Bad and good news for ash trees in Europe: alien pest *Agrilus planipennis* has spread to the Ukraine and the south of European Russia, but does not kill *Fraxinus excelsior* in the forests

Marina J. Orlova-Bienkowskaja
A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, 33 Leninskiy Prospect, Moscow, Russia 119071
e-mail: marinaorlben@yandex.ru

Alexander N. Drogvalenko
V.N. Karazin Kharkiv National University, 4 Svobody Square, Kharkov, Ukraine 61022
e-mail: triplaxxx@ukr.net

Ilya A. Zabaluev
A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, 33 Leninskiy Prospect, Moscow, Russia 119071
e-mail: fatsiccor66@mail.ru

Alexey S. Sazhnev
Papanin Institute for Biology of Inland Waters, Russian Academy of Sciences, Borok, Nekouz District, Yaroslavl Region, Russia 152742
e-mail: sazh@list.ru

Elena Yu. Peregudova
Saint Petersburg State Forest Technical University, Institutskiy per., 5, Saint Petersburg, Russia 194021
e-mail: dinamo-l@mail.ru

Sergey G. Mazurov
Middle School of General education, Leski, Krasnoe District, Lipetsk Region, Russia 399675
e-mail: mazusergej@yandex.ru

Evgenij V. Komarov
All-Russian Scientific Research Institute of Irrigated Agriculture,
Timiryazev str., 9, Volgograd Russia 400002
e-mail: evkomarov@rambler.ru

Andrzej O. Bieńkowski
A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, 33 Leninskiy Prospect, Moscow, Russia 119071
e-mail: bienkowski@yandex.ru

Acknowledgements

The study was supported by Russian Science Foundation, Project No 16-14-10031. We would like to thank entomologists V.V. Martynov and T.V. Nikulina (Donetsk, Ukraine), L.V. Egorov (Cheboksary, Russia), A.N. Volodchenko (Balashov, Russia), V.V. Anikin and M.V. Lavrentiev (Saratov, Russia) for the information about surveys of ash trees in different regions of European Russia and Ukraine and to Ya.N. Kovalenko for the valuable information on official phytoquarantine documents.

Abstract Emerald Ash Borer (EAB) *Agrilus planipennis* (Coleoptera: Buprestidae) native to Asia is a devastating pest of ash trees (*Fraxinus* spp.). It was first detected in Europe in Moscow in 2003. It is spreading over the country and causing serious damage to plantations of *F. pennsylvanica* introduced from North America. Our surveys of ash trees in 2017–2019 in 25 localities has shown that the range in ER has the area of 600 000 km^2, i.e. exceeds the area of Spain. We have first detected *A. planipennis* in the very south of Russia (Volgograd) and in the Ukraine (Markovka district of Lugansk Region). Therefore, now *A. planipennis* is detected in 14 regions of ER: Bryansk, Kaluga, Lipetsk, Moscow, Orel, Ryazan, Smolensk, Tambov, Tula, Tver, Vladimir, Volgograd, Voronezh and Yaroslavl as well as in Lugansk Region of the Ukraine. The only native ash species *F. excelsior* is susceptible to *A. planipennis*, but all cases of its infestation refer to the trees in urban, roadside and shelterbelt plantations planted near *F. pennsylvanica*, which is highly susceptible to the pest. Our survey of 500 *F. excelsior* trees in the large Tulskie Zaseki forest situated in the center of the pest range has not revealed any signs of infestation. There is no doubt that *A. planipennis* will appear in other European countries soon and severely damage plantations of *F. pennsylvanica* there. But the hope appeared that the pest could be less dangerous for *F. excelsior* in European forests.

Keywords Emerald Ash Borer; EAB; *Fraxinus pennsylvanica*; *Fraxinus excelsior;* invasive pest; ash

Introduction

Emerald ash borer (EAB) *Agrilus planipennis* (Coleoptera: Buprestidae) is a devastating alien pest of ash trees in European Russia and North America (Baranchikov et al. 2008; Haack et al. 2015). The native range of this wood-boring beetle occupies a restricted territory in East Asia (Orlova-Bienkowskaja and Volkovitsh 2017). In 2003 *A. planipennis* was first recorded in European Russia, namely in Moscow (Shankhiza 2007), and the severe outbreak and quick spread of the pest began (Baranchikov et al. 2008). By 2013 the pest was recorded in 9 regions of European Russia: from Yaroslavl in the north to Voronezh in the south (Straw et al 2013; Orlova-Bienkowskaja 2014a). The probabilistic model of spread has shown that in the next few years the range of *A. planipennis* can significantly expand, and the pest can appear in the neighboring countries (Orlova-Bienkowskaja and Bieńkowski 2018). The first aim of our study was to determine the current range of *A. planipennis*.

Fraxinus pennsylvanica introduced from North America is widely planted in European Russia as an ornamental and landscaping tree. It is highly susceptible to *A. planipennis* (Baranchikov et al. 2014). The overwhelming majority of detected infestations of ash trees in European Russia refer to this ash species (Baranchikov et al. 2008; Straw et al 2013; Orlova-Bienkowskaja 2014a). The only native ash species *F. excelsior* is also susceptible to the pest (Baranchikov et al. 2014), but studies on the feeding preferences of adult *A. planipennis* on different species of ash suggest that *F. excelsior* is not as susceptible as *F. pennsylvanica* (Pureswaran and Poland 2009). *Fraxinus excelsior* is rare in Moscow Region and other regions of Central Russia. So the information about infestation of *F. excelsior* by *A. planipennis* was scarce and referred only to urban plantations and artificial

shelterbelts, where *F. excelsior* was planted together with *F. pennsylvanica* (Straw et al. 2013; Baranchikov 2018). There were no information about the impact of A. planipennis on *F. excelsior* in natural forests and, therefore, it was a great deal of uncertainty surrounding the likely future impact of *A. planipennis* on ash in European forests (Straw et al. 2013). So the second aim of our study was to get the information about current condition of *F. excelsior* in natural forest stands in the regions occupied by *A. planipennis.*

Materials and Methods

In 2017, 2018 and 2019 we made surveys of ash trees in 25 localities of European Russia, Belarus and Ukraine (see Tables 1, 2). In the most of these localities we examined artificial plantations in the cities, along motorways and railroads an in the field shelter belts. The presence of the pest was detected by D-shaped exit holes on the stem, larval galleries under the bark and the presence of larvae under the bark and adults in the canopy (Figs 1–4). Besides own data we accumulated and mapped published records of *A. planipennis* and personal communications of colleagues from several regions.

To determine the impact of *A. planipennis* on European ash *F. excelsior* we made a survey of more than 500 ash trees in the large forest Tulskie Zaseki situated in Tula Region in the center of the recent *A. planipennis* range.

Fig. 1 Exit hole of *Agrilus planipennis* on *Fraxinus pennsylvanica* in Volgograd (photo by E.V. Komarov).

Fig. 2 Larval galleries of *Agrilus planipennis* on *Fraxinus pennsylvanica* in Volgograd (photo by E.V. Komarov).

Fig. 3 Adults of *Agrilus planipennis* in the pupal cells on *Fraxinus pennsylvanica* in Volgograd (photo by E.V. Komarov).

Fig. 4 Adult of *Agrilus planipennis* on the leaf of *Fraxinus pennsylvanica* in Volgograd (photo by E.V. Komarov).

Abbreviations used in the tables:

AD – Observations by Alexander N. Drogvalenko

AS – Observations by A.S. Sazhnev

EK – Observations by Evgenij V. Komarov

EP – Observations by E. Yu. Peregudova

IZ – Observations by Ilya A. Zabaluev

MOB and AB – Observations by Marina J. Orlova-Bienkowskaja and Andrzej O. Bieńkowski.

SM – Observations by Sergey G. Mazurov

Table 1. Localities, where *Agrilus planipennis* has been detected in European Russia and the Ukraine. RU – Russia, UA – Ukraine

Locality	Damaged trees	Kind of plantations	Year of the first detection	Lat	Lon	Sources of information
Moscow (*A. planipennis* occurs all over the city)	*F. pennsylvanica*, few *F. excelsior*	Urban	2003	55.81	37.64	(Shankhiza 2007; Izhevskii and Mozolevskaya 2010; Baranchikov et al., 2008; Straw et al., 2013; Orlova-Bienkowskaja 2014;

						Volkovitsh and Mozolevskaya 2014)
Moscow Reg.: Manikhino	*F. pennsylvanica*	Roadside	2006	55.88	36.97	(Shankhiza 2007)
Moscow Reg.: Serpukhov	*F. pennsylvanica*	Urban	2009	54.92	37.41	(Baranchikov et al. 2009)
Moscow Reg.: Mozhaisk	*F. pennsylvanica*	Urban	2009	55.51	36.01	
Moscow Reg.: Mytiszhi	*F. pennsylvanica*	Urban	2009	55.91	37.74	
Moscow Reg.: Pushkino	*F. pennsylvanica*	Urban	2009	56.01	37.84	(Baranchikov and Kurteev 2012)
Moscow Reg.: Korolev	*F. pennsylvanica*	Urban	2011	55.92	37.85	Volkovitsh and Mozolevskaya 2014
Moscow Reg.: Zelenograd	*F. pennsylvanica, few F. excelsior*	Urban	2011	56.00	37.18	(Orlova-Bienkowskaja 2014)
Smolensk Reg.: localities along the road Moscow-Vyazma	*F. pennsylvanica*	Roadside	2012	55.30	34.50	(Baranchikov and Kurteev 2012)
Moscow Reg.: Sergiev Posad	*F. pennsylvanica*	Urban	2012	56.31	38.13	
Ryazan Reg:Vysokoe	Not indicated	Not indicated	2012	54.52	39.41	(Baranchikov 2013)
Tula Reg.: Shchekino	*F. excelsior*	Roadside	2013	53.99	37.63	(Straw et al. 2013)
Tver Reg.: Zubstov	*F. pennsylvanica*	Urban	2013	56.18	34.58	
Tver Reg.: Novozavidovskiy	*F. pennsylvanica*	Roadside	2013	56.55	36.43	
Tver Reg.: Emmaus	*F. pennsylvanica*	Roadside	2013	56.78	36.09	
Moscow Reg.: Uzunovo	*F. pennsylvanica*	Along the railway	2013	54.55	38.62	(Orlova-Bienkowskaja 2014)
Moscow Reg.: Klin	*F. pennsylvanica*	Urban	2013	56.33	36.73	

Moscow Reg.: Staraya Kupavna	*F. pennsylvanica*	Urban	2013	55.81	38.18	
Voronezh	*F. pennsylvanica, F. excelsior*	Urban	2013	51.68	39.18	
Tula	*F. pennsylvanica, F. excelsior*	Urban	2013	54.20	37.62	
Kaluga	*F. pennsylvanica*	Urban	2013	54.52	36.26	
Tver Reg.: Konakovo	*F. pennsylvanica*	Urban	2013	56.71	36.77	
Orel	*F. pennsylvanica, F. excelsior*	Urban	2013	52.97	36.07	
Yaroslavl	*F. pennsylvanica*	Urban	2013	57.63	39.87	
Tambov Reg.: Michurinsk	*F. pennsylvanica*	Urban	2013	52.90	40.50	
Vladimir Reg.: Petushki	Not indicated	Not indicated	2013	55.93	39.46	(Baranchikov 2013)
Orel Region: Livny	Not indicated	Urban	2013	52.43	37.60	(Rosselkhoznadzor 2014)
Moscow Reg.: Solnechnogorsk	*F. pennsylvanica*	Roadside	2014	56.19	36.98	Own data (MOB and AB)
Moscow Reg.: Planernaya	*F. pennsylvanica*	Along the railway	2014	55.92	37.38	
Moscow Reg.: Povarovka	*F. pennsylvanica*	Along the railway	2014	56.06	37.08	
Smolensk Reg.: Semirechje	Not indicated	Roadside	2014	54.89	32.07	(Zvyagintsev et al. 2015)
Smolensk Reg.: Andreykovo	Not indicated	Roadside	2014	55.24	34.26	
Tver: Khiminstituta Settlement	*F. pennsylvanica*	Roadside	2015	56.80	36.03	(Peregudova 2016)
Moscow Reg.: Stupino	*F. pennsylvanica*	Urban	2017	54.89	38.10	Own data (MOB and AB)
Moscow Reg.: Kolomna	*F. pennsylvanica*	Urban	2017	55.08	38.79	
Moscow Reg.: Dedinovo	*F. pennsylvanica*	Urban	2017	55.06	39.12	
Voronezh Reg.: Talovaya	Not indicated	Not indicated	2018	51.11	40.72	(Baranchikov et al. 2018)
Lipetsk Reg.: Elets	Not indicated	Not indicated	2018	52.62	38.50	Baranchikov Y.N, oral communication

						in PREPSYS conference
Smolensk	Not indicated	Along the railway	2018	54.80	32.03	(Baranchikov and Seraya 2018)
Tver: Doroshiha railway station	*F. pennsylvanica*	Along the railway	2018	56.87	35.84	(Peregudova 2019)
Voronezh Reg.: Olkhovatskoe Forestry	Not indicated	Not indicated	2018	50.12	39.26	(Rosselkhoznadzor 2019)
Volgograd Reg.: Sarpinsky Island	*F. pennsylvanica*	Floodplain forest	2018	48.60	44.49	Own data (EK)
Volgograd Reg.: Volga-Akhtuba floodplain	*F. pennsylvanica*	Floodplain forest	2019	48.69	44.61	
Volgograd Reg.: Sarepta Peninsula	*F. pennsylvanica*	Floodplain forest	2019	48.53	44.51	
Volgograd City: Mira Street	*F. pennsylvanica*	Urban	2019	48.71	44.52	
Bryansk: Majskij Park	Not indicated	Urban	2019	53.31	34.31	(Rosselkhoznadzor 2019)
Moscow Reg.: Shakhovskaya	*F. pennsylvanica*, few *F. excelsior*	Urban	2019	56.03	35.51	Own data (MOB and AB)
Lipetsk Reg.: Leski	*F. pennsylvanica*	Along the railway	2019	52.88	39.00	Own data (SM)
Ukraine: Markovka District, near Starokozhij Forest	*F. pennsylvanica*	Field shelter belt	2019	49.61	39.56	Own data (AD)

Table 2. Localities where *A. planipennis* was not detected during the surveys in 2017, 2018 and 2019. BY - Belarus, RU - Russia, UA - Ukraine

Country and locality	Examined trees	Kind of plantations	Year of survey	Lat	Lon	Sources of information
BY: Borisov	*F. pennsylvanica*, *F. excelsior*	Urban	2017	54.22	28.51	Own data (MOB and AB)
RU: Cheboksary	*F. pennsylvanica*	Urban	2017	56.14	47.25	L.V. Egorov, pers. comm.
RU: Saransk	*F. pennsylvanica*	Urban	2017	54.19	45.18	A.B. Ruchin, pers. comm.
RU: Tambov	*F. pennsylvanica*	Urban	2017	52.72	41.45	R.N. Ishin, pers. comm.

RU: Millerovo	*F. pennsylvanica*, *F. excelsior*	Urban and roadside	2017	48.92	40.39	(Martynov et al. 2017)
RU: Shakhty	*F. pennsylvanica*, *F. excelsior*	Urban and roadside	2017	47.71	40.22	(Martynov et al. 2017)
RU: Rostov-na-Donu	*F. pennsylvanica*, *F. excelsior*	Urban and roadside	2017	47.23	39.72	(Martynov et al. 2017)
RU: Krasnodar	*F. pennsylvanica*, *F. excelsior*	Urban	2018	45.11	39.00	Own data (MOB and AB)
RU: Sochi	*F. excelsior*	Natural forest and urban plantations	2018	43.44	39.93	Own data (MOB and AB)
BY: Stolbtsy	*F. pennsylvanica*, *F. excelsior*	Urban	2018	53.48	26.74	Own data (MOB and AB)
BY: Mogilev	*F. pennsylvanica*, *F. excelsior*	Urban	2018	53.89	30.33	Own data (MOB and AB)
BY: Orsha	*F. pennsylvanica*, *F. excelsior*	Urban	2018	54.51	30.42	Own data (MOB and AB)
BY: Vitebsk	*F. pennsylvanica*, *F. excelsior*	Urban	2018	55.18	30.20	Own data (MOB and AB)
RU: St.-Petersburg	*F. pennsylvanica*	Urban	2018	59.93	30.28	Own data (MOB and AB)
UA: Donetsk	*F. pennsylvanica*, *F. excelsior*	Urban and roadside	2019	48.01	37.83	V.V. Martynov, T.V. Nikulina, pers. comm.
RU: Saratov	*F. pennsylvanica*, *F. excelsior*	Urban	2019	51.52	45.98	V.V. Anikin, M.V. Lavrentiev, pers. comm.
RU: Balashov	*F. pennsylvanica*, *F. excelsior*	Urban	2019	51.55	43.15	A.N. Volodchenko, pers. comm.
RU: Rzev	*F. pennsylvanica*	Urban	2019	56.26	34.34	Own data (MOB and AB)
RU: Pskov Reg.: Sebezh	*F. excelsior*	Urban	2019	56.30	28.47	Own data (MOB and AB)
RU: Pskov Reg.: Velikie Luki	*F. pennsylvanica*	Urban	2019	56.34	30.53	Own data (MOB and AB)
RU: Tver Reg.: Ostashkov	*F. pennsylvanica*, *F. excelsior*	Urban	2019	57.14	33.12	Own data (MOB and AB)
RU: Tver Reg.: Bologoye	*F. pennsylvanica*, *F. excelsior*	Urban	2019	57.89	34.05	Own data (MOB and AB)
RU: Tver Reg.: Vyshniy Volochek	*F. pennsylvanica*	Urban	2019	57.58	34.57	Own data (EP, MOB and AB)
RU: Yaroslavl Reg.: Borok	*F. pennsylvanica*	Urban	2019	58.05	38.25	Own data (AS)

UA: Kharkiv	*F. pennsylvanica*, *F. excelsior*	Urban	2019	49.99	36.26	Own data (AD)
RU: Tula Reg.: Tulskie Zaseki, Severno-Odoevskoe Forestry	*F. excelsior*	Natural forest	2019	54.01	36.78	Own data (IZ)
RU: Tula Reg.: Tulskie Zaseki, Krapivna	*F. excelsior*	Natural forest	2019	53.97	37.16	Own data (IZ)

Results

Current range

By 2019 *A. planipennis* has been detected in 14 regions of European Russia and Lugansk Region of the Ukraine (Fig. 5). Our surveys in 2018 and 2019 have shown that *A. planipennis* has spread to the south of European Russia: Volgograd Region and to the east of the Ukraine: Lugansk Region, but the western border of the range has not significantly change in the last five years.

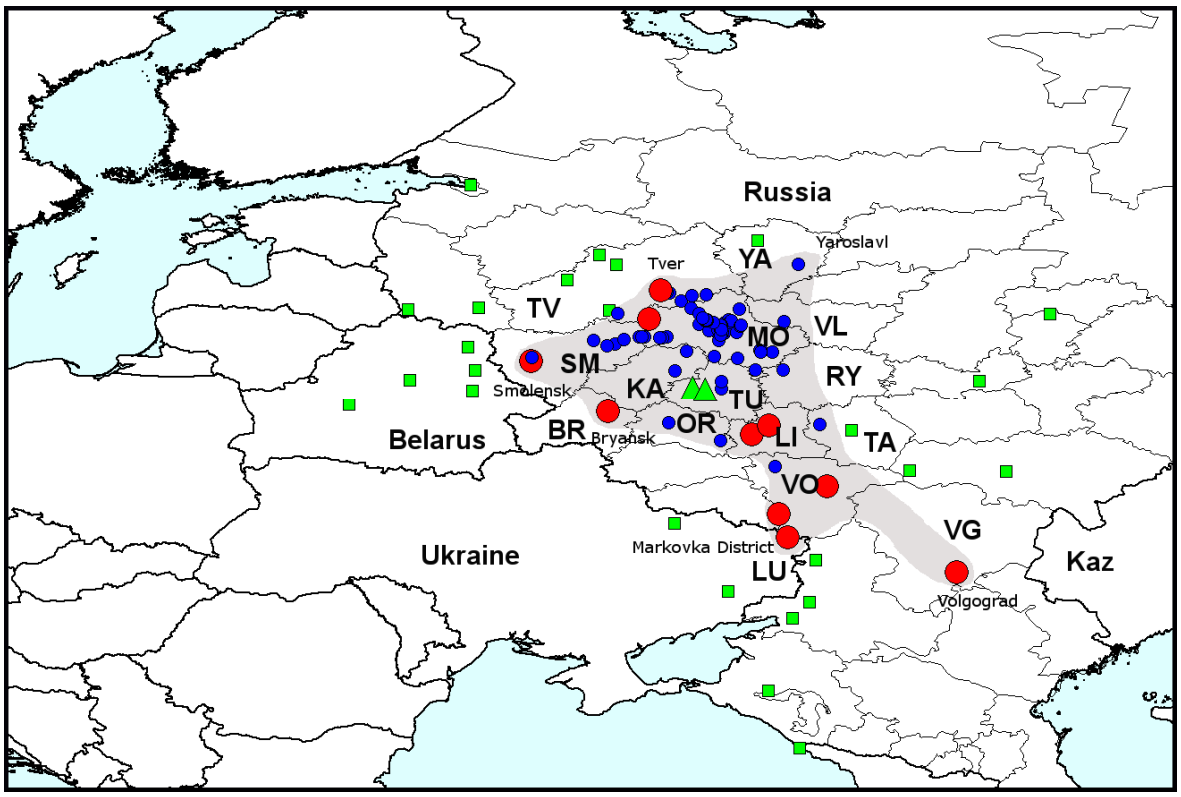

Fig. 5 Range of *Agrilus planipennis* in European Russia and the Ukraine in 2019. Blue dots – localities, where *A. planipennis* was first detected in 2003 –2017. Red dots – localities, where it was first detected in 2018 –2019. Green squares – localities, where it was not detected during surveys in 2018–2019. Green triangles – localities of surveys of *Fraxinus excelsior* in the broad-leaved forest Tulskie Zaseki, where ash trees are healthy and have no signs of *A.*

planipennis infestations. Russia: BR – Bryansk Region, KA – Kaluga Region, LI – Lipetsk Region, LU – Lugansk Region, MO – Moscow Region, OR – Orel Region, RY – Ryazan Region, SM – Smolensk Region, TA – Tambov Region, TU – Tula Region, TV – Tver Region, VG – Volgograd Region, VL – Vladimir Region, VO – Voronezh Region, YA – Yaroslavl Region. Kaz - Kazakhstan.

The outbreak in Volgograd Region

The survey of declined plantations of *F. pennsylvanica* (104.9 ha) in Sarpinsky Island in the Volga River (the city of Volgograd) in October 2018 has shown that the trees have been severely damaged by *A. planipennis*. The island is occupied with the floodplain forest, which initially consisted of oak, poplar, elm later replaced by artificially planted green ash. In different parts of the island the degree of damage of ash trees varied from 20–30% to 90–100%. The official phytoquarantine zone is declared in the island (Rosselkhoznadzor 2019). The decline of the ash plantations because of the pest outbreak attracted the attention of the local TV (Vesti Volgograd 2018). Since 21 May 2019 the mass emerging of adult *A. planipennis* in the island began. In 2019 the outbreak was also detected in the left bank of Volga – in Volga-Akhtuba floodplain (more than 500 damaged *F. pennsylvanica*) and in Sarepta Peninsula (more than 200 ones). Besides that, one tree damaged by *A. plannipennis* was also detected in the center of Volgograd city (Mira Street).

The first record in the Ukraine

In 20–22 of June 2019 ash trees in Starokozjij Forest and field shelter belt in its vicinity were examined (Markovka District of Lugansk Region of the Ukraine; 49.612958 N, 39.56344 E) (the survey was made by A.N. Drogvalenko). The forest consists of *Quercus* sp., *Acer platanoides*, *Fraxinus excelsior* and *Pyrus* sp. Undergrowth and edges consist of *Acer campestre*, *Acer tataricum*, *Fraxinus excelsior*, *F. pennsylvanica*, *Prunus spinosa*, *Prunus fruticosa*. Forest belts consisted mainly from *F. pennsylvanica.* As a result of examination of 250 ash trees three trees of *F. pennsylvanica* damaged by *A. planipennis* were detected. These trees were situated at the edge of the forest belts and have the diameter of 7–10 cm. Characteristic D-shaped exit holes were situated at a height of 50-200 cm. The infested trees had dying of upper branches, foliage density reduced (small leaves) and fewer seeds.

Records in Lipetsk region

Lipetsk region is surrounded by the regions where *A. planipennis* was found in 2013 (Orlova-Bienkowskaja 2014a). The survey by M.J. Orlova-Bienkowskaja in the city of Gryazy in Lipetsk region did not revealed the infestation of trees by *A. planipennis*, though the trees of *F. pennsylvanica* were in poor condition, and the species *Agrilus convexicollis* usually associated with *A. planipennis* was found (Orlova-Bienkowskaja and Volkovitsh 2014). In 2018 *A. planipennis* was first found in Lipetsk Region - in the city of Elets (Y.N. Baranchikov, oral communication in PREPSYS conference, 2018). In June 2019 *A. planipennis* was also found in plantations along the railway in Leski (Lipetsk Region) (our data, survey was made by S.G. Mazurov.

The results of surveys of trees at the western and north-west border of range

In 2018 we tried to find *A. planipennis* in the east of Belarus: in the cities of Mogilev, Orsha and Vitebsk, but did not find any signs of infestations in spite of *F. pannsylvanica* and *F. excelsior* are very common in these cities.

Therefore, the westernmost localities of the pest are in Smolensk Region: Semirechje (56 km from the border of Belarus), where the pest was first recorded in 2014 (Zvyagintsev et al. 2015) and Smolensk (Baranchikov and Seraya 2018). In the north-west the border of range is in Tver region: In the north-west the most remote locality is still Zubtsov, where *A. planipennis* was found in 2013 (Straw et al., 2013). In 2019 we failed to find the pest in other cities of Tver and Pskov Regions, even in the city of Rhev, which is only 15 km north-west to Zubtsov. The marginal location of range in the north-western outscirt of Tver city, where *A. planipennis* was first detected in 2018 (Peregudova, 2019). It is at the distance of 19 km from Emmaus, where *A. planipennis* was detected in 2013 (Straw et al., 2013). In the cities of Tver and Smolensk infested trees occur only in restricted small foci, though the most of ash trees in the cities are have no signs of infestation.

The results of survey of *F. excelsior* in the natural forest Tulskie Zaseki in the center of the pest range

The large broad-leaved forest Tulskie Zaseki (65 000 ha - проверить) is situated in Tula Region in the center of current range of *A. planipennis*. *Fraxinus excelsior* is one of the main tree species of this forest. The pest was detected in its vicinity – in Tula and Shchekino as well as in surrounding regions: Kaluga and Orel in 2013 (Straw et al., 2013; Orlova-Bienkowskaja M. J. 2014a). Trees of *Fraxinus pennsylvanica* are very usual in the cities of Tula and Shchekino, and now almost all of them are destroyed by the pest (Baranchikov et al 2018b and own observations by I.A. Zabaluev). In 19–20 of June 2019 more than 500 trees of *F. excelsior* were examined by I.A. Zabaluev in the forest Tulskie Zaseki in two localities: near Krapivna village and in Severno-Odoevskoe Forestry (Fig. 6). The trees were situated both in the edge and in the depth of the forest. No signs of infestation by *A. planipennis* have been found. Ash trees are in good condition.

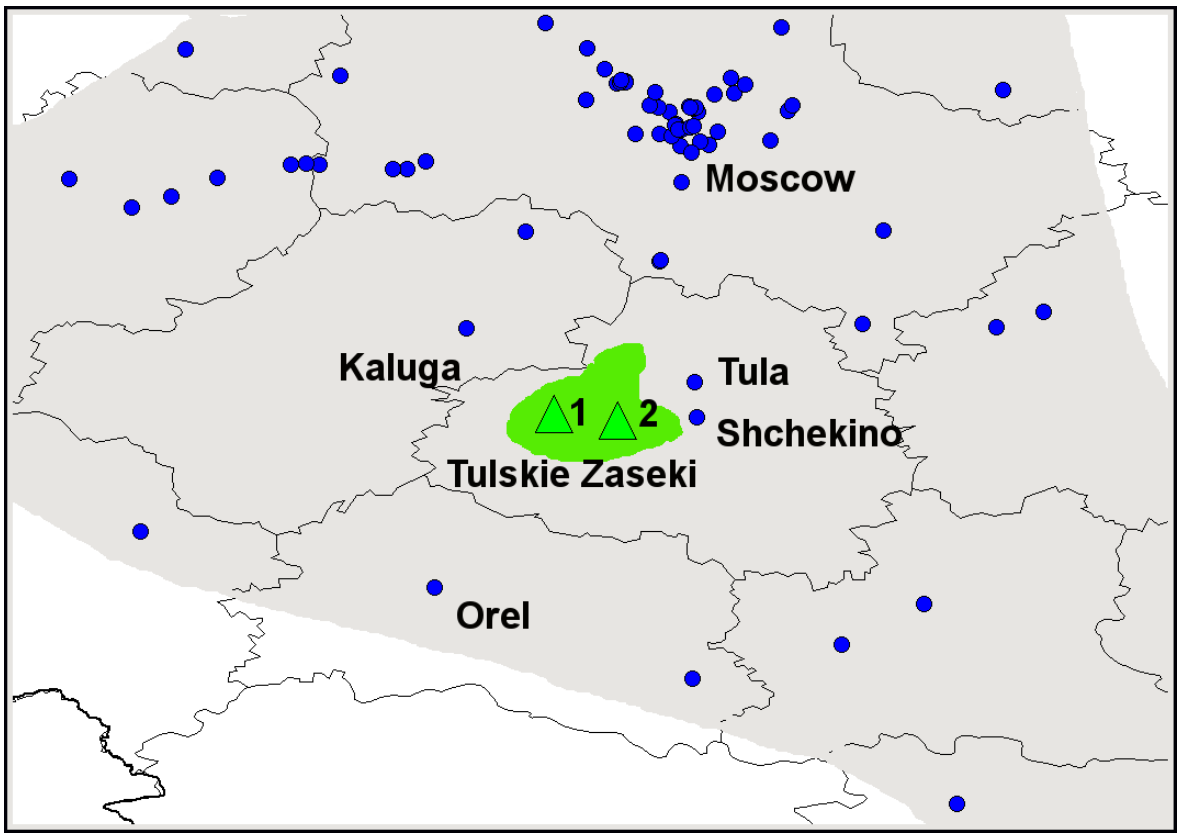

Fig. 6 The broad-leaved forest Tulskie Zaseki (shaded with green), where *F. excelsior* is usual is shaded with green. The range of *A. planipennis* is shaded with gray. Green triangles - locations of survey of of *F. excelsior* trees: 1 – Severno-Odoevskoe Forestry, 2 – vicinity of Krapivna village. Blue dots – localities, where *A. planipennis* has been detected.

Discussion

Borders of the range

The westernmost localities are in Smolensk region: Semirechje (Zvyagintsev et al. 2015) and Smolensk (Baranchikov and Seraya 2018). In the north-west the border of the range is in Tver Region: Zubtsov and Tver. The northernmost locality is Yaroslavl. The border of the range in the north-east is poorly known. The marginal points in this direction are in Vladimir, Ryazan and Tambov regions. The most eastern and the most southern locality is Volgograd. In the south-west the border cross Voronezh Region and Bryansk regions of Russia and Lugansk Region of the Ukraine.

The northern and north-western border of the pest range is almost the same as in 2013. The northernmost locality - Yaroslavl is at the latitude 57.63' N, i.e. much to the north of the northernmost locality in North America (47.31' N) (Emereld Ash Borer Info 2019) and in Asia (49.42' N) (Orlova-Bienkowskaja and Volkovitsh 2018). Therefore, it is unknown if *A. planipennis* will spread further north - to St.-Petersburg and northern Europe, or it has already reached the range of its potential border in the north. To answer this question the ecological model of potential range in Europe should be done.

In the south the situation is much worse. The pest has already appeared in the Ukraine, and since there the outbreaks of the pest in Volgograd, Bryansk and all over Voronezh Region, the pest will probably enter Ukraine and Belarus with a broad front.

Mechanism of spread is unknown

Natural spread of *A. planipennis* populations is limited to only a few kilometers per year (Siegert et al. 2010). So the disperse of the pest in the vast territory: 600 000 km^2 in 16 years after the first detection can be explained only by human-assisted dispersal. The important vector of spread of this pest in North America is unintentional introduction with firewood (Herms and McCullough 2014). But unlike the United States, ash firewood is not used in European Russia. Ash wood is also not used for making package in Russia, since the wood of *F. excelsior* is expensive and *F. pennsylvanica* is an ornamental and landscaping tree not used for timber. It is also doubtful that larvae can be transported with seedlings, since *A. planipennis* in Moscow Region occur only in the trees more than 10 cm thick (Orlova-Bienkowskaja 2014). It is suspected that the vector of dispersal is hitchhiking of adult beetles on vehicles (Straw et al. 2013). Up to now no specimens of *A. planipennis* have been yet detected in vehicles in Russia, but other Buprestidae sometimes occur in transport. In particular, jewel beetles have been detected in cruise ships sailing along the Volga River (Komarov E.V., unpublished data). So it is not excluded that *A. planipennis* was introduced from Moscow to Volgograd by ships. It is also quite possible, that *A. planipennis* appeared in Volgograd, Voronezh and other regions remote from Moscow not as a result of spread from Moscow, but as a result of multiple introduction events from Asia or North America. This hypothesis is supported by the fact that the focus of *A. planipennis* in Volgograd is not young. The death of the trees on large territory indicates that *A. planipennis* appeared there least 7–10 years ago.

The distance from Moscow to Volgograd is more than 900 km. It is more than the distance from Moscow to Lithuania, Latvia and Estonia. Obviously, the pest can be detected in any part of Eastern Europe. Besides that, *A. planipennis* can soon appear in Kazakhstan, since the distance between the Volgograd and the border of country is about 150 km.

Since there are no infested trees of *F. excelsior* in a big forest (in Tula Region) in the center of *A. planipennis* range, it seems, that European ash is more resistant to the pest than American species, at least in natural forest stands. All cases of infestation of *F. excelsior* in Russia refer to the trees which grow near plantations of *F. pennsylvanica*. *Fraxinus pennsylvanica* is highly susceptible to the pest and triggers the outbreak of the pest, which can also attack *F. excelsior* growing near. The similar situation was observed in China: in 1964 the plantations of *F. americana* introduced from North America triggered the outbreak of *A. planipennis* in Harbin (Wei et al. 2004). The pest damaged both *F. americana* and native ash species in the region, but after the trees of *F. americana* were cut off, the outbreak finished.

Agrilus planipennis has not become a forest pest in European Russia and Ukraine. It occurs only in artificial plantations: urban plantations, along motor roads and railroads, in field shelter belts. The overvelming majority of damaged and killed trees are *F. pennsylvanica*. The only native ash species *F. excelsior* is also susceptible to *A. planipennis*, but there are still no evidences of massive damage of this ash species in the forests. There is no doubt that *A. planipennis* will severely damage plantations of *F. pennsylvanica* in Europe. But there is a hope that natural forests consisting of *F. excelsior* are more resistant to the pest.

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