* (GERM.), being similar in nymphal morphology, shape of tergal and sternal apodemes and the tendency to show dark transverse wing bars.

Life history: According to present data, the new species lives monophagously on Olive Willow (*Salix eleagnos*) along shores of brooks and rivers, mainly in submontane areas in the Alps. After MEUSEL et al. (1965), *Salix eleagnos* also occurs in mountainous regions in southern and eastern Europe (southern and central Spain, Pyrenees, Apennines, Carpathians, Dinaric Alps), but there are no data on *Macropsis remanei* sp. n. from there. Adults were collected from end of June until the end of August. Like other *Macropsis* species, it is univoltine and overwinters in the egg stage.

Holotype: Bavaria, Ramsau, Wimbachtal, 800–1000 m a.s.l., 08. VIII. 1997, ad. ♂. – **Paratypes:** Bavaria: Schwarzeck near Ramsau, 1000 m a.s.l., 24. VIII. 1996, 6 ♂♂, 8 ♀♀; Krün, Isar floodplains, 900 m a.s.l., 27. VIII. 1996, 1 ♂; Bad Tölz, Isar floodplains, 650 m a.s.l., 23. VI. 1997, 4 ♂♂, 5 ♀♀, 1 nymph; Vorderriss, Isar floodplains, 780 m a.s.l., 23. VI. 1997, 18 ♂♂, 9 nymphs; Ramsau, Wimbachtal, 800–1000 m a.s.l., 08. VIII. 1997, 12 ♂♂, 12 ♀♀ (2 ♂♂, 2 ♀♀ of these deposited in ZMS). Further specimens were found in HAUPT's collection (MTD): Mittenwald, Isar floodplains, 16. VII. 1924, 2 ♀♀, and 02. VIII. 1924, 2 ♀♀, all labelled *Pediopsis virescens* f. *nassata* GERM. (see HAUPT 1924).

Idiocerus vicinus MELICHAR, 1898

Bavaria: Vorderriss, Isar floodplains, 800 m a.s.l., 26. VIII. 1996, 2 ♂♂, 3 ♀♀, 1 nymph; 23. VI. 1997, 2 ♀♀; 04. VI. 1998, 7 ♀♀; Wallgau, Isar floodplains, 820 m a.s.l., 27. VIII. 1996, 2 ♂♂, 2 ♀♀ (freshly emerged); Mittenwald, Isar floodplains, 900 m a.s.l., 13. IX. 1996, 3 ♂♂, 1 ♀♀; Tyrol: Hinterriss, Rissbach floodplains, 940 m a.s.l., 23. VIII. 1998, 2 ♂♂, 3 ♀♀; almost all specimens on Purple Willow (*Salix purpurea*), few on Olive Willow (*S. eleagnos*), on gravel banks and along shores of rivers.

Described from Spain and reported by RIBAUT (1952) from different regions in southern France (including Alsace), the species at present is also known to occur in the Netherlands, Switzerland, Austria, Southern Russia, Italy, former Yugoslavia, Bulgaria and Greece (NAST 1986, 1987, GÜNTHART 1987b). The only published information on life history is a short note by RIBAUT (1952): “Sur les Saules”. There are no published records from Germany, although it is widely distributed in the Bavarian Alps and the upper Rhine valley: southern Baden: Achkarren, 300 m a.s.l., 02. VIII. 1997, 1 ♂; Burkheim, 180 m a.s.l., 02. VIII. 1997, 1 ♂, 2 ♀♀; Heitersheim, 250 m a.s.l., 06. VIII. 1997, 1 ♀; Palatinate: Speyer, 100 m a.s.l., 08. X. 1996, 1 ♀, and 17. VIII. 1998, 1 ♀; Bavaria: Ramsau, Hintersee, 820 m a.s.l., 1 ♂, 1 ♀; Isny, 750 m a.s.l., 22. VIII. 1998, 1 ♀.

Accordingly, the species is not confined to unregulated mountain rivers, but also lives along oxbow lakes, brooks and even ditches in lowland areas. Single specimens were collected on planted willows in vineyards and along roadsides far from water. The main host plant is *Salix purpurea*; few specimens were found on *S. eleagnos*, but only in close proximity to the previous species. Adults emerge in August, at least ♀♀ live until next June.

Opsius stactogalus FIEBER, 1866

Bavaria: Geretsried, Isar floodplains, 590 m a.s.l., 10. IX. 1994, 5 ♂♂, 9 ♀♀; Vorderriss, Isar floodplains, 780 m a.s.l., 26. VIII. 1996, 5 ♂♂, 13 ♀♀; Wallgau, Isar floodplains, 820 m a.s.l., 27. VIII. 1996, 3 ♂♂, 2 ♀♀; Krün, Isar floodplains, 900 m a.s.l., 27. VIII. 1996, 6 ♂♂, 1 ♀.

Following NAST (1972, 1987), the species is reported from Tadshikistan and Usbekistan to north-western Africa, western Europe and southern Scandinavia. North of the Alps, after REMANE & WACHMANN (1993), non-synanthropic populations are confined to river banks with German Tamarisk (*Myricaria germanica*). In contrast, in most parts of Central Europe it lives on ornamental *Tamarix* species in gardens and parks, the oldest records originating from the 19th century from Frankfurt (KIRSCHBAUM 1868). According to HAMILTON (1983), it was introduced to North America about 100 years ago and is well established there. The only records of non-synanthropic populations in Germany were published by FISCHER (1972) and SCHÖNITZER & OESTERLING (1998): Augsburg, Lech floodplains, 1936 and 1937, and Wolfratshausen, Pupplinger Au, 18. IX. 1944. The previous locality has since been drained.

Balclutha saltuella (KIRSCHBAUM, 1868)

Bavaria: Vorderriss, Isar floodplains, 800 m a.s.l., 27. VIII. 1996, 1 ♂, 1 ♀.

The species was described 130 years ago after one single ♀ from the surroundings of Wiesbaden, but has no more been found in Germany since. More records are from southern Lower Saxony: Ebergötzen (near Göttingen), 19. VIII. 1996, and southern Baden: Radolfzell, 21. VIII. 1998, 1 ♀ respectively, on roadside verges. It lives on grasses in more or less ruderal habitats. Its distribution is almost worldwide in subtropical and tropical zones (WEBB & VILBASTE 1994). In Europe, it occurs mainly on the Balkan Peninsula and in Mediterranean regions. Regarding the above mentioned records, there are irregular influxes into parts of Central Europe. Closest populations to these localities are in southern Moravia and in the middle Rhone valley (LAUTERER pers. comm., DELLA GIUSTINA in litt.).

Mimallygus lacteinervis (KIRSCHBAUM, 1868)

Bavaria: Vorderriss, Isar floodplains, 780 m a.s.l., 26. VIII. 1996, 6 ♂♂, 16 ♀♀; Vorderriss, Rissbach, 800 m a.s.l., 26. VIII. 1996, 1 ♂, 1 ♀; Krün, Isar floodplains, 900 m a.s.l., 1 ♂, 1 ♀; Mittenwald, Isar floodplains, 930 m a.s.l., 13. IX. 1996, 1 ♀; Tyrol: Hinterriss, Rissbach, 940 m a.s.l., 23. VIII. 1998, 1 ♂; on sparsely vegetated gravel banks, most specimens on very low shoots of Purple Willow (*Salix purpurea*), single ones on Olive Willow (*S. eleagnos*).

This is another species living on low pioneer bushes on almost bare gravel banks. After NAST (1972, 1987), it is known from France, Switzerland, Italy, Germany, Austria, former Yugoslavia and Albania. From Germany, there is only one single record: "K. Schmidt fing die Art zahlreich auf Geröllbänken an der Iller bei Oberstdorf im Allgäu" (FRANZ 1943). One of these specimens was seen in the collection of H.J. MÜLLER (now MTD) and is labelled "16. VIII. 1937". Probably these populations do no more exist, since the river Iller has been drained. Several authors mention Buckthorn (*Hippophae rhamnoides*) as host plant (KIRSCHBAUM 1868, MELICHAR 1896, MOOSBRUGGER 1946), which might be due to confusion with *Salix eleagnos*.

Ophiola decumana (KONTKANEN, 1949) sensu OSSIANNILSSON (1983)

Bavaria: Vorderriss, Isar floodplains, 780 m a.s.l., 26. VIII. 1996, 1 ♀; Wallgau, Isar floodplains, 820 m a.s.l., 27. VIII. 1996, 5 ♀♀; Krün, Isar floodplains, 900 m a.s.l., 27. VIII. 1996, 2 ♀♀; on gravel banks with scattered, but regular vegetation cover.

According to NAST (1972), this species is widespread in the Palaearctic, although within the genus there are different views concerning taxonomy and systematics.

In Central Europe, *O. decumana* (KONTK.) occurs locally, but sometimes highly abundant in different plant communities of early successional stages, mostly on sandy to gravelly substrates (e.g. sand and gravel pits, ruderal areas, military training areas, heavily trampled places). In most localities, host plants are Knotgrass (*Polygonum aviculare*) and Sheep's Sorrel (*Rumex acetosella*), in Sweden, after OSSIANNILSSON (1983), Bilberry (*Vaccinium myrtillus*) and Heather (*Calluna vulgaris*). Further records have been published by NIEDRINGHAUS & OLTHOFF (1993), REMANE (1987) and SCHIEMENZ et al. (1996).

Psammotettix unciger RIBAUT, 1938

Vorderriss, Isar floodplains, 780 m a.s.l., 26. VIII. 1997, 6 ♂♂, 8 ♀♀ on very scattered stems of Bank Reedgrass (*Calamagrostis pseudophragmites*) on almost bare gravel banks.

This species was recorded only twice before. It was described from the Bavarian Alps (Oberstdorf, Iller floodplains) by RIBAUT (1938) and then collected in Tyrol: Reutte, Lech floodplains, August 1973 (REMANE & FRÖHLICH 1994), both localities at an altitude of approximately 800 m a.s.l. Apparently it is very rare and endemic to gravel banks of braided rivers in the northern Alps. Populations along the river Iller are now probably extinct since its drainage.

RIBAUT (1938) and MOOSBRUGGER (1946) suggested that *P. unciger* RIB. might be conspecific with specimens collected in Vorarlberg, Austria, and preliminarily named "*Deltocephalus striatus* forma X" by HAUPT (1924). The author has revised parts of HAUPT's collection (now MTD) and found that these specimens belonged to *P. poecilus* (FL.). However, along the upper course of the river Isar both species live syntopically on the same host plant (see NICKEL 1999).

Errastunus antennalis (HAUPT, 1924)

Bavaria: Geretsried, Isar floodplains, 590 m a.s.l., 10. IX. 1994, 2 ♂♂, 2 ♀♀ on a gravel bank.

This is another species being only known from gravel banks along mountain streams in the northern part of the Alps. Altogether, there are 5 records from Austria and Germany: Vorarlberg: Bregenz, Ache floodplains, 400 m a.s.l., 03. VI. 1917 (HAUPT 1924); Tyrol: Reutte, Lech floodplains, 800 m a.s.l., August 1973. "eine relativ individuenreiche Population" (REMANE & FRÖHLICH 1994); Bavaria: Oberstdorf, Iller floodplains, 800 m a.s.l., 11. VIII. 1934 and 20. VIII. 1935, altogether 1 ♂, 2 ♀♀ (WAGNER 1939, see this paper also for a sufficient redescription); Ascholding, Isar floodplains, 600 m a.s.l., 07. VII. 1959, 1 ♂, 1 ♀, and 10. VII. 1959, 3 ♂♂, 1 ♀ (REMANE 1961). Little is known on its biology. It lives on grasses. Presumably it overwinters in the egg stage and has two generations a year.

Other Auchenorrhyncha species which commonly occur in disturbed habitats of various types in Central Europe were recorded along the upper Isar near Vorderriss. In this locality, a more or less complete, non-quantitative survey was made by sweep-netting and directly searching on all potential food plant species. Auchenorrhyncha species found included *Laodelphax striatellus* (FALL.), *Javesella dubia* (KBM.), *Javesella obscurella* (BOH.), *Macrostelus cristatus* (RIB.), *M. frontalis* (SCOTT), *M. horvathi* (W.WG.), *M. laevis* (RIB.), *M. lividus* (EDW.), *M. sexnotatus* (FALL.), *M. viridigriseus* (EDW.), *Limotettix striola* (FALL.) and *Psammotettix confinis* (DHLB.). Interestingly, *Javesella pellucida* (F.), probably the most abundant planthopper species in Central European lowlands, was not found.

3. Discussion

Auchenorrhyncha species treated in this paper can tentatively be divided into 4 groups with different requirements concerning food plants and abiotic conditions. However, it must be noted that the data base is weak and needs further confirmation by field studies. Some species have been recorded less than 10 times since their description.

1. Stenoecious species, being exclusively confined to this type of habitat and single host plant species, e.g. *Pseudodelphacodes flaviceps* (FIEB.), *Mimallygus lacteinervis* (KBM.), *Psammotettix unciger* RIB. and presumably *Errastunus antennalis* (HPT.).
2. Specialists regarding microclimate or substrate (e.g. density and height of vegetation, soil conditions), but with broader range of host plants, e.g. *Pentastiridius beieri* (W.WG.).
3. Monophagous species, living also in different types of habitat, provided their host plants occur, e.g. *Javesella stali* METC., *Idiocerus vicinus* MEL. and *Opsius stactogalus* FIEB.

Table 1: Traits of life strategies of some Auchenorrhyncha species living on alpine river banks.

Species	Wing length	Generation number	Food plant specificity	Habitat specificity	Distribution
<i>Pentastiridius beieri</i> (W.WG.)	m	1	po	st	Alps, Carpathians
<i>Pseudodelphacodes flaviceps</i> (FIEB.)	m/b	2	m1	st	Alps, endemic?
<i>Javesella stali</i> (METC.)	b/(m)	2	m1	ol	Siberia, Europe
<i>Macropsis remanei</i> sp. n.	m	1	m1	ol	Alps, endemic?
<i>Idiocerus vicinus</i> MEL.	m	1	m1	eu	Europe
<i>Opsius stactogalus</i> FIEB.	m	1	m1	eu	western Palearctic
<i>Mimallygus lacteinervis</i> (KBM.)	m/sb	1	m2?	st	Alps, Dinaric Alps
<i>Ophiola decumana</i> (KONTK.)	m	2?	po?	eu	Siberia, Europe
<i>Psammotettix unciger</i> RIB.	m	1?	m1?	st	northern Alps, endemic?
<i>Errastumus antennalis</i> (HPT.)	m/sb	2?	o?	st	northern Alps, endemic?

Abbreviations: m = macropterous, b = brachypterous, sb = subbrachypterous; m1 = monophagous 1st degree (1 host plant species only), m2 = monophagous 2nd degree (1 host plant genus), o = oligophagous (1 host plant family), po = polyphagous; st = stenotopic, ol = oligotopic, eu = eurytopic

4. Generalists with low host plant specificity, occurring on various types of pioneer vegetation, e.g. *Laodelphax striatellus* (FALL.), *Javesella obscurella* (BOH.), *Macrosteles sexnotatus* (FALL.), *M. cristatus* (RIB.) and *Psammotettix confinis* (DHLB.). These species are abundant in whole Central Europe and large parts of the Palearctic.

Table 1 summarizes the species mentioned above and traits of their life strategies. *Balclutha saltuella* (KBM.) and *Chloriona stenoptera* (FL.) are not included, due to erratic records in Central Europe. Species living in disturbed and temporary habitats should show a stronger tendency towards macroptery, higher generation number, polyphagy, broader range of habitats and larger distribution (NOVOTNÝ 1995, SOUTHWOOD 1988, TILMAN 1990, WARD 1992). This was demonstrated for the Auchenorrhyncha fauna of temporarily drained ponds in Czechia (KLIMES et al. 1991), newly-created polders in the Netherlands (SCHULTZ & MEIJER 1978) and intensively managed meadows in southern Germany (ACHTZIGER & NICKEL 1997).

Life traits of species treated here are only partially in accordance with conditions found in other temporary habitats (see Table 1). All species are either macropterous or wing dimorphic, as was also found by DENNO et al. (1991) and NOVOTNÝ (1994a), although after wing length definitions of OSSIANILSSON (1983), ♀♀ of *Mimallygus lacteinervis* (KBM.) and *Errastumus antennalis* (HPT.) would be termed sub-brachypterous. Regarding generation numbers, it appears that species, which live on grasses and forbs are mainly bivoltine, whereas those living on bushes are univoltine. This is in accordance with predictions, but it should be noted that *Salix* and *Myricaria* stands in these habitats are frequently inundated or even completely destroyed by floodings. While *Macropsis remanei* sp. n., *Idiocerus vicinus* MEL. and *Opsius stactogalus* FIEB. are also found in drier places, *Pentastiridius beieri* (W.WG.) and *Mimallygus lacteinervis* (KBM.) are confined to almost bare river banks, the former to taller, but almost dead bushes, the latter to very low-growing pioneer shoots.

Generally, species inhabiting temporary habitats, e.g. drained pond bottoms and intensively managed meadows, show a broad food plant range (NOVOTNÝ 1994b, ACHTZIGER & NICKEL 1997). However, most of the species mentioned here are monophagous (Table 1), with the exception of *Ophiola decumana* (KONTK.) and *Pentastiridius beieri* (W.WG.). Regarding abiotic conditions, e.g. soil qualities and moisture, habitat specificity of most Central European Auchenorrhyncha species of disturbed habitats is generally low, provided the vegetation is in an early successional stage. Habitats often range from salt meadows and ruderal places to cereal fields and intensively managed meadows (NICKEL in prep.). However, Auchenorrhyncha communities on alpine river banks show a high proportion of species, which live stenotopically in this type of habitat. Species in temporary habitats tend to be widely distributed, as was proposed for Auchenorrhyncha by NOVOTNÝ (1991, 1995), e.g. several species of *Javesella*, *Macrosteles* and *Psammotettix*. Some species living on banks of alpine rivers, however, have

only small ranges (Table 1). *Psammotettix unciger* RIB., *Errastunus antennalis* (HPT.) and possibly *Pseudodelphacodes flaviceps* (FIEB.) are even endemic in the Alps. *Pentastiridius beieri* (W.WG.) and *Mimalligus lacteivervis* (KBM.) are confined to European mountains.

Thus, general predictions for life strategies of species in disturbed habitats can only partially be confirmed for Auchenorrhyncha communities on banks of alpine rivers. Although all species are either macropterous or wing-dimorphic, some of them appear to show a small food plant range, high habitat specificity and small distribution ranges. However, the data presented here are not sufficient to question general explanations of the role that disturbance can play for selection of life strategies. They can only draw attention to some striking exceptions. As SOUTHWOOD (1988) suggested, there may be more than one evolutionary response to a particular environmental challenge.

4. Acknowledgement

My thanks are due to D.YU. TISHECHKIN for the drawings, as well as for comments on taxonomy of *Macropsis*, and to H. BAUMGÄRTNER, M. SCHAEFER and M.R. WILSON for helpful comments on the manuscript.

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