

FIELD STUDY TO EVALUATE THE EGG PARASITOID *APROSTOCETUS ANOPLOPHORAE* SP. N. (HYMENOPTERA: EULOPHIDAE) ON TWO *ANOPLOPHORA* HOSTS

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Abstract

Our current main objective is to evaluate possible new associations between *Anoplophora glabripennis* (ALB) or *Anoplophora chinensis* (CLB) and natural enemies of European Cerambycids that have similarities with the Asian pests in terms of taxonomy, host plants, and behavior. In Europe, two CLB-infested sites were found, at Parabiago, Italy, in 2000, and at Soyons, France, in 2003, and 2 ALB-infested sites were found, at Braunau, Austria, in 2001, and at Gien, France, in 2003. So far, the infested trees are located in urban areas, in streets, parks and private yards. During the eradication operations, which started in most of the sites, we dissected some infested plant material to eventually discover possible associations between ALB/CLB and local or inadvertently introduced natural enemies. On 20 February, 2002, at Parabiago, CLB eggs were found to be parasitized by a gregarious endoparasitoid, which was identified by G. Delvare (CIRAD, Montpellier, France) as a new species of Eulophidae (Hymenoptera), and described under the name *Aprostocetus anoplophorae* sp. n. (in press). The probable origin of the parasitoid is Japan or China, and its introduction pathway likely is the importation of bonsais infested with eggs of *A. chinensis*.

At Parabiago, CLB adults emerged and escaped from the greenhouses where bonsais had been imported (supposedly around 1992 – 1995) and attacked various local tree species in the surrounding green spaces. During the first surveys made in 2001 through 2003 in the Parabiago area we observed that the plant species attacked by CLB were *Acer saccharinum*, *Acer palmatum*, *Acer pseudoplatanus*, *Aesculus hippocastanum*, *Betula pendula*, *Carpinus betulus*, *Fagus silvatica*, and *Prunus laurocerasus*. CLB eggs parasitized by *A. anoplophorae* were found on

A. saccharinum, *A. hippocastanum*, *B. pendula*, and *P. laurocerasus*. From the 30 trees dissected during winter 2002-2003, 133 CLB young larvae and 40 parasitized eggs were collected, which represented 23.1% egg parasitism among the eggs laid in summer 2002. From the overall emergence of *A. anoplophorae* adults, a skewed sex ratio, with 1 male for 7.5 females, was observed.

The presence of well established populations of CLB and its egg parasitoid in the field at Parabiago gave us an opportunity to evaluate ALB eggs as potential target hosts for *A. anoplophorae*. For this purpose, we first obtained from the French and Italian Plant Protection Services the necessary permits to move potted plants infested with eggs of ALB/CLB to Italy to expose them in a secured woodlot. The sentinel plants were rooted potted boles (7 through 10 cm diameter, and 55 cm height boles) of *Populus nigra*, or *Acer negundo*, which had been planted in pots during the previous winter. Prior to exposure in the field, the plants were caged during 5 days with a pair of adults CLB, or ALB, for egg deposition, in EBCL quarantine greenhouse, at Montpellier, France. Every 14 days, mid-July through mid-September, 2003, a dozen of infested potted plants were transported to Italy and exposed for 2 weeks in the study plot, inside a woodlot where the presence of CLB and its egg parasitoid had been observed during summer 2002. The plants were positioned in plastic buckets embedded in ground, and watered as needed. The plot was covered with a plastic mesh screen to prevent bird predation.

Data reported in Table 1 show that *A. chinensis* eggs were parasitized by the females of *A. anoplophorae* naturally occurring in the habitat. This result validated the

Table 1.—Parasitization of eggs of *Anoplophora* spp. exposed in sentinel plants at Parabiago (MI), Italy, during summer 2003

	Dates of exposure in 2003	No. of plants exposed	Plants exposed	No. of eggs exposed	No. of eggs parasitized by <i>Aprostocetus</i> on each plant species	No. of eggs parasitized by <i>Aprostocetus</i>	Percent parasitism
<i>A. chinensis</i>	10-24 Jul.	5	5 <i>P. nigra</i>	29	2 / <i>P. nigra</i>	2	6.9
	24 Jul.-7 Aug.	6	4 <i>P. nigra</i> + 2 <i>A. negundo</i>	41	6 / <i>P. nigra</i> + 4 / <i>A. negundo</i>	10	24.4
	7-20 Aug.	5	4 <i>P. nigra</i> + 1 <i>A. negundo</i>	23	1 / <i>P. nigra</i>	1	4.3
	20 Aug.-3 Sep.	5	2 <i>P. nigra</i> + 3 <i>A. negundo</i>	21	0	0	0
	3-17 Sep.	-	-	-	-	-	-
<i>A. glabripennis</i>	10-24 Jul.	6	6 <i>P. nigra</i>	26	0	0	0
	24 Jul.-7 Aug.	7	6 <i>P. nigra</i> + 1 <i>A. negundo</i>	30	0	0	0
	7-20 Aug.	8	6 <i>P. nigra</i> + 2 <i>A. negundo</i>	35	0	0	0
	20 Aug.-3 Sep.	8	8 <i>P. nigra</i>	22	0	0	0
	3-17 Sep.	3	3 <i>P. nigra</i>	5	0	0	0

technique using infested sentinel host-plants to capture parasitoids. The parasitoid showed a very high level of specificity for its original host: all the attacked hosts were *A. chinensis* eggs. As no egg of *A. glabripennis* was attacked by *A. anoplophorae*, the eulophid species has no potential as a biological control agent against ALB.

Some information on host-plant effect on parasitization of CLB eggs was obtained from the plants exposed 24 Jul.-7 Aug., 2003. The parasitized CLB eggs were distributed 40 % on *A. negundo* and 60% on *P. nigra*. *A. anoplophorae* showed a similar ability to find and attack its host in both plant species.

Some information on host age effect on parasitization of CLB eggs was obtained from laboratory and field tests. At 22° C, duration of incubation of the CLB eggs was 15-20 days. During laboratory tests, some 2- through 5-day-old CLB eggs were parasitized by *A. anoplophorae*, successfully. Older hosts were not tested in the laboratory. In field tests, all the eggs exposed were older than 5 days but some were parasitized. Moreover, observations made during dissection of host eggs showed us that a fully developed embryo of CLB also can be parasitized

successfully. Therefore, it appears that parasitization may occur during most of the host egg incubation period.

Some information on the number of generations per year in *A. anoplophorae* was collected. From the overwintering parasitized eggs collected in April 2003, adults of *A. anoplophorae* emerged July through August 2003. This cohort represented a first generation with a diapause lasting from summer 2002 through June, July, or August 2003. In early August 2003, parasitized eggs collected in the field under freshly made oviposition scars produced adult parasitoids 28 August through 6 September 2003. Moreover, CLB eggs laid in the laboratory 17 through 23 July 2003, then exposed and parasitized in the field 24 July through 7 August, produced adult parasitoids on 5 September 2003. Consequently, at least one summer generation, with a 4-week larval development, occurs in *A. anoplophorae*.

Some information on the level of host specificity in *A. anoplophorae* was inferred from field observations made at Parabiago where both hosts *Saperda carcharias* and *A. chinensis* live sympatrically. *S. carcharias* was parasitized by *Euderus caudatus* (Hymenoptera: Eulophidae), and *A.*

chinensis parasitized by *A. anoplophorae*; however, their respective egg parasitoids were never found in a non original host.

The gregarious egg parasitoid, *A. anoplophorae*, was fairly abundant in all the sites infested with *A. chinensis* around

Parabiago. It showed a high level of host specificity. It attacked hosts during a long period in summer. It showed at least two generations per year. Consequently, it has the major traits of a promising biological control agent against *A. chinensis*. On the other hand, it appears to have no potential against *A. glabripennis*.