



Marina Orlova-Bienkowskaja

A.N Severtsov Institute of Ecology and Evolution,
Russian Academy of Sciences, Moscow, Russia

To EAB or not to EAB?

**It is doubtful that
Agrilus planipennis will become
a devastating **forest pest** in
Europe in the nearest future**

Beginning of EAB history in Europe

2003 – EAB was first detected in Europe (in Moscow).

2004-2009 – Local groups of damaged ash trees were detected.

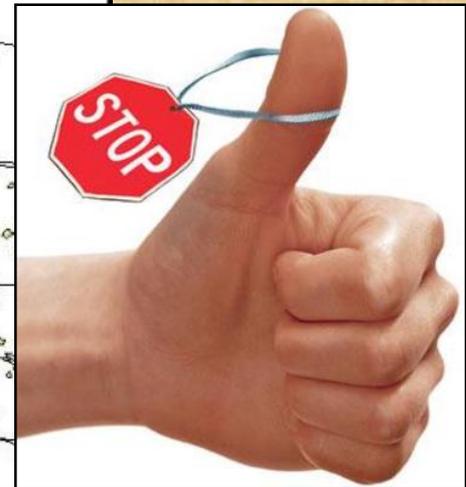
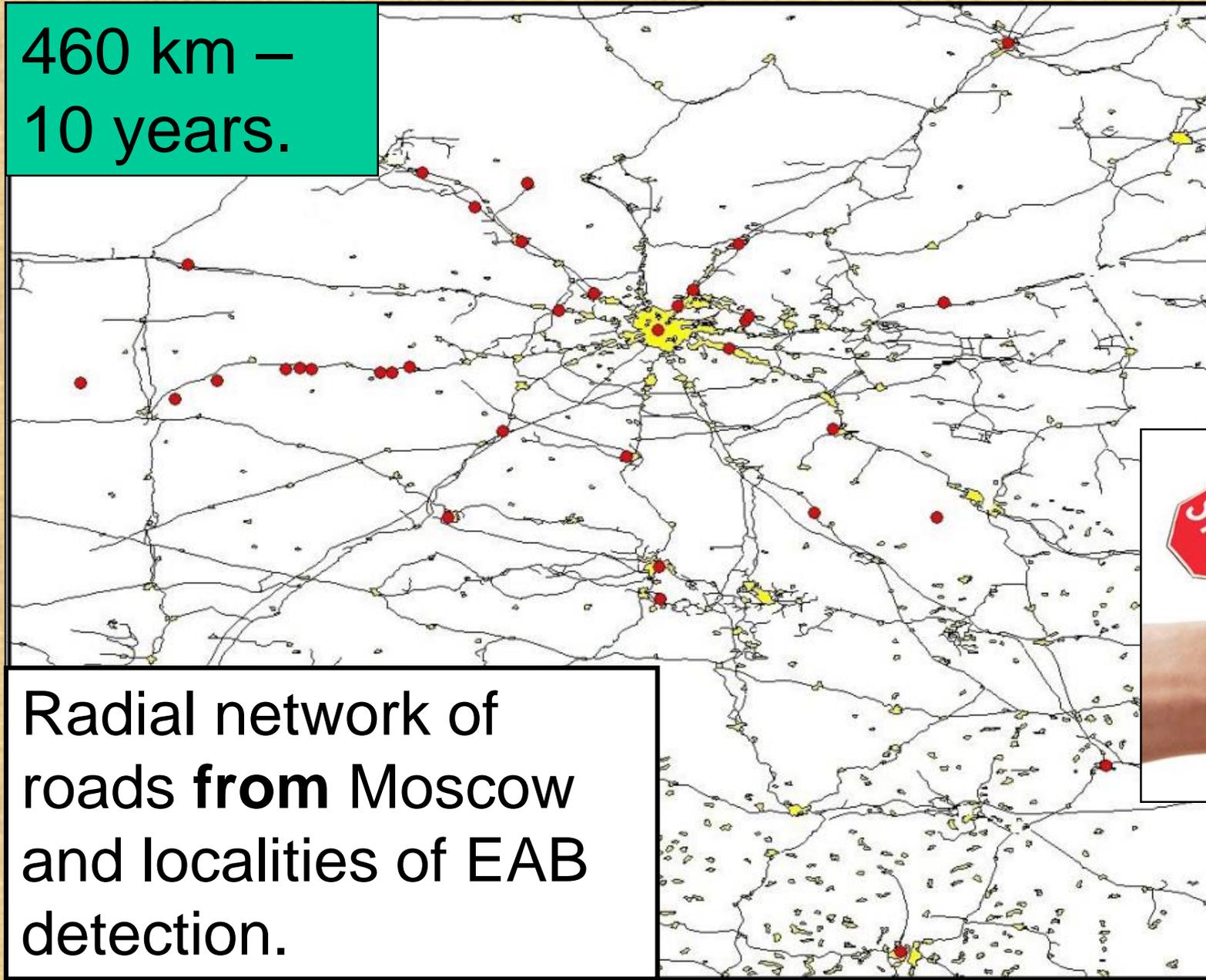
2010 – Extraordinary drought caused the outbreak.

2013 – Almost all ash trees in Moscow were severely damaged, the range expanded to 11 regions of European Russia.



Beginning of EAB history in Europe

460 km –
10 years.



Radial network of
roads **from** Moscow
and localities of EAB
detection.

**In 2013
all experts including me believed that EAB
would become
a devastating forest pest all over Europe
as in North America.**



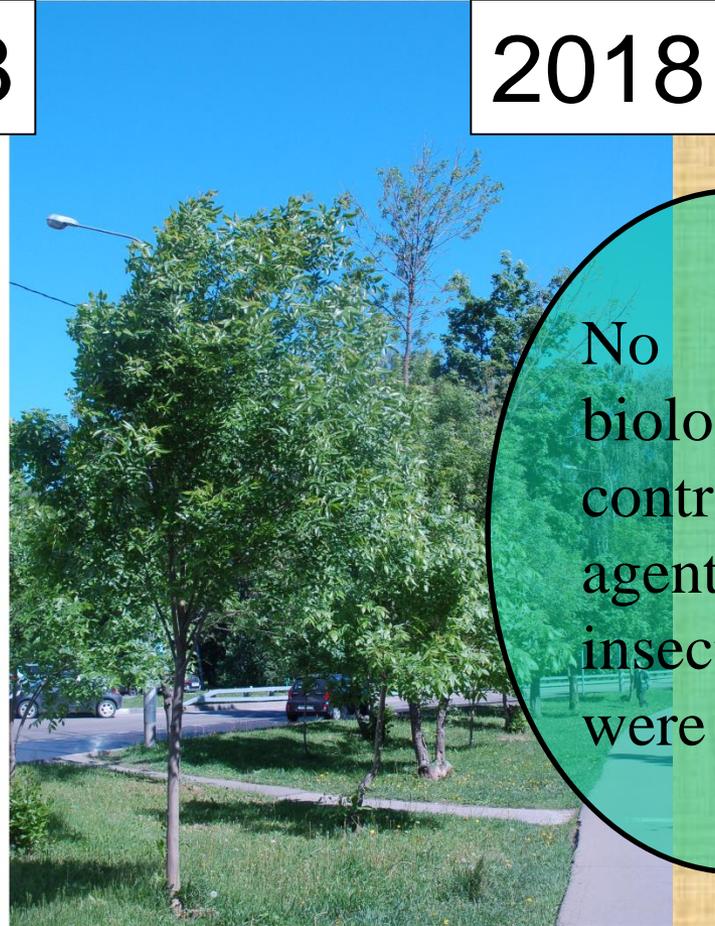
Orlova-Bienkowskaja 2014 Ashes in Europe are in danger... // Biological Invasions.

Ash trees in Moscow are recovering



2013

The trees in my street seemed to be dying, but had epicormic shoots about 2 cm thick.

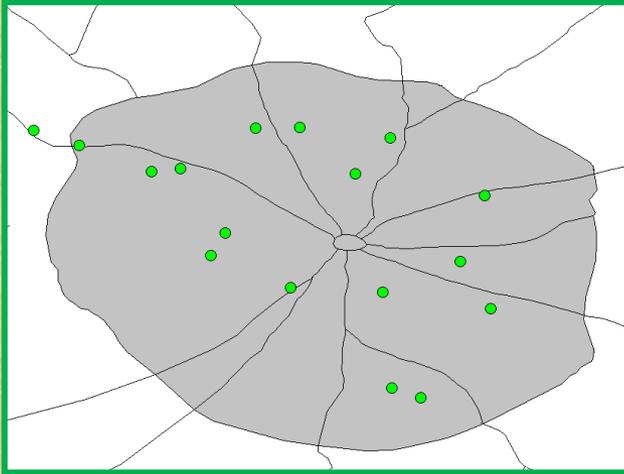


2018

No biological control agents or insecticides were used.

The same trees are alive. The dead stems have been cut off, but the epicormic shoots are healthy and up to 10 cm thick.⁵

Ash trees in Moscow are recovering



Localities of survey in
Moscow 2016-2017
> 1000 trees examined

Dead trees

12%

Fresh exit holes

7%

Recovering trees

44%

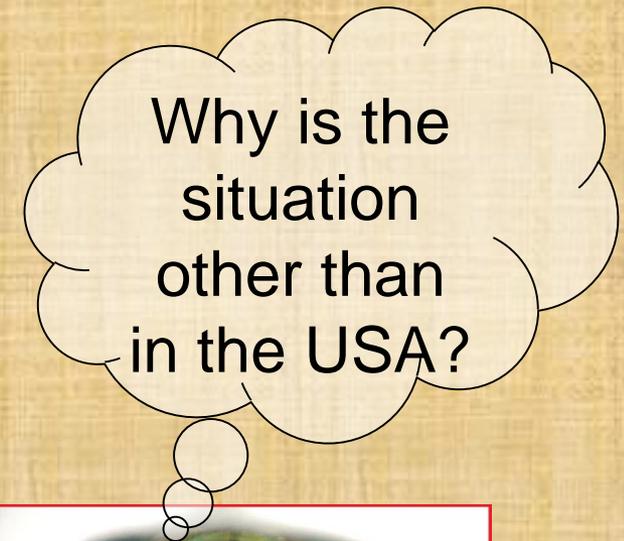
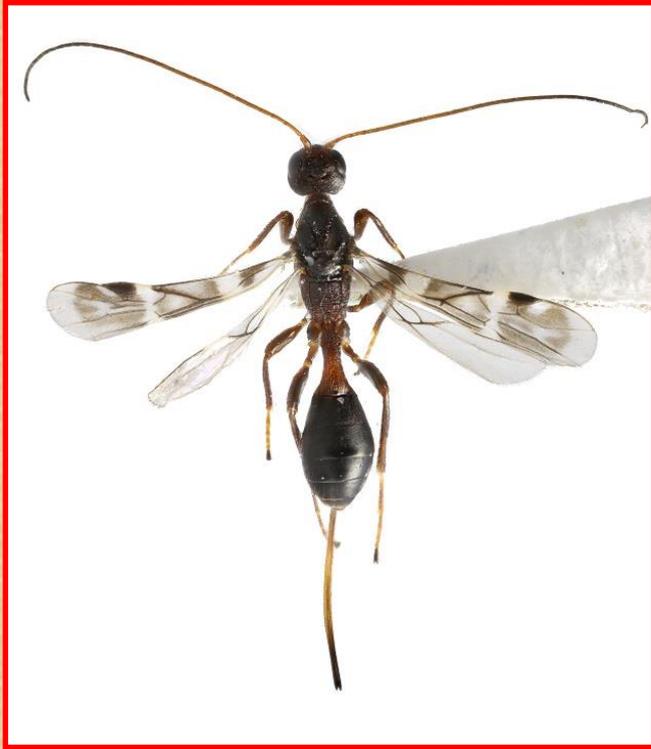
Healthy trees

37%

0 100 200 300 400 500

Number of examined trees

Ash trees in Moscow are recovering



Possible reasons:

- Impact of parasitoids.
- Colder climate.

Life cycle

Region	Number of months with mean temperature above 10 °C	Duration of development
Tianjin, China	7	1 year
Michigan, USA	6	1 - 2 years
Harbin, China	5	2 years
Moscow, Russia	5	2 years

In warm climate
1 overwintering (prepupa)

In cold climate
2 overwinterings (larva and prepupa)

Less chances to survive!

Sum of effective temperatures (>10C) is about 800C.

2-year life cycle in Moscow

1st year					2nd year												3rd year							
Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
L	L	L	L	L	L	L	L	L	L	L	L													
												P	P	P	P	P	P	P	P	P	P			
																							A	A

L	feeding larvae
L	hibernating larvae
P	prepupae in pupal cells
A	adults

- Adults occur in June and July.
- Larvae or prepupae can be found all year round.

We asked all regional centers of forest protection
of European Russia in summer 2018

**EAB is not a forest pest
in European Russia.
It is just a pest
of urban plantations.**

EAB is not a **forest pest** in European Russia

- The main host plant is ***Fraxinus pennsylvanica***, one of the most usual trees in the cities and along the highways and railroads.
- This tree introduced from North America about 100 years ago is extremely susceptible to EAB.

Fraxinus pennsylvanica



+

Agrilus planipennis



=

**Destroyed
urban plantations**



EAB is not a **forest pest** in European Russia

➤ All cases of damage of *Fraxinus excelsior* were detected near severely damaged plantations of *F. pennsylvanica*.

➤ EAB is not a serious pest in the forests even in Tula and Voronezh regions, where *F. excelsior* is a very usual forest tree, in spite of the severe EAB outbreak in the cities of Tula and Voronezh in 2013-2018.

*Fraxinus
excelsior*



*Agrilus
planipennis*



+

=

?

Susceptibility of different ash species

- The outbreaks in China and Russian Far East occurred only in the regions, where American species were introduced. Native ashes were also infested near severely damaged introduced ashes (Wei et al., 2004).

Native range of *Agrilus planipennis* (Orlova-Bienkowskaja, Volkovitsh, 2018)



Red dots – outbreaks caused by plantation of American species:
1964 – *F. americana*, (Harbin);
1982 and 1998 - *F. velutina* (Tianjin);
2000 - *F. pennsylvanica* (Vladivostok and Khabarovsk)
Green dots – *A. planipennis* localities.

The outbreak occurs everywhere if EAB meets *Fraxinus pennsylvanica*

	Asia	North America	European Russia
<i>Agrilus planipennis</i>	Native	Alien	Alien
<i>Fraxinus pennsylvanica</i>	Alien	Native	Alien

Impact of EAB in different continents

	Asia	North America	European Russia
Plantations in cities, along highways <i>etc.</i>	Devastating pest of <i>Fraxinus pennsylvanica</i> and other species native to America		
Forests	Minor pest of Asian <i>Fraxinus</i> species	Devastating pest of <i>F. pennsylvanica</i> and other species native to America	Only few cases of infestation of <i>F. excelsior</i> have been yet known.

I am looking for the co-authors to make a climatic model of potential EAB range in Europe

The aim: to map the climatic areas where the pest can survive

I have:

- My own data on the life cycle of the pest. Larvae were regularly collected from under the bark in 2013-2014.
- The most complete database of localities of EAB detection in Asia and in European Russia.

I need:

- The database of EAB localities in North America.
- The co-author experienced in ecological modelling to make the model of potential range.

Current range of EAB in 2018 is almost the same as in 2013

Red dots – EAB

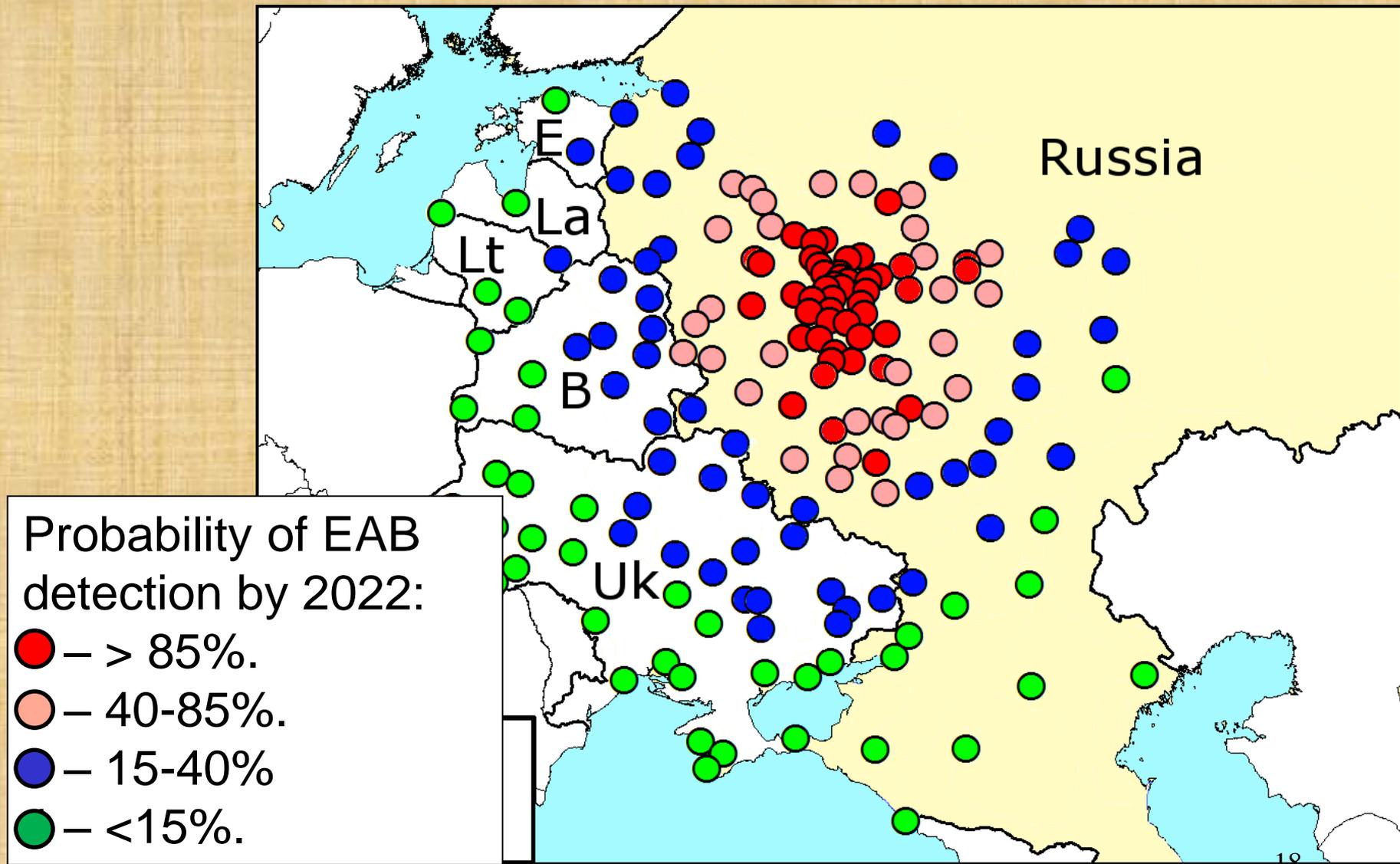
Green dots – no EAB



Green circle - Our survey of ash trees in Belarus (Mogilev, Orsha, Vitebsk) in 2018 has not revealed EAB.

Black circle - The outbreak in Moscow is over (own observations).
Red circle – Severe outbreak in Voronezh (Baranchikov *et al.*, 2016).

Probabilistic model of spread to the **cities** of other European countries by 2022



Detection methods

Symptoms of infestation

Upper part
of main
stem dead

Foliage
density
markedly
reduced

Epicormic
shoots

Loose bark



Detection methods

Symptoms of infestation

Galleries of the larvae under the bark



Detection methods

Symptoms of infestation

D-shaped emergence holes (about 4 mm)



Detection methods

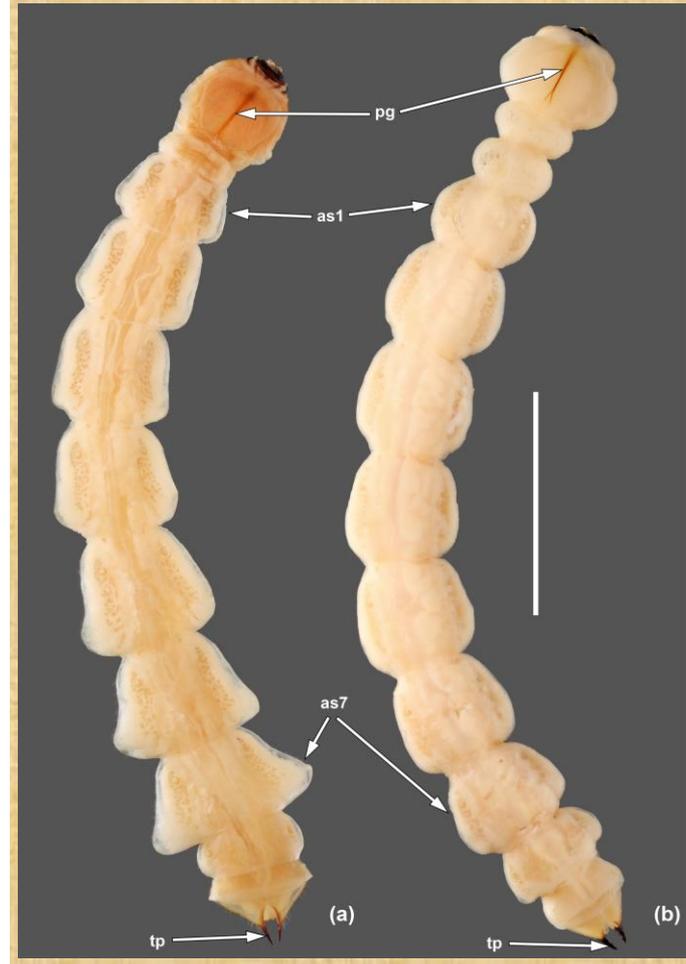
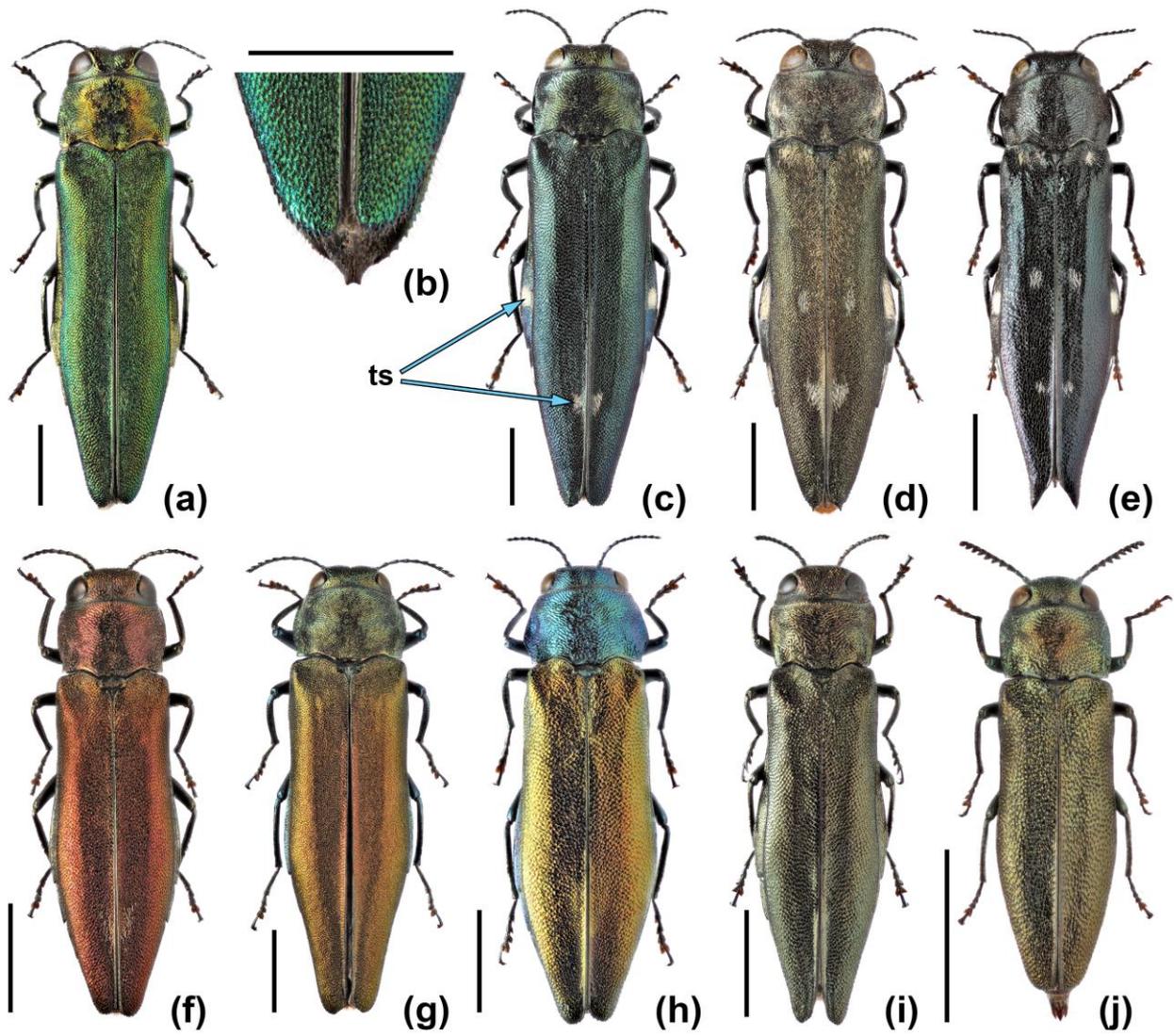
Symptoms of infestation

**Beetles died during emerging from the bark
and alive beetles on leaves**



Flight period
in Moscow:
8 June - 9 July

How to distinguish *Agrilus planipennis* from its congeners in Europe?

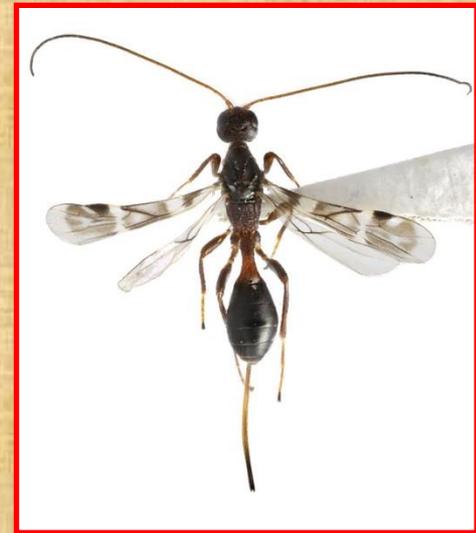


Possible containment strategies

- Removal of plantations of *Fraxinus pennsylvanica* along the roads from W. Europe to the east.



- Since *Spathius polonicus* can destroy more than 50% of larvae, it should be assessed as a possible agent of biological control of the pest.



Conclusions

- **Current European range of EAB is restricted to Russia. It has not significantly change over the last 5 years.**
- **EAB has not been recorded to damage European ash in the forests in the absence of green ash (!)**
- **The outbreak in Moscow is over.**
- **Information about biology and distribution of EAB in Russia is still insufficient.**

The main conclusions

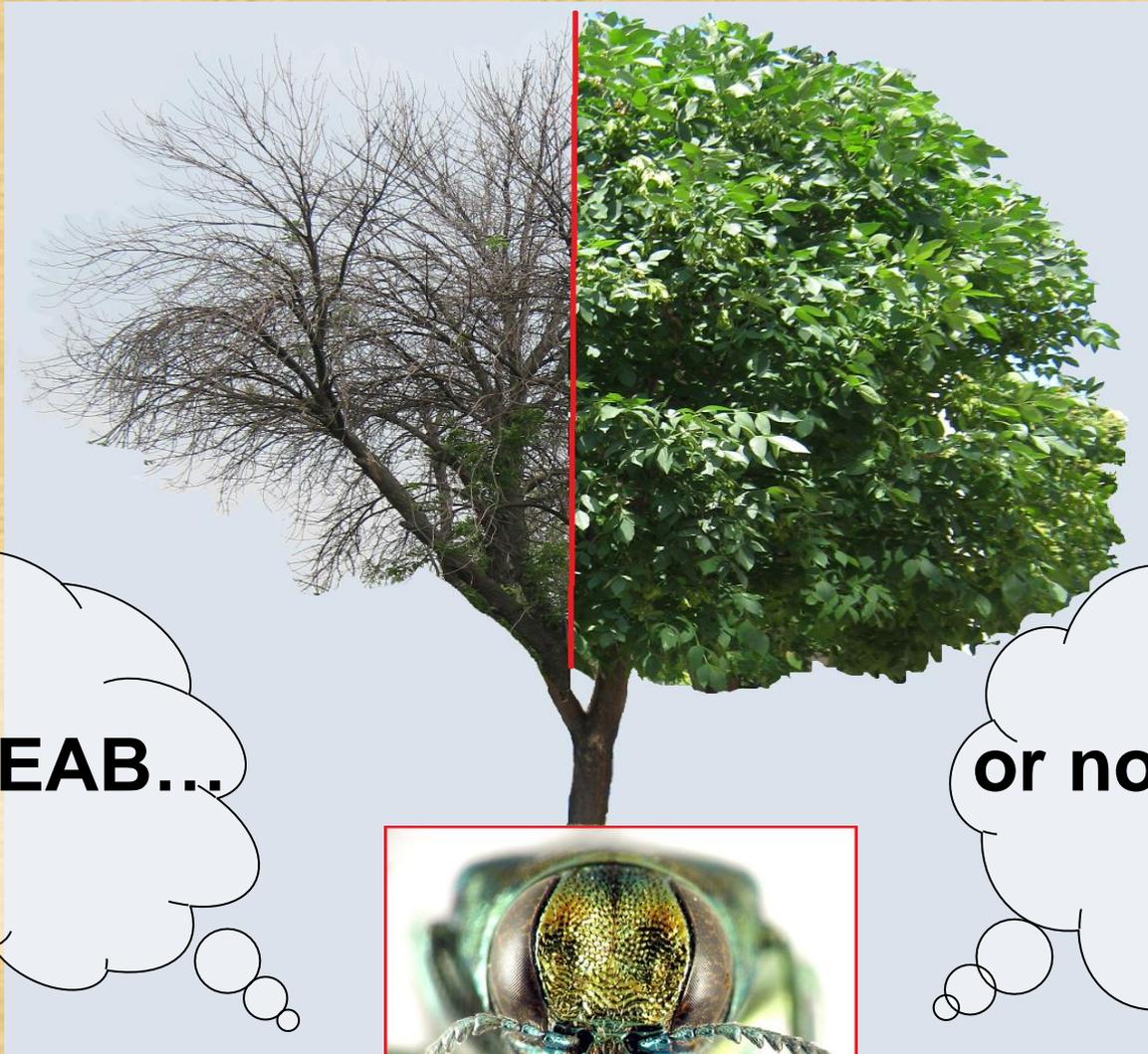
- The situations with the EAB in America and Russia are quite different.**
- The only way to protect ash trees in Europe is to study EAB in European Russia.**

Synopsis of alien beetles of European Russia will be published in December 2018

- About 200 species.
- 19 authors, 350 pages.
- Photos and diagnostic characters.
- Maps of distribution.
- History of invasion.
- Free pdf in Russian.



Thank you!



To EAB...

or not to EAB?



marinaorlben@yandex.ru