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# The Peculiarity of the Coccinellid (Coleoptera) Fauna of the Kamchatka Peninsula

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**Abstract** Twenty species of the family Coccinellidae are known from the Kamchatka Peninsula. This diversity is less than in the mainland areas of the Far East at the same or more northern latitudes. The available evidences suggest that the absence of species widely distributed even in northern localities (Magadan region and Yakutia) is not due to the severe climate and poor vegetation of the region, but to the geographical isolation of the peninsula. Additionally, the coccinellid fauna in Kamchatka has been strongly affected by the human transformation of the natural landscape.

**Key words**: lady beetles, fauna, ecology, geographic and biotopic distribution, Kamchatka.

Members of Coccinellidae are well known as effective predators of insect pests of agricultural and forest plants. The taxonomy, ecology, and economy of the lady beetles in the southern parts of the Far East have been very well studied. In contrast, there is little information on the species from the northeastern regions of Russia. Eighteen species were hitherto known from Kamchatka (Jacobson, 1905–1916; Dobrzhansky, 1926; Ivliev, Kuznetsov and Matis, 1975; Kuznetsov, 1981, 1996; Iablokoff-Khnzorian, 1983).

In this study we review published information available for Coccinellidae in Kamchatka (Ivliev *et al.*, 1975; Kuznetsov, 1981) in addition to our own data. We also studied collections of the Institutes of Biology and Soil Science, Zoology, and Ecology of Kamchatka of the Russian Academy of Sciences and material recently collected by some entomologists. Incects were collected in various plant formations in most regions of Kamchatka, with the main attention to the central part of the peninsula. Adults and larvae were collected by sweeping grass and bushes with entomological nets and by beating trees. A total of 1223 specimens were examined.

## Discussion

### Habitats and Distribution of Coccinellidae in Kamchatka

Our investigations have shown that 20 species of coccinellids are distributed in Kamchatka, although knowledge of the fauna of the family is still insufficient. The species composition of lady beetles of Kamchatka is less diverse than in other regions of the Russian North East. Forty-three species were counted in different localities in Yakutia (Averensky and Kuznetsov, 1978), and 32 species are known in the Magadan region (Kuznetsov, 1997). The Coccinellidae recorded in Kamchatka occur in two subfamilies: Scymninae, with three species, and Coccinellinae, with 17 species (Table 1).

The following species were most common in our material: *Coccinella trifasciata, Adalia bipunctata frigida,* and *Anatis ocellata. Anisosticta strigata* and *Adonia arctica* were recorded from Kamchatka for the first time. The specimens collected and the corresponding data are described below.

#### *Anisosticta strigata* (Thunberg)

*Material examined.* **Kamchatka:** Laso, 19. VI. 1986, coll. L. F. Lobkova, 1 male; Atlasovo, 6. IX. 1987, coll. L. F. Lobkova, 1 female.

**Table 1.** Distribution and occurrence of the Coccinellidae in various landscapes of Kamchatka. AG, agrocenosis; MD, meadow; M, mire; FPL, flood-plain leaved; B, birch; LDC, larch and dark-coniferous; EW, elfin woods; TFT, tundra and forest tundra. Abundance is indicated by the following symbols: +++, abundant; ++, common; +, rare.

| | Plant formations | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | AG | MD | M | FPL | B | LDC | EW | TFT |
| Subfamily Scymninae | | | | | | | | |
| 1. *Stethorus (Stethorus) punctillum* Weisem 1891 | + | | | + | | | | |
| 2. *Scymnus (Pullus) formicarius* Mulsant, 1850 | | | | | | | + | + |
| 3. *Hyperaspis kamtchaticus* Kuznetzov and Ren, 1996 Subfamily Coccinellinae | | | | | | | | |
| 4. *Anisosticta bitriangula* (Say, 1824) | | | + | | | | | |
| 5. *Anisosticta strigata* (Thunberg, 1795) | | | + | | | | | |
| 6. *Hippodamia septemmaculata* (Degger, 1775) | | ++ | + | | | | | |
| 7. *Hippodamia tredecimpunctata* (Linnaeus, 1758) | +++ | + | ++ | | + | | | |
| 8. *Adonia arctica* (Schneider, 1787) | | | | | | | | + |
| 9. *Adalia bipunctata frigida* (Schneider, 1792) | ++ | + | | ++ | ++ | | + | + |
| 10. *Coccinella undecimpunctata* Linnaeus, 1758 | | | | + | | | | |
| 11. *Coccinella trifasciata* Linnaeus, 1758 | ++ | + | + | ++ | ++ | + | | |
| 12. *Coccinella transversoguttata* Faldermann, 1835 | | | | + | | + | | + |
| 13. *Coccinella nivicola* Mulsant, 1850 | | | | + | | + | + | + |
| 14. *Coccinella hieroglyphica mannerheimi* Mulsant, 1850 | | + | | | | + | + | |
| 15. *Coccinella septempunctata septempunctata* Linnaeus, 1758 | +++ | ++ | + | ++ | ++ | | | |
| 16. *Coccinula quatuordecimpustulata* (Linnaeus, 1758) | | + | | | | | | |
| 17. *Calvia quatuordecimguttata* (Linnaeus, 1758) | + | | | ++ | ++ | + | + | |
| 18. *Myzia oblongoguttata* (Linnaeus, 1758) | | | | | | ++ | + | + |
| 19. *Anatis ocellata* (Linnaues, 1758) | | | | +++ | + | ++ | + | + |
| 20. *Halyzia sedecimguttata* (Linnaeus, 1758) | | | | ++ | + | | | |

*Distribution.* Magadan, north of Siberia, northern regions of European part of Russia, northern Europe, Alaska; now first recorded from Kamchatka.

### *Adonia arctica* (Schneider)

*Material examined.* **Kamchatka:** Uson, 22. VII. 1974, coll. L. F. Lobkova, 1 female.

*Distribution.* Magadan Region, Siberia (except south), north of European part of Russia, Sweden, Norway, North America; now first recorded from Kamchatka.

Carnivorous species are dominant in Kamchatka. Only *Halyzia sedecimguttata* feeds on *Fungal mycelia* (family Erysiphaceae), which damage trees, bushes, and herbs. Predacious lady beetles eat aphids, psyllids, whiteflies, thrips, spider mites, and other small arthropods, and play a role in the natural regulation of pests number.

Lady beetles possess a vast ecological flexibility and occur in various plant communities in Kamchatka. The distribution of coccinellids in various biotopes is determined partly by their food specificity and partly by the need for certain environmental condi-

tions developed in the evolution of each species. Food specificity greatly influences the biotopic distribution of lady beetles. The reproduction of carnivorous coccinellids depends on the availability of prey insects. Lack or scarcity of such insects may motivate carnivorous lady beetles to relocate to a different habitat. During the vegetative season, aphids migrate from one host plant to another. They are followed by aphid-feeding lady beetles. However, this type of migration does not influence the general rules for their distribution.

The characteristic features of the distribution of the Coccinellidae in biotopes in Kamchatka are determined by the topography and geographical position of the region, the richness of the flora, and the economic activities of humans.

The greatest species diversity is found in floodplain leafy forests (willow, poplar, alder). Microclimate conditions are especially favorable for the vegetation in the river valleys. Here, with the presence of meadows, different willow species (*Salix sachalinensis, S. viminalis* and *S. rossica*), chosenia (*Chosenia macrolepis*), fragrant poplar (*Populus suaveolens*), aspen (*P. tremula*), fluffy alder (*Alnus hirsuta*), asiatic bird-cherry (*Padus asiatica*), hawthorn (*Crataegus pinnatifida*), dog-rose (*Rosa dahurica* and *R. accicularis*), spiraea (*Spiraea salicifolia*), currant (*Ribes triste*), and other trees and shrubs grow well. In these forests, mass occurrences of aphids, the main food of lady beetles, often appear. *Adalia bipunctata frigida, Coccinella septempunctata septempunctata, C. trifasciata, Calvia quatuordecimguttata,* and *Anatis ocellata* are dominant among 10 species of coccinellids occurring in the floodplain leafy forests. *Stethorus punctillum, Coccinella undecimpunctata, C. nivicola, C. transversoguttata,* and *Halyzia sedecimguttata* are also found there.

In comparison with floodplain leafy forests, the numbers of coccinellid species and the numbers of individuals are more abundant in birch forest. *Adalia bipunctata frigida, Coccinella trifasciata, C. septempunctata septempunctata, Calvia duodecimmaculata,* and *Halyzia sedecimguttata* are common in these formations. Species that are common in grassland (*Hippodamia tredecimpunctata, C. septempunctata septempunctata,* and *C. trifasciata*) occur also in dense grass in birch forests.

Seven coccinellid species were discovered in the larch forests in the valley of the River Kamchatka. In the taiga, such common species as *Anatis ocellata, Myzia oblongoguttata, Coccinella trifasciata, C. nivicola,* and *C. transversoguttata* are found.

Lady beetles are usually scarce in dark coniferous forests of Jeddo spruce (*Picea jezoensis*) and Kurile Dahurian larch (*Larix kurilensis*). The same coccinellid species as inhabit larch forests were recorded here, but numbers are fewer.

Eight species of lady beetles (including *Hyperaspis kamtschatica, Adalia bipunctata frigida, C. nivicola, Anatis ocellata,* and *Myzia oblongoguttata*) inhabit elfin woodlands of cedar elfin wood (*Pinus pumila*) and fruticose species of alder (*Alnus kamtschatica*), elder-leaved rowan (*Sorbus sambucifolia*), and birch (*Betula exilis* and *B. middendorfii*).

In mountain tundra and forest tundra, seven species of lady beetles were discovered. It was interesting to collect *Adonia arctica* and *Hyperaspis kamtschatica* in arid tundra, which is a relic of the Pleistocene grassy landscapes. We consider these species to be relics of xerophyll fauna that were widespread in the Pleistocene.

In the forest formations in Kamchatka, the greatest density of lady beetles is found at the forest edges, in felled areas, and in well-lit stands, where plant-sucking pests very often appear in mass. Lady beetles were rarely encountered under the denser canopy.

In various formations of herbaceous vegetation, the number and density of species decrease with increasing humidity. The richest diversity of lady beetles is found in dry meadows in the valley of the River Kamchatka. *Hippodamia tredecimpunctata, Coccinella septempunctata septempunctata, C. trifasciata,* and *Coccinula quatuordecimpustulata* live there. *Hippodamia septemmaculata, H. tredecimpunctata, Anisosticta bitriangularis, A. strigata,* and *Coccinella trifasciata* are found in marshes and swamp meadows.

Scarcity in the numbers of observed species is characteristic of cultivated land, but at the same time there is a sharp increase in the

numbers of individuals of some species. On agricultural crops (e.g. cabbage, potato) the following taxa were found: *C. septempunctata septempunctata, A. bipunctata frigida, Stethorus punctillum, C. trifasciata,* and *Calvia quatuordecimguttata.* These species of carnivorous lady beetles, together with other entomophages, work well in controlling the numbers and mass appearance of aphids, which are serious cultural plant pests in agrocenosis.

Thus, there is a clear relation between the distribution of lady beetles and definite plant formations in Kamchatka. Some coccinellid species show a change of habitats. *Anatis ocellata,* a common species in conifers forest, lives in the crowns of coniferous trees in Europe, Siberia, and the Far East, but in Kamchatka it appears en masse with aphids damaging broadleaved breeds. It is characteristic of Kamchatka that lady beetles prefer warm habitats in drier biotopes with thin vegetation located in river valleys. At the southern part of the Far East of Russia, the same species inhabits more humid and shadowy biotopes with thick vegetation.

## Biogeography of Coccinellidae in Kamchatka

The coccinellid fauna of Kamchatka has a boreal element represented by 11 holarctic, five transpalearctic, two eurasiatic-taiga, one east-siberian, and one conventional endemic species. The coccinellid fauna of Kamchatka is represented mainly by the holarctic species (55% of the total number): *Anisosticta bitriangulata, A. strigata, Hippodamia tredecimpunctata, Adonia arctica, Adalia bipunctata frigida, Coccinella undecimpunctata, C. transversoguttata, C. trifasciata, C. nivicola, C. hieroglyphica mannerheimi,* and *Calvia quatuordecimguttata.* These species are widespread in taiga and broadleaved forests in Europe and Asia. The presence of holarctic species in boreal Eurasia that are common with those of North America suggests the existence of ancient Tertiaryties between the faunas of Palearctica and Nearctica.

Transpalearctic species (25%) include *Stethorus punctillum, Coccinella septempunctata septempunctata, Coccinula quatuordecimpustulata, Hippodamia septemmaculata,* and *Halyzia sedecimguttata.* These species are distributed over a wide area covering the boreal part of Eurasia.

The two eurasiatic-taiga species are *Anatis ocellata* and *Myzia oblongoguttata.* In the Palearctic taiga zone, these species are widespread from western Siberia to the shore of the Pacific Ocean, and are also common in coniferous forests in Europe, Siberia, and the Far East.

The eastern Siberian *Scymnus formicarius* occurs in dark coniferous forests in eastern Siberia and Kamchatka.

We consider *Hyperaspis kamtchatica* as an endemic species. In Kamchatka it occurs in elfin woodlands and in mountain tundra. On the basis of our research on the northeastern Russian fauna, we suppose that the species is found in the high mountain belt of the Magadan region.

The coccinellid fauna of Kamchatka is significantly scarcer than that of mainland parts at the same or more northern latitudes of the Far East. Although some species (e. g. *Propylea quatuordecimpunctata, Adonia variegata, A. amoena, Adalia conglomerata, Oenopia conglobata, Myzia gebleri, Scymnus nigrinus,* and *S. rubromaculatus*) are widespread in Magadan, they are not distributed on the peninsula. The lack of many lady beetles and other insect species that are widespread even in northern areas may not be a result of severe climate and poor vegetation but the consequence of the geographic isolation of the peninsula (Kurentsov, 1966). The insect fauna of Kamchatka was established relatively recently on a geological time scale after the glaciation had thawed, and now it also has some traits of island fauna. The accelerating transformation of the natural landscape by human activities is strengthening the formation of the coccinellid fauna of Kamchatka. This is increasing the numbers of aphidophagous lady beetles in agrocenosis.

## References

Averensky A. I. and V. N. Kuznetsov. 1978. Ecological-faunistic essay on the Coccinellidae of Yakutia (Coleoptera, Coccinellidae). *In* Biologia nekotoryh vidov vrednyh I poleznyh nasekomyh Dalnego Vostoka, pp. 19–30. Far East

Scientific Center of the Academy of Sciences of USSR, Vladivostok. (In Russian)

Dobrzhansky, F. G. 1926. Material for fauna of Coccinellidae (Coleoptera) of Yakutia. Materialy komissii po izucheniju Yakutskoi ASSR, 3. 10 pp. Akademy Nauk, Leningrad. (In Russian)

Iablokoff-Khnzorian, S. M. 1983. Survey of the family of the Coccinellidae beetles of the USSR fauna (Coleoptera, Coccinellidae). Zool. sbornik. Erevan 19: 94–161. (In Russian)

Ivliev, L. A., V. N. Kuznetsov and E. G. Matis. 1975. Ecological-faunistic information on the Coccinellidae (Coleoptera, Coccinellidae) of the Far North-East of the USSR. *In* Entomofagi sovetskogo Dalnego Vostoka, pp. 5–20. Far East Scientific Center of the Academy of Sciences of USSR, Vladivostok. (In Russian)

Jacobson, G. G. 1905–1916. The beetles of Russia and Western Europe. 1024 pp. Devroena Publishing, Petrograd. (In Russian)

Kurentsov, A. I. 1966. About zoogeographic peculiarities of the fauna of Kamchatka. *In* Entomofauna lesov Kurilskykh ostrovov, poluostrova kamchatki, Magadanskoi oblasti, pp. 63–76. Nauka, Moscow and Leningrad.

Kuznetsov, V. N. 1981. Fauna and ecology of the Coccinellidae (Coleoptera, Coccinellidae) of Kamchatka. *In* Pauki I nasekomyje Dalnego Vostoka SSSR, pp. 46–54. Far East Scientific Center of the Academy of Sciences of USSR, Vladivostok. (In Russian)

Kuznetsov, V. N. 1996. The Coccinellidae family-lady beetles. Dopolnenie 1. Rody Sumnius Ws. I *Hyperaspis* Chevr. *In* Key to the insects of Russian Far East, Vol. 3, Coleoptera, Part 3, pp. 423–427. Dal'nauka, Vladivostok. (In Russian)

Kuznetsov V. N. 1997. Lady beetles of the Russian Far East. 248 pp. Center for Systematic Entomology, Gainesville.

## カムチャッカ半島のテントウムシ相の特異性

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カムチャッカ半島からは，20種のテントウムシ科が知られている．その多様性は，同緯度あるいはそれより高緯度（マガダンやシベリアのヤクート）の極東の大陸地域の多様性よりも低いが，それは，カムチャッカにおける気候の厳しさや貧弱な植生が原因ではなく，半島が地理的に隔離されていることによるものと考えられる．さらに，カムチャッカのテントウムシ相は，人間の活動による自然環境の変化に大きく影響を受けているものと考えられる．