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Considerations on the presumed „mass extinction" of caddisflies and other insects

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Abstract. This paper is a contribution to the discussion on the „mass extinction of insects" (Insektensterben) and gives examples of Trichoptera species which were not found for a long time in particular areas. The only caddis species on earth with reasonable evidence that it is really extinct is *Hydropsyche tobiasi*, formerly known only from the River Rhine. *Platyphylax frauenfeldi* whose last population lives in River Drava at the border between Hungary and Croatia seems to be highly endangered.- Several cases of species with rare records or regional declines are discussed. It is unlikely that cold stenothermous species will die out by a moderate increase in global temperature.

Introduction

One of the dominant topics in the mass media of our days is the decrease of insects („Insektensterben"). Around the 1960s, European agriculture was rearranged from a traditional extensive cultivation to an intensive machine and fertiliser supported increasing productivity. The following dramatic decrease of butterflies was so impressive that it was noticed even by people who are not particularly interested in nature. Also other groups of free-living animals were heavily affected and were driven back to isolated sites. Unfortunately the mass media exaggerated the situation with unreliable statements such as e.g. „one third of plant and animal species will be extinct within the next 30 years" „eight million species are threatened by extinction" or „Every day, 150 plant and animal species die out", and the like. One of these headlines was „62% of caddisfly species are threatened by extinction". What is the real situation ? Here I present some cases with their real situation.

The term „extinct" or „die out" is used in different meanings. In some popular movies, an asteroid drops with flames and noise so that the big dinosaurs perish with scary roaring. On the other hand, we learn in books on history that ruling families had „died out" such as the Habsburg family with Emperor Karl VI because he had no sons as successors. But his daughter Maria Theresia and her offspring made sure that enough Habsburgs exist until now who however have the name Habsburg-Lothringen.

The extinction of animal species is a normal natural phenomenon. In the course of geological history, many more species became extinct than are presently existing. Normally their populations became too small for a successful propagation, and a minor influence of any kind, which would normally not affect them, may be enough for their total extinction. One can often observe this immediately in local populations. Nearby my house existed a dry slope with many species of butterflies including *Polyommatus coridon* in the years around 1970. Successively spruce trees grew up so that the remaining area with the foodplant *Hippocrepis comosa* decreased, and the abundance of the butterfly decreased correspondingly. In 2015 only a few tree-free square metres existed, the foodplant was still present, but the butterfly had disappeared. This is a normal procedure in the extinction process. The reasons may be very different, and are not understood in many cases. The normal explanation for the disappearance could be that the area of a species is split into small populations along the edge of the area which can break down also without a dramatic event.

On the other hand, we know examples in which small populations may survive over extraordinarily long periods. A population of *Limnephilus algosus* MCLACHLAN, 1868 lives very isolated in the tiny Sulzkarsee in Styria since the last glacial period in the Pleistocene which means a period of about 10.000 years (MALICKY 2014:52). Three species of the genus *Apataniana* live in isolated cold springbrooks in Greece for estimated hundreds of thousands of years as relicts of earlier glacial periods (MALICKY 2005:26; 2014:190, 205), and *Hughscottiella auricapilla* ULMER 1910 is surviving on the small Seychelles islands for at least 135 million years (MALICKY 1994).

In this paper I understand as „extinct" the total disappearance of a species from the earth with all of its populations, but this must be confirmed by appropriate methods. All of the species known from Baltic Amber in the Eocene Period (about 34 - 55 million years ago) are obviously extinct. With recent species, the confirmation of extinction depends on the possibility of reliable methods. Animals which are easy to observe and which are subject of study by many people, such as birds, deliver more information than animals with a hidden life such as caddisflies and other insects. Scientists often know the number of breeding bird couples in a region every year, but we may be glad if we had only one record of a caddis species in a large region over long periods.

The well-known Red Lists include the category „extinct or missing". This statement is however only valid for the respective area. Normally this means nothing else that the species was not found for a long period there, but it does not mean its total disappearance or extinction. I understand under „extinct" that a species has totally disappeared on earth and may only exist as preserved specimens in collections. In any case, it depends on careful monitoring and documentation. The only well documented extinct caddisfly is the European *Hydropsyche tobiasi*. I am not aware whether more examples are known from well-studied areas such as North America or Japan. For other parts of the world, in particular tropical regions, the faunistic documentation is too poor for this kind of conclusion.

1. Trichoptera species which are extinct or immediately endangered by extinction.

Hydropsyche tobiasi MALICKY, 1977

Hydropsyche tobiasi had lived, as far as we know, only in the middle part of the River Rhine and lower River Main, and was apparently abundant there at the beginning of the 20th century, as the series of specimens in some old collections demonstrate. Altogether more than 30 specimens were known from the years between 1906 and 1914 in museums, coming from the localities Neuenahr, Assmannshausen, Biebrich, Königswinter, Siegmündung, Rüdesheim and Bonn. At that time it was not yet recognised as a separate species, and was only later described as such after the examination of museum specimens (MALICKY 1977). The last record is from 4 August 1938 near Klingenberg am Main, collected by Walter Döhler (TOBIAS 1999). This was long before the heavy pollution disaster of the Rhine in 1986. Intensive search by Ragnar Kinzelbach in 1979 at Oppenheim, Schierstein and Ingelheim (MALICKY 1980) was negative; at this time the pollution of the river was extreme: in 3 light traps, far more than 100.000 specimens of *Hydropsyche contubernalis* (which is an unusually pollution resistant species) were collected, in addition to only 39 specimens of 6 other species of caddisflies. Another search at St. Goarshausen in 2004 and 2005 (MEY 2006), when the River Rhine was cleaner and had again more species, was also negative.

Platyphylax frauenfeldi BRAUER, 1857 ** Footnote

P. frauenfeldi is the next candidate in the extinction list. It is a large and relatively striking species which lives in big rivers. It was possibly widespread in Europe, but apparently already rare in the 19th century. Voucher specimens in museums came from Vienna (1879, 1932), from „River Mur" (1856), presumably from River Enns (labelled „Austria, Brittinger"), „from the Styrian border", from Bern and from the Berner Oberland (Switzerland), maybe also from Napoli and Marseille (MALICKY 2002, MALICKY & al. 2002). The last Austrian specimens were collected by ADLMANNSEDER (1973) at the River Inn near Reichersberg in 1956, where I could not find it again in 2001.

On the other hand, in the years 1976 to 1990 it was often found in Hungary along the River Dráva (UHERKOVICH & NÓGRÁDI 1997): altogether more than 100 specimens are documented from 14 sites including Böszénfa 1980, Kaposfő 1986, Sumony 1990, Szentborbás 1989, Szentpéterfölde 1989 und 1990, Barcs, Magyarszombatfa 1976, Középrigóc 1976. In adjacent Croatia it was found near Murščak 1999 by Perović, and one specimen probably from Varaždin 1940, by Košćec (MALICKY 2009). In autumn 2000 I have found, together with Ákos Uherkovich, four specimens at Vizvár and 37 specimens at Örtilos, which we used for breeding and for the description of the larva (MALICKY & al. 2002).

It was a concern that this beautiful species could be endangered by the construction of a power plant in the region. Meanwhile the region is now a National Park on both sides of the river. Uherkovich informed me on 12 December 2022 that he and other Hungarian colleagues were unable to find the species at several attempts at the known sites in the years 2002 to 2022. The last documented specimen is from 2001. – Considering the length of 80 km of the river in which *P. frauenfeldi* was recorded earlier than 2001, it is well possible that it still exists somewhere there, but it appears that the species is on its decline. River Dráva is one of the rare European rivers which are not yet canalised, and was never much polluted. Its tributary river the Mur was polluted for some time by paper mills, but this was before our rich catch in the autumn of 2000, and is meanwhile clean. The situation is not clear now.

The caddisflies of the Greek island of Serifos

Island endemics are particularly endangered, as many extinct animal species demonstrate (no Trichoptera until now). Many Mediterranean islands are inhabited by endemic caddisflies which however are not really endangered in the larger islands, as these are mountainous and sparsely settled by man. Possible danger exists in these cases rather near the shores by tourism or industry. Serifos is a tiny island of about 10 x 10 km size and is unusual in its rich caddis fauna (MALICKY 1987) as 12 species were found, three of them endemic (*Stactobia livadia* MALICKY, 1984, *Tinodes serifos* MALICKY, 1984 and *Hydropsyche pygmalion* MALICKY, 2001). To compare: on the larger islands of Naxos, Rhodos and Crete live 22, 29, and 40 species respectively; on other small islands like Kos, Paros, Skiros or Kea, 2, 2, 2 and 5 species, respectively, were recorded (MALICKY 2005). Only three or four small brooks run on Serifos, and the danger is high that they will be used for irrigation or for domestic use. Nevertheless, Ioannis Karaouzas tells me that he has found *Tinodes serifos* and *Hydropsyche pygmalion* in 2017. He has not found *Stactobia livadia*, but as this tiny insect is difficult to find, it may nevertheless still survive.

2. Examples of „missing" caddis species in Austria

Comparing the list of Austrian caddis species over the last approximately 50 years, a clear increase of known species is noted, and not a decrease as generally expected (MALICKY 1999, 2009a). That does however not mean immigration but better knowledge. *Polycentropus excisus* KLAPÁLEK, 1894 was earlier known from the Balkan Peninsula, but it turned out that it is widespread in Central Europe including Austria, Switzerland, Germany and Italy, also confirmed by old specimens in museum collections which were not correctly identified. Several species new to science were since found in Austria (*Rhyacophila ferox* GRAF, 2006, *Hydroptila ivisa* MALICKY, 1972, *Hydropsyche bulgaromanorum* MALICKY, 1977, *Consorophylax carinthiacus* MALICKY, 1992, *Melampophylax austriacus* MALICKY, 1990, *Rhyacophila konradthaleri* MALICKY, 2009). On the other hand, species which were confirmed by old voucher specimens in the collections, could not be found recently without explanation for a disappearance here. In contrast to Switzerland (LUBINI-FERLIN & VICENTINI 2005) an official faunistic survey programme had never existed in Austria. Our faunistical knowledge is a result of individual collecting activity mostly by amateur entomologists or a by-product of other research activity. During the last about 50 years I often got freshly collected material for identification, mostly by amateur entomologists, and I see, except the normal oscillation within the populations, no sign of a general decrease in individual and species number. This is the reality compared with fake stories in the mass media (e.g.. "studied freshwater populations decreased by 83%"). A few species however are lacking in the collections for some years.

The mystery of *Hydropsyche contubernalis* MCLACHLAN, 1865 in the Austrian Danube

The case of *Hydropsyche contubernalis* is mysterious. This is a common species, widespread in Europe and Siberia which is particularly pollution resistant (see above under *H. tobiasi*). It lives in smaller and larger rivers, but avoids higher elevations in mountains. In the Austrian Danube it was very common earlier, e.g. near Linz (O), Altenwörth (N), Deutsch Altenburg (N) as well as in the River March (N) (WARINGER & GRAF 2006). The closely related *H. bulgaromanorum* MALICKY, 1977 was regularly found in the Danube together with *contubernalis* in roughly equal abundance. Both species were represented in the type series from the River Thames after which MCLACHLAN had described the species *contubernalis*, but only from the revision by KIMMINS (1957) and the fixation of a lectotype it became clear which of the two had to carry the name *contubernalis*. The other species was without a name, for which, astonishing enough, no older synonyms were available. So I had named it in honour of the colleagues Kumanski and Botosaneanu *bulgaromanorum*, who had recorded it at the lower Danube (MALICKY 1977, 1984).

During the last few years it appears that *H. contubernalis* had disappeared from the Danube in Austria. [Records are given at the end of this publication; *H. contubernalis* is by no means extinct. In the last years including 2022 it was present in samples from other sites in Austria e.g. from River March and from several sites in Carinthia which I have studied. The reason for the decline in the Danube is not clear. It cannot be pollution because this species is extremely resistant to pollution (see above under *H. tobiasi*), and the River Danube was never extremely polluted.

**Footnote: Abbreviations for Austrian regions (Bundesländer): N – Niederösterreich (Lower Austria), O – Oberösterreich (Upper Austria), St – Styria, K – Carinthia, T – Tirol, S – Salzburg, V - Vorarlberg.

It is known that meanwhile some alien crustaceans and fish were introduced in the Danube which eat „everything", but if so, why do they possibly eat only the larvae of *H. contubernalis*, and not the closely related *H. bulgaromanorum* ? Feeding experiments may give an answer.

Psychomyia fragilis PICTET, 1834

This species was known from the outlet of the lake Lunzer Untersee (N) which is by far the warmest stream in the region and which has the temperature of the lake surface. *P. fragilis* has a Western European distribution (NEU & al. 2018:689) and is not rare in the Iberian Peninsula and prefers streams with rather higher temperature. Lunz is possibly its easternmost site. We know some other sites in Austria, mainly in Salzkammergut (O). Voucher specimens or records from the lake outlet in Lunz are available in the years 1955, 1970 and 1971, but since I had tried to find it at many occasions since by light-trapping and by sweeping without result. Nothing had changed with this stream, no building activity, no pollution.

Mass media try to explain everything with „earth heating" and „climate change". Austrian Radio said (http://noe.orf.at/news/stories/2793957/): „Before 1980 the lake had not a single day with a temperature more than 18°C, but meanwhile water temperatures of 24°C were recorded" [„Bis 1980 war der See an keinem Tag im Jahr wärmer als 18 Grad", „Mittlerweile werden im Hochsommer auch Wassertemperaturen von 24 Grad gemessen"]. In reality I had measured in the 1970s occasionally 24°C, and 22°C were a normal temperature during fine summer weather (MALICKY 1978a, 2014:14). Even in July of 1925, the lake had on three days in summer more than 20°C (BREHM & RUTTNER 1926:385). Such is the method how „climate change" is made by the mass media. Not to be misunderstood: the annual average of the air temperature here is now 2°C higher than 50 years ago, but the effect on caddisflies whose larvae live in water with different temperatures was never studied.

Similarly, *Rhyacophila praemorsa* MCLACHLAN, 1879 has probably its easternmost site while it is widespread in western Europe (NEU & al. 2018:788). It lives in small spring brooklets at the upper course of Kothbergbach near Lunz (N) and represents a small isolated population which still exists, with records from 1988, 2012 and 2022. Only one kilometre to the east, I had operated two emergence traps for eight years in another small brook near the locality Presslreith, where *praemorsa* was never recorded.

Annitella thuringica ULMER, 1909

The pond called Rohrwiesteich in the community of Gaming (N) is one of the two known localities of this species in the Alps. The other one is in the upper part of River Traun (O) with two records in 1995. I have discovered the species at Rohrwiesteich in 1969, and have since collected there almost every year in autumn. Normally the specimens were easy to find by net-sweeping of the vegetation. The last two male specimens were found on 21 October 2008. In October 2009 and all following years I found none. At the occasion of the construction of a small power plant in 2007, a deep ditch was carved through the shallow ground so that large lateral parts of the pond fell dry for two years. There is no objection against the power plant, but the ditch was useless as it was meanwhile already filled by the annual floods with gravel. As a result, all other known species in the pond are still present until now, but *Annitella thuringica* disappeared.

3. Rare records but locally abundant species:

If a species was not found for long time in a certain area, it does not necessarily mean its decline, but is often easily explained by the fact that it was not collected due to the lack of specialists or simply the lack of interest.

Ylodes kawraiskii MARTYNOV, 1909

Ylodes kawraiskii was known for a long time from a few specimens: Wien 1865, Wegscheid (St) 1876, Melk (N) 1883. A high number of records exists from the years 1959 to 1970 in southeastern Styria. In Kitzeck, Deutschlandsberg, Silberberg, St. Ulrich in Greith, Rassach, Kitzeck, St. Marein am Pickelbach, Graz, Kittenberg, Hartberg, Deutsch Haseldorf and Bad Gleichenberg were found altogether 165 specimens. Since this period, only one record was made at Lannach (St) in 1976 and another at the Marchfeldkanal (N) in 1998. This is a widespread species which was found from southern France to Afghanistan (NEU & al. 2018:395). The high number of records in the Sixties is striking but can easily explained: At the occasion of my visit to the Styrian Regional Museum Joanneum in 1971, the former curator E. Kreissl entrusted me two big paper bags with the rest of insects from light traps which were operated for the control of *Carpocapsa pomonella* (Apple Maggot) in southeastern Styria. The remaining insect catch from these traps was – exceptionally – not thrown away but sent to the Museum. The specimens were in poor condition but good enough for a safe identification. This is the explanation for the high number of *T. kawraiskii* in this region and period. Before nobody had collected there. But it is a mystery that Zweidick (2022) did not find the species in the same region between 2014 and 2022.

Hydropsyche silfvenii ULMER, 1906

(NEU & al. 2018:230). Single records from Ulrichsberg (O) 1915 (1 specimen), Haslach (O) 1974 (6), Gabrielental (N) 1978 (1), but 3496 specimens in a light trap at Stift Schlägl (O) 1982.

Ecclisopteryx dalecarlica KOLENATI, 1848

(NEU & al.2018:444). Single records from Haslach (O) 1974 (1 specimen), Leopoldstein (O) 1993 (2), 1995 (1), Sonnenwald bei Aigen i.M. (O) 2002 (1), Muhr (Lungau, S) 2003 (3), Lafnitz near Mayerhof (St) 2012, leg. Graf, but 3139 specimens in a light trap at Stift Schlägl (O) 1982.

4. Scattered and isolated records

The following species were recorded in Austria only by a few or single specimens, often many years ago. No conclusions for population dynamics can be drawn from these examples. Even if they were not found for many years, it does not mean that they are extinct. In most instances nobody had searched for them.

Limnephilus elegans CURTIS, 1834 is widespread in northern Europe and Siberia (NEU & al. 2018:534) and prefers peat bogs. In some peat bogs in adjacent countries it is regularly found (e.g. Červeno Blato in southern Bohemia). In Austria we have altogether only three records with each one specimen: Wachberg bei Melk (N) 1885 where no peat bogs are in the wide surrounding area; Ibmer Moos (O) 1951, which is a peat bog, and Gebhartsteich near Heidenreichstein (N) 1979 where peat bogs are only at some distance. Conclusions on increase or decrease with these kind of records are useless.

Grammotaulius nitidus MÜLLER, 1764: Only old records in Prater (Vienna) from the 19th century, each one specimen at Laudachsee (near Mt. Traunstein, O) 1876, Bruck an der Leitha (N) 1901, Gänserndorf (N) 1909. This is a widespread species with a rather northern distribution (NEU & al.

2018:513). which may be abundant e.g. at some sites in northern Germany. Surprisingly, Christian Wieser found one specimen on 16 September 2023 near Oberweiden, not far away from Gänserndorf.

Nemotaulius punctatolineatus RETZIUS, 1783: Records from: Admont (St) ca. 1900 (1 specimen); Premstätten near Graz (St) 1928 (1); Velden (K) 1937 (1); Kanzelhöhe (K) 1967 (3); Lannach 1976 (St) (2).

Setodes argentipunctellus MCLACHLAN, 1877: Gmunden (O) 1994 (some specimens); Kreuzstein, Mondsee (O) 1995 (1); Weyregg, Attersee (O) 2004 (3).

Chimarra marginata LINNAEUS, 1767: Gloggnitz 1856 (N) (1); Pregarten (O) 1933 (2), 1935 (7); Kopl Steinwänd (O) 1950 (1), and larval records in river Ager near Lenzing (O) 1991 (Graf & al. 1998).

Apatania muliebris MCLACHLAN, 1866: Biberwier (Tirol) 1974 (1); Deutsch Altenburg light trap 1989 (1); St.Georgen an der Gusen 2003 (1); Bad Ischl / Kreutern 2004 (1).

Molanna albicans ZETTERSTEDT, 1840: Only two records in Austria: Leiblachmündung at Lake Constance (V) July 1963 and August 1964, leg. Amann: 6♂.

Plectrocnemia kisbelai BOTOSANEANU, 1967: Only one record at Obermöschach near Hermagor (K) in a light trap 1.7.1985.

Plectrocnemia smiljae MARINKOVIĆ, 1966: Only one record at Mitterwinkel near Zell Pfarre (K) 3.7.1995.

Hydroptila taurica MARTYNOV, 1934: Only one male found at Schlarassingbach near Sölling (N) 11.7.1973, leg. Rausch. It could not be found again in a later visit to this brook. This species has a more southeastern distribution in Europe (NEU & al. 2018:286) so that this record was extremely unexpected, but it appeared not so strange when CHVOJKA (1996) found it in a locality in Bohemia which is far more northerly.

Limnephilus tauricus SCHMID, 1964: Only one specimen found near Moosbrunn (N) 27.8.96. This species is widespread in Europe and Asia Minor (NEU & al. 2018:557). but is usually found as single specimens and at unexpected sites far away from other known sites.

Ceraclea aurea PICTET, 1834: Only one specimen found at Hartberg (St) of this widespread species (NEU & al. 2018:363) on 25.7.1969 in an agricultural light-trap.

Tinodes sylvia RIS, 1903: Only a few specimens from the northern slope of Koschuta (K) 3.7.1995.

Beraea dira MCLACHLAN, 1875: This species was erroneously described from Turkestan which however was based on mislabelling (MALICKY 2005:584). From Austria it was only known by one male specimen with the label „Cari. 1854", collected by Josef Mann, (which is the abbreviation of Carinthia). In adjacent Slovenia and northern Italy it was regularly found and is not rare (NEU & al. 2018). ZWEIDICK (2022) has now found several specimens at four sites in Styria.

Potamophylax pallidus KLAPÁLEK, 1899: Only one specimen at St. Ulrich im Greith (Styria) in an agricultural light trap, 10.9.1959. It is not rare on the Balkan Peninsula (NEU & al. 2018:590). ZWEIDICK (2022) found now another specimen at Glanz an der Weinstraße (St) in 2018.

Leptocerus interruptus FABRICIUS, 1775: This widespread species (NEU & al.2018:372) was for long known from Winden near Melk (1883), leg. Strobl and was found in the years 1949 and 1952 on repeated occasions at Mauerbach near Hadersdorf (Lower Austria) by Mayer and Pleskot. At the same site it was found in 2016 again after 64 years (GRAF & al. 2017). During the decades between nobody had looked for it.

5. Immigration of southern species ?

According to the mass media, many southern species will immigrate caused by the "climate change". Are there real records in Trichoptera? Some insects may immigrate and expand their distribution area quickly. Recent examples in Europe are the mining moth *Cameraria ochridella* or the Asiatic ladybird *Harmonia axyridis*. Caddisflies, however, are expanding their area slowly. Only few examples are known such as in Hawaii (FLINT & al. 2003) or in Iceland (GISLASON & al. 2015, 2023). Even if single specimens were introduced, it is not sure whether they can build up a population.

On 22 May 2006, Christian Wieser caught one female of *Limnephilus flavospinosus* STEIN, 1874 in Carinthia, at the southern slope of Hohe Tauern near Mallnitz at 1720m elevation, at the upper edge of forests in a locality called Tauernmähder. This species is widespread in southern Europe (NEU & al. 2018:573). According to the observation of the collector, there was a strong southern wind during this day. *L. flavospinosus* is not a mountain species, but the circumstances of the catch are explained by its biology. Like in related other species of *Limnephilus*, the adults emerge in spring, perform a summer dormancy and oviposit only in autumn (NOVÁK & SEHNAL 1963). The adults spend the summer often higher in mountains where they preferably feed on the excretions of aphids on conifers (MALICKY 2005:42, 208-213). *L. flavospinosus* could well spend its complete life cycle in Austria. There are many records from adjacent northern Italy, Ticino and southern Tyrol. This voucher specimen was most probably „blown" by the southern wind from Italy to the high mountains in Carinthia, but proved autochthonous records in Austria are still missing.

6. Cold stenothermous Trichoptera in higher elevations

It is sometimes claimed that cold stenothermous species in higher mountain elevations may be driven to even higher elevations by increasing temperatures of their streams and springs so that they may perish when the mountains are not high enough. Sometimes this is suspected in connection with the well-known decline of glaciers. However, glacier outlets do not accommodate caddis larvae: the fine particles in this water disturb their oxygen uptake (MALICKY 2014:12). Caddisflies may live in springs in high elevations, but away from of glaciers.

An emergence trap was operated from May to December 1972 in a spring at the site Herrnalm near Lunz (N) in 1400m elevation (MALICKY 2014:72). This spring has a water temperature of 3°C almost over the whole year, with a slight warming up in summer, and may be indeed called cold stenothermous. Water freezes at 0°C, therefore springs cannot become much colder than this one. Brooks and springs in more than about 2500m elevation in the Alps are normally frozen to the ground and are not inhabited by caddis.

In this springbrook live the following undoubtedly cold stenothermous species:

Rhyacophila glareosa MCLACHLAN,1867,
Lithax niger HAGEN, 1864,
Acrophylax zerberus BRAUER,1867,
Allogamus uncatus BRAUER, 1857,
Drusus chrysotus RAMBUR, 1842,
Drusus monticola MCLACHLAN, 1876 und
Pseudopsilopteryx zimmeri MCLACHLAN, 1876.

A few metres nearby runs a stream called Taglesbach, a stream typical for this altitude in which more species live which are obviously not cold stenothermous as they live in a wider variety of temperature, such as *Rhyacophila aurata, R. tristis, R. vulgaris, Tinodes dives, Allogamus auricollis, Metanoea rhaetica* (MALICKY 2014:71-72).

Much deeper in the same valley, at 800m elevation runs the Schreierbach (MALICKY 2014:69) with a water temperature which was constant at 6,5°C over the whole year. This is a karstic stream with minimal temperature variations. All of the above species from the Herrnalm spring live also in the Schreierbach, together with other species which are lacking in the Herrnalm spring. These cold stenothermous species therefore have a tolerance limit of at least 3°C which means that they will not be endangered by a general moderate warming. Stream-inhabiting species in lower elevations however have by far higher temperature tolerances (MALICKY 2014:14-15).

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Locality records in the text may be unpublished data by the author, or are taken from *www.zobodat.at*.

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ZWEIDICK, Oliver, 2022, Rezente Köcherfliegenfunde (Trichoptera) aus dem Alpenvorland in der Steiermark und dem Burgenland mit Landesneufunden und dem Erstnachweis von *Parasetodes respersella* RAMBUR, 1842 in Österreich. – Beiträge zur Entomofaunistik 23:11-72.

Records of *H. contubernalis* and *H. bulgaromanorum* at the Danube: Linz (O): light trap at irregular nights over between 4 May 1976 and 26 October 1977 by G. Theischinger (MALICKY 1978); Altenwörth (N): permanent light trap from May 1986 to June 1987 (WARINGER 1989); Deutsch Altenburg (N): permanent light trap from February 1989 to March 1990 (WARINGER 1991); Ysperdorf and Sarling (N): light trap each one night by the author; Klein Pöchlarn: light trap in one night by E. Hüttinger (2016) and F. Pühringer (2017). The few specimens of *contubernalis* from 2017 and 2022 may have come from any nearby smaller stream].

	Linz 1976/77	Altenwörth 1986/87	Dt.Altenburg 1989	Ysperdorf 4.8.2016	Sarling 4.9.2016	Pöchlarn July 2016	Pöchlarn 23.6.2017	Ysperdorf 5.8.2022
contubernalis	6113	2130	2027	0	0	0	4	2
bulgaromanorum	787	5218	2144	ca.400	44	17	64	ca.300

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