

Biology of Bark and Ambrosia Beetles (Coleoptera: Scolytidae and Platypodidae) of a Tropical Rain Forest in Southeastern Mexico with an Annotated Checklist of Species

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ABSTRACT Feeding habits, degree of host specificity, and mating systems were examined for 83 species of Scolytidae and Platypodidae in a tropical rain forest in the Isthmus of Tehuantepec, Mexico. Neotropical genera dominate the fauna; most species have been found in Central America and northern South America. The dominant feeding habit was xylomycetophagy (60.2%) followed by phloeophagy (26.5%), a pattern observed in other humid tropical areas, but different from that observed in other Mexican communities. Most xylomycetophagous species were highly polyphagous; phloeophagous species were much more host-specific. Most common mating systems were monogyny (49.4%) and inbred polygyny (34.9%), the latter associated with a high degree of polyphagy. An annotated checklist of species is presented as appendix.

BARK AND ambrosia beetles are among the most important groups of wood-boring insects in all forest communities. They form a compact group, biologically and taxonomically. These tiny beetles (0.5–10 mm length) breed in live or recently dead woody tissues, often causing the death of all or part of their host plants. In general, they are among the first insects to invade cut, fallen, or moribund hosts. The common names, bark and ambrosia beetles, refer to the most common feeding habits in the group: consumption of phloem, or inner bark (phloeophagy), and consumption of ectosymbiotic fungi introduced into their galleries in the wood of their hosts (xylomycetophagy), respectively. Other habits include the direct consumption of wood (xylophagy), pith in twigs and branches (myelophagy), herbaceous plants (herbiphagy), fruits or seeds (spermatophagy) (Schedl 1958, Wood 1982).

Reproductive biology in the Scolytidae and Platypodidae has recently been reviewed by Wood (1980, 1982) and more extensively by Kirkendall (1983), whose terminology is used here. Mating systems of outbreeding species are monogyny and harem polygyny (heterosanguineous polygamy of Wood 1980, 1982). Males or females may initiate gallery construction in monogynous species, depending on species; males initiate attacks in harem polygynous species. Another important mating system is inbred polygyny (spanandry of Beaver 1977, 1979; consanguineous polygamy of Wood 1980, 1982) in which females mate with their siblings prior to emergence and then construct gal-

leries alone. In this last case, males are few in number, reduced in size, and flightless.

The biology of bark and ambrosia beetles is poorly known in tropical areas. The only areas from which reasonably complete information is available are Malaysia (Browne 1961), Fiji (Roberts 1976, 1977a,b), and Mato Grosso, Brazil (Beaver 1972, 1973a,b, 1974, 1976). Beaver (1977, 1979) compared feeding habits, degree of host specificity, and the incidence of inbred polygyny among faunas of temperate and tropical regions. However, three of four areas he compared were large and ecologically heterogeneous (France, California, West Malaysia), making interpretation difficult. Recently, ecologically oriented faunistic studies have been made in Central Mexico in tropical deciduous forest (Equihua et al. 1984) and temperate highland communities (Atkinson & Equihua 1985).

Since 1982 we have been collecting Scolytidae and Platypodidae in the Uxpanapa region of Veracruz and Oaxaca, an area dominated by lowland tropical rain forest. We present here an analysis of the biogeographical affinities of the bark and ambrosia beetles, their feeding habits, host specificity, mating systems, and interrelationships among these. These biological patterns are compared with those of other tropical areas and are interpreted within the ecological context of tropical rain forest. An annotated checklist of the species found is included as an appendix.

Methods

The Uxpanapa region is an area in southeastern Veracruz and adjoining areas of Oaxaca that has been opened to settlement relatively recently and still contains extensive rain forest. The area covers ca. 2,000 km² in the Isthmus of Tehuantepec (Fig.

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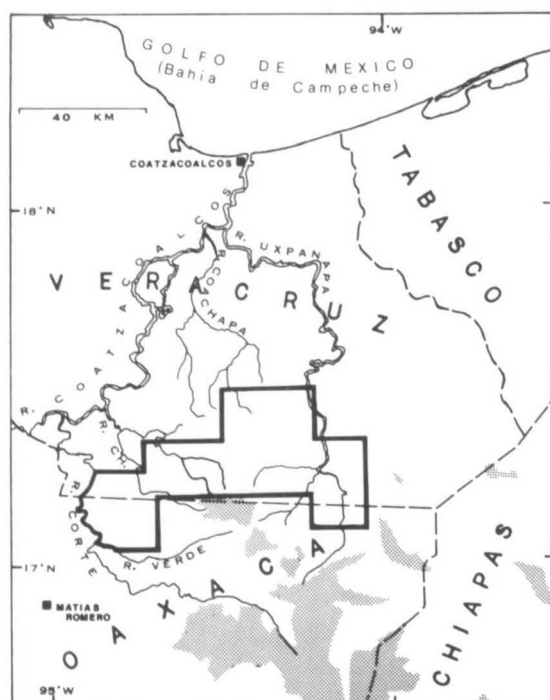


Fig. 1. Location of the Uxpanapa region (thick line), Veracruz and Oaxaca, Mexico. Shaded area, mountain ranges of over 1,000 m elevation. R. CH., Río Chalcijapa. (Reprinted from Wendt 1983 with permission.)

1) and includes parts of the watersheds of the rivers Corte, Chalcijapa, Coahuila, and Uxpanapa, all tributaries of the Río Coatzacoalcos. All collection sites were at <300 m in elevation. Depending on area, average annual rainfall ranges from 2,850 to 4,400 mm or more with a relatively dry season from late March through May. The area includes parts of the municipios of Minatitlán, Hidalgotitlán, and Jesús Carranza in Veracruz and Matías Romero in Oaxaca (Wendt 1983).

We made four collecting trips to the area from May 1982 to February 1984, during which we sampled extensively for bark and ambrosia beetles in trees felled by loggers, in agricultural clearings, in naturally fallen trees and branches, and in small trees and branches specifically felled to attract insects. Seeds, fruits, leaf petioles, and vines were also examined. Blacklight traps were also used on some trips. We made extensive observations on the activities of beetles with respect to type of tissues consumed, part of plant occupied, gallery architecture, and number and sex of adults present. All host identifications were made by Tom Wendt, Centro de Botánica, Colegio de Postgraduados, Chapingo, Mexico. Insects were identified by the authors and confirmed by S. L. Wood, Department of Zoology, Brigham Young University, Provo, Utah.

Feeding habits (type of tissue consumed) were determined by direct observation, interpreted by

Table 1. Taxonomic summary of Scolytidae and Platypodidae known from the Uxpanapa region

Family/subfamily	Tribe	No. genera	No. species
Scolytidae			
Hylesininae	Hylesinini	1	2
	Phrixosomini	1	1
	Phloeotribini	1	2
	Phloeosinini	1	2
Scolytinae	Scolytini	4	5
	Ctenophorini	3	8
	Dryocoetini	1	2
	Xyleborini	6	25
	Cryphalini	1	4
	Corthylini	5	18
Platypodidae			
Platypodinae ^a		2	14

^a Platypodidae not separated into tribes here.

experience with this group. Mating habits were inferred by gallery architecture, number and sex of adults present, and supporting evidence in the available literature. Degree of host specificity was based on our collections, a critical examination of literature, and our subjective judgement, based on long experience with these insects. We recognize three degrees of host specificity: 1) monophagy (restriction to a single host genus), 2) oligophagy (restriction to a single host family), and 3) polyphagy (utilization of hosts in unrelated host families). Some of our assignments of degree of specificity are tentative.

Results

Taxonomy. A total of 83 species from 26 genera was collected. These are summarized by subfamily and tribe in Table 1. More complete information on each species is presented in the appendix in the form of an annotated checklist. Based on the numbers of previously uncollected species found in each trip we believe that many more species remain to be collected. The largest groups were the Xyleborini (25 spp.), Corthylini (17 spp.), and Platypodidae (14 spp.). The Scolytini and Ctenophorini are also well represented.

In Table 2 the biogeographic affinities of the genera are summarized. The neotropical element is most outstanding, followed by genera with circumtropical distributions. It is noteworthy that no nearctic or Mexican/southwestern United States genera were found. Both groups are important to varying degrees in temperate highland communities (Atkinson & Equihua 1985) and tropical deciduous forest (Equihua et al. 1984). Many species reported here are widely distributed in humid areas of Central and South America and reach their northernmost limits in southeastern Mexico. The genera *Phloeoborus*, *Camptocerus*, *Phrixosoma*, *Theoborus*, *Xyleborinus*, and *Tesserocerus* are restricted in Mexico to the rain forest in the southeastern part of the country (personal observation).

Table 2. Biogeographic affinities of genera of Scolytidae and Platypodidae from the Uxpanapa region

Affinity	No. genera	Genera
Neotropical	17	<i>Phloeoborus</i> , <i>Chramesus</i> , <i>Cnemonyx</i> , <i>Camptocerus</i> , <i>Scolytopsis</i> , <i>Pycnarthrum</i> , <i>Gymnochilus</i> , <i>Scolytodes</i> , <i>Dendrocranus</i> , <i>Dryocoetoides</i> , <i>Theoborus</i> , <i>Araptus</i> , <i>Tricolus</i> , <i>Amphicranus</i> , <i>Monarthrum</i> , <i>Corthylus</i> , <i>Tesserocerus</i>
Circumtropical	6	<i>Xylosandrus</i> , <i>Ambrosiodmus</i> , <i>Xyleborus</i> , <i>Xyleborinus</i> , <i>Hypothemus</i> , <i>Platypus</i>
Other	3	<i>Prixosoma</i> ^a , <i>Phloeotribus</i> ^b , <i>Scolytus</i> ^b

^a Neotropical Region and West Africa.^b Neotropical, Nearctic, and Palearctic Regions.

Of the 83 species reported here, 15 were undescribed and 14 had not previously been reported from Mexico. In spite of the high proportion of previously undescribed species (18%), the fauna of the rain forest in Mexico and Central America is so poorly known that there is no compelling reason to consider the Uxpanapa region as an area of high endemism.

Feeding Habits. The relative importance of different guilds based on feeding habits is summarized in Table 3. Xylomycetophagy (60.2%) and phloeophagy (26.5%) were most important. These results contrast sharply with the patterns in upland communities (14% xylomycetophagy and 71% phloeophagy) (Atkinson & Equihua 1985) and tropical deciduous forest in Mexico (13% xylomycetophagy and 56% phloeophagy) (Equihua et al. 1984). Our results are similar to those reported for West Malaysia (74% of fauna xylomycetophagous) (Browne 1961) and Fiji (57% xylomycetophagous, 30% phloeophagous) (Roberts 1976, 1977a,b), both humid tropical areas.

Host Specificity. The degree of host specificity of the Uxpanapa fauna is summarized in Table 3. Overall, polyphagous species are more numerous than those of the other two classes combined; oligophagy is by far the least important in terms of number of species. There does not appear to be any intergradation between monophagy and po-

Table 3. Cross-tabulation of feeding habits and degree of host specificity of 83 species of Scolytidae and Platypodidae in a tropical rain forest in the Uxpanapa region, Mexico

Degree of specificity	Feeding habit ^{ab}						Total
	P	XM	X	H	M	S	
Monophagy	17	—	—	3	—	—	20
Oligophagy	4	2	—	2	—	1	9
Polyphagy	1	48	2	—	3	—	54
Total	22	50	2	5	3	1	83

^a Values are number of species.^b P, phloeophagy; XM, xylomycetophagy; X, xylophagy; M, myelophagy; H, herbiphagy; S, spermatophagy.**Table 4. Cross-tabulation of feeding habits and mating systems for 83 species of Scolytidae and Platypodidae in a tropical rain forest in the Uxpanapa region, Mexico**

Feeding habit	Mating system ^{ab}			Total
	MG	HPG	IPC	
Phloeophagy	10	11	1	22
Xylomycetophagy	24	1	25	50
Xylophagy	2	—	—	2
Herbiphagy	5	—	—	5
Myelophagy	—	—	3	3
Spermatophagy	—	1	—	1
Total	41	13	29	83

^a Values are number of species.^b MG, monogyny; HPG, harem polygyny; IPC, inbred polygyny.

lyphagy. This implies that selective forces favor one extreme or the other, at least in this area. The low overall specificity is similar to that of the humid tropical areas reported by Beaver (1979). Degree of host specificity is closely related to feeding habit (Table 3). Two combinations stand out prominently, phloeophagy-monophagy and xylomycetophagy-polyphagy. Other combinations are insufficiently represented here to allow meaningful comparisons.

Mating Systems. Mating habits of the fauna are shown in Table 4. The most important systems were monogyny (49.4%) and inbred polygyny (39%). Although there is little comparative information, inbred polygyny is rare in temperate communities (Beaver 1977, Wood 1982, Kirkendall 1983). Even in tribes such as the Dryocoetini and Cryphalini, which include numerous genera in temperate as well as tropical areas, the inbred polygynous genera are largely restricted to the tropics while outbreeding ones occur in temperate areas. The Xyleborini, which are all inbred polygynous, are essentially tropical in distribution. In Malaysia (Browne 1961) and Mato Grosso, Brazil (Beaver 1972, 1973a,b, 1974, 1976), 57% and 29%, respectively, of the fauna consists of inbred polygynous species. The information given by these authors does not permit calculations of the frequency of other systems. In deciduous tropical forest (Equihua et al. 1984) and temperate communities in Mexico (Atkinson & Equihua 1985), the respective percentages of inbred polygynous species are 21% and 1%.

Mating systems and feeding habits are closely related (Table 4). Among the phloeophagous species, monogyny and harem polygyny are equally represented, but inbred polygyny is essentially absent. Most of the harem polygynous species are in the Corthylini; the monogynous species belong to several unrelated tribes. In the case of xylomycetophagous species, monogyny (Corthylini, Platypodidae, *Camptocerus*) and inbred polygyny (Xyleborini) are similar in importance and harem polygyny is insignificant.

Reproductive systems and degrees of host spec-

ificity are cross tabulated in Table 5. All of the inbred polygynous species found here, mostly ambrosia beetles, are polyphagous. Most harem polygynous species are monophagous. For monogynous species, degree of specificity is related to feeding habit; all of the monogynous polyphages are ambrosia beetles and most of the monophages are bark beetles.

Discussion

The taxonomic composition of the fauna of the Uxpanapa region differs markedly from that of tropical deciduous forest in Jalisco, Mexico, where the Micracini and Cryphalini, relatively insignificant here, are dominant groups (Equihua et al. 1984). Even though the Corthylini are important in both areas, the genera represented are different. The tribes and genera found in the Uxpanapa area were quite different from those found in temperate highland communities in central Mexico at the genus or tribal level (Atkinson & Equihua 1985). The Uxpanapa region is located near the northern limits of the neotropical rain forest which reaches its northernmost extension on the Gulf coast of the states of Veracruz and Tamaulipas (Rzedowski 1978). The fauna of Scolytidae and Platypodidae present seems to be mostly associated with this community and appears to have been derived from a larger neotropical rain forest fauna rather than from local sources.

In Fiji (Roberts 1976, 1977a,b) and Malaysia (Browne 1961), the Xyleborini, Platypodidae, and Dryocoetini are most important in that order. The Uxpanapa fauna is similar to those areas with respect to the relative importance of the first two groups, but the Corthylini and Ctenophorini, abundant here, are restricted to the New World and the Dryocoetini are poorly represented in the Neotropical Region.

Several authors have suggested that phloeophagy is the dominant feeding habit in temperate areas and xylomycetophagy is dominant in the tropics (Browne 1961, Beaver 1979, Wood 1982). However, in a tropical deciduous forest in Jalisco, Mexico, at nearly the same latitude as the Uxpanapa region, the proportions of phloeophagous (56%) and xylomycetophagous species (13%) more nearly resemble those of temperate areas. The Valley of Mexico, also at a similar latitude, is located at high elevations (2,200 to 5,000 m) and its "profile" is also similar to that of the temperate areas cited by Beaver (1979). On the other hand, 36% of the Scolytidae and Platypodidae of Korea are ambrosia beetles (Choo 1983), the highest reported for any temperate area. It seems likely, then, that xylomycetophagy is basically a response to high humidity. The Uxpanapa region is located well to the north within the equatorial zone and has a more pronounced dry season and seasonal temperature variation than would be expected in an area closer to the equator. This may explain the

Table 5. Cross-tabulation of host specificity and mating systems for 83 species of Scolytidae and Platypodidae in a tropical rain forest in the Uxpanapa region, Mexico

Degree of specificity	Mating system ^{ab}			
	MG	HPG	IPG	Total
Monophagy	9	11	—	20
Oligophagy	8	1	—	9
Polyphagy	24	1	29	54
Total	41	13	29	83

^{ab} See Table 4 footnotes.

lower incidence of ambrosial species in the Uxpanapa region by comparison with Malaysia.

The combination of high, sustained heat and humidity present in tropical rain forests presents extremely favorable conditions for fungal growth. Virtually all Scolytidae and Platypodidae that have been studied seem to be associated with fungi, even phloeophagous species (Francke-Grosman 1967, Barras & Perry 1975). It is likely that the ambrosial habit initially arose under conditions that were more favorable for fungal growth than for insect development; utilization of fungi as the primary food source may have arisen out of competition between beetles and microorganisms for the same substrate. The fact that xylomycetophagy has evolved at least eight separate times from phloeophagous ancestors in the Scolytidae and Platypodidae supports this hypothesis (Wood 1982, Kirkendall 1983).

The low degree of host specificity of ambrosia beetles has been discussed by several authors, most thoroughly by Beaver (1977, 1979). This is due in large part to the fact that these beetles feed on fungi rather than on plant tissues. Assuming that fungi are less host-restricted than beetles, this symbiotic association allows lower specificity, but does not necessarily cause it. In any event, as Beaver (1979) points out, the insect still selects the host. Beaver (1977, 1979) has also suggested that the greater floristic diversity of the humid tropics makes it ecologically more costly or even unfeasible for host-specific species to flourish. Of the 50 species of ambrosia beetles known from the Uxpanapa region, 48 are polyphagous and 2 are oligophagous. In the Valley of Mexico, an area of comparatively lower floristic diversity, 9 are monophagous and 1 is oligophagous out of a total of 19 xylomycetophagous species. These host-specific ambrosia beetles are mostly associated with pines and oaks, the dominant trees of the area (Atkinson & Equihua 1985). It seems that the shift to xylomycetophagy allows a decrease in specificity, which then is determined by resource availability.

The high degree of host specificity (monophagy or oligophagy) of phloeophagous species observed here agrees with data presented by Beaver (1979), which imply that phloeophages are mostly host-specific wherever found. Several authors have not-

ed that phloeophagous Scolytidae are mostly associated with hosts that produce latex, resin, or gum (Browne 1961, Wood 1982, Atkinson & Equihua 1985, Equihua et al. 1984). This is also true of phloeophagous species in the Uxpanapa region; many are associated with Moraceae, Guttiferae, and Myristicaceae. Because these beetles bore in and feed on live or moribund tissues, they frequently encounter active defense systems of their host plants. It seems that host plants with this type of defense system effectively select for specificity in their associated bark beetles. The relative absence of bark beetles in hosts without resin or latex may indicate that they are at a competitive disadvantage with other insects or microorganisms in these hosts. This high degree of specificity may contribute to the reduction in number of phloeophagous species in rain forest with respect to more temperate communities, since the difficulties of finding suitable hosts where these are widely dispersed might make this niche less profitable.

Recently Kirkendall (1983) discussed the evolution of different reproductive systems in the Scolytidae and Platypodidae. Most Scolytidae and all Platypodidae are monogynous, which is considered to be the primitive habit. He hypothesized that harem polygyny arose from monogyny in situations in which host resources were of high, but variable quality. Under these circumstances it would be more profitable for males to find and defend patches of high quality breeding resource and then attract females than to directly seek out females. Of all the host substrates utilized by Scolytidae and Platypodidae, phloem is the highest in nutrient quality. Most of the harem polygynous species found in the Uxpanapa region were phloeophagous and host-specific to resin or latex-producing hosts, supporting this hypothesis.

The origins of inbred polygyny are obscure but species with this reproductive system are able to increase their populations very rapidly by comparison with out-breeding species (Beaver 1977). Most inbred polygynous species in the Uxpanapa region were polyphagous and xylomycetophagous. However, there was an equally large group of polyphagous xylomycetophages in the area which were monogynous. There are no immediately apparent differences, other than taxonomic, between the monogynous and the inbred polygynous ambrosia beetles. One might expect that inbred polygynous species would be better able to exploit ephemeral resources since they do not depend on finding mates after dispersal. Further studies should focus on ecological differences between these two groups in humid tropical forests.

Despite the extreme northern position of the Uxpanapa region within the Neotropical rain forest and important taxonomic differences between neotropical and paleotropical Scolytidae and Platypodidae, the results presented here agree in many important respects with those of areas of rain forest in the Old World. This suggests that

the patterns observed reflect a common evolutionary response to similar conditions in widely separated areas by a single group of organisms.

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Appendix

Annotated Checklist of Scolytidae and Platypodidae from the Uxpanapa Region of Veracruz and Oaxaca, Mexico

This checklist is based entirely on collections made by the authors and collaborators (Tom Wendt, Armando Burgos S.). There is no additional material from the region in other Mexican collections. Wood (1982) lists several dozen collections from the municipio of Matías Romero but these are not listed here since the municipio is large and heterogeneous with respect to vegetation and rainfall. All material is deposited in the insect collection of the Centro de Entomología y Acarología, Colegio de Postgraduados, Chapingo, Mexico. The following information is included for each species: valid name, feeding habit (p, phloeophagous; xm, xylomycetophagous; x, xylophagous; m, myelophagous; h, herbiphagous; s, spermatophagous), reproductive system (mg, monogynous; pg, polygynous; ipg, inbred polygynous), degree of host specificity (mo, monophagous; ol, oligophagous; po, polyphagous), geographic distribution, collection data, and pertinent comments. Feeding habits, reproductive systems, and degree of host specificity are explained fully in the text. Distributions are taken from Atkinson & Equihua (1985), Equihua et al. (1984), Schedl (1940, 1972), and Wood (1982). Biological information is basically derived from observations by the authors, complemented from the above sources. Since all collections were made by the authors in an area with little altitudinal variation, only state (VER, Veracruz; OAX, Oaxaca), municipio, host plant, and collection number (not present in all cases) are included. Data are grouped by state, municipio, and host plant. Significant new records of distribution or host plants are indicated in boldface. Comments are included for some species when these represent significant new information. Subfamilies and tribes are ar-

ranged according to Wood (1982); genera and species are ordered alphabetically.

Scolytidae

Hylesininae

Hylesinini

1. *Phloeoborus asper* Erichson. (x, mg, po). SE Mexico to Brazil. VER: Hidalgotitlan, *Protium copal* (Engl. ex DC) (**NEW HOST**), S-441; OAX (**NEW STATE**): Matías Romero, host unknown. Male/female pairs were found boring into the underside of a recumbent, recently felled tree in a portion of the trunk ca. 30 cm diam. Tunnels extended up to 10 cm into the wood with no signs of branching or oviposition. Females were actively boring while males expelled frass. The wood showed no signs of decomposition.

2. *Phloeoborus scaber* Erichson. (x, mg, po). SE Mexico to Brazil. VER: Hidalgotitlan, *Protium copal* (**NEW HOST**), S-441. Collected with *P. asper* but only one pair was collected.

Phrixosomini

3. *Phrixosoma minor* Wood. (p, mg, ol). SE Mexico to Brazil. VER (**NEW TO MEXICO**): Jesús Carranza, *Rheedia* sp., S-950; OAX: Matías Romero, Guttiferae, S-286.

Phloeotribini

4. *Phloeotribus maurus* Wood. (p, mg, ol). Veracruz to Costa Rica. VER: Minatitlan, *Pseudolmedia spuria* (Sw.) Griseb. (**NEW HOST**), S-450. Gallery biramous, longitudinal. In branches from 10 to 20 cm diam.

5. *Phloeotribus setulosus* Eichhoff. (p, mg, ol). Lowland Mexico to Brazil. VER: Minatitlan, *Pseudolmedia spuria* (**NEW HOST**), S-450. Gallery

biramous, transverse. Found with *P. maurus* but in smaller diameter material (5–10 cm).

Phloeosinini

6. *Chramesus minus* Wood. (p, mg, mo). Oaxaca to Honduras. OAX (**NEW TO MEXICO**): Matías Romero, *Acacia glomerosa* Benth. (**NEW HOST**), S-266.

7. *Chramesus tibialis* Wood. (p, mg, mo). Known only from Uxpanapa region. VER: Hidalgo, *Olmea recta* Soderstrom, S-439, S-442. Excavates biramous gallery in epidermis of woody canes (3–4 cm diam) of a bamboo endemic to SE Mexico. The branches of the gallery on either side of the entrance ascend diagonally, giving the whole system a V shape, similar to that of *C. annectans* (Wood) (Atkinson & Equihua 1985).

SCOLYTINAE

Scolytini

8. *Camptocerus auricomis* Blandford. (xm, mg, ol). SE Mexico to Venezuela. VER (**NEW TO MEXICO**): Hidalgo, *Protium copal* (**NEW HOST**), S-441. In wood of recently cut tree in diameters ranging from 5 to 15 cm. Attacks were observed in trees with smaller diameters but these had been abandoned without oviposition; there were no attacks in trees of larger diameters (maximum diameter of trunk was 30 cm). The gallery consisted of a short, radial entry; at a depth of ca. 1 cm, a short transverse tunnel was constructed on both sides of the entrance and oriented along the wood grain (1 cm length). The entry tunnel extended another 1 to 2 cm into the wood and bifurcated into two more or less equal branches. The entry tunnel and branches were in a horizontal plane (i.e., perpendicular to the trunk) and had an overall Y shape. Larval cradles were excavated in six rows above and below the two branches, perpendicular to the plane of the tunnels and at 45-degree angles to it. At the time of collection, large larvae, pupae, and both parents were present in the galleries (>10 observed).

9. *Cnemidophorus glabratus* (Schedl). (p, mg, m). SE Mexico. OAX (**NEW STATE**): Matías Romero, *Virola guatemalensis* (Hemsl.) Warb. (**NEW HOST**), S-268. In branches, 3–4 cm diam.

10. *Scolytopsis puncticollis* Blandford. (m, mg, ol). Cuba, lowland Mexico to Argentina. VER: Jesús Carranza, *Terminalia amazonica* (J. F. Gmel.) Exell in Pulle (**NEW HOST**), S-939. In trunks and branches (10–50 cm diam) of fallen tree.

11. *Scolytus binodus* Wood. (p, mg, mo). Known only from Uxpanapa region. OAX: Matías Romero, *Combretum* sp., S-282. In woody vine (2–4 cm diam).

12. *Scolytus* sp. (undescribed). (p, pg, mo). Known only from Uxpanapa region. VER: Jesús Carranza, *Machaerium cirrhiferum* Pittier, S-931.

In broken stems of fallen liana (3–4 cm diam). Galleries were radial with a large nuptial chamber and two to four egg galleries leading from it, each containing a separate female.

Ctenophorini

13. *Gymnochilus reitteri* Eichhoff. (p, mg, mo). Lowland Mexico to Panama. VER: Hidalgo, S-441. Found in *Ficus* spp.

14. *Pycnarthrum hispidum* (Ferrari). (p, mg, mo). Lowland Mexico to northern South America, Caribbean. VER: Minatitlan, UV light. Associated with *Ficus* spp.

15. *Scolytodes atratus* (Blandford). (h, mg, mo). SE Mexico to Panama. VER: Hidalgo, *Cecropia obtusifolia* Bertol., S-438; Minatitlan, *C. obtusifolia*, S-959. Three species of *Scolytodes* are found in fallen petioles of *Cecropia obtusifolia* in the region: *S. atratus* (largest), *S. maurus* (medium-sized), and *S. parvulus* (smallest). *S. atratus* and *S. maurus* make galleries in the pithy center of these petioles; the former is restricted to more humid sites and to the larger, basal portion of the petioles. The latter tolerates a wider range of conditions and may initiate galleries along the length of the petioles. *S. parvulus* differs from the other two in that its galleries are between the epidermis and immediately underlying fibrous layers and do not enter the pith.

16. *Scolytodes maurus* (Blandford). (h, mg, mo). SE Mexico to Venezuela. VER: Hidalgo, *Cecropia obtusifolia*; Minatitlan, *C. obtusifolia*, S-959, OAX: Matías Romero, *C. obtusifolia*.

17. *Scolytodes multistriatus* Wood. (ph, pg, mo). Puebla, Veracruz. VER (**NEW STATE**): Hidalgo, *Ficus insipida* Willd., S-274; host unknown, S-287.

18. *Scolytodes parvulus* Wood. (h, mg, mo). SE Mexico to Costa Rica. VER: Hidalgo, *Cecropia obtusifolia*, S-438, S-433; Minatitlan, *C. obtusifolia*, S-959; OAX (**NEW STATE**): Matías Romero, *C. obtusifolia*, S-288, S-436.

19. *Scolytodes pilifer* Wood. (p, pg, mg). Known only from Uxpanapa region. VER: Hidalgo, host unknown, S-287. Although the host is unknown, this species was collected with *S. multistriatus*, which is known from *Ficus* spp.

20. *Scolytodes schwarzi* (Hopkins). (p, pg, mo). Florida, Veracruz, Jalisco. VER: Hidalgo, *Ficus insipida* (**NEW HOST**), S-274.

Dryocoetini

21. *Dendrocranulus maurus* (Blandford). (h, mg, ol). SE Mexico to Honduras. OAX (**NEW STATE**): Matías Romero, unknown cucurbit vine, S-431.

22. *Dendrocranulus vinealis* Wood. (h, mg, ol). Oaxaca, Honduras. OAX (**NEW TO MEXICO**): cucurbit vine, S-431.

Xyleborini

23. *Ambrosiodmus guatemalensis* Hopkins. (xm, ipg, po). SE Mexico to Brazil. VER: Minatitlan, *Ficus insipida*, S-274; *Esenbeckia pentaphylla* (MacFad.) Griseb., S-285; *Trema micrantha* (L.) Blume, S-961; Lauraceae, S-279; Hidalgotitlan, *Senna* sp., S-276; OAX: Matías Romero, *Trema micrantha*, S-261; *Quararibea* sp., S-284. Attacks in material of small diameter, usually <5 cm.

24. *Ambrosiodmus obliquus* (LeConte). (xm, ipg, po). SE United States, SE Mexico to Brazil, Central Africa. VER (NEW STATE): Hidalgotitlan, *Senna* sp., S-276; Minatitlan, Lauraceae, S-279; *Trema micrantha*, S-961; Jesús Carranza, *Cephaelis* sp., S-934; OAX (NEW STATE): Matías Romero, *Trema micrantha*, S-261. Attacks in small-diameter branches, usually <5 cm diameter.

25. *Dryocoetoides capucinus* (Eichhoff). (xm, ipg, po). Lowland Mexico to Brazil and Peru. VER: Minatitlan, Lauraceae, S-279; Jesús Carranza, *Miconia trinerva* (Sw.) D. Don ex Loud., S-947; OAX (NEW STATE): Matías Romero, host unknown, S-265, S-292.

26. *Theoborus solitariceps* (Schedl). (xm, ipg, po). SE Mexico to Brazil. VER: Hidalgotitlan, *Inga* sp., S-275; *Cmelina arborea* Roxb., S-289. This species is mostly found in small branches (<5 cm diam). The gallery consists of a short entrance tunnel that is abruptly enlarged into a cavelike chamber, normally lying between adjacent growth rings, where all immature stages and the brood mother are found together.

27. *Theoborus theobromae* Hopkins. (xm, ipg, po). SE Mexico to northern South America, Caribbean. VER: Minatitlan, *Guarea* sp., S-269; Sapotaceae, S-283; *Cestrum* sp., S-451; Jesús Carranza, *Miconia trinerva*, S-947. Habits similar to those described for *T. solitariceps*.

28. *Xyleborinus aspericauda* (Eggers). (xm, ipg, po). Florida, SE Mexico to northern South America. OAX (NEW TO MEXICO): Guttiferae, S-286; VER: Jesús Carranza, *Miconia trinerva*, S-947.

29. *Xyleborinus intersetosus* (Blandford). (xm, ipg, po). SE Mexico to northern South America. VER: Minatitlan, *Esenbeckia pentaphylla*, S-285; Rubiaceae, S-788; *Dialium guianense* (Aubl.) Sandw., S-932, S-957; *Heliocarpus appendiculatus* Turcz., S-956; *Schizolobium parahybum* (Vell.) S. F. Blake, S-963; Jesús Carranza, *Machaerium cirriferum*, S-948; Hidalgotitlan, *Miconia* sp., S-273; OAX (NEW STATE): Matías Romero, *Spondias radlkoferi* Donn. Sm., S-281.

30. *Xyleborinus tribuloides* Wood. (xm, ipg, po). Oaxaca. OAX: Matías Romero, host unknown, S-292.

31. *Xyleborus affinis* (Eichhoff). (xm, ipg, po). SE United States to Argentina, tropical Africa, Malaysia, Hawaii. VER: Minatitlan, UV light, *Dialium guianense*, S-957; Jesús Carranza, *Rheedia*

sp., S-950; OAX: Matías Romero, host unknown, S-265.

32. *Xyleborus catulus* Blandford. (xm, ipg, po). SE Mexico to Brazil. VER (NEW TO MEXICO): Jesús Carranza, host unknown, S-936; OAX: Matías Romero, Lauraceae, S-279.

33. *Xyleborus declivis* Eichhoff. (xm, ipg, po). SE Mexico to Costa Rica. VER: Minatitlan; OAX (NEW STATE): Matías Romero, host unknown, S-265.

34. *Xyleborus discretus* Eggers. (xm, ipg, po). SE Mexico to Peru. VER (NEW STATE): Minatitlan, *Schizolobium parahybum*, S-440; Rubiaceae, S-788, *Heliocarpus appendiculatus*, S-956; Jesús Carranza, *Dialium guianense*, S-932.

35. *Xyleborus ferrugineus* (F.). (xm, ipg, po). Tropical and subtropical regions of world. VER: Minatitlan, UV light; *Cecropia obtusifolia*, S-449; *Dialium guianense*, S-932; Jesús Carranza, *Terminalia amazonica*, S-946; *Rheedia* sp., S-950; *Heliocarpus appendiculatus*, S-952; OAX: Matías Romero, *Guarea* sp.

36. *Xyleborus horridus* Eichhoff. (xm, ipg, po). Southern Texas to Guatemala. VER: Minatitlan, *Zygia* sp., S-853; *Alchornea* sp., S-937.

37. *Xyleborus perebeae* (Ferrari). (xm, ipg, po). SE Mexico to northern South America. OAX (NEW TO MEXICO): Matías Romero, *Combretum* sp., S-282; *Pouteria neglecta* Cronq., S-264; *Quararibea* sp., S-284; *Robinsonella mirandae* Gomez P., S-854; Lauraceae, S-852; VER: Jesús Carranza, host unknown, S-949.

38. *Xyleborus posticus* Eichhoff. (xm, ipg, po). SE Mexico to Brazil. VER: Hidalgotitlan, *Heliocarpus appendiculatus*, S-270; *Cecropia obtusifolia*, S-958; Jesús Carranza, *Heliocarpus appendiculatus*, S-952.

41. *Xyleborus pseudotenuis* Schedl. (xm, ipg, po). SE Mexico to Brazil. VER: Minatitlan, *Cestrum* sp., S-451; *Zygia* sp., S-853; *Heliocarpus appendiculatus*, S-956; Hidalgotitlan, host unknown, S-444; Jesús Carranza, *Dialium guianense*, S-932.

42. *Xyleborus sharpi* Blandford. (xm, ipg, po). SE Mexico to Panama. OAX: Matías Romero, *Trema micrantha*, S-261; Jesús Carranza, host unknown, S-949.

43. *Xyleborus spinulosus* Blandford. (xm, ipg, po). OAX (NEW STATE): Matías Romero, host unknown, S-291.

44. *Xyleborus tolimanus* Eggers. (xm, ipg, po). SE Mexico to Brazil. VER: Hidalgotitlan, host unknown, S-444; Jesús Carranza, *Heliocarpus appendiculatus*, S-952.

45. *Xyleborus vespatorius* Schedl. (xm, ipg, po). SE Mexico to Argentina. VER: Minatitlan, *Cestrum* sp., S-451.

44. *Xyleborus volvulus* (Fabricius). (xm, ipg, po). World tropics. VER: Minatitlan, *Dialium guianense*, S-957; *Schizolobium parahybum*, S-963; Jesús Carranza, *Terminalia amazonia*, S-946; OAX: Matías Romero, *Tapirira* sp.

45. *Xyleborus* sp. (undescribed). (xm, ipg, po). Known only from Uxpanapa region. VER: Minatitlan, *Zygia* sp., S-853.

46. *Xylosandrus morigerus* (Blandford). (xm, ipg, po). Circumtropical. VER: Minatitlan, Sapotaceae, S-283; *Esenbeckia pentaphylla*, S-285; *Pouteria sapota* (Jacq.) H. E. Moore & Stearn, S-960; *Cecropia obtusifolia*, S-958, S-959; *Schizolobium parahybum*, S-963; Jesús Carranza, petioles of *Didymopanax* sp., S-935; *Machaerium cirriferum*, S-948; *Licania hypoleuca* Benth., S-951; *Terminalia amazonica*, S-946; *Miconia trinerva*, S-963; OAX (NEW STATE): Matías Romero, *Quararibea* sp., S-284.

47. *Xylosandrus zimmermanni* (Hopkins). (xm, ipg, po). South Florida, SE Mexico to northern South America. VER (NEW STATE): Hidalgotitlan, *Byrsonima cotinifolia* HBK., S-445.

Cryphalini

48. *Hypothenemus dolosus* Wood. (m, ipg, po). SE Mexico to Costa Rica. OAX (NEW STATE): Matías Romero, *Pouteria neglecta*, S-264.

49. *Hypothenemus erectus* LeConte. (m, ipg, po). S Texas to Venezuela, tropical Africa. VER: Minatitlan, *Pouteria sapota*, S-960; OAX: Matías Romero, *Pouteria* sp., S-263; *P. neglecta*, S-264.

50. *Hypothenemus eruditus* Westwood. (p, ipg, po). Circumtropical. VER: Minatitlan, Lauraceae, S-278; *Esenbeckia pentaphylla*, S-285; *Lonchocarpus guatemalensis* Benth., S-287; *Gmelina arborea*, S-289; Hidalgotitlan, *Olmea recta*, S-442; OAX: Matías Romero, *Quararibea* sp., S-284.

51. *Hypothenemus seriatus* (Eichhoff). (m, ipg, po). Circumtropical. VER: Hidalgotitlan, host unknown, S-636.

Corthylini

58. *Amphicranus micans* Wood. (xm, mg, po). SE Mexico to Panama. OAX (NEW TO MEXICO): Matías Romero, host unknown, S-265; VER: Hidalgotitlan, *Protium copal* (NEW HOST) S-441; Jesús Carranza, *Dialium guianense* (NEW HOST), S-932; *Machaerium cirriferum* (NEW HOST), S-948; Minatitlan, *D. guianense*, S-957.

53. *Amphicranus spectus* Wood. (xm, mg, po). SE Mexico. VER (NEW STATE): Minatitlan, *Zygia* sp. (NEW HOST), S-853.

54. *Araptus eruditus* (Schedl). (p, pg, mo?). Nayarit to Panama. OAX: Matías Romero, host unknown, S-290.

55. *Araptus laudatus* Wood. (p, pg, mo). SE Mexico to Costa Rica. OAX (NEW TO MEXICO): Matías Romero, *Virola guatemalensis* (NEW HOST), S-286. This is the first reported host for this species.

56. *Araptus politus* (Blandford). (s, pg?, ol). S Florida, Caribbean, SE Mexico to Costa Rica. VER: Minatitlan, seeds of *Mucuna* sp., S-432. Found boring into mature seeds both on the ground and

still attached to the vine. In some cases beetles bored through pods to reach seeds.

57. *Araptus tenellus* (Schedl). (p, pg, mo?). Nayarit to Chiapas. OAX (NEW STATE): Matías Romero, host unknown, S-290.

58. *Araptus* sp. (undescribed). (p, pg, mo). Known only from Uxpanapa area. OAX: Matías Romero, *Virola guatemalensis*, S-268.

59. *Araptus* sp. (undescribed). (p, pg, mo?). Known only from Uxpanapa region. OAX: Matías Romero, host unknown.

60. *Araptus* sp. (undescribed). (p, pg, mo). Known only from Uxpanapa region. VER: Minatitlan, *Citharexylum pterocladium* Donn. sm., S-448. Attacks observed in branches (2–5 cm diam) of recently felled tree. Galleries radial.

61. *Araptus* sp. (undescribed). (p, bg, mo). Known only from Uxpanapa region. VER: Jesús Carranza, *Licania hypoleuca*, S-951. Attacks were in cut branches, 1–5 cm diam.

62. *Corthylus concisus* Wood. (xm, mg, po). SE Mexico to Panama. OAX (NEW STATE): Matías Romero, host unknown, S-291.

63. *Corthylus pumilus* Wood. (xm, mg, po). SE Mexico to Panama. VER (NEW TO MEXICO): Jesús Carranza, host unknown, S-949.

64. *Corthylus spinifer* Schwarz. (xm, mg, po). Florida, lowland Mexico to Brazil. VER: Minatitlan, UV light.

65. *Corthylus suturifer* Schedl. (xm, mg, po). SE Mexico. OAX (NEW STATE): host unknown, S-291.

66. *Corthylus uniseptis* Schedl. (xm, mg, po). SE Mexico. VER: Hidalgotitlan, *Heliocarpus appendiculatus* (NEW HOST), S-270.

67. *Corthylus villus* Bright. (xm, mg, po). SE Mexico to Costa Rica. OAX (NEW STATE): Matías Romero, *Spondias radlkoferi* (NEW HOST), S-281.

68. *Monarthrum robustum* (Schedl). (xm, pg, po). SE Mexico to Costa Rica, Trinidad. VER (NEW TO MEXICO): Jesús Carranza, *Machaerium cirriferum* (NEW HOST), S-948.

69. *Tricolus difodinus* Bright. (xm, mg, po). Lowland Mexico to Guatemala. VER (NEW STATE): Jesús Carranza, *Miconia trinerva* (NEW HOST), S-947. This species makes a circular gallery between adjacent growth rings of small branches (<4 cm).

PLATYPODIDAE

70. *Platypus discicollis* Chapuis. (xm, mg, po). Mexico to Bolivia. VER (NEW TO MEXICO): Minatitlan, *Dialium guianense* (NEW HOST), S-957.

71. *Platypus enixus* Schedl. (xm, mg, po). SE Mexico to Brazil. VER (NEW TO MEXICO): Minatitlan, *Dialium guianense* (NEW HOST), S-957; Jesús Carranza, *D. guianense*, S-932; OAX: Matías Romero, host unknown, S-265.

72. *Platypus excisus* Chapuis. (xm, mg, ol).

Lowland Mexico to Brazil. VER: Jesús Carranza, *Dialium guianense* (**NEW HOST**), S-932; Minatitlan, *D. guianense*, S-957; OAX (**NEW STATE**): Matías Romero, *Pterocarpus rohrii* Vahl (**NEW HOST**), S-789.

73. *Platypus obtusus* Chapuis. (xm, mg, po). SE Mexico to Brazil. OAX (**NEW TO MEXICO**): Matías Romero, *Guatteria* sp., S-435.

74. *Platypus parallelus* (F.). (xm, mg, po). Tropical America and Africa. VER: Minatitlan, *Cecropia obtusifolia* (**NEW HOST**), S-449; OAX: Matías Romero, *Pterocarpus rohrii* (**NEW HOST**), S-789.

75. *Platypus pulchellus* Chapuis. (xm, mg, po). Lowland Mexico to Brazil. VER (**NEW STATE**): Hidalgotitlan, UV light.

76. *Platypus segnis* Chapuis. (xm, mg, po). Lowland Mexico to Bolivia. VER: Jesús Carranza, *Heliocarpus appendiculatus* (**NEW HOST**), S-952; OAX: Matías Romero, *Pouteria neglecta* (**NEW HOST**), S-264.

77. *Platypus* sp. #1. (xm, mg, po). VER: Hidalgotitlan, *Cecropia obtusifolia*, S-639; Minatitlan, *Citharexylum* sp. #, S-448; Rubiaceae, S-788; *Bauhinia* sp., S-855; Jesús Carranza, *Heliocarpus appendiculatus*, S-952.

78. *Platypus* sp. #2. (xm, mg, po). VER: Hidalgotitlan, *Cecropia obtusifolia*, S-639.

79. *Platypus* sp. #3. (xm, mg, po). OAX: Matías Romero, *Pouteria neglecta*, S-264.

80. *Platypus* sp. #4. (xm, mg, po). VER: Hidalgotitlan, *Inga* sp., S-275; Minatitlan, *Pseudolmedia spuria*, S-450; Jesús Carranza, *Heliocarpus appendiculatus*, S-952.

81. *Platypus* sp. #5. (xm, mg, po). VER: Jesús Carranza, *Heliocarpus appendiculatus*, S-952.

82. *Platypus* sp. #6. (xm, mg, po). VER: Jesús Carranza, *Rheedia* sp., S-950.

83. *Tesserocerus ericius* Blandford. (xm, mg, po). SE Mexico to Panama. VER: Hidalgotitlan, UV light.
