Erasing the Asian Longhorned Beetle with Determined Actions, but at High Costs—A Case Report

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Abstract: In 2012, an infestation of Asian Longhorned Beetle (ALB) was detected in Winterthur (Canton Zurich, Switzerland). With more than 140 adult beetles and several hundred eggs and larvae, the infestation was by far the most extensive in Switzerland. Based on long-term experiences made in Braunau (Austria), where the first ALB infestation in Europe occurred, the beetle was fought with extensive actions: removal of all infested trees, preventive removal of potential host trees and installation of a focus- and a buffer zone. Transport of plant material out of these zones was banned and a close monitoring regime including specialised dogs put in place. As a result of these efforts, there were no adult beetles and only a few living larvae detected 2013. Neither larvae nor beetles were found in 2014. However, costs are high: 700,000 Swiss francs were spent in 2012 alone, not including hundreds of working hours spent by employees of the Canton Zurich. The previewed monitoring programme between 2013 and 2017 is estimated to cost another 2.8 million Swiss francs, if no more living beetles are detected. The experiences from Winterthur thus show that elimination of a relatively small ALB infestation with determined actions is likely possible in short time. However, the high costs demonstrate the need for strong boarder controls or alternative packaging materials for imports from infested regions (China). In addition, a concept for small communities with limited resources is needed.

Key words: Infestation, zone, focus, buffer, transport, monitoring, elimination, resources.

1. Introduction

Asian Longhorned Beetle (ALB) is one of the most dangerous plant pests worldwide, causing millions of dollars of damage and being the reason for thousands of trees cut in urban space [1]. ALB was introduced into the United States in the early or mid nineties, and has since then become a major economical and ecological problem in the US, Canada and Europe [2], where it was introduced first in Braunau (Austria) in 2001. Its broad host spectrum, its ability to attack completely vital trees and its larvae's capability of final development even in dead timber enhance ALBs spread and the damage it causes after infestation [3, 4].

Here, we report the case of an ALB infestation in Switzerland, which was discovered at a relatively

early stage. Our goal is to provide authorities in similar situations with a set of measures that have proven successful before and that might be used to deal with comparable ALB infestations.

2. Case Description

The first living beetles were discovered in June 2012 by members of the city gardening office in Winterthur, a city of some 100,000 inhabitants near Zurich [5]. Compared to earlier infestations in the US, in Canada or Europe [6], the infestation was discovered at an early stage (likely in its third generation) and was therefore smaller in extent. Nevertheless, it was by far the most extensive infestation in Switzerland: more than 140 living beetles and several hundred eggs were discovered. The infestation occurred in an industrial area, where a new street had been constructed a couple of years

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before. It was surrounded by industrial property and waste land, with no private housing in the immediate proximity of the infestation. From the beginning, authorities in Switzerland were cooperating closely with partners from Braunau, and decisions were taken based upon experiences in the Austrian town, where ALB could be declared extinct in 2013. Consequently, ALB was fought with rigorous actions immediately after discovery, and this active phase was followed by an intense monitoring programme, which also included organisational measures with respect to transport of plant material. At the moment, this monitoring programme has completed its second year, and will go on at least until 2017, as there were new larvae found since 2013.

3. Methods

3.1 Actions on Site

A number of different short-term and long-term measures were taken in order to erase ALB in Winterthur, as well as to prevent further spread of the infestation [7]. The concept applied was based on three different zones that were defined around the

infestation core (Fig. 1):

Infested area: living beetles or trees with larvae, eggs or exit holes detected;

Focus zone: 200-500 m around infested area, depending on density of broadleaf trees;

Buffer zone: up to 2 km around infested area.

Measures in infested area:

- Immediate removal of all infested trees. Trees were shredded on-site and all material was disposed of at a waste incineration plant;
- Removal of potential host trees in a radius of 100 m around infested trees.

The first measure is absolutely necessary to quickly stop further spread of the infestation. As no private gardens were affected, there was no substantial resistance against the removal of infested trees. Furthermore, the legal situation in Switzerland is clear, as the enactment of plant protection [8] allows authorities to remove infested trees without the explicit consent of property owners. However, in the case of potential host trees, the legal situation is less clear, necessitating the owner to agree if a potential, but not infested host tree should be removed preventatively.

Fig. 1 Focus zone (continuous line) and buffer zone (dotted line) as installed around the ALB infestation.

Measures in focus zone:

- Mapping of all potential host trees;
- Intense control of broadleaf trees with specialised sniffer dogs and tree climbers;
- Suspicious trees indicated by sniffer dogs have to be controlled with tree climbers, as well as trees that are not easily controllable from the ground;
- Preventive removal of many potential host trees;
- Information of the public by personal contact.

Overall, these measures pursue the objective to reduce tree loss to a minimum. Especially in “green” neighbourhoods (as often found in Switzerland), preventative felling of a large number of trees might not be feasible. Even more, as authorities do not have the legal background to enforce this approach, intense analysis and monitoring of potential host trees therefore saves trees. However, it is very time-, personal- and cost-intensive.

Measures in buffer zone:

- Sampling of potential host trees with dogs and from the ground, including controls in forest stands;
- Information of public by flyers;
- Control and information of companies at risk (importers of stone-material).

Zones were marked with signs. Transport of any plant material out of these zones was banned, and a central collecting point was installed inside the infested area. Stem wood as well as firewood could only be moved out of the zones with cantonal permission or had to be shredded at place. In principle, these rules should support the containment of the infestation. Convincing and informing people within the zones or close to them were not perceived as especially difficult; surprisingly however, the central collection point needed to be closed off, as people from far away were intentionally removing wooden material for their private chimney.

From the beginning on, there was a close cooperation between municipal, cantonal and federal authorities, as well as with research groups and

partners abroad. Monitoring as well as control measures have to be continued for four years without any living beetle, larvae, egg or any new exit hole to be found for the infestation to be declared as erased. In Winterthur, this will be in 2017 at the earliest.

3.2 Legal Background

Combating with ALB was based legally on the enactment of plant protection [8], where ALB was listed as one of the most dangerous plant pests that have to be reported and fought. The Federal Department of the Environment ordered the Canton of Zurich to implement the measures described above. Generally, based on the enactment of plant protection, the canton has to pay for the monitoring, while the community with an infestation on its territory has to pay for eradication measures.

3.3 Import Control

As a direct reaction on the large ALB infestation in Winterthur, the federal office for plant protection strongly increased border controls. All wooden packing material imported from different asian countrys has to be declared in advance and is controlled visually or with sniffer dogs upon arrival. Suspicious batches have to be aerated. In parallel, political efforts have been made to increase heat treatment in the exporting countries. The stone industry, the main importer of suspicious wooden packing materials, took measures in order to decrease the risk for ALB introduction: new packaging methods, inspections on production sites as well as efforts to increase heat treatment frequency and quality by the stone suppliers from Asia.

4. Results and Discussion

4.1 Effectiveness of Methods

So far, the measures taken have proved effective. After removal of all infested trees and the intense

search for ALB, no more beetles have been found so far. In 2013, only some living larvae were found, but ALB was not expected to fly in that year. During 2013, sniffer dogs kept on finding larvae and a few infested trees, and there were a number of trees under suspicion. Most of them were removed precautionarily. In 2014, no more larvae, eggs or beetles were found.

This rises hopes that the infestation might be extinct, indicating the effectiveness of the actions taken. There were no new infestations nearby or related in any sense to the infestation in Winterthur. If confirmed until 2017, this result would show that it is possible for eliminating an ALB infestation with fast and rigorous actions. However, some limitations need to be emphasised. First of all, the ALB infestation was discovered at a rather early stage. Had already four or five generations lived in Winterthur and had the infestation reached one of the nearby forests, the situation would have been completely different. Namely, the monitoring efforts made in this case are not easily upscale-able, both due to lacking personal, sniffer dogs or simply money. Thus, the concept presented in this case report is suited for a small to intermediate, not for a large infestation that is discovered only late after initial introduction of ALB.

In addition to advances in eradicating the existent ALB infestation, border controls found only a few shipments contaminated with ALB since 2013. This is proof of an increased awareness within the stone and transport industry. This awareness has significantly been driven by exorbitant restoration costs that have to be born by the import company in case ALB contaminated material is found. However, strict and near-complete border controls are not possible for transports inside open markets like the EU or the US. And controlling every single loading of stones imported into such a large market seems barely practicable. Thus, it is of essential importance to improve packaging material quality at the source in order to prevent ALB from being shipped outside its native range. This will finally increase costs for

“cheap” stones from china. However, this additional costs are by far below the significant financial burden that has to be born by cities and counties where ALB manages to get established.

4.2 Financing and Organization

Luckily, Switzerland’s first big ALB infestation occurred in Winterthur, a city with sufficient personal, machinery and financial capability to deal with the infestation. The direct costs for 2012 had to be borne by the city, and they rocketed to 700,000 Swiss francs (\$715,000) within a few months. Not included in these numbers are hundreds of working hours spent by employees of the Canton Zurich, by members of the Swiss Federal Institute of Forest, Snow and Landscape Research WSL and employees of the Federal Office for the Environment (BAFU). The 4-year monitoring programme is estimated to cost another 2,800,000 Swiss francs (\$2,860,000), which will be paid for by the canton (based on a special enactment of the local government) [9].

It is clear, however, that Winterthur itself was lucky in several respects: First of all, the city was big enough to finance and execute all necessary actions; secondly, the infestation was just about three generations old and consequently not yet very big. Luckily, a nearby forest was not infested. Another big plus was the fact that a mainly industrial area was in the focus, not private property with gardens full of beloved trees and bushes. This certainly made rigorous actions easier and it prevented the question of compensation from being raised. In fact, the legal basis for such a compensation is not really clear, as ALB is considered a forest pest, but the infestation took place on city grounds. Legally, there are big differences between forests, agriculture and public or private green, with different administrative units in charge.

One consequence of this ALB infestation is the need for a clearer legal basis with respect to compensations that might be or might have to be provided after eradication measures have taken place.

Secondly, there must be a concept for smaller communities that: (a) do not have enough personnel and machinery to deal with an infestation and (b) do not have the financial resources to have this work done by external services. At the moment, there are discussions about a cantonal action force equipped with enough capacities to intervene whenever necessary. However, as there are, hopefully, not that many ALB infestations, this action force should be integrated into other cantonal duties. Last but not least, clarity about the costs of such an infestation is needed. Specifically, it has to be determined within a legal frame, which cost are to be born by the community, the cantonal or the federal administrations, respectively. On the practical side, knowledge transfer has to be guaranteed. This refers to both eradication measures and monitoring (sniffer dogs, tree climbers).

4.3 Recommendations

The case in Winterthur has shown that once ALB is detected, immediate und vigorous actions are recommended. In case of doubt, it is recommended to cut a tree too much than one too little. However, as the case in Winterthur has shown, these measures are expensive and the legal situation might not be totally clear. Therefore, it might be a good advice for authorities to prepare for infestations with ALB or other potentially harmful organisms before they are actually there. This includes both methological as well

as legal precautionary measures.

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