

FIRST FINDINGS OF THE CLAM SHRIMPS *LEPTESTHERIA* SARS, 1896 AND *IMNADIA* HERTZOG, 1935 (CRUSTACEA, CONCHOSTRACA) IN THE WESTERN FOOTHILLS OF THE STARA PLANINA MOUNTAINS, SERBIA

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Abstract - During 2004 conchostracans *Imnadia* and *Leptestheria* were recorded near the Serbian-Bulgarian border, in the foothills of the Western Stara Planina Mountains. *Leptestheria* occurred in relatively large density and was presented by adults of both sexes. *Imnadia* was identified only by resting eggs separated from the pond sediment. This is the first report of genus *Imnadia* in the Balkans, and also a first record of the second genus in the limnological area of the 'Eastern Balkans'.

Key words: Conchostraca, *Leptestheria*, *Imnadia*, Stara Planina, the Balkan Peninsula

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INTRODUCTION

Clam shrimps, which belong to the conchostracan group of large branchiopods (Branchiopoda, Crustacea), need a dry period for egg hatching and are progressively eliminated at higher latitudes, where low temperatures slow embryonic development and the growth rate (Brtek and Thiéry, 1995). Belk (1977) and Geddes (1983) showed that species richness is related to habitat diversity. In regions with alternation of dry and rainy periods, species richness increases from the extremely dry southern regions, to the northern ones with rainy climates.

General distribution pattern

The genus *Leptestheria* Sars, 1896 has a worldwide distribution (North America, Europe, Asia, and Africa). The geographic distribution of the genus in Europe is shown in Fig. 1. *Leptestheria* mainly inhabits the Pannonian lowlands and the Romanian or Wallachian plains in the basins of the lower Danube and lower Dniester Rivers in continuation with the Ukrainian steppes (Bănărescu, 1991). The genus also inhabits some places in the 'Eastern Balkans' and 'Dinaric Western Balkans' (according to Illies, 1978).

Imnadia Hertzog, 1935 is an endemic European genus. It is present in Central Europe (Fig. 2), mainly on the Pannonian Plain (lowlands in Austria, Slovakia, Hungary and Northern Serbia) and in the lowlands of Romania (in the basin of the Middle Danube). Until now there were no data indicating the presence of this genus in the Balkans (Bănărescu, 1991; Brtek and Thiéry, 1995).

Distribution in Serbia

To date investigations of Conchostraca in Serbia were performed mainly in the northern parts (on the Pannonian Plain), whereas data from the southern region of the country were scarce (Marinček and Petrov, 1991).

Leptestheria is the most common conchostracan genus found in the northern, Pannonian part of the country. Numerous populations from the Morava Valley in Central Serbia also belong to this genus (Marinček and Petrov, 1991). The genus is represented by two species: the common species *L. saetosa* Marinček & Petrov, 1992 and *L. dahalacensis* (Rüppell, 1837), reported by Marinček (1961) from only one locality. Petrov and Petrov (1997) suggested that *L. saetosa* could also be *L. dahalacensis*.

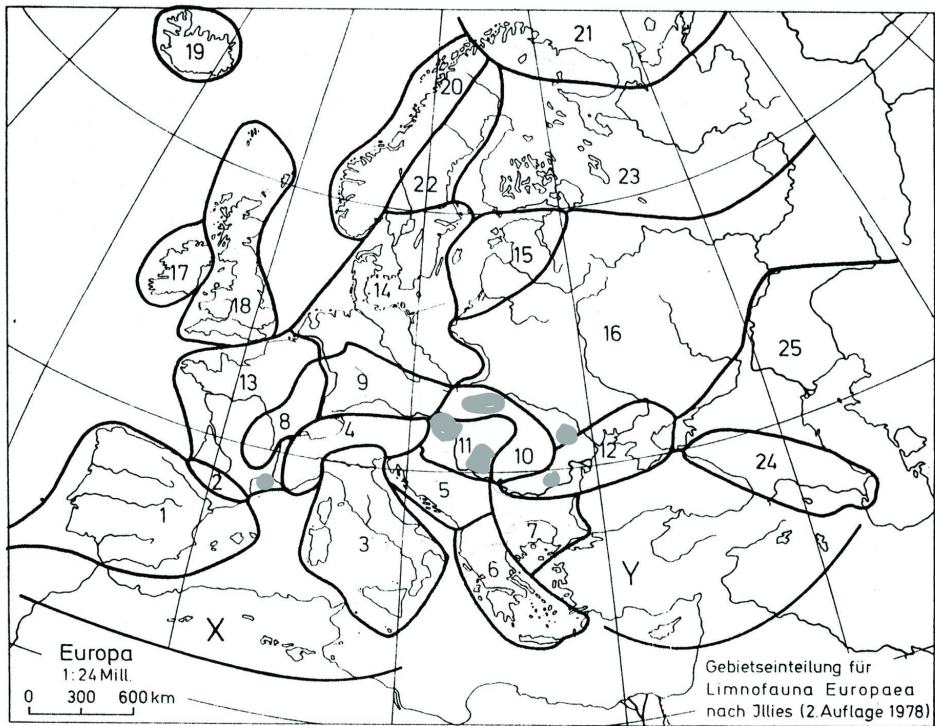


Fig. 1. Distribution of the genus *Imnadia* in Europe (according to Illies, 1978 and Brtek and Thiéry, 1995, combined).

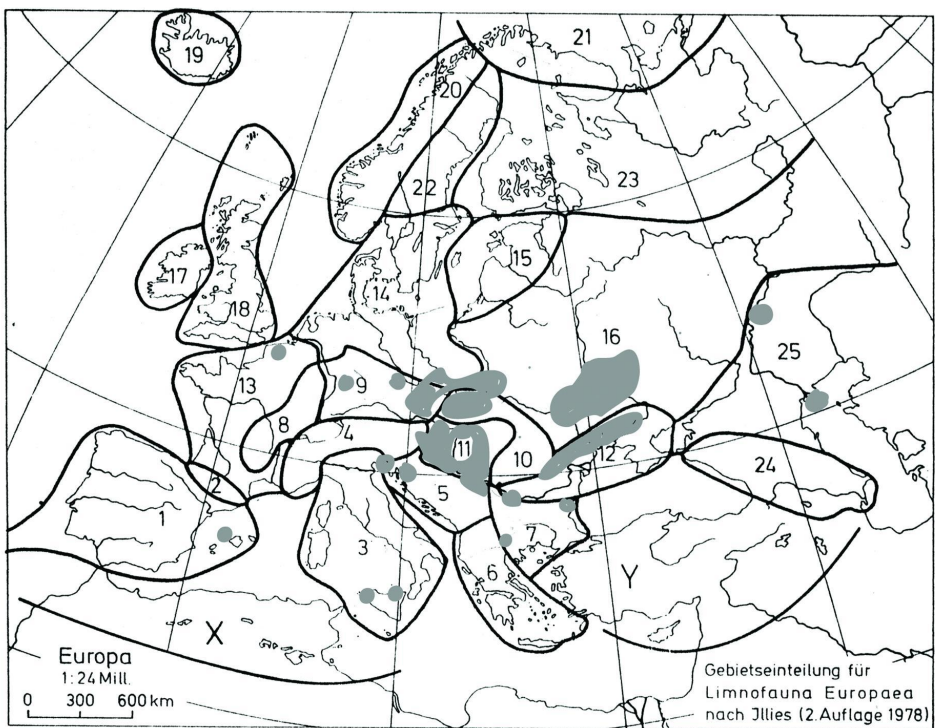


Fig. 2. Distribution of the genus *Leptestheria* in Europe (according to Illies, 1978 and Brtek and Thiéry, 1995, combined).

Within the genus *Imnadia* three species have been found in Serbia: *I. cristata* Marinček, 1972, *I. banatica* Marinček & Valvajter, 1982, and *I. panonica* Marinček & Petrov, 1984, all in the Pannonian part of the country. On the IUCN Red List of Endangered Species, they are listed as vulnerable (S k e t, 1996).

MATERIAL AND METHODS

This research is based on our field investigations during 2004 near the Serbian-Bulgarian border, in the western foothills of the Stara Planina Mountains. The investigated area is situated along the left bank of the Nišava River 4 km upstream from the city of Pirot near the village of Trnjana (43° 07.403' N and 22° 40.148' E) at an altitude of 387 m. Specimens were collected from shallow pools on an unpaved road. Sampling was carried out using standard technique (specimens were collected with a hand net and preserved in ethanol). Both resting eggs and carapaces were dehydrated in alcohol, mounted on stubs, coated with gold (10 nm at 25 kV, Bal-Tec SCD 005), and observed under a JEOL JSM 6460LV scanning electron microscope. Diameter was measured with the SEM numerical point-point system.

RESULTS AND DISCUSSION

Leptestheria (family Leptestheriidae Daday, 1923) occurred in relatively large numbers. Females were somewhat smaller than males. Up to 10 growth lines were present. To judge from diameter of the carapace and the number of growth lines (P e t r o v, 1990; P e t r o v and M a r i n č e k, 1995), they were younger adults. Generally, setae were present along the free margin of the shell and (particularly in females) along the growth lines, as in *L. saetosa* (Fig. 3). Females had trunk limbs modified to structures that glue eggs to the abdomen, but we did not observe any clutch of resting eggs within the carapace in the present population.

We identified the genus *Imnadia* (family Imnadiidae Botnauric & Orghidan, 1941) only on the basis of resting eggs separated from the pool sediment. In this genus the cyst patterns are unique among large branchiopods and can be considered as generic (T h i é r y et al., 1995). Eggs are ovoid, 175 to 179 μm in size, with characteristic spiraled surface (Fig. 4).

Ecology

Leptestheria was found in late spring. Specimens

occurred in high density in the same pool with *Imnadia* eggs. The pools were small, turbid and shallow, with a muddy bottom. They co-occurred with *Branchipus* Schaeffer, 1766 and gastropods. Their potential predators (frogs) were also present. pH of the water varied between 7 and 8. The water temperature was 21°C.

Distribution pattern

The genus *Leptestheria* is known mainly from the lowland regions and river valleys of Europe (Brtek and Thiéry, 1995). Thus, the record of this genus along the

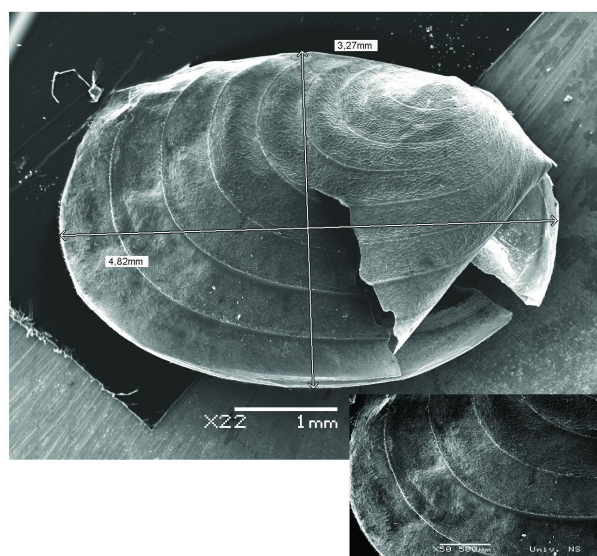


Fig. 3. Carapace microstructure of *Leptestheria* (SEM).



Fig. 4. SEM of resting egg of *Imnadia*.

Nišava River in Eastern Serbia was to some extent expected. This population probably belongs to *L. saetosa*, to judge from the presence and distribution of setae on the shell (Marinček and Petrov, 1992).

Up to now there were no confirmations of the presence of the European endemic genus *Imnadia* in the limnological area of the Balkans (according to Illies, 1978).

Both *Imnadia* and *Leptestheria* were previously noted mainly in the northern parts of Serbia (Fig. 5) and were determined as faunal elements of the Pannonian region (Petrov and Petrov, 1997). The evidence from the western foothills of the Stara Planina Mountains represents the first findings of the given genera in this region. Brtek and Thiéry (1995) noted mountainous regions of the Balkans as climatic refugia during periods of glaciation, aridization, and transgressions and as a center of diversification of some branchiopod families in Europe, including Limnadiidae Burmeister, 1843 [Brtek

and Thiéry (1995) consider the genus *Imnadia* to be a member of the family Limnadiidae]. According to the same authors, *Imnadia* is distributed between 40° N and 50° N. Thus, finding of *Imnadia* in the investigated area was to be expected and additionally supports Brtek and Thiéry's theory. One of the possible paths of dispersal of these genera could be through the northward corridor composed of the Morava and Danube Rivers. Another possibility is that the Pannonian Plain, which is noted as a distinct area of endemism in Central Europe (Bănărescu, 1991), could be the center of origin of these genera, *Leptestheria* in particular.

Our finding represents the first report indicating the presence of the genus *Imnadia* in the Balkans. The presence of *Imnadia* and *Leptestheria* in the western foothills of the Stara Planina Mountains further suggests the possibility that the given genera can also be found in other parts of these mountains.

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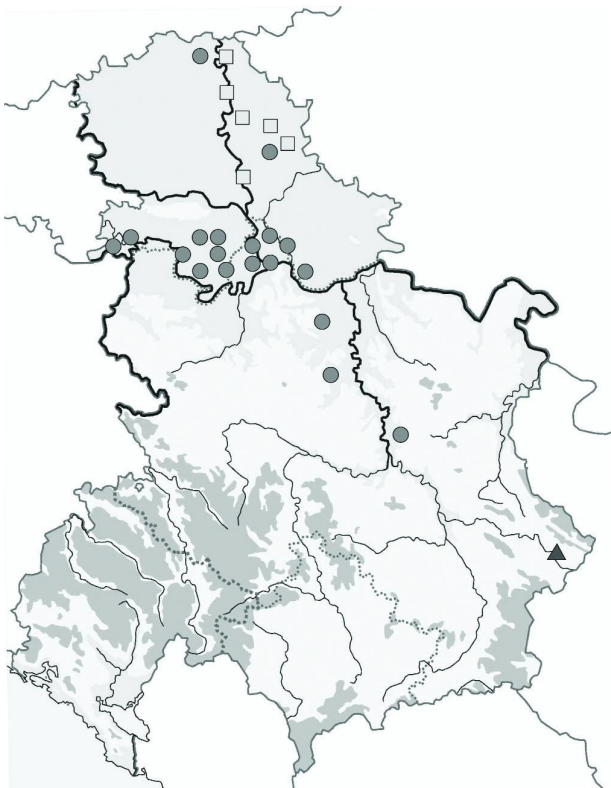


Fig. 5. Distribution of *Imnadia* (squares) and *Leptestheria* (circles) in Serbia, (according to Marinček and Petrov, 1991 and Petrov and Petrov, 1997, combined). The region of new findings of these genera is marked with a triangle.

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ПРВИ НАЛАЗ *LEPTESTHERIA* SARS, 1896 И *IMNADIA* HERTZOG, 1935 (CRUSTACEA, CONCHOSTRACA) У ЗАПАДНОМ ДЕЛУ СТАРЕ ПЛАНИНЕ

ДРАГАНА МИЛИЧИЋ И БРИГИТА ПЕТРОВ

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Род *Leptestheria* Sars, 1896 има космополитско распрострањење (Северна Америка, Европа, Азија и Африка). На Балкану насељава лимнолошку област Источног и Западно – Динарског дела Балканског полуострва (Illies, 1978; Vanárcs, 1991). *Imnadia* Hertzog, 1935 је европски ендемични род, заступљен у централним деловима Европе, углавном у деловима Панонске низије који припадају Аустрији, Словачкој, Мађарској и Србији), као и у низијском делу Румуније (долина средњег тока Дунава).

У Србији родови *Leptestheria* и *Imnadia* углавном су познати из панонског дела Србије а род *Leptestheria* је регистрован и дуж обала Велике Мораве у централној Србији (Marinček and Petrov, 1991).

У току 2004. године, родови *Leptestheria* и *Imnadia* су по први пут регистровани у региону Старе Планине, у барама дуж обала реке Нишаве, у близини српско-бугарске границе. Род *Leptestheria* се јављао у релативно густим популацијама. На основу дијаметра карапакса и броја нараштајних линија, јединке су припадале млађим адултима (Petrov, 1990). Род *Imnadia* је идентификован само на основу мирујућих

цисти изолованих из седимента баре. Јаја су овална, дијаметра 175 до 179 μm , спиралног изгледа. Заједно са јединкама *Imnadia* и *Leptestheria*, у барама су регистроване и јединке рода *Branchipus*, пужеви и жабе. Баре у којима су налажене ове заједнице биле су плитке, малих димензија, замућене, са муљевитим дном (рН 7 – 8, температура воде 21° С).

С обзиром на чињеницу да је род *Leptestheria* у Европи распрострањен углавном у равничарским пределима и долинама река, присуство овог рода у долини реке Нишаве је донекле очекиван. На основу присуства и распореда сета на љуштурици, ова популација вероватно припада врсти *L. saetosa* (Marinček and Petrov, 1992). Међутим, све до сада, европски ендемични род *Imnadia* није био регистрован у овом делу земље, нити регистрован у оквиру читавог лимнолошког подручја Балкана (Illies, 1978). Наш налаз овог рода је први како за регион Западне Старе Планине, тако и за Балкан уопште. Присуство родова *Leptestheria* и *Imnadia* у области западног дела Старе Планине указује да постоји могућност да ови родови насељавају и друге делове те планине.