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**NEW INFORMATION ON THE TROPHIC SPECIALIZATION  
OF *GALERUCELLA NYMPHAEAE* (LINNAEUS, 1758)  
(COLEOPTERA, CHRYSOMELIDAE) OF ALTAI KRAI**

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Feeding of *Galerucella nymphaea* (Linnaeus, 1758) (Coleoptera, Chrysomelidae) on leaves of water chestnut (*Trapa natans* L.) was registered in Siberia for the first time.

*Key words:* *Galerucella nymphaea* L., Chrysomelidae, *Trapa natans* L., trophic relations, Altai Krai.

## INTRODUCTION

*Galerucella nymphaea* (Linnaeus, 1758) (Coleoptera, Chrysomelidae) is a widespread holarctic species (Beenen, 2010). The literature reports that the basic food plants of this leaf beetle are white water lily (*Nymphaea alba*) and yellow water-lily (*Nuphar lutea*) (Nymphaeaceae) (Medvedev & Roginskaya, 1988; Guskova, 2001). However the representatives of this species can feed on other plants: *Polygonum*, *Rumex* (Polygonaceae), *Potentilla* (Rosaceae) and others (Brovdiy, 1973), and its nutrition on currants has been registered in Siberia (Dubeshko & Medvedev, 1989).

## RESULTS

In Zmeinogorskiy district of Altai Krai on Lake Kolyvanskoye on the 25th of August, 2013, *G. nymphaea* beetles and instar larvae actively feeding on leaves of water chestnut *Trapa natans* L. (Trapaceae) were registered in large quantity (Figs 1–2).



Fig. 1. Russia, Altai Krai, Zmeinogorskii district, lake Kolyvanskoe.

Despite the availability of large amounts of yellow and white water lilies in the lake, the larvae and beetles fed only on floating leaves of water chestnut. The instars larvae skeletonized the lamina leaving only large veins, and the beetles gnawed the leaf completely, making ribbon-like holes. Both beetles and larvae fed on the upper side of the leaves. The trophic connection of *G. nymphaea* with *T. natans* was also registered in France, Italy, Poland, Switzerland (Pemberton, 2002) and in Ukraine (Trach, 2002; Reshetnyak, 2015). However on the territory of Siberia the nutrition of this leaf beetle on the water chestnut has not been registered yet.



Fig. 2. Beetles and larvae *Galerucella nymphaeae* (Linnaeus, 1758) on the *Trapa natans* L. Russia, Altai Krai, Zmeinogorskii district, lake Kolyvanskoe, 25.08.2013.

Photo by R.V. Yakovlev.

*Trapa natans* (water chestnut, roguhnik, chilim) (Trapaceae) is a relic of the Tertiary period which is shown by the fragmentation of its current range and by the palaeobotanic studies (Yarmolenko, 1935; Palibin, 1936; Karasev, 2002). Water chestnut is widespread from moderate to tropical regions of Eurasia and Africa, its northern border is 54-57° of north latitude (Vasilyev & Belavskaya, 1981), in it also introduces into North America. It is a rare plant for Siberia. In West Siberia it is registered in Tomsk, Novosibirsk and Kemerovo Provinces, Altai Krai and the Altai Republic (Vlasova, 1996; Viser & Kipriyanova, 2009).

Water chestnut is also quite rare in Europe, it has been categorized as A (ii) (endangered species), it is included into Appendix 1 of the Berne Convention (The Convention on the conservation of European Wildlife and Natural Habitats, Bern, 19 IX 1979) and into the Summary of the Rare and Endangered Plants of Siberia (1980), the Red data Book of USSR (1984), the Red data Book of the Russian Federation (1988), the Red data Book of Altai Krai (2006) and the Red Book of the Altai Republic

(2007). In the Altai Krai six habitats of the species are known, the largest is Kolyvanskoye lake (over 5000 specimens). The other five are: Biysk district (Kanonerskoye lake), Smolenskoe district (Khomutina lake), Tal'menka district (the area of villages Tal'menka and Ozerki), Ust'-Pristan' district (the area of village Elbanka) (Durnikin, 2006). Due to this species rarity, the study of various aspects of its biology, including trophic connections, is of particular interest.

It is interesting that in different parts of its habitat – in the natural, as well as in the anthropogenic one – the water chestnut is either a protected species (Europe, Siberia) or a harmful one (impeding the development of indigenous flora and fauna, navigation and recreational potential of water bodies) (northeastern United States, including the states of New York, Connecticut, Delaware, Maryland, Massachusetts, New Hampshire, Pennsylvania, Vermont, Virginia and Washington, DC, and the province of Quebec in Canada), or a specially cultivated species (India, China, Vietnam, Thailand), where the leaf beetles of genus *Galerucella* damage the water chestnut plantations.

In the USA and Canada considering that the water chestnut is an invasive adventive element of flora, there are no aboriginal phytophages. To develop the biological control over *T. natans* on the US territory the species of genus *Galerucella*, oriental *G. birmanica* Jacoby, 1889 and *G. nymphaeae*, were brought in (Schmidt, 1985; Pemberton, 1999, 2002; Ding et al., 2007). These actions did not bring any significant results.

In connection with the above, the discovery of the active nutrition of larvae and adults of *G. nymphaeae* on the water chestnut in Altai Krai has a dual significance. First, it can show a possible decrease in the population of the protected species. Second, it is a possibility to use the Siberian population of the leaf beetle in the development of biological control over *T. natans* on the territories where this species is a weed.

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