

# Dramatic Expansion of the Range of the Invasive Ash Pest, Buprestid Beetle *Agrilus planipennis* Fairmaire, 1888 (Coleoptera, Buprestidae) in European Russia

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**Abstract**—The emerald ash borer (*Agrilus planipennis* Fairmaire, 1888) is a dangerous invasive pest of ashes. It was previously believed that in European Russia it occurs only in Moscow, Moscow Province, and in the eastern regions of Smolensk Province. An examination of ash trees in 12 cities of European Russia has revealed a much wider area of the emerald ash borer invasion. The pest was found in Konakovo (Tver Province), Tula, Kaluga, Orel, and Voronezh. We have found that *A. planipennis* damages not only *Fraxinus pennsylvanica* (an American species which is commonly planted in cities), but also the aborigine European ash *Fraxinus excelsior*. Ashes in the European forests and in the protective forest belts are badly endangered.

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The emerald ash borer *Agrilus planipennis* Fairmaire, 1888 is the most dangerous trunk pest of ash-trees. Invasion of this Asian beetle into North America has led to killing tens of millions trees (Emerald Ash Borer Website, 2013), and now the insect attacks the territory of Central Russia.

The first foci of *A. planipennis* in Europe were found 10 years ago in Moscow (Izhevskii, 2007; Volkovitch, 2007; Mozolevskaya, 2007; Shankhiza, 2007). The beetles had arrived from America with planting material or from China with wooden packing at the beginning of the 1990s (Izhevskii, 2007; Mo-

**Table 1.** The state of ash-trees in the cities and villages of Central and Southern Russia

City or village	Distance from the Moscow encircling highway (km)	Green ash ( <i>Fraxinus pennsylvanica</i> Marshall)		Common ash ( <i>Fraxinus excelsior</i> L.)	
		portion of trees with exit holes (%)	number of trees investigated	portion of trees with exit holes (%)	number of trees investigated
Zelenograd	20	95.6	161	0	0
Monino Vill.	20	98.2	112	0	0
Staraya Kupavna	20	94.5	109	0	0
Klin	70	98.9	88	0	0
Konakovo	100	88.3	128	0	0
Kaluga	145	15.6	128	0	0
Tver	145	0	144	0	0
Tula	150	10.5	124	100	3
Orel	310	48.2	193	57.1	14
Bryansk	330	0	159	0	0
Voronezh	460	52.7	110	100	1
Rostov-on-Don	950	0	83	0	84

**Table 2.** Records of *Agrilus planipennis* Fairm. in the European part of Russia

District	Year of the first record	Source of the data
Moscow Prov.		
Moscow	2003	Shankhiza, 2007
Istra District, Manikhino	2006	Volkovitsh, 2007
Mozhaisk District, Mozhaisk and villages in the western part of the district	2009	Baranchikov et al., 2009; Baranchikov and Kurteev, 2012
Serpukhov	2009	Baranchikov et al., 2009
Mytishchi	2009	Baranchikov et al., 2009
Pushkino	2009	Baranchikov and Kurteev, 2012
Zelenograd	2011	The author's data
Sergiev Posad	2012	Baranchikov and Kurteev, 2012
Klin	2013	The author's data
Kolomna	2012	Lifantieva, 2012
Noginsk District, Staraya Kupavna	2013	The author's data
Shchelkovo District, Monino	2013	The author's data
Smolensk Prov.		
Gagarin District	2012	Baranchikov and Kurteev, 2012
Vyazma District	2012	Baranchikov and Kurteev, 2012
Tver Prov.		
Konakovo	2013	The author's data
Kaluga Prov.		
Obninsk	2012	Report of the "Regnum" News Agency, 2012
Kaluga	2013	The author's data
Orel Prov.		
Orel	2013	The author's data
Tula Prov.		
Tula	2013	The author's data
Voronezh Prov.		
Voronezh	2013	The author's data

zolevskaya, 2007; Izhevskii and Mozolevskaya, 2008). The pest has highly increased its abundance over the last years, and the infestation of ash-trees in the capital has become almost continuous; dead and dying trees are common in the streets of the city. According to Mozolevskaya (2012), with time, planted ash-trees will disappear from Moscow and its suburbs.

It was recently believed that in European Russia *A. planipennis* occurs only in Moscow and its nearest environs (Baranchikov et al., 2010). However, in 2012, the pest was recorded in the neighboring regions. In the south, the emerald ash borer occupied Obninsk Town of Kaluga Province ("Regnum" News Agency, 2012) and approached Tula (Gninenko,

2012); in the west it got into Gagarinskii and Vyazemskii districts of Smolensk Province (Baranchikov and Kurteev, 2012); and in the east, it was found in Kolomna (Lifantieva, 2012).

In May–June 2013, ash-trees were investigated in 12 cities and villages of Central Russia for new foci of *A. planipennis*.

## RESULTS

According to our data, the range of the emerald ash borer has significantly widened. Withered trees with characteristic D-shaped exit holes on the trunks are found not only in Moscow, but also in Kaluga, Orel, Tula, Voronezh, and Tver provinces (Figs. 1–6). The



**Fig. 1.** A withering tree of *Fraxinus pennsylvanica* in Voronezh.

results of investigation of the green plantings are given in Table 1.

In the surveyed cities and villages of Moscow Province, Zelenograd, Klin, Monino, and Staraya Kupavna, and also in Konakovo Town of Tver Province, the infestation is nearly 100%, and most trees have already perished.

In Kaluga, the majority of the trees seem to be healthy. Groups of damaged Green ashes (*Fraxinus pennsylvanica*) with exit holes are found only in Bilibin Street and Chicherin Alley.

In Orel, the destruction of ash-trees is also not continuous but focal. Groups of dying and dead trees are found in the Detskii Park on the Orlik River bank, near



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**Figs. 2–4.** (2) Exit holes of *Agrilus planipennis* Fairm. on the bark of an ash-tree in Orel; (3) an exit hole on the bark of an ash-tree in Tula; (4) head of an adult beetle in a exit hole during its emergence from the bark (Voronezh).

the boat station, in the city recreation park, and also in the 2nd Posadskaya and 3rd Kurskaya streets. The focus near the boat station seems to have existed for several years; all the trees have perished there.

In Tula, damaged trees are not numerous, and they only start withering. Exit holes on the trunks are found on Krasnoarmeiskii Avenue, in Dmitry Ulyanov Street, Friedrich Engels Street, and near the entrance to the P.P. Belousov Central Recreation Park. One beetle was found in the square at the crossing of Krasnoarmeiskii Avenue and Feodor Smirnov Street.

The only but rather large pest focus was found in Voronezh: there are many dead and perishing ash-trees in the territory of the Komintern Recreation Center (Moscow Avenue, building no. 9) and in the neighboring streets. Many characteristic holes and one dead beetle were found.

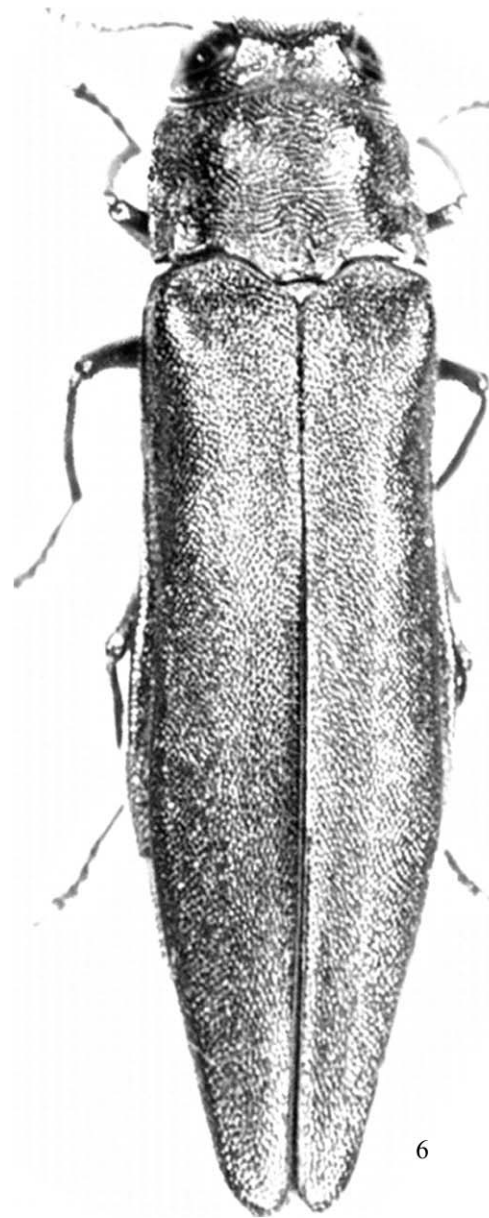
In Tver, Bryansk, and Rostov-on-Don, no signs of the pest activity were found, though the green plantings of these cities include a lot of ash-trees.

Mass destruction of ash-trees was observed in the forest belt along the railway from Sysoevo Station (Chertkovo District of Rostov Prov.) to Voronezh, but, having had no opportunity to examine the tree trunks, we cannot determine exactly whether their destruction was caused by *A. planipennis*.

Until recently, traces of the activity of *A. planipennis* in the European part of Russia were found only on the American *F. pennsylvanica* used for gardening, therefore, some authors hoped that the pest would not damage the common ash (*F. excelsior*) (Baranchikov et al., 2008). However, our studies have shown that the local ash-trees also suffer from the invasive pest. The trees infested with emerald ash borer were found in Orel, Voronezh, and Tula (Fig. 5).

#### DISCUSSION

The cities and villages in which *A. planipennis* was recorded are listed in Table 2 and their situation is shown in Fig. 7.



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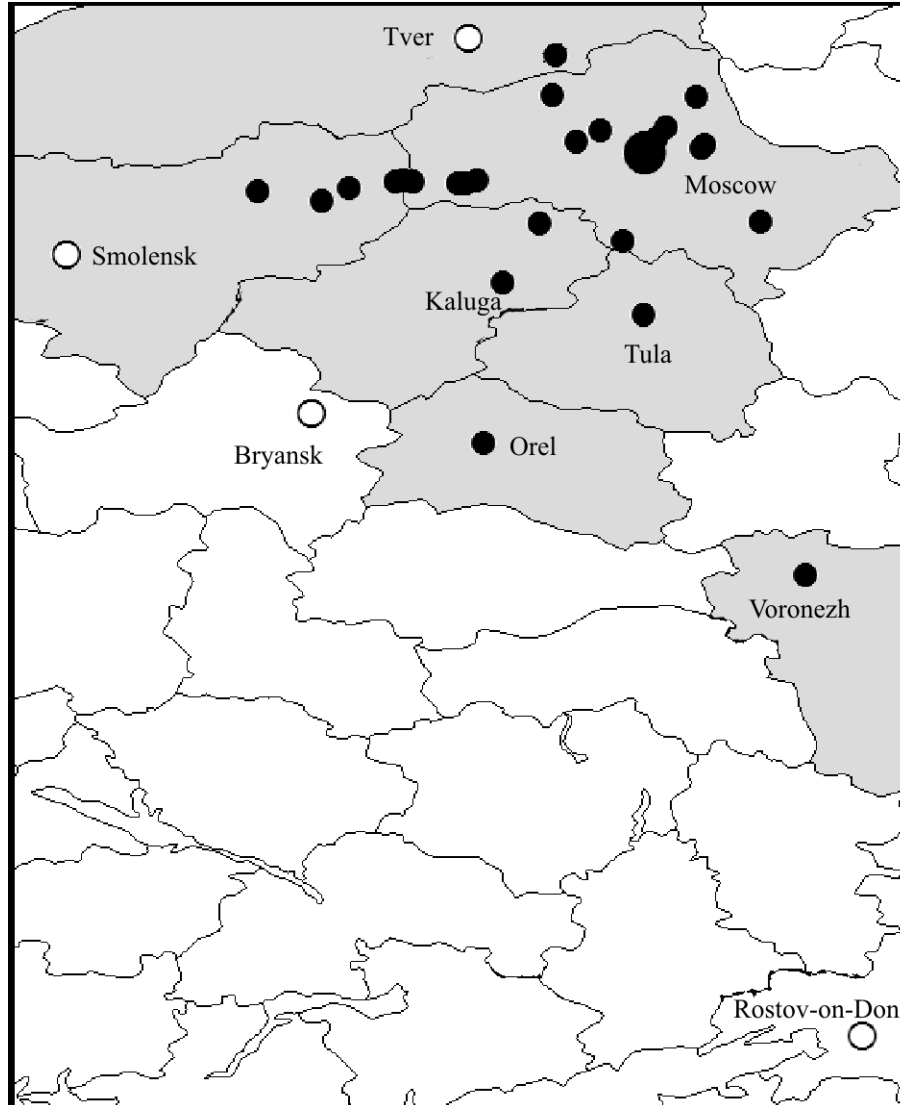
**Figs. 5, 6.** A withering tree of *Fraxinus excelsior* (5) and the beetle *Agrilus planipennis* Fairm. found on it (6), Tula.

The data obtained confirm that the initial invasion originated in Moscow Province where the percent of the attacked trees is highest (see Table 1). Now the range of the pest has expanded southward to Voronezh, i.e., its southern border runs about 500 km from Moscow.

The pest's invading the zone of broadleaf forests, where ash timber is harvested, is very dangerous. The forest industry of our country can incur enormous losses from the mass destruction of trees, as it hap-

pened in the USA (Emerald Ash Borer Website, 2013). The forest belts of the Chernozem Region are also threatened. It is necessary to investigate as soon as possible the forest belts and, in case of need, to strengthen them by planting trees of other wood species, instead of the perishing ashes.

The distribution of *A. planipennis* in the European part of Russia has been insufficiently studied. The pest's range is not outlined, with only scanty records being known. Monitoring of insect ranges is an impor-



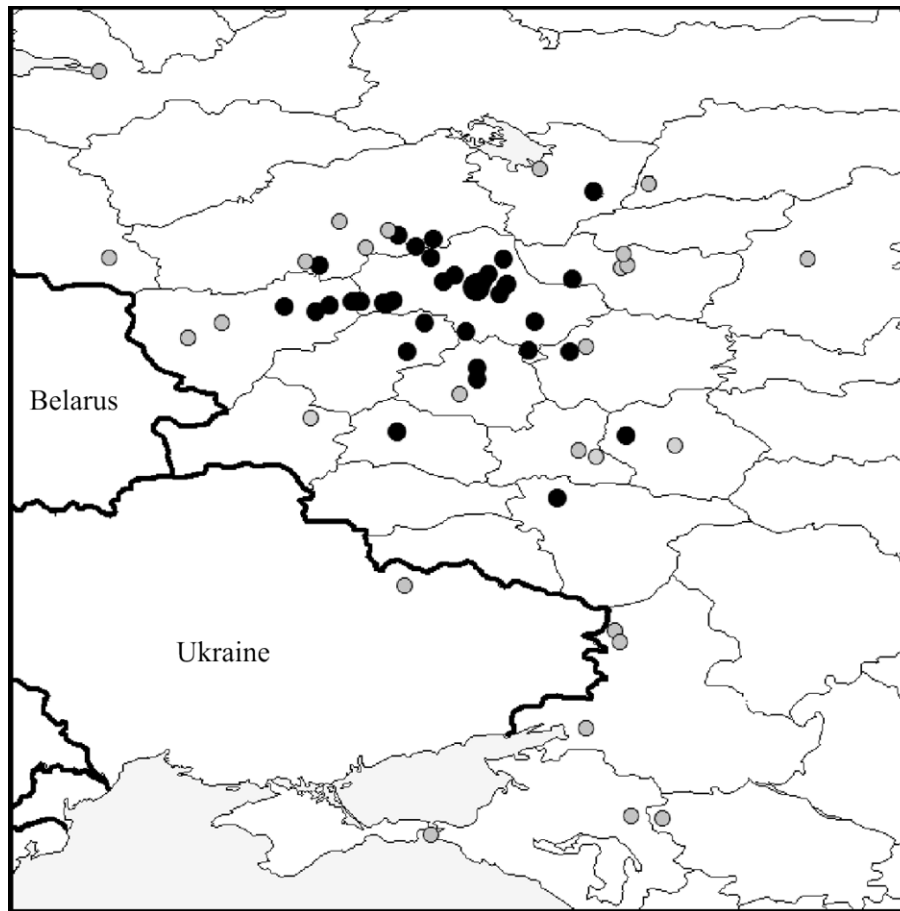
**Fig. 7.** Distribution of *Agrilus planipennis* Fairm. in the European part of Russia. Gray shading designates the provinces in which *A. planipennis* was found; black circles designate the localities in which the pest was recorded; white circles designate the localities in which investigations have not revealed *A. planipennis* (for sources of the data, see Table 2).

tant problem, which cannot be solved by efforts of separate scientific, agricultural, forestry, or ecological organizations. It is necessary to join their efforts and to create a common database similar to that formed in the United Kingdom (National Biodiversity Network, 2013). Though such a project requires financial investments, the example of *A. planipennis* shows that without the entomological monitoring service the state bears considerably greater losses, since foci of invasive pests should be found and neutralized timely.

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**Fig. 8.** New data on the distribution of *A. planipennis* in the European part of Russia. Black circles designate the localities in which the pest was recorded; grey circles designate the localities in which investigations have not revealed *A. planipennis*.

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#### SUPPLEMENTS

New data on the distribution of *A. planipennis* appeared after the submission of the original manuscript. Part of the author's data have been published (Orlova-Bienkowskaja, 2013), but some data have not. Now the emerald ash borer has been recorded in 11 provinces of European Russia: Moscow, Tver, Smolensk, Kaluga, Tula, Orel, Voronezh, Yaroslavl, Tambov, Ryazan, and Vladimir provinces (Fig. 8).

New records: Tver Prov.: Zubtsov, Emmaus, Novozavidovskii; Yaroslavl Prov.: Yaroslavl (the author's data); Vladimir Prov.: Petushki (Baranchikov, 2013); Tula Prov.: Shchekino (Straw et al., 2013); Ryazan Prov.: Vysokoe; Moscow Prov.: Uzunovo (the author's data); Bykovo (Danilevsky, 2012); Tambov Prov.: Michurinsk (the author's data).

Locations where the investigation was performed, but no evidences of *A. planipennis* were found are as following: Pskov Prov.: Velikiye Luki; Leningrad Prov.: St. Petersburg; Tver Prov.: Nelidovo, Rzhev, Torzhok; Yaroslavl Prov.: Rybinsk; Kostroma Prov.: Kostroma; Vladimir Prov.: Vladimir (the author's data), Bogolyubovo, Suzdal (Baranchikov, 2013); Nizhny Novgorod Prov.: Nizhny Novgorod; Smolensk Prov.: Yartsevo (Straw et al., 2013); Tula Prov.: Plavsk; Ryazan Prov.: Ryazan; Lipetsk Prov.: Lipetsk,

Gryazi; Tambov Prov.: Tambov; Rostov Prov.: Millerovo, Sysoevo; Krasnodar Terr.: Abinskoe, Krymskoe, and Tuapsinskoe forestries (Federal Forestry Agency, 2013); Kavkazskaya District, Taman' Peninsula (Korotyaev, 2013); Stavropol Terr.: Novoaleksandrovsk District (Korotyaev, 2013). Ukraine: Kharkov Prov.: Kharkov (the author's data).

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