

## Tree state and a probability of tree' attacks by invasion species of bark beetles

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In recent years local outbreaks of Ussuri polygraph *Polygraphus proximus* Brandford were observed in fir forests of Siberia. Earlier the outbreaks of this specie were observed only in the Far East of Russia (Baranchikov et al, 2011) and mechanisms of invasion of this species into Siberian forests remain unclear. The purpose of this study is to test a hypothesis about connection of tree state to intensity

of insects' attacks for stands of *Abies sibirica* Ldb. in Middle Siberia.

A state of trees and an intensity of attacks by different species of xylophagous were studied in four sample areas:

- control area, where the level of damage of trees by xylophagous was minimal;
- area with trees attacked by black fir beetle *Monochamus urusovi* Fisch, and where as a result about 10% the trees in the area were damaged;
- area where a small part of trees was attacked by Ussuri polygraph;
- area, where there the maximum damage was done to the trees by Ussuri polygraph.

The state of each tree on a sample area was estimated simultaneously in two ways. First, we used a visual scale, i.e. trees were categorized into six categories according to their crown condition and level of occupancy of a trees by insects. According to this scale xylophagous can attack trees of the fourth state category. Second, we used an original dielectric pulse Fourier spectrometer for estimation of tree state. It was shown previously that xylophagous can attack trees whose impedance-godograph characteristics of stem tissues lie within a certain range (Souhovolsky et al, 2010).

A good correlation was observed between visual tree state and characteristics of the tree's dielectric parameters for the first three areas. Number of trees, which could be occupied by xylophagous, was low according to both visual and biophysical scales.

At the same time in the zone of Ussuri polygraph outbreak, trees were not damaged by insects and apparently healthy according to the visual scale, however in terms of dielectric characteristics of stem tissue the trees were defined as not resistant to the xylophagous attacks.

In this regard, it appears that the local outbreaks of Ussuri polyphagous in Siberian forests and spatial heterogeneity of these outbreaks may be associated with a local weakening of the trees. Trees unable to resist xylophagous' attacks didn't demonstrate abnormal visual characteristics in these territories.

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