

New data on the biology and distribution of the *Lathromeroidea silvarum* Nowicki, 1937 (Chalcidoidea: Trichogrammatidae) — an egg parasitoid of water beetles (Hydrophilidae and Dytiscidae)

Новые данные по биологии и распространению *Lathromeroidea silvarum* Nowicki, 1937 (Chalcidoidea: Trichogrammatidae) — паразита яиц водных жуков (Hydrophilidae, Dytiscidae)

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KEY WORDS: aquatic wasp, swimming, egg parasitoid, *Lathromeroidea*, Trichogrammatidae, Hymenoptera, Hydrophilidae, Dytiscidae, Palaearctics.

КЛЮЧЕВЫЕ СЛОВА: водный наездник, плавание, яйцеед, *Lathromeroidea*, Trichogrammatidae, Hymenoptera, Hydrophilidae, Dytiscidae, Палеарктика.

ABSTRACT: Males and females of *Lathromeroidea silvarum* Nowicki, 1937 were reared from eggs of water scavenger beetles (Hydrophilidae) and predaceous water diving beetles (Dytiscidae) in rice paddy fields in Japan for the first time. Recorded hosts are *Berosus punctipennis* Harold, *B. lewisius* Sharp (Hydrophilidae), *Rhantus pulverosus* (Stephens) and *Eretes sticticus* (L.) (Dytiscidae). Egg parasitoids of the family Hydrophilidae are reported for the first time. A description of morphology and biology of *L. silvarum* is given. The previously unknown male of *L. silvarum* is described. The unique capability of *L. silvarum* to swim under the water with the help of wings is reported. The genus *Lathromeroidea* and *L. silvarum* are recorded for the first time for the fauna of Japan. *L. silvarum* is widely distributed in the Palaearctic region.

РЕЗЮМЕ: Самки и самцы водного наездника *Lathromeroidea silvarum* Nowicki, 1937 впервые выведены из яиц жуков-водолюбов (Hydrophilidae: *Berosus punctipennis*, *B. lewisius*) и жуков-плавунцов (Dytiscidae: *Rhantus pulverosus* и *Eretes sticticus*), собранных на рисовых полях в Японии. Впервые обнаружены паразиты яиц жуков-водолюбов. Приводится описание морфологии и особенностей биологии *L. silvarum*. Впервые описаны самцы *L. silvarum*. Впервые для рода *Lathromeroidea* обнаружена уникальная способность имаго к плаванию под водой при помощи крыльев. Наездники *L. silvarum* впервые обнаружены в фауне Японии. Показано, что *L. silvarum* широко распространён в Палеарктике.

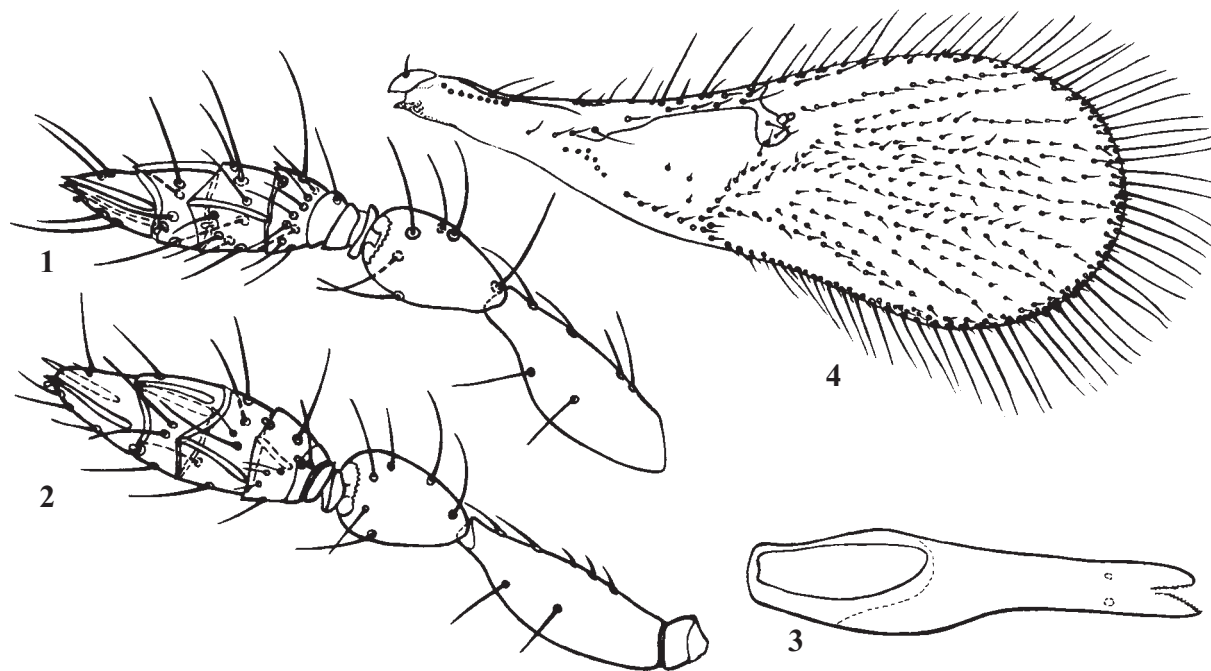
Introduction

The genus *Lathromeroidea* is known as a group of egg parasitoids of aquatic insects and some grasshoppers. The species *L. odonatae* was described from eggs of a damselfly of the genus *Lestes* (Lestidae) in the USA [Ashmead, 1900]. Another species, *L. ajmerensis*, was recorded in India from eggs of *Nephotettix* sp. (Homoptera, Cicadellidae) [Yousuf & Shafee, 1987]. An undescribed species of *Lathromeroidea* was reared in Canada from eggs of the two genera of water bugs, *Gerris* and *Limnoporus* (Gerridae) [Henriquez & Spence, 1993]. The genus *Lathromeroidea* includes 8 described species (*L. odonatae* Ashmead, 1900; *L. ajmerensis* Yousuf et Shafee, 1987; *L. angustipennis* Yousuf et Shafee, 1984; *L. domestica* Girault, 1920; *L. nigra* Girault, 1912; *L. nigrella* Girault, 1912; *L. silvarum* Nowicki, 1937 and *L. trichoptera* Lin, 1994).

Material and methods

Specimens of egg parasitoids (*L. silvarum*) were collected by the author in various localities of the Ukraine, Russia and Japan. Egg-parasitoids were collected with a sweep net and reared from eggs of various hosts (Hydrophilidae and Dytiscidae) in the laboratory. Most rearing was done at the Laboratory of Entomology, National Agriculture Research Center, Tsukuba, Japan in June–August 1997.

Collection was done in various aquatic habitats with a range of vegetation. Many specimens were collected at the rice paddy fields near Tsukuba-city (Ibaraki Pref., Japan). Although rice paddy fields are temporary aquatic



Figs. 1–4. *Lathromeroidea silvarum* Nowicki: 1 — female antenna, 2 — male antenna, 3 — male genitalia, 4 — fore wing of female.
Рис. 1–4. *Lathromeroidea silvarum* Nowicki: 1 — усик самки, 2 — усик самца, 3 — гениталии самца, 4 — переднее крыло самки.

times as long as maximum wing width; 15 discal setal lines similar to these of female. RS1 bearing 9 setae.

Genital capsule (Fig. 3) narrow, tube-like, with very narrow apical half and 2 small divided parts on top, 3.91 times as long as maximum width, with elongate dorsal aperture, dorsal aperture 0.39 times as long as genital capsule.

HOSTS. Aquatic beetles: *Berosus* (*Berosus*) *punctipennis* Harold, *Berosus* (*Enoplurus*) *lewisius* Sharp (Hydrophilidae), *Rhantus pulverosus* (Stephens) and *Eretes sticticus* (L.) (Dytiscidae).

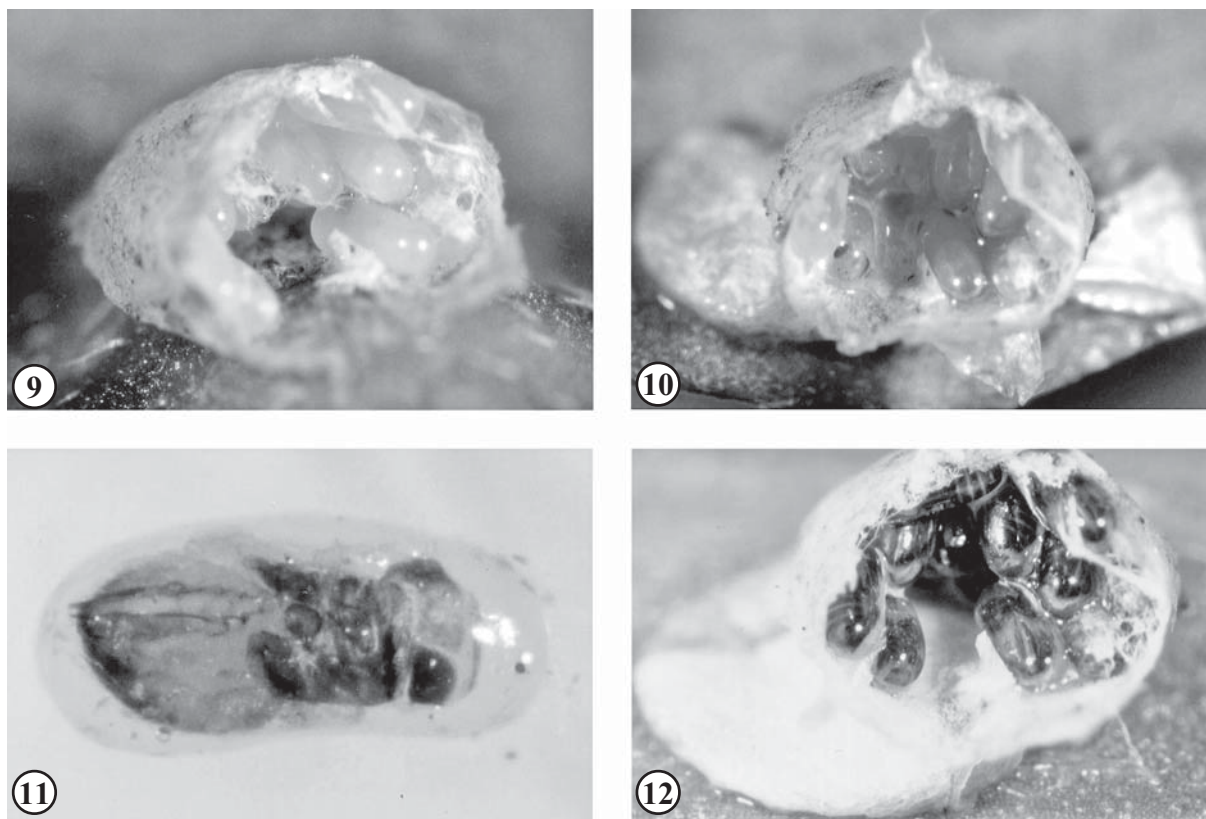
BIOLOGY. Many specimens of *L. silvarum* were reared from eggs of two species of water scavenger beetles (Hydrophilidae): *Berosus* (*Berosus*) *punctipennis* Harold and *Berosus* (*Enoplurus*) *lewisius* Sharp, collected in rice fields. Fresh eggs of these hosts have also been laid on water plants in glass jars in the laboratory. These eggs were given to females of *L. silvarum* and successfully parasitized (Figs. 5, 6, 8–12). Developmental period of *L. silvarum* in the laboratory was 10–11 days at 25°C. Studied species of beetles (Hydrophilidae) laid eggs inside peculiar small egg cocoons (about 3–5 mm), covered by fine white web (similar to that of spiders), on the surface of leaves of water plants (*Potamogeton* sp., *Alisma* sp. and *Sagittaria* sp.) and rice leaves (*Oryza sativa*) that floated on the water surface in rice paddy fields. A single long leaf of a plant had several egg cocoons of beetles. Only one individual of *L. silvarum* developed inside a single egg of both studied species of Hydrophilidae (Fig. 9–12). About 10–12 individuals of *L. silvarum* were reared from large egg cocoons of *B. punctipennis* Harold, which contained a large group of eggs. Only 2–3 specimens of *L. silvarum* developed inside a small egg-cocoon of *B. lewisius* Sharp, which contained a small group of eggs.

Large egg-cocoons of *Hydrochara affinis* (Sharp), attached to floating leaves of rice, were collected in rice fields during June–July 1997. They were studied as a possible host of *L. silvarum*. Nevertheless, we did not find parasitized eggs

of *H. affinis* inside cocoons. Females of *L. silvarum* did not parasitize large eggs of *H. affinis* in the laboratory. At the same time, we found some eggs of predaceous diving beetles (Dytiscidae) that were laid inside egg cocoons of *H. affinis*, probably after the emergence of *H. affinis* larvae. Eggs of *Rhantus pulverosus* (Stephens) and *Eretes sticticus* (L.) were found inside large open holes of egg cocoons of *H. affinis*. Some females of *L. silvarum* were reared from eggs of *R. pulverosus* (Stephens) and *E. sticticus* (L.) inside egg cocoons of *H. affinis*. During our studies, we did not observe the process of egg-laying of Dytiscidae inside egg cocoons of Hydrophilidae.

Egg parasitoids of water scavenger beetles (Hydrophilidae) are reported here for the first time. The chalcid wasp *Horismenus mexicanus* Burks (Chalcidoidea, Eulophidae) was recorded as a larval parasitoid of the water penny beetles (Psephenidae) which are similar to the water scavenger beetles in their behaviour [Burks, 1968; Schauff, 1991]. Egg parasitism on predaceous water diving beetles (Dytiscidae) was reported for several species of parasitic wasps of the families Trichogrammatidae, Mymaridae and Eulophidae [Rimsky-Korsakow, 1916, 1920, 1931; Jackson, 1961; Fursov & Kostjukov, 1987; Fursov, 1995; Shumakova et al., 2003].

BEHAVIOUR. Females and males of *L. silvarum* easily swim under the water using their wings (fig. 7). Wing movements under the water are relatively slow, but adults can easily penetrate water surface and walk upon it. Adults of *L. silvarum* also freely fly in the air. The unique phenomenon of underwater “flight” was reported for the first time for the mymarid wasp, *Caraphractus cinctus* Lubbock (Hymenoptera, Mymaridae) [Lubbock, 1863]. While moving in this way, in the water or air, aquatic egg-parasitoids can successfully find and parasitize eggs of their hosts. The unique capability of *L. silvarum* to swim under the water with the help of wings was reported for the genus *Lathromeroidea* and in the family Trichogrammatidae as a whole for the first time. Species of



Figs. 9–12. *Lathromeroidea silvarum* Nowicki: 9, 10, 12 — parasitized eggs inside an egg cocoon of *B. punctipennis*: 9 — on the 1st day; 10 — on the 5th day; 12 — on the 10th day; 11 — pupa inside a host egg.

Рис. 9–12. *Lathromeroidea silvarum* Nowicki: 9, 10, 12 — заражённые яйца жука *B. punctipennis* внутри яйцевого кокона: 9 — на 1^{-й} день, 10 — на 5^{-й} день, 12 — на 10^{-й} день; 11 — куколка наездника внутри яйца жука.

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