Apechoneura longicauda Kriechbaumer (HYMENOPTERA: ICHNEUMONIDAE: LABENINAE), PARASITOID OF *Phloeoborus punctatorugosus* Chapuis (COLEOPTERA: CURCULIONIDAE: SCOLYTINAE)

[1]Paul E. Hanson, [2]Roberto A. Cambra T., y [2]Alonso Santos M.
[1]Escuela de Biología, Universidad de Costa Rica, San José, Costa Rica.
[2]Museo de Invertebrados G. B. Fairchild, Universidad de Panamá, Estafeta Universitaria 0824-00021, Panamá, Panamá.
E-mail:hansongodoy@racsa.co.cr, asantos@ancon.up.ac.pa

ABSTRACT
Observations of the parasitism of *Phloeoborus punctatorugosus* (Curculionidae: Scolytinae) by *Apechoneura longicauda* (Ichneumonidae: Labeninae) are presented. This is the first host record for a species of *Apechoneura*. Based on the very long and flexible ovipositor of *A. longicauda*, it was previously suggested that this and closely related species do not drill into wood, but rather thread the ovipositor through host tunnels. We provide field observations that support this suggestion.

KEYWORDS
Apechoneura, *Phloeoborus*, parasitoid, Neotropical, Gondwanic distribution, oviposition, wood-borers.

RESUMEN
Observaciones del parasitismo de *Phloeoborus punctatorugosus* (Curculionidae: Scolytinae) por *Apechoneura longicauda* (Ichneumonidae: Labeninae) son descritas. Este es el primer registro de hospedero para una especie de *Apechoneura*. Basado en su ovipositor muy largo y flexible, se ha sugerido previamente que A. *longicauda* (y especies relacionadas) no taladra la madera sino que mete su ovipositor a través de los túneles hechos por el hospedero. Aquí se presentan observaciones de campo que apoyan esta sugerencia.

PALABRAS CLAVES
Apechoneura, *Phloeoborus*, parasitoide, Neotropical, distribución Gondwanica, oviposición, taladradores de madera.

INTRODUCTION

Labeninae is the only subfamily of Ichneumonidae showing a predominantly Gondwanic distribution, occurring primarily in the Neotropical and Australian regions. It is divided into four monophyletic tribes, three of which occur in the Neotropics (Gauld & Wahl, 2000). In Central America the subfamily is represented by two tribes and three genera: *Grotea* in the tribe Groteini, and *Apechoneura* and *Labena* in the tribe Labenini (Gauld, 2000). As far as known, members of the latter tribe are idiobiont ectoparasitoids of wood-boring beetle larvae. A diagnostic character of the tribe Labenini is the presence of a basal groove on the inside surface of the hind coxa of females, which is used for supporting the ovipositor during oviposition (Gauld & Wahl, 2000). Species of *Labena* have tarsal modifications that allow them to cling to wood that is in a vertical position (standing tree trunks, fence posts, etc.) and/or has a smooth surface. In contrast, species of *Apechoneura* lack these modifications and are probably limited to horizontal logs and/or wood with a rough surface (Gauld, 2000).

Apechoneura is known from southern Nicaragua to Paraguay and Bolivia, and comprises approximately 30 species (Gauld, 2000). Although there are no host records for *Apechoneura*, North American species of *Labena* have been reared from larvae of Buprestidae and Cerambycidae. Among other genera in the tribe Labenini, *Gauldianus* has been reared in Chile from branches containing cerambycid larvae and *Certonotus* in New Zealand from *Rhynchodes* (Curculionidae) (Gauld & Wahl, 2000, and references cited therein). *Apechoneura* has been divided into six species groups, and it has been noted that those in the *carinifrons* group (*A. longicauda* and related species) have extremely long ovipositors that are thin and flexible, suggesting that they do not drill into wood but rather thread their ovipositors into crevices in the wood (Gauld, 2000). In this paper we present observations supporting this suggestion and present the first host record for the genus.

METHODS

The study site was in La Tronosa Forest Reserve, Tonosí, Los Santos Province, Panama in the area of Los Planes of Serrano (7° 21' N; 80° 28' O, 350 msnm). The field observations were made on May 2, when three females of *Apechoneura longicauda* were observed inserting their ovipositors into a small, frass/sawdust filled hole in fallen wood of *Inga*. Only one adult female of *A. longicauda* was collected, with an entomological net, above the fallen tree of *Inga*. Three adult males of *A. longicauda* and six adults of *P. punctatorugosus* were collected with forceps inside the split wood from the fallen *Inga* tree. The wood was split using a machete. The specimens were weighed and pinned in the laboratory. The specimens were photographed in the field using a digital camera 8.1MP. All specimens are deposited in the Museo de Invertebrados G. B. Fairchild, University of Panama (MIUP).

RESULTS AND DISCUSSION

On May 2, 2006, three adult females of *Apechoneura longicauda* were observed inserting their ovipositors into a small, frass/sawdust filled hole in fallen wood of *Inga* (Fabaceae) (Fig. 1). This is the first behavioral evidence corroborating the suggestion, based on morphological evidence, that *A. longicauda* does not drill into wood, but rather threads its ovipositor through crevices or tunnels in order to reach its host. The white bands on the ovipositor sheaths, which are extended posteriorly during oviposition, resemble the white bands on the anteriorly extended antenna. As has been previously noted (Gauld, 2000, Gauld & Wahl, 2000), this might possibly serve to confuse potential predators of ovipositing females, although this suggestion requires futher study.

Upon splitting the wood, tunnels, larvae (Fig. 2), pupae, and six young adults (Fig. 3) of *Phloeoborus punctatorugosus* were found. In addition, a pupa (Fig. 2) and three adult males (Fig. 4) of *A. longicauda* were found in the same wood. Detached ovipositors were also found, presumably belonging to unemerged *A. longicauda* females. Although *Apechoneura* larva were not observed feeding on *Phloeoborus* larvae, the observation of three female wasps ovipositing into tunnels of *Phloeoborus*, combined with the presence of both

Apechoneura and *Phloeoborus* inside the log, and the absence of other insects, provides strong evidence that *A. longicauda* is a parasitoid of *P. punctatorugosus* larvae (and possibly pupae). This represents the first host record for the genus *Apechoneura* and the first record of a parasitoid of *P. punctatorugosus*.

Fig. 1. *Apechoneura longicauda* inserting its ovipositor into a hole in fallen wood of *Inga*.

Fig. 2 Larva of *Phloeoborus punctatorugosus* and pupa of *Apechoneura longicauda* in wood.

Based on our observations, it appears that adult *A. longicauda* could possibly use host tunnels to escape from the log. The three live adult males were found inside the tunnels. Since some tunnels reach the surface of the log it is possible that the adult wasps make their way through the frass/sawdust filled tunnels in order to reach the surface. Further study is required to confirm this suggestion.

Fig. 3. One of the six adults of *Phloeoborus punctatorugosus* observed in wood.

Fig. 4. One of the three adult males of *Apechoneura longicauda* observed emerging from tunnels made by *Phloeoborus punctatorugosus*.

A scolytine larva might be assumed to be too small to host a labenine ichneumonid, but a comparison of the adult sizes of the two (Fig. 5) suggests this is not the case for species of *Phloeoborus*, which are larger than most other scolytines. Four adults of P. punctatorugosus weighed 19 mg, 22 mg, 23 mg, and 38 mg. Three adult males of A. longicauda found inside tunnels in the wood weighed 15 mg, 17mg, and 17 mg. An adult female ovipositing on the outside of the log weighed 23 mg.

The following synopsis of the biology of *Phloeoborus* is taken from Wood (2007). Species of this genus occur from Veracruz, Mexico, to northern Argentina, and bore into fallen logs or branches that exceed 15 cm in diameter. Adult beetles burrow into the lower side of the wood, creating a tunnel that extends 2-5 cm into the xylem and then branches two or more times. The eggs are laid individually in niches along the tunnel and the larvae form long, meandering tunnels through the wood. Neither adults nor larvae feed directly on fungi, but the latter probably enhance the nutritional value of the xylem, and tissue decay is rapid in the vicinity of larval tunnels. Pupation occurs anywhere in the log.

Fig. 5. Relative size of *Phloeoborus punctatorugosus* and *Apechoneura longicauda*

ACKNOWLEDGEMENTS
We wish to thank Lawrence Kirkendall, University of Bergen, Norway, for confirmation of our identification of the scolytine, and project PROBIO (Universidad de Panamá- Japan International Cooperation Agency) for funding the field work and others facilities.

REFERENCES

Gauld, I. 2000. The Ichneumonidae of Costa Rica, 3. Memoirs of the American Entomological Institute 63: 1-453.

Gauld, I. D. & D. B. Wahl. 2000. The Labeninae (Hymenoptera: Ichneumonidae): a study in phylogenetic reconstruction and evolutionary biology. Zoological Journal of the Linnean Society 129: 271-347.

Wood, S.L. 2007. The Bark and Ambrosia Beetles of North and South America (Coleoptera, Scolytidae). Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah, USA. 900 pp. + 230 plates.

Recibido noviembre de 2007, aceptado octubre de 2008.