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Quick spread of the invasive rose flea beetle *Luperomorpha xanthodera* (Fairmaire, 1888) in Europe and its first record from Russia

(Coleoptera, Chrysomelidae, Galerucinae, Alticini)

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The flea beetle *Luperomorpha xanthodera* (Fairmaire, 1888) is a pest of floriculture. It damages flowers of ornamental plants, especially roses. *Luperomorpha xanthodera* is native for China and Korean peninsula. In 2003 it was recorded in Europe for the first time (in England) and then began to spread quickly. To date it has been also recorded in France, Italy, Switzerland, Germany, The Netherlands, Hungary, Austria, Poland and Belgium. Here, we report the first record from Russia. Fourteen specimens were collected in 2016 and 2017 in Sochi, at the Black Sea shore of the Caucasus. *Luperomorpha xanthodera* is established in Sochi, since the beetles were found on grasses in the wastelands and on the bank of the pond, and on rose flowers on the streets of the city. The data on spread of *L. xanthodera* in Europe are summarized and the first map of its invasive range is presented, together with identification characters of *L. xanthodera* and the position of the genus *Luperomorpha* within the group of morphologically close genera of European Alticini. Probably the quick spread of *Luperomorpha xanthodera* in Europe is connected with its transport with ornamental plants.

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Introduction

The flea beetle *Luperomorpha xanthodera* (Fairmaire, 1888) (Coleoptera, Chrysomelidae, Galerucinae, Alticini) is a pest of ornamental plants, especially roses (*Rosa*). Adults damage flowers of grasses, shrubs and trees. Beetles feed on anthers, chew petals and sometimes leaves. Larvae develop in the soil, on roots (Conti & Raspi 2007, Del Bene & Conti 2009, Bodor 2010).

Luperomorpha xanthodera was originally described from Jiangxi Province of China (Fairmaire 1888). Its native range includes Korean peninsula and central, southern and southeastern parts of China (Gruev & Döberl 1997, Döberl 2010). In 2003 it was firstly recorded outside its native range, namely in Great Britain: the survey of flowers in 11 garden centers in 2003 revealed that this flea beetle was widely distributed and common in England (Johnson & Booth 2004). In 2005 the flea beetle was found in continental Europe: in France near the large sea port in Saint-



Fig. 1. Female of *Luperomorpha xanthodera* from Russia, city of Sochi, the Black Sea shore, dorsal view. Photo by Kirill Makarov.

Malo, which is connected with Great Britain with many ship lines (Doguet 2008). In 2006 *L. xanthodera* was recorded to be common in two localities in Italy (Conti & Raspi 2007). Now it is widely spread over France (Vincent & Doguet 2011), Germany (Döberl & Sprick 2009) and The Netherlands (Beenen et al. 2009), and occurs also in Switzerland (Döberl & Sprick 2009), Hungary (Bodor 2010, 2011), Belgium (Fagot & Libert 2016), Austria (Geiser & Bernhard 2012) and Poland (Kozłowski & Legutowska 2014). *Luperomorpha xanthodera* is definitely established in France and Italy, but it is unclear, if it is established in other European countries, since all findings were made in or near garden-centers or on recently imported plants. We have found *L. xanthodera* much east of all previously known localities in Europe, namely in Sochi (Russia).

Material

The findings reported herein were made in the city of Sochi at the Black Sea shore of the Caucasus (Russia: Krasnodar Territory). On 22.05.2016 we found one female in Adler district of Sochi in the wastelands and roadside at south-west border of the international airport "Sochi" (43°26' N, 39°55' E). On 23.05.2016 numerous beetles were observed in the Central district of Sochi (43°35' N, 39°45' E) on rose flowers; three males and seven females were collected. On 08.06.2017 two males and one female were collected with a sweep net in Adler district of Sochi, in Olympic Village on grasses on the

bank of the pond (43°25' N, 39°56' E). One pair (male and female) will be deposited to Zoological State Collection Munich. Other specimens are in the collection of the first author (Zelenograd, Russia).

Identification

The specimens were identified to belong to the genus *Luperomorpha* Weise, 1887 using the keys for leaf beetle genera of the following regions: Palaearctic (Warchałowski 2010), China (Gressitt & Kimoto 1963), Indo-China (Medvedev 2009), India (Maulik 1926, Scherer 1969), Japan (Kimoto & Takizawa 1994), Taiwan (Kimoto & Takizawa 1997), Nepal (Medvedev & Sprecher-Uebersax 2005), Philippines (Medvedev 1993), Russian Far East (Medvedev 1992), Siberia (Medvedev & Dubeshko 1992) and the key to flea-beetles of Palaearctic (Konstantinov & Vandenberg 1996).

Identification of the species with the key for *Luperomorpha* of China (Yang et al. 2015) shows that our specimens belong to *L. xanthodera* (Figs 1, 2). Body including head, antennae, scutellum, elytra, legs, tarsi, meso- and metasternum, abdominal sternites, and pygidium is black, with antennomeres 1–3 some lighter, dark piceous; pronotum and prosternum are rufous. Antennal calli are weakly separated from vertex, without sharp supracallinal sulcus. Surface of pronotum is distinctly shagreen. Pronotum is without lateral impressions. Lateral side of pronotum is slightly rounded. Posterior corners of pronotum are almost obsolete. Prosternum is narrow between fore-coxae. Elytra are shagreen, covered with dense fine irregular punctures. Elytral epipleuron is smooth, with sparse fine punctures. Hind wings are normally developed. In male, antennomeres 4–11 are moderately dilated, slightly broader than in female. Tibiae are narrow, without preapical excavation or deep longitudinal impression on external side. In male, first protarsomere is broadened. Third tarsomere is distinctly bilobed. Aedeagus is almost parallel-sided along entire length. Body length: 3.2–3.9 mm.

This species recently established in Europe was erroneously identified as *Luperomorpha nigripennis* Duvivier, 1892 in Italy and France (Conti & Raspi 2007, Doguet 2008). However, *L. nigripennis* differs from *L. xanthodera* in body coloration: abdominal sternites are brown or orange, legs are partly reddish brown, and in the aedeagus structure (it is narrowing laterally near mid-length) (Maulik 1926, Scherer 1969). So the identification was corrected (Döberl & Sprick 2009). One more species, *L. nigricornis* Medvedev, 2009 recently described from Laos and Vietnam (Medvedev 2009) is very close to *L. xanthodera* by the external characters and differs only in

aedeagus structure. In *L. nigricornis* it is cuneiform apically, without prominent denticle.

Our specimens do not correspond to any other members of *Luperomorpha* included in the keys to species from Indo-China (Medvedev 2009), India (Maulik 1926, Scherer 1969), Japan (Kimoto & Takizawa 1994), Taiwan (Kimoto & Takizawa 1997), Philippines (Medvedev 1993), Russian Far East (Medvedev 1992), Siberia (Medvedev & Dubeshko 1992). Warchałowski (2010) in the key to species of *Luperomorpha* of Palaearctic erroneously assigned *L. xanthodera* to the species group, in which “surface of pronotum is smooth and shining”.

Luperomorpha xanthodera is very similar to *Calomicrus pinicola* (Duftschmid, 1825) (Galerucinae, Galerucini, Luperini) by body size, shape and coloration and differs from the latter in black antennae and legs, distinctly thickened metafemora and by behavior: beetles are able to jump.

Trying to find a placement of the genus *Luperomorpha* among the Alticini genera of Europe (Mohr 1966, Doguet 1994, Warchałowski 2003, Bieńkowski 2004), we have revealed that *Luperomorpha* is morphologically close to the group of genera, including *Phyllotreta* Chevrolat, 1836, *Aphthona* Chevrolat, 1836, and *Heyrovskyia* Madar & Madar, 1968 because it shares the following characters of this group: body is elongate, moderately convex; antenna with 11 antennomeres; pronotum with neither antebasal impression, nor basal furrows; anterior coxal cavities opened behind; mid- and hind-tibiae without subapical excavation on upper side; hind-tibiae with apical spur pointed; hind-tarsi attached to apex of tibiae; first metatarsomere less than 0.5 × as long as length of hind-tibia; elytra with punctuation confused.

Luperomorpha differs from *Phyllotreta*, *Aphthona*, and *Heyrovskyia* by the following key:

- 1(4) Apical spur of hind-tibiae placed at middle of lower edge of its apex.
- 2(3) Antennomeres 2 and 3 1.4 × longer than wide, each 1.7 × shorter than antennomere 4. Elytral lateral and apical slopes covered with white, distinct (0.06 mm long) scattered erect setae. ... *Luperomorpha*
- 3(2) Antennomeres 2 and 3 2.0–3.0 × longer than wide, and not more than 1.5 × shorter than antennomere 4. Elytra without setae. *Phyllotreta*
- 4(1) Apical spur of hind-tibiae placed at exterior side of lower edge of its apex. Elytra without setae. *Aphthona* and *Heyrovskyia*

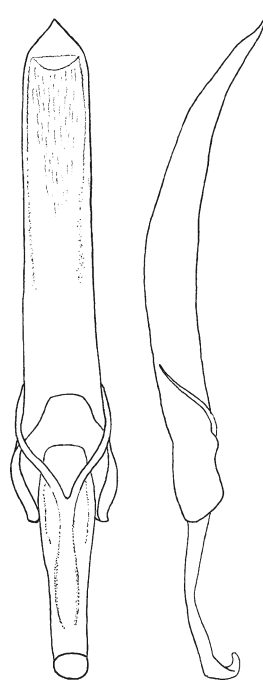


Fig. 2. Male of *Luperomorpha xanthodera* from Russia, city of Sochi, the Black Sea shore, aedeagus, ventral and lateral view.

Discussion

Luperomorpha xanthodera was apparently imported to Europe from China with exotic plants (Döberl & Sprick 2009). The dates and locations (Fig. 3, Table 1) indicate that *L. xanthodera* is quickly spreading in Europe from the west to the east. In only 13 years after the first finding it has spread over 3000 km to the east. The speed of distribution is much higher than the speed of natural spread. Therefore, we conclude that the pest spreads due to unintentional transport by men. *Luperomorpha xanthodera* is established in Sochi, since the beetles were found on grasses in the wastelands and on the bank of the pond and on rose flowers on the streets of the city.

Obviously, *L. xanthodera* was unintentionally introduced to Russia with plants from West Europe. It could, for example, be introduced from Italy as another recently established alien pest *Rhynchophorus ferrugineus* (Olivier, 1791) (Karpun et al. 2014). *Luperomorpha xanthodera* is not included into the list of quarantine pests in Russia (New Russian List of Quarantine Pests 2015). So the quarantine measures could not prevent the introduction of this species.

At least ten other alien beetle pest species have been found in the Northern Caucasus since 2000. In

Table 1. Findings of *Luperomorpha xanthodera* in Europe.

Country	Locality	Number in the map	Year	Source of information
Great Britain	Preston	1	2003	Johnson & Booth 2004
Great Britain	Barton	1	2003	Johnson & Booth 2004
Great Britain	Bolton	1	2003	Johnson & Booth 2004
Great Britain	Woodford	1	2003	Johnson & Booth 2004
Great Britain	Marple	1	2003	Johnson & Booth 2004
Great Britain	Glossop	1	2003	Johnson & Booth 2004
Great Britain	Birchcliffe	1	2003	Johnson & Booth 2004
Great Britain	Chatsworth	1	2003	Johnson & Booth 2004
Great Britain	Gailey	1	2003	Johnson & Booth 2004
France	Saint-Malo	2	2005	Doguet 2008
France	Ille-et-Vilaine	2	2005	Doguet 2008
France	Sainte-Foy-lès-Lyon	5	2008	Vincent & Doguet 2011
France	Strasbourg-Ville	9	2009	Vincent & Doguet 2011
France	Cucuron	6	2009	Vincent & Doguet 2011
France	Ile de Ré	3	2010	Vincent & Doguet 2011
France	Varennes-lès-Mâcon	5	2011	Vincent & Doguet 2011
France	Paris	4	2008	Döberl & Sprick 2009
France	Lyon	5	2008	Döberl & Sprick 2009
Italy	Pescia	15	2006	Conti & Raspi 2007
Switzerland	Basel	16	2006	Döberl & Sprick 2009
Germany	Hannover	12	2007	Döberl & Sprick 2009
Germany	Berlin	14	2008	Döberl & Sprick 2009
Germany	Botrop	11	2008	Döberl & Sprick 2009
Germany	Braunschweig	12	2008	Döberl & Sprick 2009
Germany	Darmstadt	13	2008	Döberl & Sprick 2009
Germany	Möglingen	13	2008	Döberl & Sprick 2009
Germany	Pforzheim	13	2008	Döberl & Sprick 2009
Germany	Vaihingen	13	2008	Döberl & Sprick 2009
Germany	Lippoldsberg	12	2008	Döberl & Sprick 2009
Netherlands	Utrecht	7	2008	Beenen et al. 2009
Netherlands	Friesland	7	2008	Beenen et al. 2009
Netherlands	Overijssel	7	2008	Beenen et al. 2009
Netherlands	Gelderland	7	2008	Beenen et al. 2009
Netherlands	Flevoland	7	2008	Beenen et al. 2009
Netherlands	Noord- en Zuid-Holland	7	2008	Beenen et al. 2009
Netherlands	Limburg	7	2008	Beenen et al. 2009
Hungary	Locality is not indicated	17	2010	Bodor 2011
Austria	Salzburg-Stadt	16	2011	Geiser & Bernhard 2011
Poland	Wilanow	18	2012	Kozłowski & Legutowska 2014
Belgium	Belgian Famenne	8	2014	Fagot & Libert 2016
Russia	Sochi: Adler	19	2016	Original data
Russia	Sochi: Central district	19	2016	Original data
Russia	Sochi: Olympic Village	19	2017	Original data

particular, polyphagous tree pest *Xylosandrus germanus* (Blandford, 1894) (Curculionidae, Scolytinae) was found in 2000 (Mandelstam 2000); *Stelidota geminata* (Say, 1825) (Nitidulidae), which is a serious pest of strawberry in the USA, was found in 2013

(Tsinkevich & Solodovnikov 2014), pest of tobacco *Epitrix hirtipennis* (Melsheimer 1847) (Chrysomelidae, Galerucinae) was found in 2013 (Orlova-Bienkowskaja 2014); pest of palm trees *Rhynchophorus ferrugineus* (Olivier, 1791) (Dryophthoridae) was

found in 2014 (Karpun et al. 2014), *Megabruchidius tonkineus* (Pic, 1904) and *M. dorsalis* (Fåhræus, 1839) (Chrysomelidae, Bruchinae) which damage seeds of *Gleditsia* were found in 2005 and 2013 respectively (Korotyaev 2011, 2015), established populations of *Harmonia axyridis* (Pallas, 1775) (Coccinellidae), which has been reported to feed on many fruit crops and to be the contaminant pest of wine-production, were found in 2012 (Belyakova & Reznik 2013); *Lamprodila festiva* (Linnaeus, 1767) (Buprestidae), which is a pest of Cupressaceae, was found in 2013 (Karpun & Volkovitsh, 2016), pest of bamboo *Dinoderus japonicus* Lesné, 1895 (Bostrichidae) and pest of soybeans *Medythia nigrobilineata* (Motschulsky, 1861) (Chrysomelidae) were found in 2016 (Bieńkowski & Orlova-Bienkowskaja 2017, 2018).

It is generally believed that the alien beetle species is usually staying unnoticed for many years after establishment outside its native range (Beenen & Roques 2010). Probably the rapid communication between entomologists by Internet is changing this situation. It seems that *L. xanthodera* is noticed by entomologists soon after its establishment in their countries, because the scientists know that the range of the species is expanding, know its biology and taxonomic characters and intentionally look for it.

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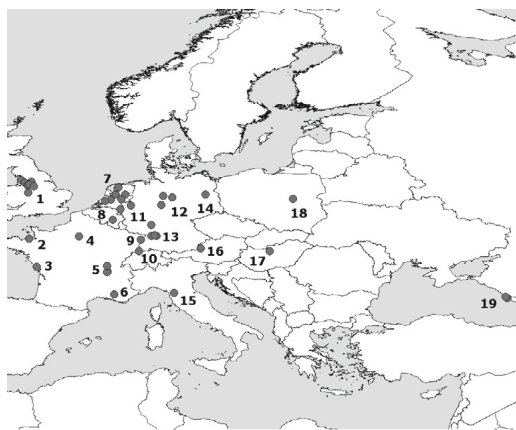


Fig. 3. Invasive range of *Luperomorpha xanthodera* in Europe. Localities with corresponding numbers are listed in Table 1.

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