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Lady Beetles (Coleoptera, Coccinellidae) of the Russian Far East

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Abstract Faunistics and ecological characteristics of the Coccinellidae of the Far East and perspectives of their use in biological control of plant pests are dealt with. Eighty species of lady beetles have been known from the Russian Far East.

Our investigations have established that the coccinellid fauna of the Russian Far East includes 80 species (Table 1). The coccinellid fauna of Primorye is the richest in species composition. There are 65 species observed over the territory of this region, 55 species are registered in the Amur Region, 50 in Khabarovsk, 35 on Sakhalin, 29 in the Magadan Region, 20 on Kunashir, and 16 on Kamchatka (KUZNETSOV, 1975, 1981 a, b, 1983, 1984).

Characteristics of the geographical location of regions, originality of relief and abundance of plant clusters affect the formation of the coccinellid fauna. Fauna of lady beetles includes 24 palearcharctic species distributed in Primorye and Priamurye of Russia, Japan, China and the Korean Peninsula.

Lady beetles are observed in different plant formations. Distribution and occurrence of the Coccinellidae in the main landscapes of the Russian Far East are given in Table 1. The species composition of lady beetles of the broadleaved and mixed coniferous broadleaved forests from the forest formations is the most abundant in Primorye. Twenty-nine species live on the forest-bushy vegetation; 27 of them live on broadleaved trees, 22 on *Larix* species and 20 on fir-spruce forests (20). In the belt of alpine vegetation represented by mountain tundra, forest-tundra and creeping vegetation (*Pinus pumila* REGEL), we have found 15 species of lady beetles. Number and species variety of lady beetles decreased as the moistening increased in different formations of herbs. Fauna of lady beetles is mostly rich in the steppe meadows of the Prikhanka Plain and scanty in the peat-bogs and tundra.

According to the character of feeding of beetles and larvae, 4 species of the Coccinellidae (*Henosepilachna vigintioctomaculata*, *Epilachna chinensis*, *Cynegetis impunctata* and *Subcoccinella vigintiquatuorpunctata*) are phytophagous, one species (*Psyllobora vigintiduopunctata*) mycetophagous and the other 75 species predators, eating aphids mostly. *Henosepilachna vigintioctomaculata* ia a serious pest of potatoes and vegetables and the remaining 3 species were observed in meadows.

Different species of aphids, mealybugs, armored scales, psyllids, leaf beetle larvae,

Table 1. Distribution and occurrence of the Coccinellidae in landscapes of the Russian Far East.

N	Species	Plant formation							
					Forest				
		Agrocoenosis	Meadow	Mire	Broadleaved	Mixed coniferous-broadleaved	Fir-spruce	Larch	Mountain alpine tundra and forest-tundra
1	2	3	4	5	6	7	8	9	10
1.	*Serangium lygaeum* KHNZORIAN				+	+			
2.	*Stethorus punctillum* WEISE	++	+		++	+	+		
3.	*Stethorus* (*Allostethorus*) *amurensis* KHNZORIAN				+				
4.	*Pseudoscymnus hareja* (WEISE)				+	+			
5.	*Scymnus* (*Scymnus*) *nigrinus* KUGELANN					+	+	+	
6.	*S.* (*S.*) *frontalis* (FABRICIUS)	+	++						
7.	*S.* (*S.*) *jakowlewi* WEISE		+						
8.	*S.* (*S.*) *rubromaculatus* (GOEZE)	+	+						
9.	*S.* (*S.*) *crinitus* FÜRSCH	+	++						
10.	*S.* (*S.*) *abietis* PAYKULL					+	++	+	+
11.	*S.* (*Neopullus*) *fuscatus* BOHEMAN		+	++					
12.	*S.* (*Pullus*) *ferrugatus* (MOLL)				++	++			
13.	*S.* (*P.*) *haemorrhoidalis* HERBST	+	+						
14.	*S.* (*P.*) *auritus* THUNBERG				+				
15.	*S.* (*P.*) *suturalis* THUNBERG					++	+		
16.	*S.* (*P.*) *limbatus* STEPHENS		+						
17.	*Nephus koreanus* FÜRSCH		+						
18.	*N. redtenbacheri* (MULSANT)		+						
19.	*N. koltzei* (WEISE)	+	++						
20.	*N. bipunctatus* (KUGELANN)		+						
21.	*Hyperaspis amurensis* WEISE	+	++						
22.	*H. asiatica* LEWIS	+	++						

23.	*H. leechi* MIYATAKE		+						
24.	*H. erythrocephala gyotokui* KAMIYA	+	++						
25.	*Chilocorus rubidus* HOPE	+			+				
26.	*Ch. renipustulatus* (SCRIBA)				+				
27.	*Ch. kuwanae* SILVESTRI				++	+			
28.	*Ch. bipustulatus* (LINNAEUS)				+				
29.	*Ch. inornatus* WEISE	+			++	+			
30.	*Exochomus mongol* BAROVSKY				+				
31.	*Ex. nigromaculatus* (GOEZE)		+						
32.	*Rodolia limbata* (MOTSCHULSKY)				+	+			
33.	*Coccidula rufa* (HERBST)	+	++	+++					
34.	*Anisosticta kobensis* LEWIS	+	++	++					
35.	*A. bitriangularis* (SAY)		+	+					
36.	*A. strigata* (THUNBERG)			+					
37.	*A. sibirica* BIELAWSKI	+	++	+++					
38.	*A. novemdecimpunctata* LINNAEUS		+	+					
39.	*Ceratomegilla ulkei* CROTCH		+						
40.	*Hippodamia tredecimpunctata* (LINNAEUS)	+++	+++	+++					+
41.	*H. septemmaculata* (DE GEER)		++	+					
42.	*Adonia variegata* (GOEZE)	+	++	+					
43.	*A. amoena* (FALDERMANN)		+++						
44.	*A. arctica* (SCHNEIDER)		+					+	+
45.	*Semiadalia apicalis* (WEISE)		+						
46.	*Adalia conglomerata* (LINNAEUS)					+++	++	++	++
47.	*A. bipunctata* (LINNAEUS)				++	+		+	+
48.	*A. koltzei* (WEISE)					+			
49.	*Coccinella septempunctata* LINNAEUS	+++	+++	+	++	+	+	+	+
50.	*C. sachalinensis* OHTA		+						
51.	*C. ainu* LEWIS				+				
52.	*C. undecimpunctata* LINNAEUS	+	+		+				
53.	*C. magnifica* REDTENBACHER		+						
54.	*C. nivicola* MULSANT		+				+	++	+
55.	*C. trifasciata* LINNAEUS .		+				++	++	+

Table 1. (Continued)

1	2	3	4	5	6	7	8	9	10
56.	*C. hieroglyphica mannerheimi* MULSANT						+	++	+
57.	*C. transversoguttata* FALDERMANN				+			+	+
58.	*Coccinula quatuordecimpustulata sinensis* WEISE	+++	+++	+	++	+	+	+	
59.	*Harmonia axyridis* (PALLAS)	+++	++	+	+++	+++	++	+	
60.	*Oenopia conglobata* (LINNAEUS)				+	+			
61.	*O. bissexnotata* (MULSANT)		+		+				
62.	*Myrrha octodecimguttata* (LINNAEUS)							+	
63.	*Calvia decimguttata* (LINNAEUS)	+			++	+++	+	+	
64.	*C. quatuordecimguttata* (LINNAEUS)	+	+		+++	+++	++	++	+
65.	*C. duodecimmaculata* (GEBLER)	+			++	++	++	+	+
66.	*C. quinquedecimguttata* (FABRICIUS)				+	+			
67.	*Propylea japonica* (THUNBERG)	+	++		+	+			
68.	*P. quatuordecimpunctata* (LINNAEUS)	+++	+++	+	++	++	+	+	+
69.	*Myzia ramosa* (FALDERMANN)					++	++	++	+
70.	*M. oblongoguttata* LINNAEUS					++	+	+	
71.	*Anatis ocellata* (LINNAEUS)				+	++	+	++	+
72.	*A. halonis* LEWIS					+	+	+	
73.	*Aiolocaria hexaspilota* (HOPE)				++	+			
74.	*Halyzia sedecimguttata* (LINNAEUS)				+	+		+	
75.	*Vibidia duodecimguttata* (PODA)	+	+		+++	++	+		
76.	*Psyllobora vigintiduopunctata* LINNAEUS	+	++						
77.	*Epilachna chinensis* WEISE		+						
78.	*Henosepilachna vigintioctomaculata* (MOTSCHULSKY)	+++	+		+	+			
79.	*Cynegetis impunctata* (LINNAEUS)		++						
80.	*Subcoccinella vigintiquatuorpunctata* (LINNAEUS)		+						
	Total:	28	47	15	33	31	20	22	15

Notes. Occurrence: +++ – very often; ++ – usual; + – rare.

spider mites and other injurious insects are eaten by lady beetles. In the southern part of the Russian Far East, there is a lady beetle (*Aiolocaria hexaspilota*) eating leaf beetle larvae and damaging *Juglans manschurica*. The lady beetles *Stethorus punctillum* and *St.* (*Allostethorus*) *amurensis* are the predators specialized on spider mites. Mealybugs and armored scales are eaten by representatives of the species of the genera *Chilocorus* LEACH, *Erochomus* REDTENBACHER, *Hyperaspis* CHEVROLAT and *Rodolia limbata*. Whiteflies and aphids are eaten by *Serangium lygaeum*.

Coccinella septempunctata, *Harmonia axyridis*, *Propylea quatuordecimpunctata* and *Hippodamia tredecimpunctata* are the abundant species in the cultural and natural landscapes of the Russian Far East. Adults and larvae of these lady beetles affect the abundance of aphids on plants tremendously.

In the southern part of the Russian Far East, adults of lady beetles appear after hibernation late in April. Females lay eggs late in May. The oviposition period lasts from 15 to 80 days. Number of eggs per female varies from 150 to 920. In Primorye, development of lady beetles at the stage of eggs lasts from 2 to 9 days, larvae from 12 to 20 days and pupae from 3 to 10 days. Development from egg to adult is completed after 19 or 35 days. Juveniles emerge from July to September. In one season, most species of lady beetles give one generation, whereas *Harmonia axyridis*, *Hippodamia tredecimpunctata* and *Propylea quatuordecimpunctata* give two generations a year. In Primorye lady beetles begin to migrate from the middle of September to the middle of October and in Kamchatka from late August to early September.

Most lady beetles hibernate alone or by small groups in litter. In Primorye and Priamurye, the beetles *Aiolocaria hexaspilota*, *Harmonia axyridis* and *Oenopia conglobata* form mass gathering in places of their hibernation on rocks. The mass gathering is observed at the same places of the southern and southwestern slopes of mountains for years. Natural mass gatherings of lady beetles are economic ally significant as the unique natural stores of entomophages. Collections of lady beetles for the biological pest control are carried out in these places of mass gathering.

Recently, lady beetles are used in the following directions: introduction and acclimatization, collection of beetles in places of mass gathering of hibernation, use of lady beetles in greenhouses and conservation of local species of lady beetles and increase in their effectiveness (KUZNETSOV, 1987).

Studies on acclimatization of the Far Eastern lady beetles were carried out in Ukraina, Caucasus, Kazakhstan and Usbekistan. At present investigations on acclimatization of *Chilocorus kuwanae* and *Ch. rubidus* into the regions of Georgia are under way to control armored scales and pests of fruit cultures. Also studies are conducted on acclimatization of *Harmonia axyridis* and *Aiolocaria hexaspilota* into Caucasus to control aphids and leaf beetles.

The Far Eastern lady beetles such as *Chilocorus rubidus*, *Ch. inornatus*, *Ch. kuwanae* and *Rodolia limbata* are used in the control against coccids; *Harmonia axyridis* against aphids and *Aiolocaria hexaspilota* against leaf beetles are promising

for acclimatization in other regions.

要　約

V. KUZNETSOV: ロシア極東地方のテントウムシ類. —— ロシアの極東地方に分布する 80 種のテントウムシ類を列挙し，害虫の天敵として果たすそれらの有効性について私見を述べた．これまでに記録された種の数は，沿海州 65 種，アムール地域 55 種，ハバロフスク地域 50 種，サハリン 35 種，マガダン地域 29 種，国後島 20 種，カムチャツカ 16 種である．

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