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Rediscovery of *Leptestheria dahalacensis* and *Eoleptestheria ticinensis* (Crustacea: Branchiopoda: Spinicaudata): an overview on presence and conservation of clam shrimps in Austria

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Abstract

According to recent literature, five of the six known Austrian 'conchostracan' species are extinct. However, interim results of a current study on large freshwater branchiopods in Austria show that five species still occur at a restricted number of sites in the Pannonian region of Lower Austria. The clam shrimps *Leptestheria dahalacensis* and *Eoleptestheria ticinensis* were rediscovered in May 1994 in the flood plains of the river Morava near Marchegg. *Imnadia yeyetta* and *Cyzicus tetracerus* have been known to the authors in the same region since 1981, and 1992, respectively. *Limnadia lenticularis* occurs in the flood plains of the rivers Morava and Danube.

Lynceus brachyurus, the only Austrian representative of the Laevicaudata, was not found and most probably got extinct. All Austrian clam shrimp species are considered to be endangered. Main threats are agricultural activities and artificial changes of the hydrologic conditions. Conservational measures are discussed for their effectivity.

Introduction

The historic documentation on the distribution of clam shrimps ('conchostracans', i.e. orders Spinicaudata and Laevicaudata) in Austria has remained fragmentary, mainly due to their temporary occurrence. Up to now, only few systematic and faunistic investigations have been performed (Vornatscher, 1968; Hödl & Rieder, 1993).

Six 'conchostracan' species were reported from Austria (Vornatscher, 1968, see Table 1). All records are situated exclusively in the Pannonian region. Recently, with the exception of *Limnadia lenticularis* (L.), four were reported to be extinct and one species to be most probably extinct in Austria (Löffler, 1993: 173, Table 2). However, *Imnadia yeyetta* Hertzog and *Cyzicus tetracerus* (Krynicki) have been found regularly (since 1981 and 1992, respectively) in the flood plains of the March-river (Morava) near Marchegg (Hödl & Rieder, 1993; Hödl, 1994; Hödl & Eder, unpubl.). *Eoleptestheria ticinensis* (Balsamo-Crivelli) was reported by Vornatscher (1968) to be most probably extinct. This author knew only one Austrian site of this species in the 10^{th} district of Vienna, where urbanization had already extirpated the population. The latest specimen in the NHMW collection (Naturhistorisches Museum, Vienna) dates from 1879 (NHMW Crustacea collection, 1879.I.84). The latest record of *Leptestheria dahalacensis* (Rüppell) exists from 1975 (private collection H. Palme, Neureisenberg, pers. obs.), at a site near the river Leitha that has never been flooded since then. *Lynceus brachyurus* Müller, Austria's only representative of the Laevicaudata, was last found by Vornatscher in 1970 in the flood plains of the Morava (NHMW Crustacea collection, Aquis. No. 1948.XXI.1).

The distribution of large freshwater branchiopods (Anostraca, Notostraca, Spinicaudata, Laevicaudata) in Eastern Austria is currently being investigated (Eder & Hödl, unpubl.). All habitats known from literature were revisited. Additionally, astatic water bodies formerly unknown for large branchiopod occurrence were screened in the Pannonian lowlands of Eastern Austria. This paper presents preliminary results of our survey and an overview of known clam shrimp records in Austria.

Table 1. Current status of Austrian 'conchostracans'.
∗: cold water species
†: most probably extinct in Austria
‡: endangered in Austria
√: rediscovered for Austria in 1994

Taxon	Region	Present habitats	Extinct habitats	Reason for local extirpation
LAEVICAUDATA				
Lynceidae				
Lynceus brachyurus Müller, 1776 †	total	0	9	
	Morava	0	4	unclear
	Danube	0	1	urbanization
	others	0	4	road construction (3) urbanization (1)
SPINICAUDATA				
Cyzicidae				
Cyzicus tetracerus (Krynicki, 1830) ∗‡	total	3	4	
	Morava	3	0	
	others	0	4	road construction (3) urbanization (1)
Leptestheriidae				
Leptestheria dahalacensis (Rüppell, 1837) ‡√	total	2	18	
	Seewinkel	0	2	unclear
	Morava	2	3	agriculture
	Danube	0	11	hydrologic changes (dam)
	others	0	2	urbanization (1) afforestation (1)
Eoleptestheria ticinensis (Balsamo-Crivelli, 1859) ‡√	total	1	1	
	Morava	1	0	
	others	0	1	urbanization
Limnadiidae				
Limnadia lenticularis (Linnaeus, 1761) ‡	total	5 (+2?)	4 (+2?)	
	Seewinkel	1 ?	0	
	Morava	3	2?	agriculture
	Danube	1 (+1?)	3	urbanization (2) hydrologic changes (dam)
	others	0	1	urbanization
Imnadia yeyetta Hertzog, 1935 (∗)‡	total	3 (+2?)	5 (+1?)	
	Seewinkel	0	1 ?	unclear
	Morava	3	0	
	Danube	0	5	hydrologic changes (dam)
	others	2?	0	

Rediscoveries

Two yet unreported localities were found that contained two clamp shrimp species, thought to be extinct since 1879 and 1975, respectively.

Eoleptestheria ticinensis and *Leptestheria dahalacensis* (both identified according to Straskraba, 1966) were rediscovered at the 'Blumengang' near Markthof (16 °58′00″ E, 48 °10′42″ N; see Fig. 1), in May 1994, in the flood plains near the mouth region of the March-river (Morava). Both species co-occurred together with *Cyzicus tetracerus* and the notostracan *Triops cancriformis* (Bosc). The shallow lake covered an approximate area of 3.5 ha (700 m × 50 m) and had a maximum depth of 50 cm. High water of the river Danube caused flooding in April 1994 which lasted until the last week of June 1994.

Leptestheria dahalacensis was found in two small neighbouring astatic pools of the Morava's flood plain at the 'Lange Lüsse' near Marchegg-Bahnhof (16 °56′12″ E, 48 °14′23″ N; see Fig. 1), where it co-occurred with *Limnadia lenticularis*, *Imnadia yeyetta* and *Triops cancriformis*. The pools were flooded by the Lower Morava, dammed up due to the high water level of the Danube in April 1994. These sites fell dry at the end of May 1994.

Specimens of the found species were deposited in the NHMW Crustacea collection (catalogue numbers 10389 to 10396).

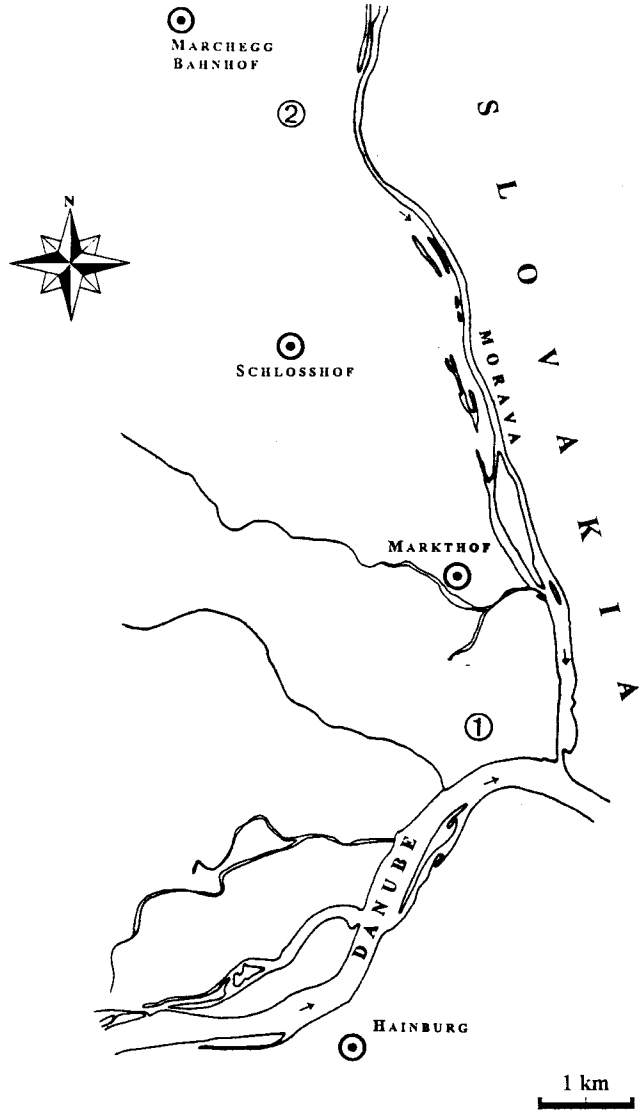

Fig. 1. Austrian localities of the clam shrimps *Eoleptestheria ticinensis* (1) and *Leptestheria dahalacensis* (1,2). 1: 'Blumengang'. 2: 'Lange Lüsse'.

Present occurrence of clam shrimps in Austria

Considering the actual data on 'conchostracan' distribution, only *Lynceus brachyurus* (Laevicaudata) most probably got extinct in Austria. All spinicaudatan species were reported from the Pannonian region of Austria in 1994, from a restricted number of sites only (see Table 1).

Threats

In spite of their ability to produce drought-resistant resting eggs (Wiggings *et al.*, 1980), all Austrian clam shrimps have to be considered as endangered. Most of the current main threats to conchostracan diversity are listed by Löffler (1993).

Agricultural development is a major cause for physical destruction of habitats. Wetlands and swamps are either drained or filled up with substrate. This development is currently threatening many of the shallow pools along the Morava (pers. obs.). Moreover, the excessive use of groundwater for irrigation lowers the groundwater lable. The impact of fertilizers, herbicides, and pesticides is difficult to estimate; most probably the cold water species are affected more than the aestival species due to their lower resistance to salinity (pers. obs.). However, decreasing agricultural activities (most possibly caused by Austria's membership in the European Community) may lead to the extirpation of habitats as well. Without a regular cut, meadows will

turn into forests, and exposure to sunlight necessary for aestival species is lost (Rieder, 1989).

A major reason for the local extirpation of clam shrimp habitats are changes of the hydrologic conditions (see Table 1). The main reason for these changes are the dams of new hydroelectric plants at the Danube, cutting off former astatic pools from river inundations. A still pending threat is the planned power station at the Danube near Wolfsthal, six kilometers downriver from the mouth of the Morava (Wagner & Gayl, 1988). Its dam would considerably change the water level dynamics. Since 1989, the storage lakes of the river Thaya in Southern Moravia near Nove Mlyny strongly affect the hydrologic dynamics of the Morava, levelling the highest peaks (Marschitz & Käfel, unpubl. study, 1993). As a consequence, the regular inundations of the astatic pools along the March-river are no longer guaranteed.

Urbanization took part in local extinction of conchostracans in the city of Vienna, but plays a minor role in the easternmost parts of Austria, where human population has been decreasing during the latest decades (Österreichisches Stastisches Zentralamt, 1992). Litter disposal is a problem difficult to predict, but not endangering any known conchostracan habitat at present (pers. obs.).

Conservation

As in most other species, clam shrimp protection can only be achieved by habitat protection. The wetlands of Danube and Morava are protected under the Ramsar Convention of 1971, a Council-of-Europe resolution of 1975, and the Bern Convention of 1979. However, the status of protection has not been effectively executed in practice (Farasin & Lazowski, 1990).

So far, neither any of the known temporary pools with high 'conchostracan' diversity is protected; nor any of the species listed above can be found in the Austrian Red Data Book of Endangered Species (Gepp, 1984). The Red Data Book has no force of law, but can be used for conservation planning purposes and provides an accepted basis for conservational procedure. Both objectives, listing of threatened clam shrimps and protection of important habitats are now aimed by the authors.

The 'Blumengang' site (1 in Fig. 1) is federal property. Recently the authors proposed natural protection of this area. The declaration as nature reserve is presumably the most effective way of preserving endangered habitats. However, in the case of private property, as is the 'Lange Lüsse' (2 in Fig. 1), legal protection sometimes faces severe problems. Without adequate information strategies, farmers may refuse conservational measures (Suske, unpubl.). A way of direct collaboration with the local farmers is intended by the 'Verein zur Erhaltung und Förderung ländlicher Lebensräume (Distelverein)'. In order to save valuable anthropogenic habitats like e.g. temporarily flooded meadows, direct payments to the farmers shall ensure continued 'wise use' or even renaturation of intensively used acres into meadows. The following years will show the efficacy of this model of collaboration for clam shrimp habitats.

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