

BRIEF COMMUNICATIONS

Areal of *Callipogon relictus* Semenov, 1899 (Coleoptera, Cerambycidae) in the Russian Far East

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Abstract—Data on the distribution of *Callipogon relictus* Semenov, 1899 over the Russian Far East were generalized. The distribution map for *C. relictus* is based upon long-term observations and collection materials by the leading institutions. The chronology was studied within the Russian geographic range of the species.

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Callipogon relictus Semenov, 1899 is the sole representative of the nontropical genus *Callipogon* Audinet-Serville, 1832 in the fauna of Eurasia (Semenov, 1899). The presence of *C. relictus* Sem. in the fauna of the East Asian subregion (Palearctic or Stenopean) of the Palaearctic region is unique and strongly suggests that there was a contact between the faunas of the Old and New Worlds during the repeated formation of the Bering land bridge. The largest intercontinental migrations of the taxons took place in the warm Palaeogene and Neogene when the high latitudes of Eurasia and North America were in the quasi-tropical climatic zone (Yasamanov, 1985; Zubakov, 1990). At present, the *Callipogon* Audinet-Serville genus comprises 19 recent species. Eighteen of them inhabit Central and South America, from the south of Mexico (Verracruz) to the north of Argentina (Jujuy), and the Antilles (Du Pont, 1832; Nonfried, 1892; Lameere, 1904; Ribeiro P. and Ribeiro M., 1935; Bleuzen, 1993; Monne, Bezark, 2009). The sole Eurasian species of the *C. relictus* Sem. genus is widely distributed in the East Asian territory, which is a part of four countries (Russia, China, North Korea, and South Korea). Over the greater part of the geographic range, the abundance of the species decreases. In some regions it has become almost or totally extinct.

C. relictus Sem. has always been listed in the Red Books of the Russian Far East (the Soviet Union) as a species with a decreasing abundance and low ecological flexibility (Red Book ..., 1978, 1983, 1984, 1999, 2001, 2004, 2005, 2009). In Russia, the species is under the protectorship of the law over the whole geographic range and especially in Ussuri Nature Reserve (Primorskii Krai), Bolshkekhtskii Nature Reserve (Khabarovskii Krai), and Khingan Nature Reserve and Norskii Nature Reserve (Amur Oblast)

(Red Book ..., 2000, 2001, 2005, 2008, 2009; Kuprin and Litvinov, 2009; Kuprin and Sasova, 2010). Up to now, only general data have been obtained on the distribution and ecology of this species in Russia (Lyubarsky, 1953; Cherepanov, 1979). The species is rare, and a census has not been undertaken (Nikitsky, 2001).

The goal of this work is to study the chronology of *C. relictus* Sem. based on the special and disembodied data obtained for the Russian geographic range of the species.

MATERIAL AND METHODS

The material for this article was collected during our field works in different areas of Primorskii and Khabarovsk kraises, Amur Oblast, and the Jewish Autonomous Oblast. We have also examined the collections from some research centers and private collections: the Amur Botanical Garden-Institute, Far East Branch, Russian Academy of Sciences; the Institute of Systematics and Ecology of Animals, Siberian Branch, Russian Academy of Sciences (Novosibirsk); the Biology and Soil Science Institute, Far East Branch, Russian Academy of Sciences (Vladivostok); Ussuri Nature Reserve, Far East Branch, Russian Academy of Sciences; and private collections by S.I. Ivanov and A.A. Voronkov (Vladivostok).

The material was collected by methods commonly accepted in entomology (Fasulati, 1971; Tsurikov M. and Tsurikov S., 2001). Visual observation on the imago inhabiting different areas of the Russian Far East was used. In the years 2008–2010, the abundance of the imago and larva was studied at field stations and routes lying in elm broad-leaved forests of Ussuri Nature Reserve and the cross-border regions, as well

as the valleys of the Komarovka, the Suvorovka, the Kamenka, and the Barsukovka. All in all, more than 70 km of routes were observed. As a result, 78 specimens of *C. relictus* Sem. inhabiting different areas of the Russian Far East were studied.

RESULTS AND DISCUSSION

The greater part of the *C. relictus* Sem. geographic range is located in the eastern Amur basin. Outside this territory, the species is distributed in the Korean Peninsula. The highest density is common for the northern regions (the North Korean Mountains) and the border area between China and North Korea (Baitoushan–Changbaishan area). The species is critically endangered in the southern part of the Korean Peninsula, because biotopes there are under the highest anthropogenic pressure (Kim et al., 1976; Byun, 1994, 2006; Bong et al., 2007). In China, the geographic range covers eastern Manchuria, both the Amur basin (Heilongjiang, Jilin) and the southward territory (Liaoning, Hebei). In Russia, the species is widespread in Primorskii krai (Khasanskii District, Shkotovskii District, Ussuri District, Chernigovskii District, Anuchinskii District, Yakovlevskii District, Chuguyevskii District, Dalnerechenskii District, and Pozharskii District), Khabarovsk krai (Khabarovsk suburbs, Bikinskii District named after S. Lazo), Amur Oblast (Arkharinskii District, Bureonskii District, Mazanovskii District, and Selemdzhinskii District), and the Jewish Autonomous Oblast (Oktyabrskii District). It should be noted that *C. relictus* Sem. has no continuous geographic range within such a vast territory. The range forms sporadic enclaves. Sometimes they are distant from each other. Thus, the largest Russian population of the species is Ussuri population inhabiting the area from Ussuriysk to Dalnerechensk (in the south–north direction) and from Spassk-Dalny to Arsenyev (in the west–east direction). It is divided into enclaves associated with surviving overmature woodlands. The center of this population is Ussuri Nature Reserve and its adjacent territories. The second largest Khorobikinskaya population is located in the northern part of Primorskii krai and the southern part of Khabarovsk krai within the basins of the Bikin and the Khor. There are some smaller populations of the species within these federal subjects in which isolated findings have been registered. *C. relictus* Sem. inhabiting the Jewish Autonomous Oblast is the least known one. Only a few findings have been registered there (mainly in southern and western districts of the oblast near the Amur) since the species was studied.

In Amur Oblast, there are two significantly distinct populations of *C. relictus* Sem. They are the Kninganobureinskaya and Selemdzhinskaya populations (Bezborodov and Kuz'min, 2003). The Khinganobureinskaya population is localized in the southeastern part of Amur Oblast in the lower reaches of the Bureya and at the branches of the Lesser Khingan and

goes through the western districts of the Jewish Autonomous Oblast (Khabarovsk krai might be also included). The Selemdzhinskaya population is the most interesting from the point of chronology, phenology, and ontogeny. It is the northern-most enclave distant from the major geographic range. It is several hundred kilometers in length and goes along the Selemdzha River (the area between Novokiyevsky Uval and the urban locality of Ekimchan), where it also has a fragmentary character and is localized in the floodplain biotopes of the southern taiga subzone. The distribution of *C. relictus* Sem. is a characteristic example of the geographic range in relict species. One of the reasons for such disjunction is that the species is highly connected with overmature (climax) nemoral forests located in valleys with the *Ulmus japonica* (Rehd.) Sarg. (Japanese or white) larvae as the major feeding ingredient. Trophically, *Callipogon relictus* Semenov, 1899 is connected with thick wilt-affected trees standing or downfallen but not barked (Il'in, 1926; Lyubarskii, 1953). The larvae are xylomycetophages. They develop in wood affected by white rot. The species can also develop on the Manchurian ash (*Fraxinus mandshurica* Rupr.), the Amur linden (*Tilia amurensis* Rupr.), the Maximovich poplar (*Populus maximowiczii* A. Henry), the Mongolian oak (*Quercus mongolica* Fisch.), the yellow birch (*Betula costata* Trautv.), and the Manchurian maple (*Acer mandshuricum* Maxim.) (Il'in, 1926; Lyubarsky, 1953). The geographic range of *C. relictus* Sem. gives a significant fit into the range of the Japanese elm (Fig. 1).

Nevertheless, in the utmost northeast part of the Selemdzhinskaya population's range located in Amur oblast (Selemdzhinskii and Mazanovskii districts), the species has been found regularly in flood-plain cenoses with no Japanese elm. At the same time, they contained *Chosenia arbutifolia* (Pall.) A. Skvorts., thick willows (*Salix caprea* L., *S. schwerinii* E. Wolf.), and the fragrant poplar (*Populus suaveolens* Fisch.). In the Selemdzha valley located to the south of Ekimchan, we have found large flight holes from pupal chambers similar to those in *C. relictus* Sem. It is likely that in the pessimum zone on the fringes of the range the species may have an uncommon nutritive base. This is very typical for insects.

In Ussuri Nature Reserve and its protected zone, the species has been found in Japanese elm forests. In the reserve, the Japanese elm is large (from 35 to 37 m in height; more than 1 m in diameter) and grows in formations located in the center of the basins of the Komarovka, the Artemovka, and the Suvorovka. The admixed trees are the following: the Manchurian ash, the painted maple (*Acer mono* Maxim.), the Manchurian maple (*A. mandshuricum* Maxim.), the Amur cork tree (*Phellodendron amurense* Rupr.), the Manchurian walnut (*Juglans manshurica* Maxim.), the Amur linden (*T. amurensis* Rupr.), and the yellow birch (*B. costata* Trautv.).

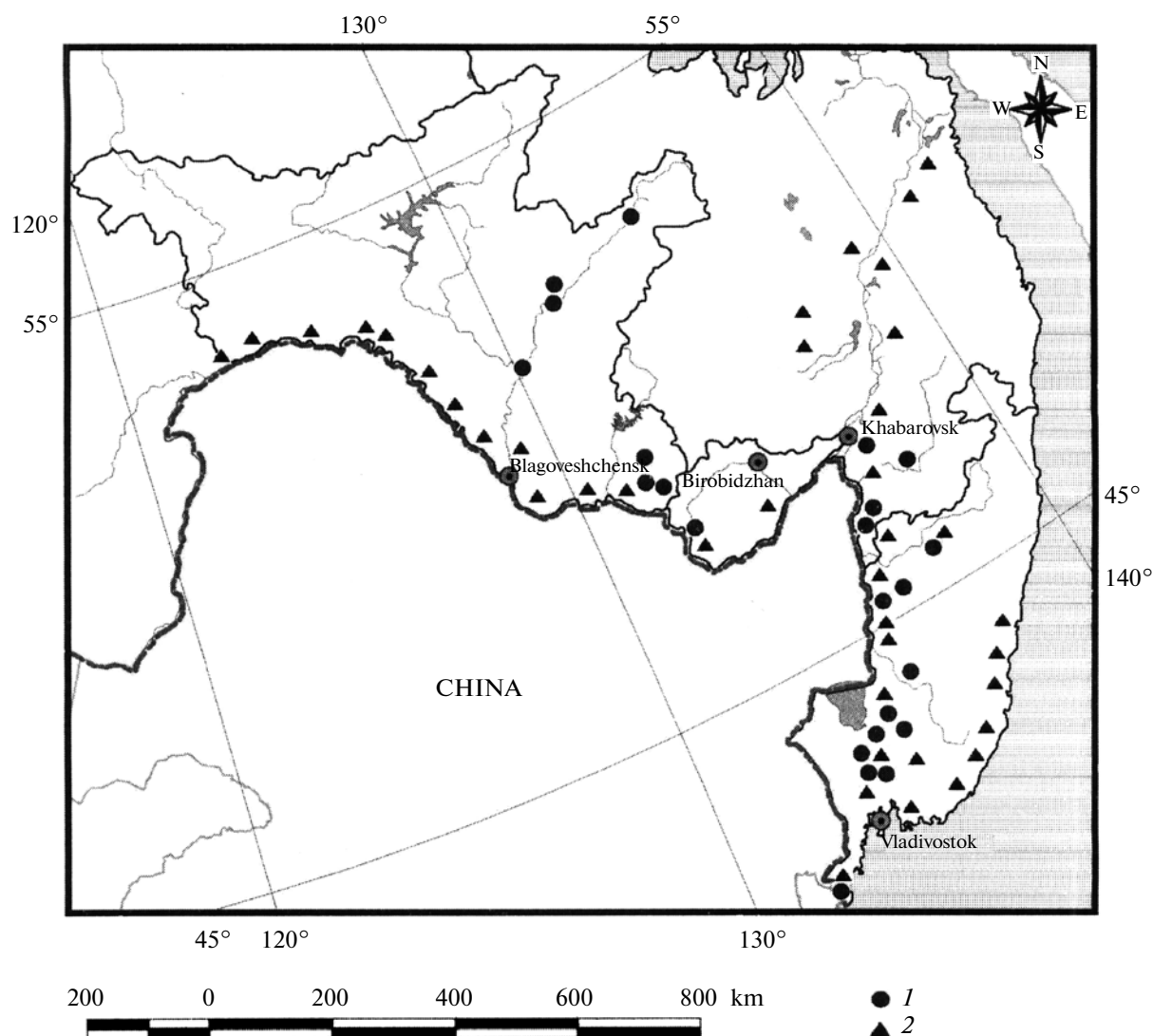


Fig. 1. Geographic range of *C. relictus* and *U. japonica* (Vasil'ev, 1979 revised) in the Russian Far East. 1, points where *C. relictus* was collected; 2, herbarium collection of *U. japonica*.

In recent decades, *C. relictus* Sem. has been found in Ussuri Nature Reserve almost every year. Figure 2 gives data on the dynamics of the *C. relictus* Sem. abundance in Ussuri Nature Reserve during the years 1983–2010.

According to Fig. 2, mass flight of imagoes occurs once every three or five years. Obviously, the reason for this timing is the long-term character of their development.

Our studying has shown that the *C. relictus* Sem. abundance is stable in the reserve and its protected zone. The greatest density of *C. relictus* Sem. was registered in Komarovskoe forest (3 specimens for 10 km of the route within the geographic range of the species). The imago density in Suvorovskoe forest is no more than 1 specimen for 10 km. The *C. relictus* Sem. larvae are indicators of Cerambycidae affection of the Japanese elm. Thus, the average abundance of the

uneven-aged larva for 1 m² ranges from 2–3 specimens. The total density of the larvae in the Japanese elm trunk (30 m) is up to 25 specimens.

CONCLUSIONS

It has been discovered that *C. relictus* Sem. from the Russian Far East inhabits four federal subjects: Primorskii and Khabarovsk kraia, the Jewish Autonomous Oblast, and Amur Oblast. In the study area, there are four local populations: Ussuriiskaya population, Khoro-Bikinskaya population, Khingano-Bureinskaya population, and Seledzhinskaya population. The Ussuriiskaya population is the largest. It is located in the southern Primorskii krai (Ussuri Nature Reserve). The *C. relictus* Sem. abundance in Ussuri Nature Reserve has been stable over the past few years. It ranges, on average, from one to three specimens for

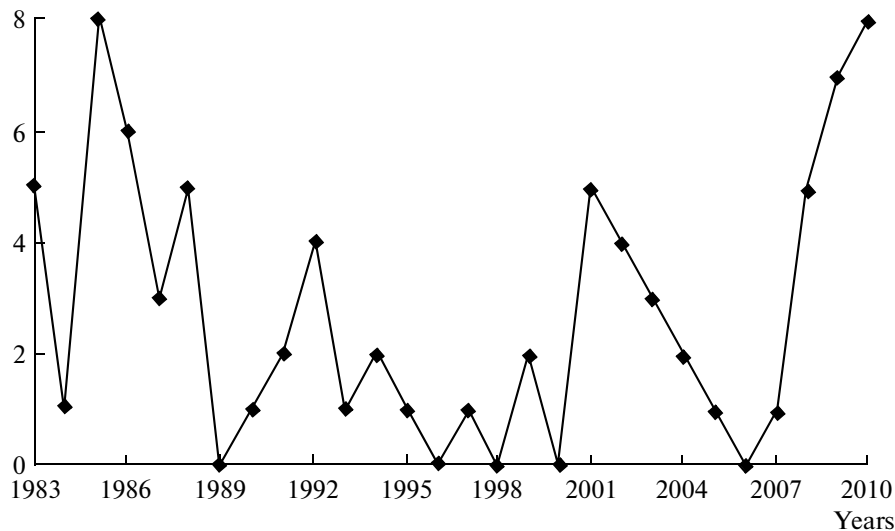


Fig. 2. The number of *C. relictus* imagoes in Ussuri Nature Reserve (1983–2010).

10 km of the route in the common geographic range of this species.

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