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Dynamics of the Distribution of *Molipteryx fuliginosa* (Uhler) (Heteroptera, Coreidae) in the Russian Far East

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Abstract—The data of more than thirty years of observations of the temporal and spatial distribution of *Molipteryx fuliginosa* (Uhler, 1860) (Heteroptera, Coreidae) in the east of Russia are generalized. Previously known only from Southeast Asia, in 1998, it was recorded in Russia as new to the fauna. Its current range in the south of the Russian Far East has been specified; 51 localities of findings have been noted. The penetration of the bug into the local fauna was traced over the years. The invasion of this species poses a danger of the appearance of a new pest of cultivated Rosaceae in Primorskii krai and in the south of the Khabarovsk krai. Three stages of the species invasion into the fauna of the south of the Russian Far East have been identified: 1987–1992, rare single findings of a species new to the local fauna; 1993–2011, expansion of the bug's range while maintaining a low number; 2012–2020, local outbreaks of numbers along with the expansion of the range on our territory.

Keywords: Heteroptera, Coreidae, *Molipteryx fuliginosa*, Russian Far East, Primorskii krai, spread, range expansion

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INTRODUCTION

The uncontrolled invasion of alien species into the composition of local faunas is one of the modern ecological problems. Monitoring of the invasion process in the region and the country as a whole is reflected in numerous publications (Shvydkaya et al., 1995; Dgebuadze, 2002, 2014; Mironova and Izhevsky, 2002; *Biologicheskie invazii...*, 2004; Yurchenko et al., 2007; Kuznetsov and Storozhenko, 2010; Kuprin et al., 2018; Kolyada, N.A. and Kolyada, A.S., 2019; etc.). Species that have successfully introduced and established resilient populations often have serious impacts on ecosystems, become pests, or compete with native species. From the European part of Russia, two alien harmful Heteroptera species introduced by humans have been repeatedly indicated: the American coniferous bug *Leptoglossus occidentalis* Heidemann, 1910 (Coreidae) (Gapon, 2012; Gninenko et al., 2014; Gapon et al., 2016; Golub et al., 2020), representing a serious problem for forest entomology and forest protection, and the tropical bed bug *Cimex hemipterus* (Fabricius, 1803) (Cimicidae) (Gapon, 2016; Golub et al., 2020), harmful to human health.

Climate change and erosion of biogeographic boundaries also led to a natural expansion of the ranges of many East Asian species of insects in the Russian Far East (hereinafter, RFE) (Koshkin et al., 2015). One of the new alien species to the fauna of eastern Russia is squash bug *Molipteryx fuliginosa* (Uhler, 1860) (family Coreidae). The species was described in the genus *Discogaster* by a single female sampled in Japan (Uhler, 1860). Later it was redescribed according to other findings in Japan by V.I. Motchulsky under the name *Menenotus tuberculipes* Motschulsky, 1866 and by G. Walker as *Micis japonica* Walker, 1871. Kiritshenko (1915) combined these species into synonyms and isolated and described a new genus *Molypterix* Kiritshenko, 1916. This researcher described its comparative differences from closely related genera, designed an identification table for two species known by that time, and provided a detailed diagnosis of both sexes of a species originally described only by the female (Kirichenko, 1916). The genus *Molipteryx* includes five species; now they are included in the tribe Mictini Amyot et Serville, 1843 of the subfamily Coreinae Leach, 1815 (Dolling, 2006; Vinokurov et al., 2010) and are common in the Southeastern Palaearc-

tic and Oriental region (Aukema and Rieger, 2006; Aukema et al., 2013).

Almost until the end of the last century, *M. fuliginosa* was known only from the territories of Northeast China, the Korean Peninsula, and Japan (Kyushu Island and Hokkaido). In the identification guide of Chines bugs (Hsiao et al., 1977), the genus *Molipteryx* was mistakenly regarded as a synonym for *Derepteryx* (Kerzhner and Kanyukova, 1998). The species is included in the list of economically important insects in China (Zhang, 1985) under the name *Derepteryx fuliginosa* with the indication of the following forage plants for the species: *Liquidambar formosana* Hance (Altingiaceae), *Rhus chinensis* Mill. (Anacardiaceae), *Petasites* sp. (Asteraceae), *Rubus* sp. and *Potentilla fragarioides* L. (Rosaceae). Other authors under the same name cited it with *Camellia oleifera* Abel (Theaceae) (Luo et al., 2014), *Bambusa* sp. (Poaceae, Bambusoideae) (Wang et al., 2002), and *Oryza* sp. (Poaceae) (Chen et al., 2014). However, according to a personal communication by Dr. D. Redei (Hungarian Natural History Museum), who worked in China, the bug is not a serious agricultural pest in China, and there is no evidence of its lifestyle or massive outbreaks. In the Japanese bug field guide (Tomokuni et al., 1993), photographs of two larval instars were published with very brief accompaniment in Japanese.

The developmental cycle of *M. fuliginosa* in laboratory conditions was studied during one season in South Korea (Park, 1996). It was revealed that the bug has one generation per year, occurs from early May to late September, and hibernates at the adult stage. Plants on which it is found in South Korea are listed, including raspberries *Rubus oldhami* Miquel, *R. coreanus* Miquel, and *R. crataeagifolius* Bunge (Rosaceae), as well as *Zelkowa serrata* Makino and *Ulmus davidiana* Planchon var. *japonica* Nakai (Ulmaceae). However, foreign publications lack information on the morphology of eggs and larvae.

Representatives of the family are phytophages; some species are known as serious pests of agricultural plants (Puchkov, 1972; Vinokurov et al., 2010). In Siberia and the Russian Far East, there are 14 Coreidae species belonging to ten genera. In Russia, *M. fuliginosa* was recorded in the late 1980s and early 1990s. The first specimens from Khabarovsk and Primorsky krais are dated 1987 and 1992 (Kerzhner and Kanyukova, 1998; Kanyukova and Vinokurov, 2009; Markova et al., 2016; etc.). But already in 2012, information began to appear about its local outbreaks of abundance and the harm caused to cultivated plants in Primorskii krai (Kanyukova, 2012).

To date, we have studied the reproductive behavior of *M. fuliginosa* in Primorskii krai and obtained information on the morphology of the preimaginal stages of the bug (Markova et al., 2017a, 2017b). The indications of new locations of *M. fuliginosa* in the Russian Far East allowed us to specify the current range of the species.

The goal of the present paper is to study temporal and spatial distribution of alien species *M. fuliginosa* in the Russian Far East and its gradual adaptation to the regional conditions.

MATERIALS AND METHODS

The studies were carried out from early May to late October 2015–2020, in conditions of field stations and route trips across the territory of Primorskii krai in order to study the distribution of *M. fuliginosa*. Visual observation, manual collection of insects, and photography were used. Published information is involved in the generalization.

Field stations (places of annual observations) were organized in Khankaisky (village of Pervomayskoye), Spassky (villages of Chkalovskoye and Spasskoye), and Chuguevsky districts (villages of Chuguevka and Novomikhaylovka) and Ussuriysky urban okrug (villages of Kamenushka and Kaimanovka, Ussuriysky Nature Reserve). In total, more than 40 settlements in 24 administrative districts of the Primorskii krai were examined; the bug was found during the study period in 39 settlements of 21 administrative regions. In 2020, data were received from specialists from Amur oblast and the Khabarovsk krai.

The abundance of insects was assessed according to the method adopted by us (Markova et al., 2019). "Solitary" in the case of finding of one to four bug specimens in the imago stage for all years of observations; "moderate," five to ten specimens in the larval and imaginal stages; "moderately mass," ten or more specimens, when larvae and imagoes colonize a group of plants located in the immediate vicinity or at a distance of 0.5–1 m from each other, and when there are obvious traces of sucking and damage. We indicated the species as "common" for a certain area with a moderate or moderately mass presence of insects in the imaginal and preimaginal phases over the last 2–3 years. During the research, more than 4000 specimens were collected and taken into account.

In the study, we used collections and photographs of the following researchers: N.M. Yavorskaya (FGBU Zapovednoye Priamurye), A.Yu. Oleinikov (Institute of Water and Ecological Problems, Far Eastern Branch, Russian Academy of Sciences), V.A. Anashkin (All-Russian State Radio and Television Company Dal'nevostochnaya), D.A. Tikhonov from Khabarovsk krai; also, M.E. Sergeev and Yu.A. Chistyakov (Federal Scientific Center of Biodiversity, Far Eastern Branch, Russian Academy of Sciences); N.A. Kolyada, A.V. Kuprin, M.M. Omel'ko, and D.M. Chernyak (Mountain-Taiga Station—Branch of the Federal Scientific Center of Biodiversity, Far Eastern Branch, Russian Academy of Sciences); L.A. Fedina (Ussuriysky Nature Reserve—Branch of the Federal Scientific Center of

Biodiversity, Far Eastern Branch, Russian Academy of Sciences); A.M. Nikolaeva (Oksky State Nature Reserve); K.A. Ostapenko (Far Eastern Federal University, Zoological Museum, Vladivostok); Yu.N. Glushchenko, N.V. Repsh, E.N. Bolovtsova, A.D. Grebenyuk, S.E. Egorenchev, Yu.S. Zavarzina, Z.A. Limachko, A.K. Mrikot, E.A. Novaya, and A.V, Khovrina (Far Eastern Federal University, School of Pedagogy, Ussuriysk); S.A. Makarevich (Private Subsidiary Farm Makarevich Fruit Nursery); M.V. Analeeva, S.V. Veriga, A.V. Kovaleva, and I.D. Solodkii from districts and city okrugs of Primorskii krai. The materials in part are stored in the private collection of the first coauthor to the present paper and in the collection of the Zoological Museum (Far Eastern Federal University, Vladivostok).

RESULTS AND DISCUSSION

The earliest, by the dates of sampling, collection specimens of a genus and species new to the Russian fauna were noted in 1987 and 1992 near the settlement of Korfovsky, in the vicinity of the Bol'shekhekhtsirsky Natural Reserve, and in the vicinity of the town of Bikin; in the south of the Khabarovsk krai; in 1991 in the village of Dal'niy Kut on the Iman River in the north of Primorskii krai (Kerzhner and Kanyukova, 1998; Kanyukova and Vinokurov, 2009; Kanyukova, 2012) (Table 1).

In 1993–2011, a gradual expansion of the species range in Primorskii krai was noted, and new localities were recorded, but without an increase in numbers. Single findings were recorded in Pozharsky district in the vicinity of Luchegorsk, in Dal'nerechensky (Vostretsovo village) and Krasnoarmeysky (Krutoy Yar village) districts, and Ussuriysky urban okrug (Ussuriysk). On the territory of Southwest Primorye, the insects were found in 2011 in the northern part of Khasansky district, now included in the territory of the Land of the Leopard National Park (Gusevka village) (Kanyukova, 2012; Kanyukova and Ostapenko, 2013).

From 1998, with the publication on the first findings (Kerzhner and Kanyukova, 1998) based on materials from 1987–1996, *M. fuliginosa* was considered new for Russia. Until 2011, this large bug, 19–25 mm long, which is impossible to miss, was found more often in single specimens and was considered a rare species (Kanyukova, 2012) (Fig. 1). Initially, mainly the sites of findings from the continental regions along the borders with China were known. By 2012, the species steadily penetrated into the local fauna and naturalized, and unexpectedly, cases of mass abundance in Central Primorye began to emerge. The first outbreaks of its abundance were recorded in 2012 in Spassky district ("from the vicinity of Spassk") and Arsenyevsky urban okrug, vicinity of Arsenev. Insects in the amount of several dozen were collected on raspberries and transferred by the Plant Protection Department of the Primorskii Branch of Federal State Unitary Enterprise Rossel'khoztsentr for study to Kanyukova (2012). After 2014, along with the addition of new locations of findings of the bug, an increase in the number of bugs was observed. In a number of settlements, the species became common (Table 1).

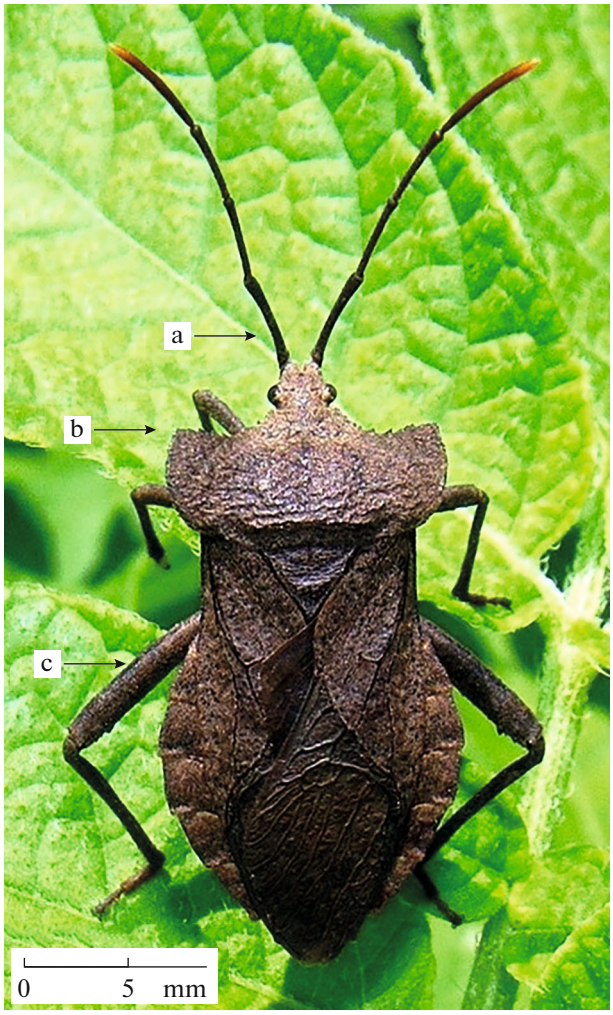

Fig. 1. Imago of *M. fuliginosa* in natural conditions (Primorskii krai): (a) segments of the antennae are cylindrical; (b) the lateral angles of the pronotum are turned anteriorly, the margins of the pronotum behind them form rounded lobes, and the anterior margins are seated with denticles; (c) the thighs of the hind legs are thickened and armed with strong tubercles and with a tooth at the apex (photo by M.V. Maslov).

In 2015, a second outbreak of *M. fuliginosa* number was recorded on the territory of Central Primorye in Kirovsky (settlement of Kirovsky) and Chuguevsky (village of Novomikhaylovka) districts and Northwestern Primorye in the Ussuriysky urban okrug, vicinity of the villages of Kaimanovka and Kamenushka, where significant damage of raspberries (*Rubus idaeus* L.) and blackberries (*R. caesius* L.) were noted (Markova et al., 2016). Since 2015, *M. fuliginosa* has firmly settled on the territory of Primorskii krai, bypassing the Khankayskaya

Table 1. Findings of *M. fuliginosa* on the territory of Russian Far East

No.	Sampling site	Coordinates	Year	Reference
Khabarovsk krai				
Nanaysky district				
1	Anyuysky National Park	49°26′26″ N; 136°33′25″ E	2019	Data of N.M. Yavorskaya
Khabarovsky district				
2	Korfovsky, vic. of Bol'shekhekhtsirsky Natural Reserve	48°18′88″ N; 135°05′59″ E	1992	(Kanyukova and Vinokurov, 2009; Kanyukova, 2012)
3	Khekhtsir set.	48°17′31″ N; 135°05′46″ E	2020	Data of A.Yu. Oleynikov
4	Osinovaya Rechka v., Garden Nonprofit Partnership	48°19′00″ N; 134°53′00″ E	2020	Data of V.A. Anashkin and D.A. Tikhonov
Bikinsky district				
5	Bikin town	46°49′00″ N; 134°15′00″ E	1987	(Kanyukova, 2012)
Primorskii krai				
Pozharsky raion				
6	Near Luchegorsk Reservoir	46°28′04″ N; 134°19′12″ E	1994	(Kanyukova, 2012; Kanyukova and Ostapenko, 2013)
7	Luchegorsk uts.	46°27′00″ N; 134°17′00″ E	2020	Data of N.A. Kolyada
Dal'nerechensky district				
8	Vostretsovo v., east of Dal'nerechensk	45°54′56″ N; 134°55′15″ E	1996	(Kerzhner and Kanyukova, 1998; Kanyukova, 2012)
Krasnoarmeysky district				
9	Dal'niy Kut v., Iman r.	45°84′26″ N; 135°26′66″ E	1991	(Kerzhner and Kanyukova, 1998; Kanyukova, 2012)
10	Roshchina v.	45°54′40″ N; 134°53′20″ E	2018	Data of A.D. Grebenyuk
11	vic. of Krutoy Yar v., Bol'shaya Ussurka r.	45°54′18″ N; 134°54′42″ E	1993	(Kanyukova, 2012)
Terneysky district				
12	Sikhote-Alin Nature Reserve, Terney set., Serebryanka r.	45°03′26″ N; 136°60′33″ E	2016	(Vinokurov et al., 2016)
Kirovsky district				
13	Kirovsky set.*	45°05′18″ N; 133°30′50″ E	2015*	(Markova et al., 2016)
Dal'negorsky urban okrug				
14	vic. of Dal'negorsk c.	44°34′41″ N; 135°37′05″ E	2018	Data of D.M. Chernyak
Khankaysky district				
15	Turiy Rog v.	45°14′05″ N; 131°58′50″ E	2017–2018	Data of K.A. Ostapenko
16	Komissarovka r., Dvoryanka v.	44°52′34″ N; 131°34′49″ E	2017–2018	Data of K.A. Ostapenko

Table 1. (Contd.)

No.	Sampling site	Coordinates	Year	Reference
17	Kamen'-Rybolov v.	44°44′24″ N; 132°02′32″ E	2018	Data of Yu.S. Zavarzina
18	**Pervomayskoe v.**	44°00′05″ N; 131°58′54″ E	2017–2020	Data of A.V. Khovrina
	Spassky district			
19	vic. of Spassk-Dal'ny c.*	44°36′00″ N; 132°49′00″ E	2012*	(Kanyukova, 2012)
20	Chkalovskoe v.	44°50′15″ N; 133°02′30″ E	2018	Data of N.V. Repsh
21	Spasskoye v.	44°36′52″ N; 132°47′49″ E	2020	Data of A.K. Mrikot
22	Evseevka v.	44°24′31″ N; 132°53′25″ E	2018	Data of A.K. Mrikot
	Yakovlevsky district			
23	Yakovlevka v.	44°25′37″ N; 133°28′47″ E	2020	Data of S.A. Makarevich
24	Mineral'noe v.	44°23′30″ N; 133°36′10″ E	2017	Data of S.V. Veriga
	Chernigovsky district			
25	Siniy Gay v.	44°27′29″ N; 132°35′28″ E	2020	Data of N.A. Kolyada
26	Sibirtsevo set.	44°12′05″ N; 132°26′40″ E	2018	Data of Yu.N. Glushchenko
	Anuchinsky district			
27	Sinegorka Mountain	44°21′53″ N; 132°56′03″ E	2016	Data of S.V. Veriga
28	Bol'shoi sp.	44°19′19″ N; 133°01′29″ E	2017	Data of K.A. Ostapenko
	Arsenyevsky urban okrug			
29	vic. of Arsenev c.,* **Arsenev c.**	44°10′00″ N; 133°16′46″ E	2012* 2014, 2016–2018, 2020	(Kanyukova, 2012) Data of K.A. Ostapenko, S.V. Veriga, and A.E. Kovaleva
	Oktaybr'sky district			
30	Chernyatino set., Sinelovka Mountain	43°58′00″ N; 131°29′00″ E	2017–2018	Data of K.A. Ostapenko
	Chuguevsky district			
31	Koksharovka v.	44°30′58″ N; 134°04′00″ E	2020	Data of A.K. Mrikot
32	Chuguevka v.	44°10′00″ N; 133°51′30″ E	2020	Data of A.K. Mrikot
33	**Novomikhaylovka v.***	44°14′01″ N; 133°51′59″ E	2015* 2016 2018–2020	(Markova et al., 2016) Data of Z.A. Limachko
	Ol'ginsky district			
34	Mikhaylovka v.	43°56′41″ N; 134°48′44″ E	2012	(Markova et al., 2016)

Table 1. (Contd.)

No.	Sampling site	Coordinates	Year	Reference
		Ussuriysky urban okrug		
35	**vic. of Kaymanovka v.***	43°37′49″ N; 132°13′49″ E	2012 –2015* 2016–2020	(Markova et al., 2016a, 2016b) Data of T.O. Markova and M.V. Maslov
36	**vic. of Kamenushka v.***	43°37′23″ N; 132°13′50″ E	2012–2015* 2016–2020	(Markova et al., 2016a, 2016b) Data of T.O. Markova and M.V. Maslova
37	**Ussuriysky Nature Reserve**	43°40′00″ N; 132°30′00″ E	2015 2016–2019	(Markova et al., 2016a, 2016b) Data of M.V. Maslov and L.A. Fedina
38	Zarechnoe v.	43°41′07″ N; 132°06′34″ E	2020	Data of S.A. Makarevich
39	**Gornotayezhnoe v.**	43°42′00″ N; 132°09′00″ E	2016–2020	Data of M.M. Omel'ko, K.A. Ostapenko, N.A. Kolyada, and A.V. Kuprin
40	Ussuriysk c.	43°48′00″ N; 131°57′00″ E	2015 2018–2019	(Markova et al., 2016a, 2016b) Data of T.O. Markova and E.N. Bolovtsova
41	Pushkino v.	43°41′18″ N; 131°40′41″ E	2018	Data of Yu.N. Glushchenko
		Shkotovsky district		
42	Anisimovka v., Smol'nyi sp.	43°10′20″ N; 132°45′22″ E	2016	Data of K.A. Ostapenko
		Partizansky district		
43	Sergeevka v.	43°20′35″ N; 133°21′15″ E	2016	Data of E.A. Novaya
44	Nikolaevka v.	43°05′20″ N; 133°12′50″ E	2019–2020	Data of S.E. Egorenchev
45	Vasil'evka sv.	42°59′00″ N; 132°55′00″ E	2020	Data of I.D. Solodkiy
		Vladivostoksky urban okrug		
46	Bogataya r.	43°15′30″ N; 132°09′51″ E	2017–2018	Data of S.V. Veriga
47	Vic. of Vladivostok c., Sputnik Station	43°24′23″ N; 132°04′31″ E	2016	Data of K.A. Ostapenko
		Nakhodkinsky urban okrug		
48	Nakhodka c., Nakhodka Garden Nonprofit Partnership	42°49′00″ N; 132°53′00″ E	2020	Data of M.V. Analeeva
		Khasansky district		
49	Gusevka v.	43°20′24″ N; 131°35′2″ E	2011	(Kanyukova, 2012)
50	Rurugel'ma i.	42°28′00″ N; 130°55′20″ E	2018	Data of M.E. Sergeev
51	Gamova pen., Vityaz' co.	42 33′59″ N 131°12′00″ E	2019–2020	Data of M.E. Sergeev, A.M. Nikolayeva, Yu.A. Chistyakov

c.—City; uts.—urban-type settlement; set.—settlement; v.—village; sv.—small village; vic.—vicinity; co.—cove; i.—island; pen.—peninsula; r.—river; sp.—spring; *—moderately mass; normal typeface—no data; boldface—"common."

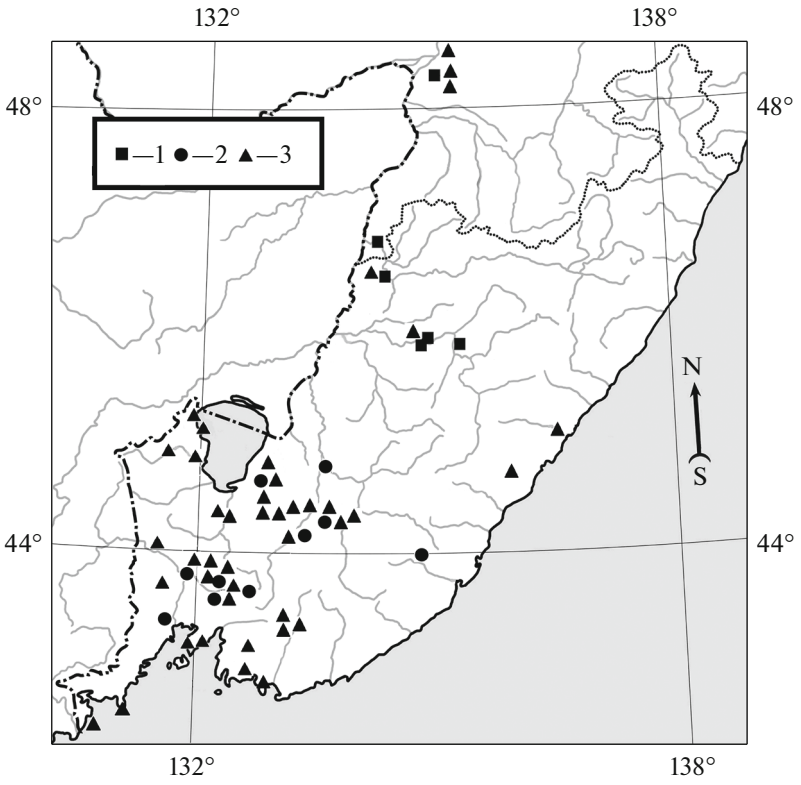

Fig. 2. Distribution of *M. fuliginosa* on the territory of the Russian Far East: (1) first data of 1987–1996; (2) data of 2011–2015; (3) modern data of 2016–2020.

Lowland (Khankaysky and Cernigovsky districts). In the southern sector (Shkotovsky and Partizansky districts and Vladivistoksky urban okrug), the bug was found in 2016–2017 (Fig. 2).

To date, *M. fuliginosa* has been recorded in 46 spots of Primorskii krai, including in protected areas: in the Sikhote-Alin Biosphere Nature Reserve and Ussuriysky Nature Reserve. With a high abundance of the species in natural and anthropogenically transformed ecosystems, it can also be found in urban settlements located on the mainland—in the cities of Arsenyev and Ussuriysk.

In addition to the mainland, where the first individuals were encountered, the bug also settled in the coastal regions: Muravyov-Amursky Peninsula: vicinity of Vladivostok, Sputnik railroad station, Gamov Peninsula, Vityaz' Cove, and Furugelm Island (the southernmost Russian Island in the Sea of Japan) and on the eastern coast of the krai, in the city of Nakhodka City and settlement of Terney.

The most populated habitats in anthropocenoses are household plots, less often decorative plantings of shrubs in urban areas. The number on one bush of raspberries here may reach 10 ind.; within the city limits, 5 ind. Studies carried out in natural cenoses of Primorskii krai have shown that in forest habitats the insects choose ecotone communities (preferring mesophilic plant associations with moderate insolation), as well as areas modified by anthropogenic impact (forest roads, forest edges, forest areas overgrown after felling, etc.). In xerophytic biotopes, they are found in small numbers: from one to three specimens on one plant. We did not find *M. fuliginosa* deep in the forest.

According to our observations in fixed areas and according to information obtained from collectors, on cultivated Rosacea, in particular, on raspberries and blackberries, full development from larval to imaginal stage can take place. Stage II–V larvae migrate to the upper parts of plants, sucking juices from young shoots and inflorescences. As a result, there is a disruption of the normal development of leaf blades, oppression of the growth point, wilting of the apical part of the shoots, and the fall of buds. The bugs negatively impact the physiology of cultivated Rosacea; however, the real damage from their activity in Primorskii krai has not yet been estimated. According to the reports of gardeners of Yakovlevsky district, feeding of the bugs on the apical parts of the shoots of remontant raspberries leads to inhibition of development and a shift in fruiting by 1.5 weeks.

Studies have shown that, in Primorskii krai, *M. fuliginosa* is a polyphage. Along with *Rubus idaeus* (Rosaceae), the bug uses as forage plants blueberry (*Rubus caesius* L.), roadside agrimony (*Agrimonia stri-*

ata Michx.), great burnet (*Sanguisorba officinalis* L.) (Rosaceae), and thistles *Cirsium pendulum* Fisch. and *C. setosum* (Willd. Bess.) (Asteraceae) (Markova et al., 2016). Expansion of the trophic spectrum of squash bug allows the use of common ragweed (*Ambrosia artemisiifolia* L.) (Asteraceae) as an additional food plant for certain stages of development and for imagoes (Markova et al., 2019; Aistova et al., 2019; Markova and Maslov, 2020).

To date, the bug has been found in three new localities in the south of Khabarovsk krai from two administrative districts north of Bikinsky district. It has not been found in Amur oblast. In Primorskii krai, *M. fuliginosa* is recorded almost everywhere: in the northern part, in Pozharsky district, the northernmost point near Luchegorsk Reservoir, and Krasnoarmeysky district; in the west, in Dal'nerechensky and border Khankaysky districts (villages Kamen'-Rybolov and Turiy Rog); in the central part, in Kirovsky, Spassky, Yakovlevsky, Chernigovsky, Anuchinsky, and Chuguevsky districts and Arsenyevsky urban okrug; in the southwest, in the border Oktyabr'sky district and Ussuriysky urban okrug; in the east, in Terneysky and Ol'ginsky districts and Dal'negorsky urban okrug; in the south, in Shkotovsky, Partizansky, and Khasansky districts: Gamov Peninsula, Vityaz' Cove and Furugelm Island, Vladivostoksky and Nakhodkinsky urban okrugs. In a number of localities in Primorskii krai, *M. fuliginosa* has become a common species (village of Pervomayskoe in Khankaysky district, village of Novomikhaylovka in Oktyabr'sky district, villages of Kamenushka, Kaymanovka, and Gornotayezhnoye, Ussuriysky Nature Reserve (Ussuriysky urban okrug), Gamov Peninsula, Vityaz' Cove (Khasansky district)) (Table 1).

The data presented here suggest that, in a historically short period of time, naturalization of the invasive species took place in most of the southern territory of the Russian Far East. Its penetration into anthropogenic and natural ecosystems, in particular, forest communities, is observed.

CONCLUSIONS

On the basis of the results of our own research and taking into account the published data for more than a 30-year observation period, an expansion of the range of *M. fuliginosa*, which appeared in the east of Russia in the 1980s, was revealed. Along with this, its abundance is rising and further stabilization of the population is taking place. Local outbreaks of the bug's abundance were recorded.

The latest data show that *M. fuliginosa* is widespread in the Far East of Russia in Khabarovsk and Primorsky krais, but is not found in Amur oblast. In Khabarovsk krai, solitary findings are known in the southern part of the region. In Primorskii krai, the bug has spread almost everywhere except in the highlands. In the north, it is found in Pozharsky district; in the south, it reaches the borders of Russia in Khasansky district. In the west, the range of the bug is limited to the regions bordering China; in the east, it reaches the shores of the Pacific Ocean in Terneysky district.

Three stages of the species penetration into the fauna of the south of the Russian Far East are distinguished. In 1987–1992, there were isolated rare finds, when the species had the status of a new one for the local fauna. In 1993–2011, there was a spatial expansion of the range with the findings of solitary specimens of the bug. From 2012 to 2020, a quantitative increase and local outbreaks of numbers were observed along with an expansion of the range on our territory. The species has taken root in the local fauna successfully. Now it may be argued that by 2020 the species had invaded and naturalized in the southwest of the region and in the eastern part of Sikhote-Alin, as well as on the seacoast and peninsular and island territories.

Currently, M. *fuliginosa* has become a serious pest of garden plants in the south of Russian Far East. The bug populates household plots with plantings of raspberries and blackberries, to which it causes noticeable harm. It is required to monitor this new species for the region and include it in the list of potential pests of cultivated Rosacea in the south of the Far East of Russia, monitor the current state, and predict further invasion of the species.

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COMPLIANCE WITH ETHICAL STANDARDS

The paper contains no studies on experiments with animals carried out by any of the authors.

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