

Natural Enemies of *Saperda* spp. (Col.: Cerambycidae, Lamiinae) in Europe, Envisioned as Potential Agents in Biological Control of *Anoplophora* spp. in Europe and the U.S.A.

Franck Hérard¹, Christian Cocquempot², and Olivier Simonot¹

¹European Biological Control Laboratory, USDA, ARS, Montpellier, France

²Institut National de la Recherche Agronomique, Montpellier, France

Abstract

Project Objectives/Approach. Our rationale is founded on the evaluation of possible new associations between the Asian longhorned beetle (ALB) and natural enemies of European cerambycids that have similarities with ALB in terms of taxonomy, host-plants, and behavior. Our first objective is to search, among the biocoenoses associated with selected European cerambycids, natural enemies (specifically early stage parasitoids) accepting ALB as hosts. The European pests that we selected for these studies are *Saperda populnea* (L.) and *Saperda carcharias* (L.).

Project Update. *Natural enemies of S. populnea:* They were surveyed in Southern and Eastern France, Denmark, Southern Sweden and Southern Finland. The egg parasitoid *Euderus caudatus* Thomson (Hymenoptera, Eulophidae), cited in the literature, was not found in the field, yet. So far, two parasitoids of early larvae were found: a yet to be identified tachinid, which was obtained from hosts collected in Southern and Eastern France, and in Finland, and *Euderus albitarsis* Zetterstedt (Hymenoptera, Eulophidae), which attacked first instar larvae of *S. populnea*. *Euderus albitarsis*, was obtained from first instar hosts, mainly, and sometimes from second instar hosts. It fully develops on the attacked instar. It was obtained from material collected in late July in Southern Finland. Two parasitoids whose adults emerged from full grown larvae of *S. populnea* were found: *Billaea irrorata* (Meigen) (Diptera, Tachinidae), and *Dolichomitus populneus* (Ratzeburg) (Hymenoptera, Ichneumonidae). An entomopathogenic fungus *Beauveria* sp. was isolated from an adult *S. populnea*. Rate of parasitism by each species in the various sites could not be fully processed yet as the duration of total development of the host is 2 years, and the duration of development is particularly lengthy for some of the parasitoid species. In the literature, 37 other parasitoids were cited on both hosts. The biocomplex of enemies of these two cerambycids constitutes a great reservoir of species that can be tested against *Anoplophora* spp.

The following predatory Diptera larvae were found by dissection of branches in *S. populnea* galleries: *Odinia xanthocera* (Collin) (Diptera, Odiniidae), and *Lasiambia baliola* Collin (Diptera, Chloropidae), both new for France, and *Thaumatomyia elongatula* (Becker) (Diptera, Chloropidae), new for continental France.

Development of laboratory rearing techniques: In the laboratory, techniques for rearing *S. populnea* on rooted cuttings of poplars were developed. Fecundity and longevity of adults of *S. populnea*, initially collected in the field as pupae in host plant material then emerged in the laboratory, were studied using fresh cuttings of poplar as oviposition sites, at 22°C. Fresh foliage was supplied to the adults for feeding and maturation. Forty percent of females had a low longevity (21-32 days) and laid 50-90 eggs. Sixty percent of females had a high (42-60 days) longevity. Among them, thirty percent of females laid 100-170 eggs, and thirty percent laid 200-230 eggs.

Several plantation conditions were tested in order to get healthy rooted cuttings. Laboratory experiments were designed to compare two types of soils, two watering systems, two types of fertilization, and several combinations of these factors. The best treatment was as follows: soil was a mixture of compost, sand, and vermiculite in the proportions 0.50, 0.25, 0.25 of the volume, using 6-litre containers; watering was supplied by saturating each clump with water once a week from the top of it, and the culture was conducted in a quarantine greenhouse at constant temperature (23 ± 1°C), under natural lighting. In growing *Populus tremula*, *Populus deltoides*, *Populus alba*, and *Salix capraea*, not adding any fertilizer was an important factor for the successful cultivation conditions.

Duration of incubation of the eggs of S. populnea: Egg incubation duration was studied in branches of living aspens was studied in the field, under natural Mediterranean climatic conditions. This informed us about the time available for egg parasitoids to attack their hosts. This information was also needed to

determine the appropriate time of exposure in the field of living branches, preliminarily laboratory infested with eggs of *S. populnea* in the laboratory, when we want to capture egg parasitoids from various sites. We showed that most eggs hatched after 5 days of incubation in the temperatures that occurred at Montpellier in the period 23 May through 2 June, 2001.

Incomplete work or areas needing further investigation:

- Continue explorations in some of the same areas and in other regions in Europe to complete inventory of the early stage parasitoids of *S. populnea* and *S. carcharias*.
- Finalize *S. populnea* and *S. carcharias* rearing techniques using rooted cuttings as host plants.

- Implement ALB rearing techniques in 5-10 cm diameter rooted cuttings.
- Test *Saperda* spp. parasitoids on ALB, in quarantine at Montpellier.
- Survey ALB and *Anoplophora chinensis* populations in sites where these 2 species were accidentally introduced in Europe, for possible occurrence of parasitism by the local species.

Products anticipated. Parasitoids of longhorned Beetles from the Western Palearctic region which are attracted to the early stages of ALB, accept ALB as hosts, utilize it for their development cycle, are promising agents to control ALB in the Nearctic region, and which have no negative impact on North American ecosystems.