Biological control of *Dryocosmus kuriphilus*

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How did it come to Italy?

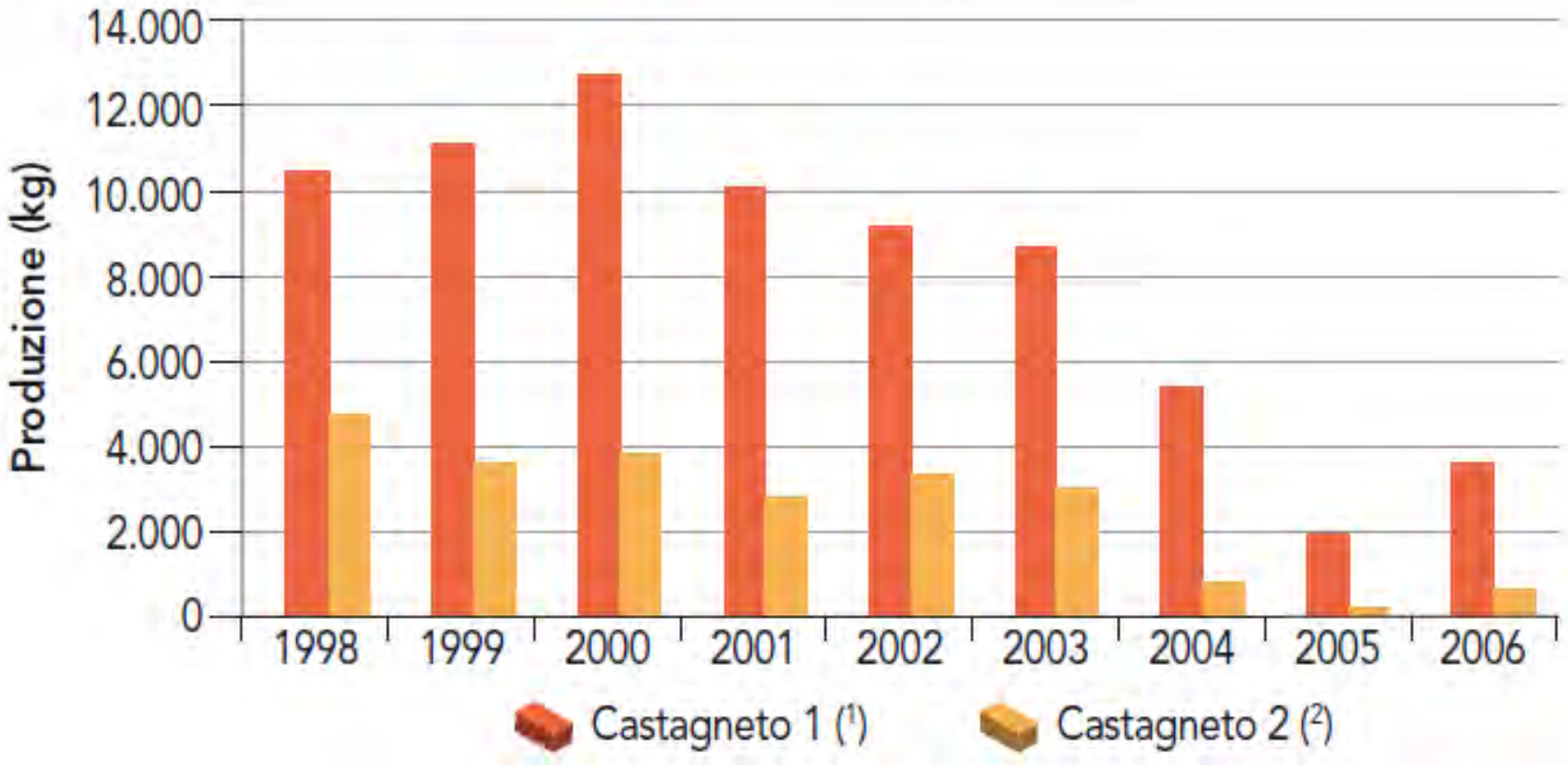
- *D. kuriphilus* In Italy came as a result of scions imported from China by some nurseries
- Planting material in the presence of the Vespa is **asymptomatic**
- The infestation was not immediately recognized
- The stop of the sale of nursery material was delayed

What sort of damage did it cause?

- Minor flowering and lower production
- Reduction of photosynthetic capacity
- Reduction in the growth
- Stress
- General weakening of the plants with increased disease secondary

Loss in production

Production losses in two chestnut woods in Piedmont



How can we stop it?

- Classical biological control based on the introduction in Italy of (T*orymus sinensis*) a specific parasitoid of Chinese wasp
- The method has already been used successfully in Japan

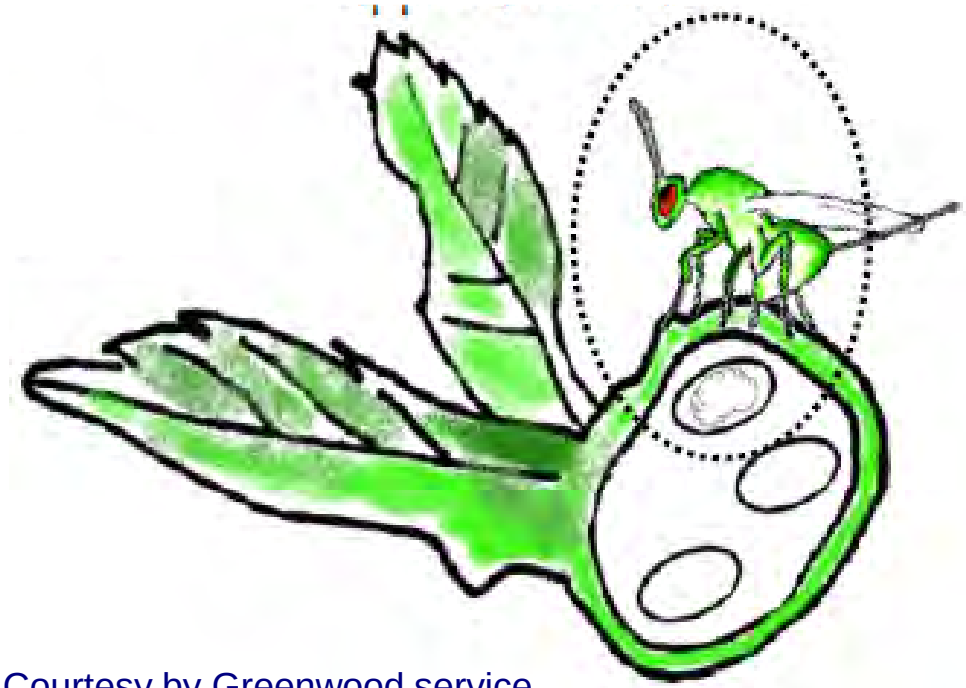
Why is biological control is a better method?

- Compatible with the natural environment of the Apennines
- No side effects for humans and animals
- Leads to an "definitive" control

Biological control

- Each "launch" is made with **10-11 tubes** from the laboratories
- In each "launch" is constituted by **100 mated females** and 50 males
- After the release in chestnut adults released *T. sinensis* mates immediately

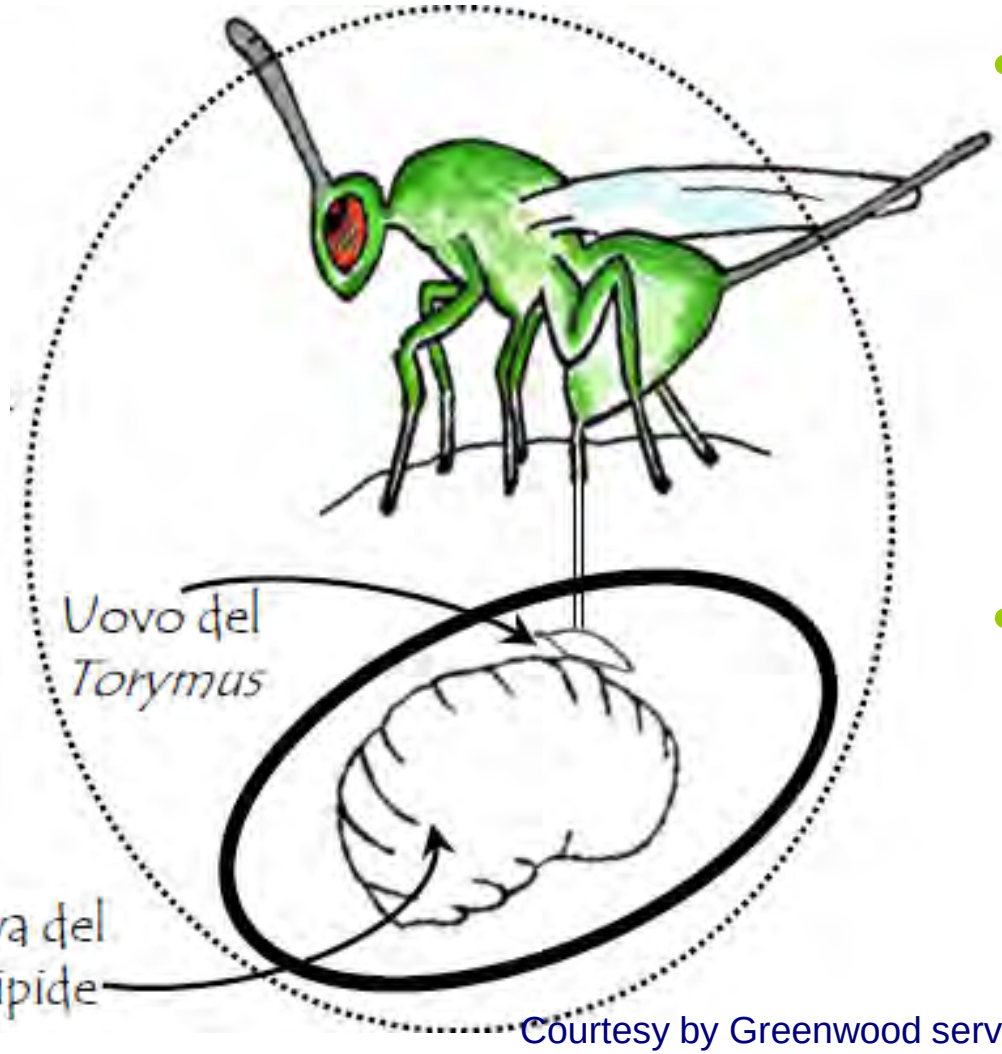
Biological control



Courtesy by Greenwood service

- After mating, the female lays her eggs *Torymus sinensis* in *Dryocosmus kuriphilus* galls
- Each female lays about **70 eggs**

Biological control



Courtesy by Greenwood service

- The females of *T. sinensis* have a long ovipositor that allow them to lay the egg inside the surface in close contact with the *D. kuriphilus* larva
- The larvae of T. *sinensis* subsequently grow at the expense of the *D. kuriphilus* larva

Cleaning the galls

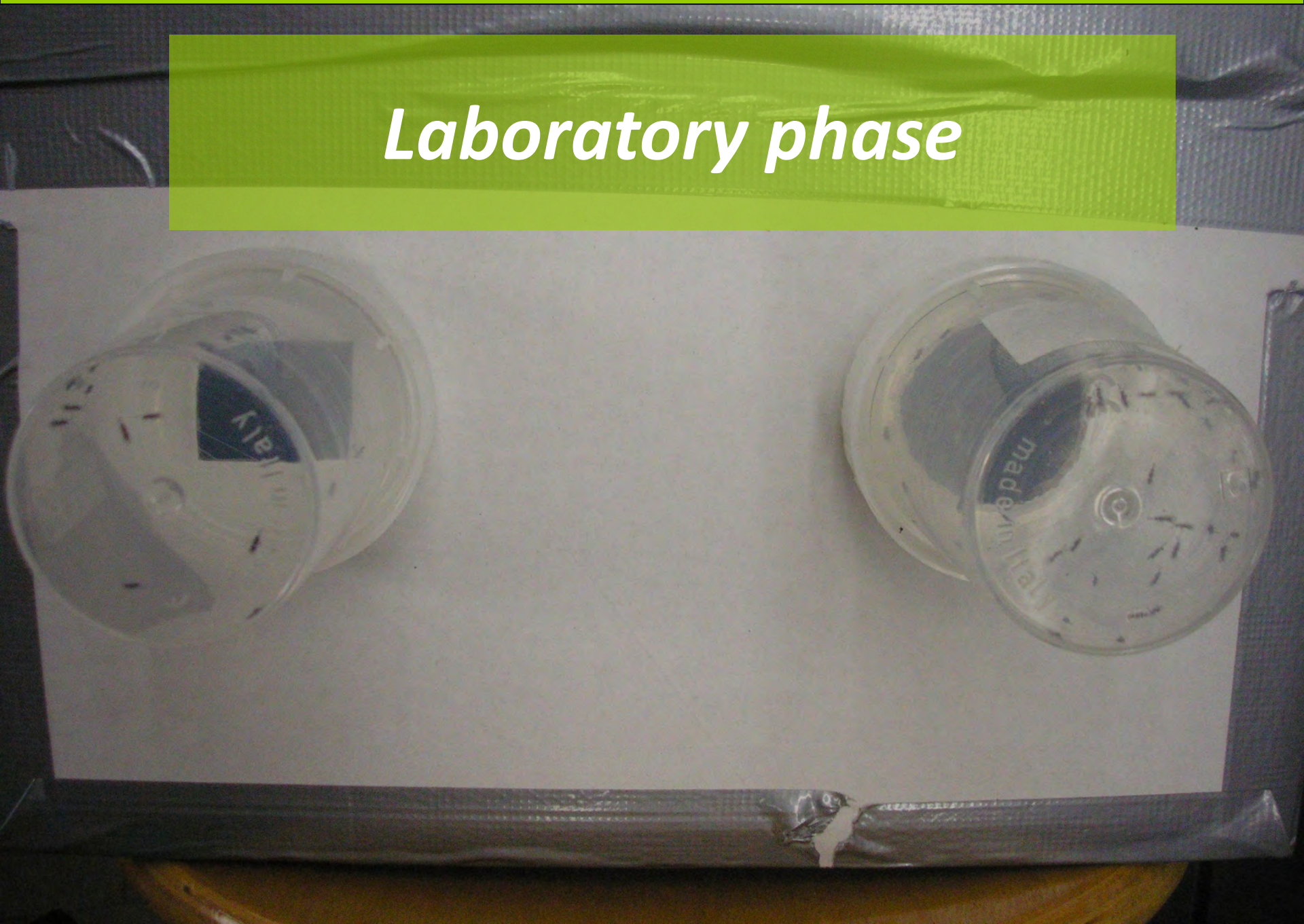
Laboratory phase

- The galls collected are counted and stored in special boxes kept outdoors in conditions similar to those in nature
- During the control is necessary to verify that there are no galls of previous years

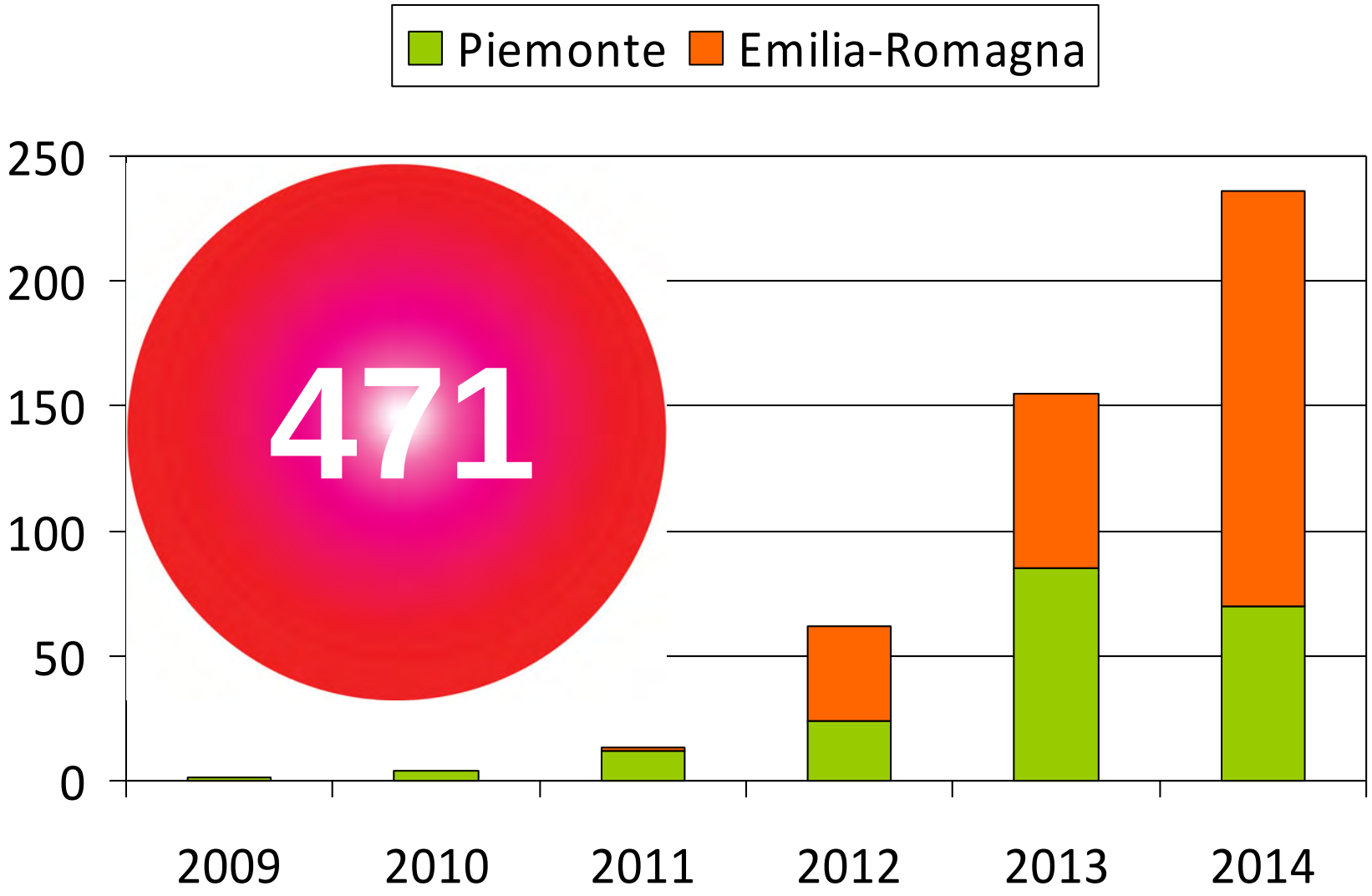
Laboratory phase

- A new spring begins flickering *T. sinensis* that are directed in skylights
- The boxes are taken to the laboratory to prepare insects for use in the throws propagation in the chestnut

Laboratory phase



Launch in Emilia-Romagna



Displacements of *Torymus sinensis*

- Spread Expected *T. sinensis* (based on Japanese data)
- 1 year – 200 m
- 2 years – 600 m
- 3 years – 1200 m
- 4 years – 2000 m
- 5 years – 5000 m


Monzuno
Bibulano
Sabbioni
Loiano
M. Venere
966
714
Quinzano
349
Gabbiano
Stiolo
Roncastaldo
Valle
Savena
Monghidoro
Campeggio
S. Benedetto
Val di Sambro
841
Frassineta

2012 - Spread of Torymus sinensis

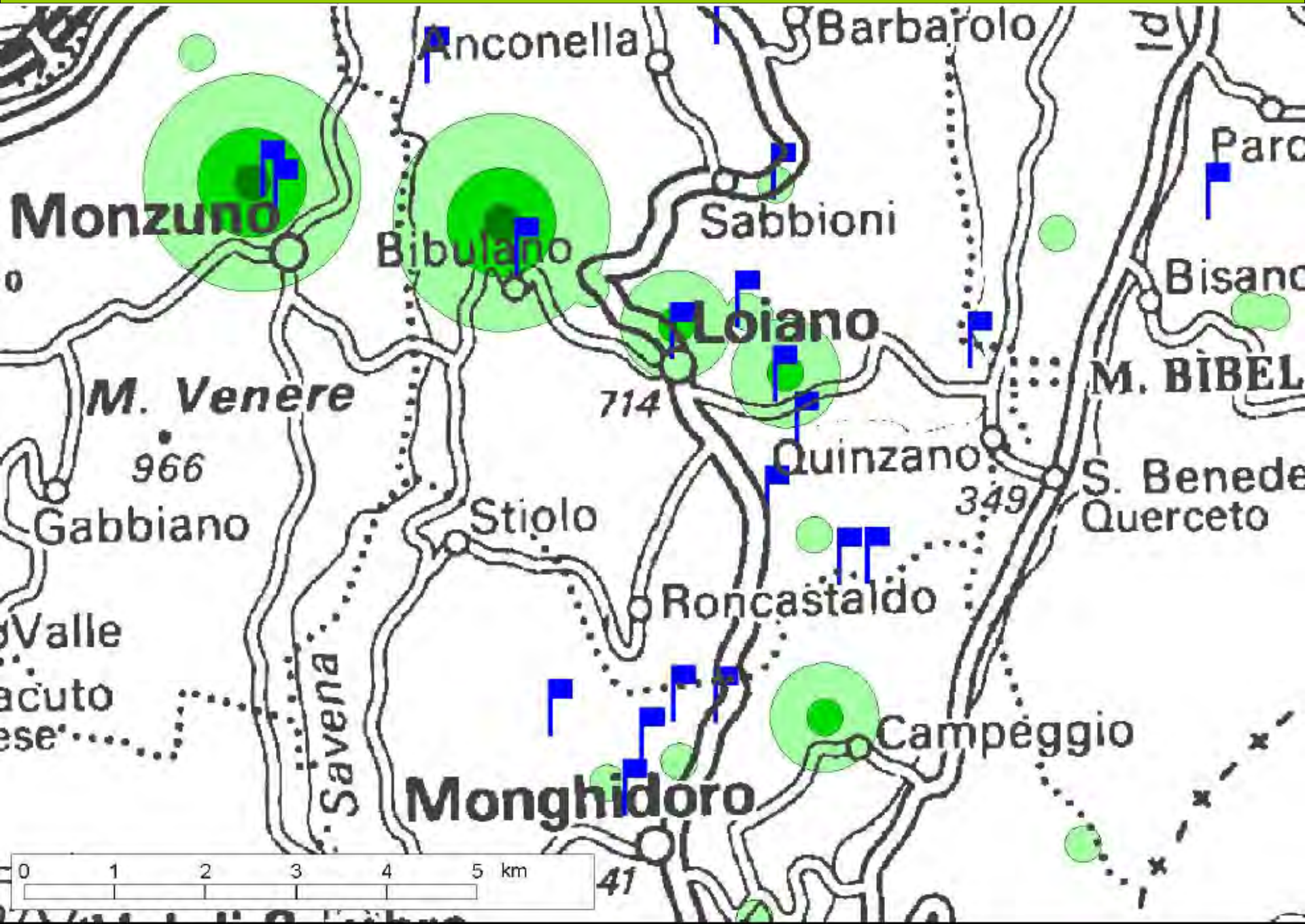
2012 - Spread Torymus sinensis and new launches

2013 - Spread of Torymus sinensis

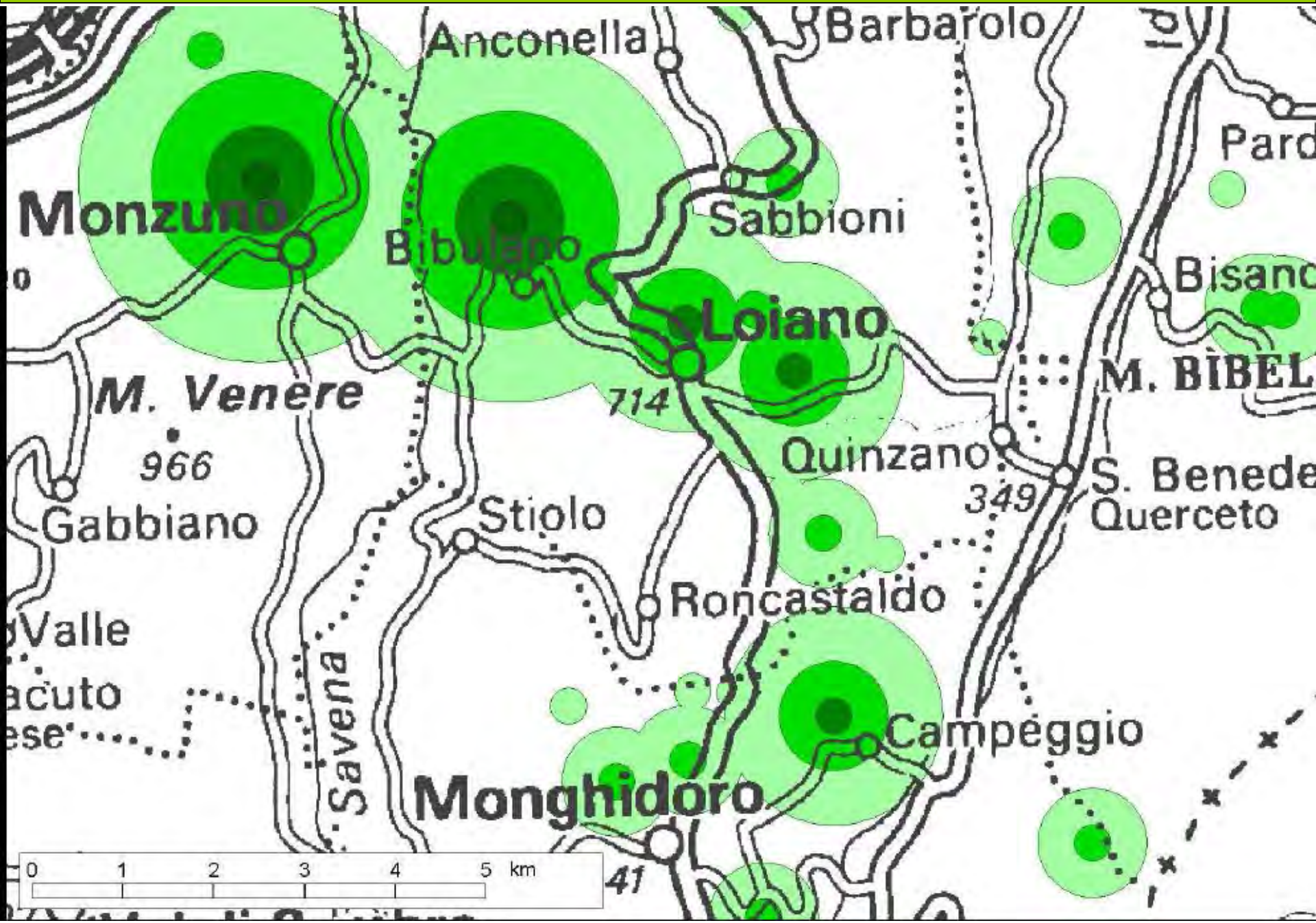
2013 - Spread Torymus sinensis and new launches

2014 - Spread of Torymus sinensis

2014 - Spread Torymus sinensis and new launches



2015 - Spread of Torymus sinensis



Management of chestnuts

- Protection of galls dry
  - If you prune the plants you need to NOT burn the branches with galls
  - The galls should be stored in bundles inside the chestnut

Norway spruce bark beetle in the Regional forest “Alta Val Parma”

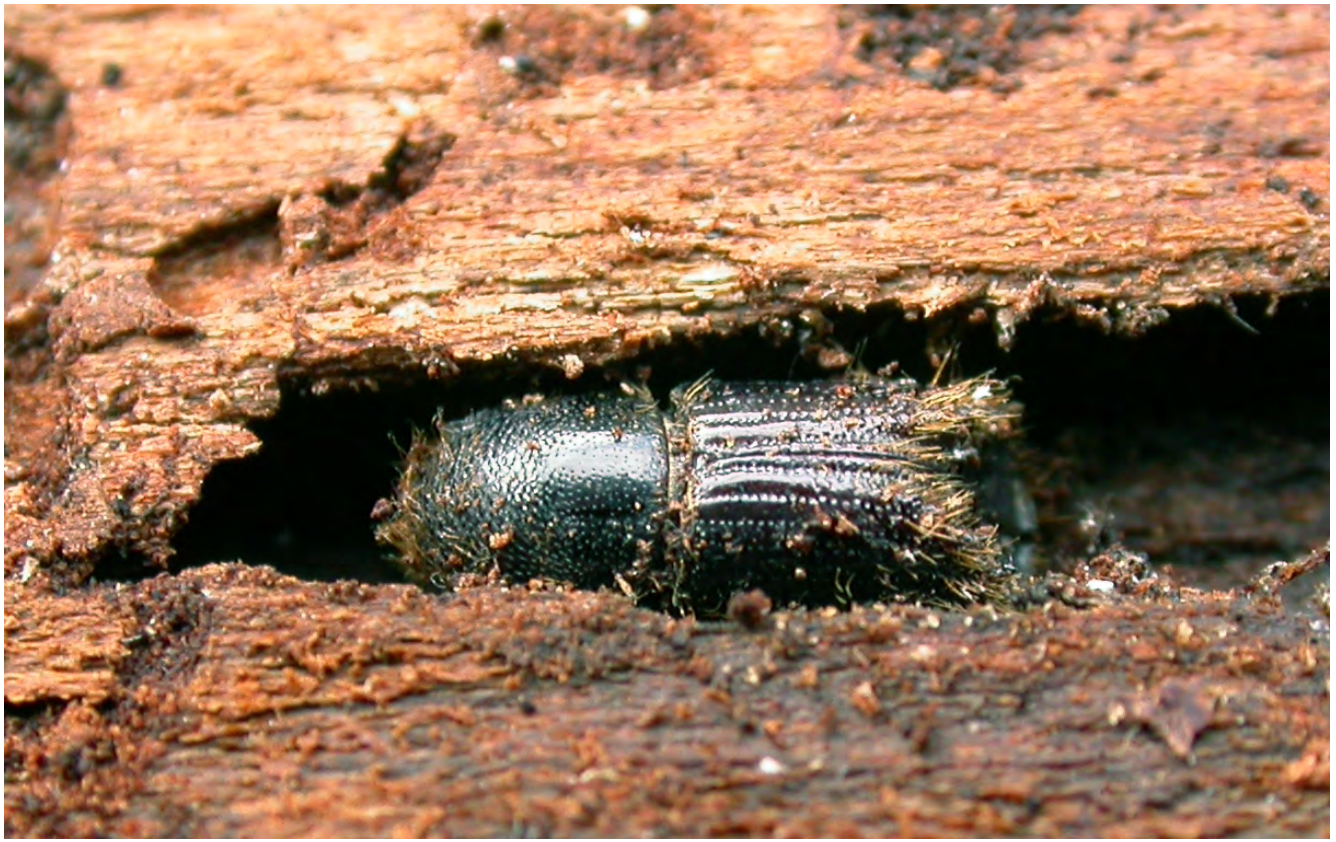
Paolo Piovani

- The massive heat wave and drought of summer 2003 triggered a severe outbreak of the Norway spruce bark beetle, *Ips typographus*, in the Regional forest “Alta Val Parma” that in the following years heavily damaged the local *Picea abies* plantations.

Regional forest “Alta Val Parma”

The Regional Forest of Alta Val Parma is located in the municipality of Corniglio (province of Parma) in the upper part of river Parma basin at an altitude between 1,100 and 1,700 m a.s.l. and covers 1812 ha. The most representative forest tree species is beech (*Fagus sylvatica),* with of the presence of relic indigenous populations of silver fir (*Abies alba*). Extensive artificial conifer plantations (mainly Picea abies, Abies alba and Pinus nigra) are also present, introduced in the first decades of XX century (starting from 1914).

The Norway spruce bark beetle (*Ips typographus*)



Ips typographus is an insect of the family *Coleoptera*, subfamily *Scolitinae*, that includes numerous forest pests species. *I typographus* is one of the most dangerous ones, causing damages all over the rang of distribution of its host, Norway spuce (*Picea abies*). It is a quite small insect, the adults range from 4.2 to 5.5 mm in length.

□The male *I. typographus* initiates a nuptial chamber with a small hole in the bark. After copulation with attracted females, each female gnaws a maternal gallery in the cambium of the host plant with egg-pockets along the sides of the gallery. Larvae from the laid eggs gnaw right-angled to the maternal galleries larval tunnels, which end in a pupal chamber. The pupae change into hairy, brown juveniles. After maturation, grub juveniles change into dark- brown, mature adults. The whole generation development from the copulation to the adult has a duration of 7–11 weeks. Adults finish maturation in the spring prior to their dispersal flight. These flights are initiated in response to air temperatures of about 18 °C.

□The galleries in the cambium have a devastating effect on the host tree.The Norway spuce individuals attacked showed always these symptoms: basipetal desiccation of the crown, progressive falling of the needles, with a “sudden” death of the tree (2-3 weeks), appearance of the emergence holes on the trunk and finally bark detachment.

- *I. typographus* is considered as secondary pests, it find favourable conditions to thrive in only in damaged and dying host trees. Storms and windthrow , snow damage, emissions from environmental pollutants, or water shortage as a result of extreme weather conditions all lead to damaged spruce trees that can serve as the ideal breeding grounds for them but which can easily favour an outbreak given the right weather conditions. Once they have reached high population levels, the *I. typographus* are even able to attack and kill healthy trees.

Following the outbreak started after 2003 massive drought, the Parco Nazionale dell'Appennino Tosco-emiliano decided to start a program to front the problem trying to ensure at the same time the natural evolution of a forest belonging to a protected area, the safety of people that visit the park and forest cover that reduce the hyrogeological risk, that is high in this area characterized by heavy rainfall events. Meanwhile a monitoring study of bark beetle outbreak evolution, supervised by Gruppo Foreste e Verde Urbano della Fondazione E. Mach di San Michele a/A (Trento) (FEM-CTT), started.

You can find details about our study in the poster session!


Chestnut tree gall wasp – El Bierzo, Leòn 2014
Thank you for your attention