Distribution, Survival and Dispersal Capability of Two Invasive Cerambycidae Species in Central Argentina

Grilli Mariano Pablo[1], Fachinetti Romina[1], Pedemonte María Laura[1]

[1]CREAN (Centro de Relevamiento y Evaluación de Recursos Agrícolas y Naturales), (CONICET-UNC). - mariano.grilli@unc.edu.ar

INTRODUCTION

An important forestry production based mainly on pine wood is located in the west of Córdoba. This region concentrates the largest pine forested area, with over 12,600 hectares implanted, being *Pinus elliottii* and *P. taeda* the most used for its adaptability**[1]**. In 2006 two invasive species of Cerambycidae were described for the first time in this area: *Arhopalus syriacus* (Reitter, 1895) and *A. rusticus rusticus (Linnaeus*, 1758), whose differences are present in maxillary palps and elytra **(Fig. 1) [2].** At least, one of these species is an important quarantine pest due to its ability of carrying the pine wood nematode *Bursaphelenchus xylophilus* (Nematoda: Parasitaphelenchidae) **[3]**.The objective of this work was to generate the baseline knowledge of these two species for the development of decision-making tools for future management.

MATERIALS AND METHODS

The study area covered the entire west of the province of Córdoba, from the Bosque Alegre Observatory to the experimental field of the Faculty of Agronomy of Rio Cuarto (UNRC). To catch dispersive beetles, we used plastic black traps "vane cross" **(Fig. 2A)**. Each trap was baited with α-β pinene and ethanol and was placed in batches of pine selected randomly. Moreover, 5 "tree-trap" per batch were selected. Each tree-trap consisted in a pine tree (*Pinus elliottii*) weakened by a dose of herbicide. Subsequently, logs of 90 cm long of these trees were kept into individual cages to record the emergency of insects **[4]**, which were used in others experiments **(Fig. 2B)**:

Dispersal potential

Two mills were built to measure *A. r. rusticus* dispersal flight. Each mill had a vertical steel needle in the center that acted as an axle. In the center of this structure, the beetles were placed 6 cm from the axis, attached to one end of the balanced wooden rod **(Fig. 3A) [5]**. With special software, flight distance and speed was recorded. Individuals flew about 8 hours.

A. syriacus rearing

The laboratory colony was started using adults collected from pine logs. Newly hatched larvae were placed individually in Petri dishes with artificial diet. These larvae were kept to adulthood in the laboratory **(Fig. 3B)**. Development time and survival of all stages and larval instars were recorded **[6]**.

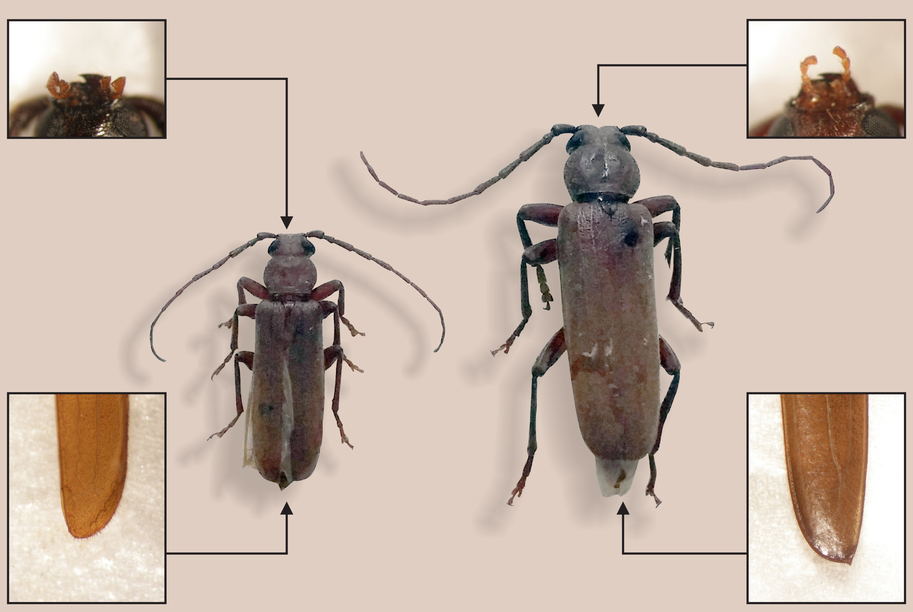

Figure 1. Male individuals of Arhopalus syriacus (left) and A. rusticus rusticus (right)

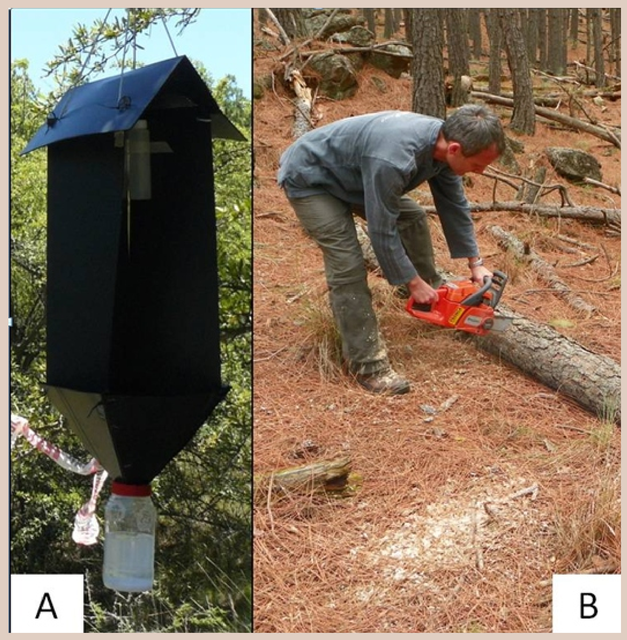

Figure 2. Vane cross trap (A). Logs of 90 cm long of weakened pine trees (B)

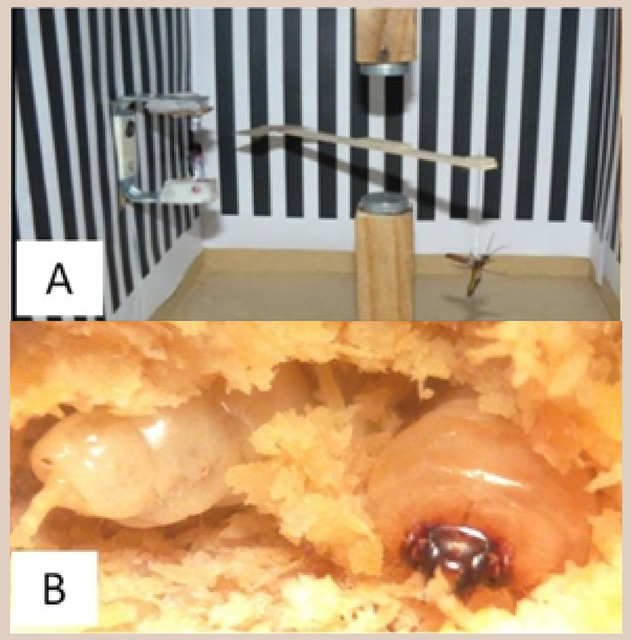

Figure 3. Flight mill (A). *A. syriacus* larvae with artificial diet (B)

RESULTS AND CONCLUSIONS

1. *Arhopalus rusticus* has a widespread distribution, while *A. syriacus* is restricted to the southern pine production area in the province of Córdoba.

2. Both species showed a flight duty period during the late spring and midsummer. *A. syriacus* had its highest abundance in November and *A. rusticus* in late December.

3. No significant differences in sex ratio were observed in these species ($p>0.05$). Anyway, males emerged first than females in both species. This could indicate that males emerge a few days prior to fertilize the females when these emerged.

4. Based on our results, we determined that *A. rusticus* can colonize and grow in healthy pines batches.

5. The abundances of both species are local, showing no correlation or spatial synchrony.

6. *A. rusticus* females can fly an average distance of 9282.23 ± 1098.31 m; while males, 5892.45 ± 1122.99 m ($N=45$; $F=4.66$; $p<0.05$).

7. The egg stage of *A. syriacus* lasted 12.10 ± 0.40 days. At the end of the larval stage, we observed that *A. syriacus* pupated after 6, 7, 8 or 9 larval instars. Developmental time varied from 297 ± 25.88 (individuals with 6 instars) to 378 ± 40.92 (individuals with 9 instars).

8. The lengths of the larvae and head capsules widths were significantly different between larval instars ($H=345.41$; $p<0.0001$; $H=91.54$; $p<0.0001$, respectively).

9. The highest mortality was observed in larval stage, where 60% of individuals did not survive the first larval instar. In the case of larvae developing in seven instars, mortality did not exceed 6%. In six, eight and nine larval instars, as well as pupae, 100% survival was observed.

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