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Issues Concerning the Conservation of the Rare Caddis *Erotesis baltica* McLachlan, 1877 (Trichoptera: Leptoceridae) in Poland

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ABSTRACT

The paper presents on the example of a red-listed caddisfly *Erotesis baltica* McLachlan, 1877 some issues important for insect biodiversity like: species distribution, preferences regarding the development habitats with some remarks on imprecise literature descriptions, threats and possibilities of protection as well as the problem with its status on the Red list and the potential role in being an umbrella species characteristic for vanishing lake littoral and fens in Poland.

Key words: Erotesis baltica, Trichoptera, fens, red lists, biodiversity.

INTRODUCTION

Caddisflies represent the orders of insects in which some European species are still insufficiently recognized in elementary terms of e.g. distribution (either local or regional), ecological preferences or even the description of preimaginal stages. This lack of basic information affects many branches of more detailed sciences as well as actions for nature in the light of maintaining biodiversity. One of the example are red lists which help to indicate the most endangered insect species together with their threats, however, they need regular updating (Witkowski, 2003; Haslett, 2007). This cannot be done without current faunistic data which in case of particularly rare species can be very doubtful or fragmentary and may lead to misunderstandings. This is the case of *Erotesis baltica* McLachlan, 1877 in Poland a very rare caddisfly with scarce data on the number of population and larval habitat preferences in Poland for most of its known records are imaginal. As a consequence, there are confusions concerning its distribution within the country, the characteristics of its habitats as well as the status on the Red list of Poland. This species can be treated as a model one for the problems which face many rare aquatic insects, with red-listed ones among others. The aim of this paper is to: (1) complete the knowledge on the distribution of this species in Poland, (2) present larval preferences towards habitats in the light

of comparative data from Europe and explain some common misconceptions about the habitats, (3) discuss the status of this species against European data with some proposals concerning Polish Red list and the list of caddisfly umbrella (cover) species, (4) asses the future perspective of the species against biodiversity issues.

Distribution of *Erotesis baltica* in Europe and Poland

Erotesis baltica has been recorded in the following regions of Europe: Italy, Corsica, Malta, Alps, Western and Central Highlands, Hungarian Lowlands, Western and Central Plains, Baltic Province, Eastern Plains, Great Britain, Borealic Uplands, Fenno-Scandian Shield and Taiga (Graf *et al.*, 2008).

In Poland, 12 sites of the occurrence of this species have been reported in the literature so far: four larval and eight imaginal records (Table 1). The last larval record (Buczyńska, 2012) was only mentioned in the checklist of caddisflies without detailed comments therefore, its description has been given for the first time. One larva (L5) was found on April 25, 2007 in a small water body on "Bagno Bubnów" calcareous fens near the village Sęków. The water body situated on the edge of the fens, had sandy substratum and highly variable water level, however, even in summer it dropped no lower than tens cm. Water was semi opaque, brownish. The basic water parameters (average values) were: water temperature 18.9 ºC, pH 7.64, electrolytic conductivity 424 µS/cm, oxygen (%) 27, oxygen (mg/l) 2.36. The submerged vegetation was very dense and consisted of *Chara* spp., *Drepanocladus aduncus*, *Myriophyllum* spp., moreover, the whole water body was rarely but equally overgrown by *Equisetum* spp. while *Iris pseudacorus* occurred around the edge of open water. One margin of the water body was shaded by dense *Salix* spp.

The new imaginal record came from the Pomorskie Lake District, Schodno village (area of the Wdzydzki Landscape Park), the River Wda - the stretch where it flows to Lake Schodno, with thick belt of *Phragmites australis* above which six males were caught into an entomological net during the day on July14, 2004.

The up to date larval records of *E. baltica* in Poland are limited to lake districts: two northern ones with early glacial landscape related to Pleistocene glacial and the south-eastern one with different origins of the lakes (thermokarstic or karstic). The sites of imaginal observations are scattered within the upland and lowland areas of Poland. In this light it can be concluded that this species is fairly regarded as a rare one but its range is much wider than it was previously concluded in the Fauna of Poland (Szczęsny and Majecki, 2007) where *E. baltica* was described as a northern species.

Habitat preferences of *Erotesis baltica*

E. baltica is described as a limnobiont either in Europe (Graf *et al.*, 2008) or in Poland (Czachorowski, 1998). In general, the spectrum of larval habitats given in European literature (Table 2) differs with respect to time, regions and degree of details provided by authors. However, very comprehensive descriptions are scarce: first comes from Scragh Bog, Co. Westmeath in Ireland (Hannigan *et al.*, 2009) where both larval and imaginal individuals were found. This site is very similar to the Polish larval

location described above. McBride *et al.* (2011), in the work about fens in the UK, also emphasized that this species develops in shallow, dense, submerged vegetation in clear water. In Germany Flößner *et al.* (1985) reported oligotrophic Lake Stechlin with the plant association of *Charetum filiformis* in the open region of the lake at a depth of 1.20-5 m while Teppke (2011) gave oligomesotrophic lakes and pools, with the bottom covered by *Chara* spp., with two different values of pH 6-7 or >7.5. The presence of *Chara* spp. was also significant at the larval site described above; according to the data from Pomerania this site would represent a pool with higher value of pH.

Table 1. Sites of *E. baltica* in Poland. L/I Larvae/Imagines, (?) no data available on numbers of individuals (n), * areas under protection.

Locality		Region	L/I (n)	Author/s
1. Szczecin (53º25'N, 14º32'E)		Szczecin Coast	I (?)	Ulmer, 1906
2. Range of district: 52º 50'-54 º 26'N, 18º 28'-23º 32'E		Mazurskie Lake District	L (?)	Szczepańska, 1958
3. Rogoźno (51º26'N, 18º27'E)		Central Masovian Lowland	I (2♂♂)	Tomaszewski, 1962
4. Białowieża Primeval Forest* (52º45'N, 23º50'E)		Northern Podlasie Lowland	I (?)	Mohammad *et al.*, 1987
Lakes	5. Redykajny (53º48'N, 20º24'E) 6. Narckie (53º32'N, 20º47'E) 7. Mikołajskie (53º47'N, 21º35'E) 8. Ublik (53º53'N, 21º53'E)	Mazurskie Lake District	L (8)	Czachorowski, 1998
9. Lake Jaczno (54º16'N, 22º51'E)		Lithuanian Lake District	L (3)	Buczyński *et al.*, 2001
10. Świętokrzyski National Park* (50º52'N, 20º59'E)		Kielce Upland	I (?)	Górecki, 2008, pers. comm.
11. Poleski National Park* (51º22'N, 23º15'E)		Western Polesie	L (1)	Buczyńska, 2012
12. Wielotów (51º50'N, 14º44'E)		Zielona Góra Heights	I (1♂)	Rychła & Buczyńska, 2013
13. Schodno* (54º03'N, 17º50'E)		Pomorskie Lake District	I (6♂♂)	new data

Older records concerning Polish lakes are limited to mesotrophic ones with vegetation referring to peat bog type while the latest records refer to eutrophic waters with fen-like type vegetation. In mesotrophic Lake Narckie the larvae were collected in vanishing littoral with floating *Sphagnum* mats together with *Stratiotes aloides* in water as well as ferns and sedges on the lake shore. In mesotrophic Lake Redykajny the larvae were found in 1989 in a small cove covered with *Sphagnum* moss and *Chara* meadows. During the re-examination of this lake in 2003-2004 it turned out to be that this habitat disappeared as well as *E. baltica* (Wissig, 2005). In eutrophic lakes the habitats were different: the shore of Lake Jaczno was a typical fen with dense *Phragmites australis* and numerous *Menyanthes trifoliata.* The similar scheme can be also observed at the new site of *E. baltica* in Lake Schodno. Although it referred to imagnes, they were not caught to a light trap but swept from reeds therefore we may suggest that their place of metamorphosis was close. Perhaps it took place in the lake shores which formed fen-like zones with dense *P. australis* and *Carex* spp. The extinction of this species in mesotrophic lakes may be related to the negative changes of these habitats which forced *E. baltica* to find alternative and less sensitive habitats.

At present, some descriptions of the habitats of *E. baltica* in literature can be a little confusing or too general. The term “peat bogs”, referring to transitional or high (raised) bogs, suggests that the species is strictly associated with *Sphagnum* moss and low pH. The data included in this paper indicates that the species seems to be associated more - at least in Poland but also in some other areas of Europe - with fens and fen-like habitats (littoral zones of lakes, pools, ditches) than with peat bog habitats. It is important in the light of looking for new potential sites of this species: we can not simply join the occurrence of this species with *Sphagnum* habitats like Peus (1932) (see Table. 2). In Poland, where fens comprise 92.4% of all raised, transitional peat bogs and fens together (Ilnicki, 2002), this species is extremely rare. There must be some limiting factors for larval development which may be connected with water parameters and/or habitat features. The presence of *Chara* spp. in waters where larvae were found may be a trail in finding new sites of this species. As for imagines, using light traps can be an effective method of locating the potential sites of this species since adults seem to be strongly associated with breeding sites.

Table 2. Literature data on the types of habitats occupied by *E. baltica* larvae in Europe. * According to Peus (1932) the development of the species at fens was not complete.

Type of larval habitats	Continent/country	Author/s
Lakes and bogs (moors) in lowlands	Europe	Botosaneanu and Malicky (1978)
Dykes and lake margins among dense vegetation; small pools, larger pools abutting fens.	Great Britain	Wallace (1991), Wallace (in press)
Peat bogs (*Sphagnum* bogs) and fens*	Germany	Peus (1932)
Fen ditches and standing waters (lakes or pools surrounded by fens)	Germany	Eidel (1952)
Bog habitats	Germany	Robert and Wichard (1994)
Ditches, ponds (pools) and peat-excavation waters	Netherlands	Higler (2005)
Dredged fens	Netherlands	Verberk *et al*. (2007)
Lakes (oligo-, meso- and eutrophic ones as well as of peat bog type)	Poland	Czachorowski (1998)
Bogs and ditches	Poland	Szczęsny and Majecki (2007)

Red lists and red books - the status of *Erotesis baltica* in Poland and Europe

In Europe the described species belongs to the group of caddisflies which are rarely recorded, moreover, the imaginal records are much often than larval ones. Many records described in the literature come from the 19th or the first half of the 20th centuries and - in some cases - the trials of rediscovering the species yielded no results. Nowadays *E. baltica* is included in Red lists of five countries in Europe and one Red data book of the region of Russia (Table 3). In Poland, in the first edition of the Red list (Szczęsny, 1992), *E. baltica* was included with “R” (rare) category. Ten years later (Szczęsny, 2002) its status was changed into “EX?” which indicated that the situation of this species changed for worse or the lack of current data. In 2007, in

the last check list of caddisflies (Szczęsny and Majecki, 2007), this red list category has been maintained. The data presented in this paper demonstrates that this species definitely cannot be treated as extinct in Poland anymore. Taking into consideration current criteria of the IUCN Red List (IUCN, 2014), it is impossible to use them and determine the status of *E. baltica*. The main problems lie in the impossibility of estimating: 1) the size of population in the past and present (too fragmentary data), and, as a result, any fluctuations cannot be analysed: 2) the total area occupied by the species (AOO). Therefore it is even hard to assign the proper criterion (A-E) which is a base for distinguishing the correct category. The only method of estimating the present abundance of *E. baltica* would be interpolation, however, what part of Polish fens and lakes should be used in such calculations? Not to mention that the score would be affected by error. Such problems, among others, were also emphasized by Cardoso *et al.* (2011) who analyzed the IUCN criteria in respect of invertebrates. In this light red lists cannot be always treated as a reliable tool which was also emphasized by Higler (2008) as for the Red list of Dutch Trichoptera or by Pietrzak and Czachorowski (2004) while analyzing the case of red listed *Leptocerus interruptus* in Poland.

Table 3. The presence of *E. baltica* in the Red list (RL) and Red Data Book (RB) in Europe.

Area	RL/RB	Author/s	Category
Great Britain	RL	Wallace, 1991	RDB 2=VU (vulnerable)
Germany	RL	Klima, 1998	3=VU (vulnerable)
Czech Republic	RL	Chvojka & Komzák, 2008	CR (critically endangered)
Hungary	RL	Nógradi & Uherkovich, 1999	E (endangered)
Switzerland	RL	Lubini et al., 2012	EN (endangered)
Leningrad Region	RB	Noskov, 2002	RE (regionally extinct)

Threats, protection and biodiversity

The situation of *E. baltica* in Poland is a two-fold case: four sites of this species are situated within protected areas (Table 1) which provide better perspectives for the maintenance of the populations. However, the real threats for caddisflies are negative changes in habitats demonstrated by pollution, eutrophication, drainage transformations of river valleys, river bed embankments or exploitation and drainage of fens and peat bogs, sinking of the water table (Baletto and Casale, 1991; Czachorowski *et al.*, 2004; Ruiz-García *et al.*, 2011; Blinn and Tiuter, 2013; Curtean-Bănăduc and Olosutean, 2013). For *E. baltica* water pollution, chemicals from fields and drainage of swamps (Noskov, 2002) as well as drying out of open fens (Wallace, in print) are the most crucial threats. The last two ones seem to be the most important especially for small pools, ditches and fens. Lakes seem to be safer than small water bodies which are sensitive to fast changes, especially to eutrophication and overgrowing. At the same time the littoral zone of lakes where this species was found can also undergo transformation which can be observed on the example of Lake Redykajny where the extinction of *E. baltica* caused by the vanishing of its habitat is confirmed. Such data

can be a real base for the evaluation of the status of this species, not hypothetical. The larval site described in the paper can also be helpful in finding potential new ones. We must be also aware that some species could adapt to new conditions or be more widely distributed than we thought. Eventually, the complete knowledge about valuable and/or endangered species is also important as the base of saving biodiversity which has been one of the most crucial priorities of the nature policy of the European Union. For insects the main method of maintaining their biodiversity is saving their habitats and environments (Samways, 1993; Czachorowski *et al.*, 2000; Dudgeon *et al.*, 2006). In this context *E. baltica* could be included in the group of caddisfly umbrella species characteristic for vanishing lake littoral and fens. So far, it was given as an umbrella species for lakes (Czachorowski *et al.*, 2000) but this category in the light of the results from this papers seems too narrow. *E. baltica* satisfies the conditions typical of such species: it is characteristic for these habitats, its larvae build easily recognizable cases and its development cycle is well recognized. Moreover, the pupal cases persist for some time after emergence and lengthen the time that the species can be comparative easily recorded (Wallace, in print). In this way it would support the idea of general protection of not only peat bogs (high and transitional ones) which already has its distinctive species *Hagenella clathrata* (Kolenati, 1848) (Czachorowski *et al.*, 2000) but also fen habitats. As an umbrella species, at the local scale, *E. baltica* may be useful in saving other valuable invertebrate species and, at larger scale, its presence can be also useful in distinguishing the most valuable fen habitats. As a consequence, such sites and populations can be preserved in the conservation network (Roberge and Angelstam, 2004). In this way *E. baltica* as an indicator of different fen habitats may perform higher use than its presence on the Red list.

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