

Preliminary observations on the natural history of representative treehoppers (Hemiptera, Auchenorrhyncha, Cicadomorpha: Membracidae and Aetalionidae) in the Yasuní Biosphere Reserve, including first reports of 13 genera for Ecuador and the province of Orellana

Kelly Swing*

*Universidad San Francisco de Quito, Colegio de Ciencias Biológicas y Ambientales.
Calle Diego de Robles y Vía Interoceánica, Campus Cumbayá
Edificio Cicerón, Tiputini Biodiversity Station.
Casilla Postal 17-1200-841, Quito, Ecuador*

*Autor principal/Corresponding author, e-mail: kswing@usfq.edu.ec

Editado por/Edited by: D. F. Cisneros-Heredia, Ph.D.(c)

Recibido/Received: 10/02/2012. Aceptado/Accepted: 10/20/2012.

Publicado en línea/Published on Web: 12/28/2012. Impreso/Printed: 12/28/2012.

Abstract

Preliminary observations on the membracids of the Tiputini Biodiversity Station, Amazonian Ecuador, are reported (i.e. habitat preferences, group sizes, sociality, plant preferences for feeding, ethological details and nesting behavior). The number of genera listed as occurring in the country of Ecuador is increased by thirteen.

Keywords. Amazonia, Membracidae, treehoppers, Yasuní, natural history

Resumen

Observaciones preliminares sobre los membrácidos de la Estación de Biodiversidad Tiputini, Amazonía ecuatoriana, son reportadas (preferencias de hábitat, tamaños de grupos, socialidad, plantas que se usan para la alimentación, detalles de comportamiento general y la anidación). Se aumenta en trece el número de géneros listados para el país.

Palabras Clave. Amazonía, Membracidae, saltarines, Yasuní, historia natural

Introduction

Membracids, commonly known as treehoppers, are small relatives of the cicadas. Most genera can be distinguished by the form of the pronotum, a dorsal portion of the thoracic exoskeleton. In some, this structure is barely developed but in others, it can only be described as extravagant. Treehoppers are primarily tropical in their distribution but some species do occur in temperate latitudes in both the Old World and the New. The family has its origins in the Neotropics [1] and there are more than 1500 species described for Latin America among over 200 genera [2]. The photographs of 38 genera seen here represent nearly 20% of those reported for the entire Neotropical Realm. All specialize on plant saps; mouthparts have the form of a sharp-pointed drinking tube. They are found on plants of all sizes from a few centimeters in height to the largest trees and lianas of the rainforest canopy, but new growth is most attractive to these insects due to the greater flow of sap and tenderness. Some species are nearly always solitary while

others tend to be quite social, living in groups of several dozen or more. The capacity to communicate through vibrations has been documented for many species [3]; as with the majority of their relatives, including the well-known cicadas, the use of sound in this way is particularly common. Observations at Tiputini have confirmed that some species/individuals may reside on a single plant that serves as a nesting site for weeks or as a food resource for months. The genera cited in this paper are undoubtedly only a fraction of the total that occurs in eastern Ecuador. While images included in this article (Figures 1-38) may serve as typical examples of genera in the Yasuní region, they should not be used alone for definitive identifications due to the fact that dozens of other genera and likely hundreds of other species occur across the country of Ecuador.

Methods

Between 2008 and 2012, treehoppers were opportunistically observed in nature at the Tiputini Biodiversity

ISSN 1390-5384



Station (TBS). Situated in Ecuador's Orellana Province in the central northern part of the Yasuní Biosphere Reserve at about 200 m elevation on the left bank of the Tiputini River, TBS is a typical lowland western Amazon rainforest site. Using various Nikon cameras and a 105 mm micro Nikkor lens, membracid presence and activities were photographically documented. Resulting digital images were submitted to several membracid specialists for generic identification (see "Acknowledgements"). Although numerous other genera have been observed at this locality, the lack of reliable identifications disallows their inclusion at this date.

Results and Discussion

Classification of treehopper genera included in this treatment, based on [4], appears as an appendix. Generalizations derived from TBS observations are presented here below. Many details included among these annotations for the representatives at Tiputini confirm information published per genus [4] from other geographical regions.

Members of the family Aetalionidae are close but primitive relatives of the membracids. These two families share many similarities morphologically, behaviorally and ecologically but a few technically important differences do exist; a second crest as in *Lophyraspis* is actually formed by the scutellum rather than the pronotum (McKamey, pers. comm.).

Here I report the occurrence of thirteen genera of treehoppers for Ecuador that were not included by Godoy et al. [4]: *Hanstruempelia*, *Sundarion*, *Dysyncritus*, *Nasunia*, *Notogonioides*, *Cladonota*, *Enchophyllum*, *Havilandia*, *Lallemandia*, *Eucyphonia*, *Todea*, *Bocydium* and *Paracentronodus*.

Annotations for genera observed at the Tiputini Biodiversity Station

Family Aetalionidae

Lophyraspis (Figure 1), *Tropidaspis* (Figure 2). These two genera of primitive treehoppers are similar in size to their membracid cousins. Their superficial resemblance aids in identification but their dorsal ornamentation is generally less developed or involves the scutellum as well as the pronotum. *Lophyraspis* has been observed very rarely but in groups of 6 to 16 for feeding on small understory treelets near treefall gaps. Feeding by *Tropidaspis* on Smilacaceae and Moraceae has been witnessed regularly. Nesting has been directly observed during both wet (March-July) and dry seasons (November, December) on a moraceous plant in edge situations, suggesting that this genus may reproduce year round. Based on local sightings, *Tropidaspis* is rather solitary except when nesting.

Family Membracidae

Subfamily Darninae

Tribe Cymbomorphini

Cymbomorpha (Figure 3). In form, but not in phylogeny, this genus is intermediate between *Amastris* and *Membracis*, the keel is well developed but not as exaggerated as in the latter genus; the pronotum is roughened or even striate. Adults are solitary, but little to nothing is known of reproduction or immature stages. Most commonly seen feeding on Melastomataceae, especially in edge situations. Reproduction not observed.

Tribe Darnini

Sundarion (Figure 4). This genus has a pair of flattened horns that extend laterally. These hoppers are of moderate size (8-10mm) and are mostly brown but some have contrasting black and white markings. Essentially nothing is known of their natural history [4]. So few observations of this genus have been made at TBS that no general conclusions may be drawn about any aspects of their lives beyond geographical occurrence.

Tribe Hyphinoini

Hanstruempelia (Figure 5). Can be described as "hammer-headed" treehoppers; the pronotum is highly inflated and has a broad convex apex; dorso-ventrally flattened lateral extensions present rather sharp margins. Coloration includes contrasting creamy yellow and black markings. One female (approx. 10mm) observed once feeding in an open, disturbed area dominated by melastomes.

Tribe Hemikypthini

Hemikyptha (Figure 6). These are some of the largest treehoppers, possibly reaching 17-25mm. They typically have a pair of elongate, sharp-pointed, curving supra-humeral horns. Horns can be round or flattened in cross section and the pronotum is generally well developed, possibly extending posteriorly beyond the wingtips. The few observations made at TBS imply that these treehoppers are solitary.

Subfamily Heterotinae

Tribe Heterotini

Anchistrotus (Figure 7). This genus is unmistakable due to the large inflated pronotum with 3 points at its postero-ventral margin; its attachment to the body is quite fragile. Coloration ranges broadly but usually involves two contrasting colors arranged in irregular splotchy patterns; the palette mostly includes typical warning colors: tans, yellows, oranges, red, black and white. Moderate in size (7-10mm), these insects usually occur in aggregations and although not common, have been observed from as low as 1.5m above ground level and up to at least 30m feeding on vegetation, from river edge to

interior. In general, this genus appears to be quite skittish and difficult to approach.

Dysyncritus (Figure 8). Around 5-6mm total length. Some of the simplest pronotal shields are typical of this genus. The pronotum has a low dorsal keel and variable coloration with creams and browns primarily. The surface of the pronotum is punctate throughout. *Dysyncritus* has been observed solitarily or in loose aggregations of a few scattered individuals on low vegetation in edge situations.

Heteronotus (Figure 9). These rather large treehoppers (7-11mm) have the pronotum developed into a lumpy structure with a pair of laterally extending long sharp spines anteriorly and another 3 shorter spines posteriorly. Coloration tends to mimic wasps in general; some have typical aposematic combinations of oranges, yellows and blacks, while at least one species is completely black. Mostly solitary but may occur in very small groups. At least one individual was seen to be plagued by mites.

Nassunia (Figure 10). Relatively small (5-7mm) treehoppers with a low dorsal keel and humeral points on the pronotum. Colors can vary widely but some are quite iridescent/metallic. *Nassunia* has been reported to occur in groups but has been observed individually as well, especially in treefall gaps in the midst of mature terra firme forest.

Subfamily Membracinae

Tribe Hoplophorionini

Potmia (Figure 11). Medium to large treehoppers (8-12 mm), mostly green, robust, with a forward pointing short thick horn, somewhat flattened laterally and often with red markings. Sometimes aggregate (up to a few dozen individuals) on small branches and twigs, preferring areas that are mostly shaded. Eggs are laid in groups on bark and are guarded by the female sitting in a position that essentially covers the egg mass. Extended parental care is typical. Nymphs occur in groups and are often colored deep red with some black markings. *Notogonioides* (Figure 12) is similar but somewhat smaller and tends to have the horn directed more upward than forward. This latter genus has only been observed solitarily, even when nesting.

Umbonia (Figure 13). A close relative of *Potmia* with which it shares many life history traits, this genus has a more well-developed horn that is swept up and curves backward. Most species are green and some have reddish markings. Some of the showiest and largest membracids (9-17mm). Nymphs are aposematically colored, black and red, and closely tended by their mothers.

Tribe Hypsoprurini

Cladonota (Figure 14). Undoubtedly one of the strangest looking groups of all insects, having the pronotum produced into oddly shaped extensions. These 'horns' may

occupy a large proportion of the body length (or profile); sizes range from very small to large (4-13mm). These treehoppers tend to be solitary but can occur in very small groups; like many membracids, they may be observed for days on the same plant if undisturbed. Colors range from grays to browns and black apparently as camouflage on bark, of twisted dry leaf fragments or mimicry of fungally-infected dead hymenopterans.

Hypsoprora (Figure 15). Tiny treehoppers (3-5mm) with a disproportionately large thick horn in some. The dorsum is provided with small spines or prickles that are evident in profile. Appear to be rather solitary but they have been observed in loose aggregations of several individuals; infrequently seen in or near minor disturbances or areas of advanced second growth in terra firme.

Notocera (Figure 16). These small insects (4-7mm) are typically black with varying amounts of white wax appearing in irregular patches. The pronotum is rather lumpy and punctate with a pair of horns (varying greatly in length) diverging upward and curving posteriorly; tiny spines are evident along the profile of the dorsum. Adults are solitary but nymphs occur in groups and are tended by ants. They have been observed most frequently around treefall gaps within mature terra firme forest.

Philya (Figure 17). Although quite distantly related, these single-horned treehoppers superficially have much in common with *Lycoderes* (Figure 36). Adults (6-9mm) are also solitary and not tended by ants. They show up on the upper and lower surfaces of leaves, on leaf petioles and small stems from one to three meters above the ground. Little is known about life history details [4].

Tribe Membracini

Bolbonota (Figure 18), *Leioscyta* (Figure 19). Several closely-related genera basically look like tiny bits of caterpillar frass (rough textured pronotum, inflated body shape) from a distance; mostly 2-5mm long and dark in general coloration. These genera are difficult or impossible to distinguish in the field. They usually occur in small groups scattered along the major veins of large leaves and/or developing leaves, especially on melastomes in edge situations. Regularly attended by ants, especially *Crematogaster*.

Enchenopa (Figure 20), *Enchophyllum* (Figure 21). Two similar genera that have a highly compressed pronotal horn rounded in profile at its tip. Primarily black but most have 1 or 2 large white to yellowish rectangular patches on the dorsum. Adults are usually rather solitary but occasionally, a few can be seen within decimeters of one another. Several *Enchenopa* egg masses (white, foamy) may occur together on small twigs or leaves; nymphs are tended by ants but adults are not. The very similar genus *Campylenchia* (Figure 22) tends to be more tan or brown; some consider it a synonym of *Enchenopa*. Sizes range from small to large (4-14mm).

Havilandia (Figure 23). A genus of small (5-6mm), inconspicuous treehoppers. Pronotal shape is reminiscent of *Membracis* in being compressed laterally and

rounded in profile, but it is much lower in overall extension. Coloration is plain dark brown. Observed nesting and with nymphs on hanging epiphyte roots between 1 and 2m from the forest floor during the month of November in both terra firme and varzea settings. Adults were solitary or accompanied by progeny. Small patches of white exudates were deposited by the mother in a spiral pattern on the roots occupied.

Membracis (Figure 24). This genus is one of the most frequently seen, because they are relatively common and large (8-13mm) often occupying areas adjacent to human activity, and due to their contrasting black-and-white markings (for most species) in adults or brilliant white, wax-covered nymphs. These species have some of the tallest, most laterally compressed, sail-like pronota of all, making them almost as tall as long in some species. In profile, the shape of the pronotum may range from resembling a rounded-off right triangle to nearly a semi-circle. In length, the pronotum may be shorter than the body or extend to the wing tips. *Membracis* usually occurs in small numbers, scattered about on shrubby vegetation in edge situations. Adults remain with their offspring beyond their molting into the adult form. The egg mass, similar in volume to the adult body or somewhat larger, is bright white and appears spongy; it is placed on the surface of small stems and tended by the mother.

Phyllotropis (Figure 25). The members of this genus were included in *Membracis* historically and are quite similar in form, resembling that genus but usually the anterior profile leans a little forward of vertical in contrast to most *Membracis*; *Phyllotropis* usually have some orange markings and appear to be more solitary. This genus tends to occur in smaller numbers than *Membracis*; after the incubation period, adults become separated from their young offspring, sometimes moving a few meters higher than the nymphs. Nests are typical for the tribe, white egg masses as much as 3cm in length laid along stems less than 1cm thick.

Tribe Amastrini

Amastris (Figure 26). The species here are small to moderate in size, 3-6mm in length and have a dorsal keel more elevated than in *Dysyncritus* but much less than *Membracis*; the pronotum is somewhat roughened. These treehoppers are usually green, greenish or tan and tend to occur in small groups at or near branch tips in open habitats. They have been observed on leaf undersides of the melastome, *Miconia grandifolia*. Although not closely related, *Vestistilus* (Figure 30) has a similar appearance but with more well-developed suprahumeral horns.

Lallemandia (Figure 27). Small treehoppers (6-7mm) with the pronotum rather lumpy in appearance, covered with dense hairs. Only observed on rare occasions, always solitary. Nothing is known of their biology.

Tribe Ceresini

Cyphonia (Figure 28). Moderate sized treehoppers with one pair of sharp lateral horns and three posteriorly-directed, inflated, pointed pronotal extensions. Observed solitarily in edge situations on rare occasions. Essentially nothing is known of its biology.

Eucyphonia (Figure 29). Moderately sized treehoppers quite similar to *Cyphonia* with 3 sharp horns directed backward. On the anterior portion of the pronotum, low protuberances and a pair of very short sharp lateral horns. They have been not been observed alive at Tiputini but one individual was generously shown to me after having been incidentally captured in a flight intercept trap by K. Riley in terra firme understory.

Vestistilus (Figure 30). Small to medium insects with a keeled pronotum and short, sharp-pointed laterally-directed humeral horns. Typical coloration includes a rather golden or greenish field with or without lighter markings. Only observed at Tiputini when incidentally attracted to artificial lights. Nearly nothing is known of its biology anywhere in its range [4].

Tribe Polyglyptini

Adippe (Figure 31). Small to medium sized tree hoppers that have the pronotal shield expanded laterally but with a low median keel; body somewhat compressed. The members of this genus are often aposematically colored with series of large bright spots (round or irregular) on a black background. They generally occur in groups and with ants. Females lay a few dozen eggs in the surface tissue of plant stems and sit over the clutch until hatching. Nymphs from several nests aggregate tightly while developing.

Tribe Tragopini

Anobilia (Figure 32), *Horiola* (Figure 33). These genera have a broad, low pronotum which is polished smooth and shiny, giving them the appearance of small chrysomelid beetles. A common species, *Anobilia luteimaculata*, has irregular bright white spots on a field of dark red-brown. *Horiola* typically has variable curving light-colored lines on its pronotum forming an X or bat wing pattern. Both of these genera are between 3 and 6mm long as adults and live in small to medium aggregations; almost always associated with ants; *Horiola* is often partially covered by detritus collected into tunnel-like structures by the ants.

Todea (Figure 34). Similar in general shape and size to the previous two genera but the pronotal surface is not shiny but rather presents a matte texture; a pair of prominent flattened suprahumeral horns is present. Coloration is light to medium brown, lending camouflage to these insects that occupy small twigs of the same colors. These treehoppers have been observed in small, tight aggregations of up to 15 adults in moderate gaps in terra firme on understory treelets of less than 3m height.

Like *Horiola*, they lay eggs in groups in the superficial layer of bark and the mother sits astride them until hatching. Nymphs remain in close proximity to the nest site. Adults and immatures are tended by ants, especially *Camponotus*.

Tribe Stegaspidini

Bocydium (Figure 35). This genus has one of the most highly branched and delicate pronotal ornaments, sometimes compared to a classic anemometer; the shape, although extravagant, blends in well with small ants that often occur on the same vegetation with these treehoppers. There are no apparent differences in pronotal development between sexes but females are slightly larger than males. They are normally considered solitary or very nearly so but have been observed at the Tiputini Biodiversity Station in mating aggregations of 350 or more individuals on *Ludwigia* at 0.5-2.5m above ground. It has been suggested that this may represent lekking behavior (S. McKamey, R. Cocroft, N. Tataric, pers. comm.).

Lycoderes (Figure 36). Single-horned treehoppers (7-9mm) usually having the horn rounded in cross section (although somewhat compressed in some). Adults are solitary and not tended by ants; they show up on the upper and lower surfaces of leaves, on leaf petioles and small stems from one to three meters above the ground. Little is known about life history details [4].

Stegaspis (Figure 37). Another genus of laterally compressed treehoppers, their colors are more subdued ranging among the browns, resembling bits of dry leaves; tibiae are broad and flat to complete the camouflage. Size ranges from 6-8mm generally and sexual dimorphism is evident in the pronotal outline; only females have an elevated section anteriorly. Several individuals may be found on the same plant but they are often quite separated. In groups observed on *Miconia* (Melastomataceae) and *Ludwigia* (Onagraceae), females outnumbered males by at least ten to one. Nymphs are sometimes tended by ants but not in large numbers. *Paracentronodus* (Figure 38) is similar in many regards but the keel is much lower and the body is not so compressed; while the tibiae are flattened, they are not as broad as in *Stegaspis*.

Conclusions

Treehoppers are good representatives of the state of our understanding and knowledge (or more appropriately, the lack thereof) of the most abundant group of organisms in Amazonia, the arthropods. There are many species and some are common but because they are small, few people take note of them. Like many members of the phylum, they are relatively easy to recognize to the family level, somewhat more challenging at the genus level and often extremely difficult at the specific level, certainly with some exceptions. It is simply impossible to

identify most species in the field. A highly limited number of specialists have the expertise necessary to make comparisons of wing venation and genital structure of collected specimens, but such tasks are only performed in laboratories with sophisticated instruments, mostly for magnification and micro-dissection. Few individuals can manage the work of discovery, classification, identification and investigations about the lives of such organisms in the field or on their evolution through the detailed study of specimens in research collections and museums. Therefore, if we wish to identify individuals to species, it would be necessary to make comprehensive collections and to make scientific specimens available to those few experts. This list of 38 genera represents a preliminary contribution to our understanding of the insect taxa occurring in Amazonian Ecuador.

Acknowledgements

I appreciate the support of Rex Cocroft of the University of Missouri, Jason Cryan of the New York State Museum, Chris Dietrich of the Illinois Natural History Survey and especially of Stuart McKamey of the United States Department of Agriculture for their help in identifications and the clarification of many details of treehopper life. Thanks to Amy Mertl and Kari Ryder-Wilkie for their assistance in confirming genus identifications for ants. For criticisms that have truly improved this article, gratitude is due to two anonymous reviewers.

References

- [1] Wood, T. 1993. "Diversity in the new world Membracidae". *Ann. Rev. Ent.*, 38: 409 – 435.
- [2] McKamey, S. 1998. "Taxonomic catalogue of the Membracoidea (exclusive of leafhoppers)". *Mem. Am. Entomol. Inst.*, 60: 1 – 377.
- [3] Cocroft, R. 2001. "Vibrational communication and the ecology of group-living, herbivorous insects". *Am. Zool.*, 41: 1215 – 1221.
- [4] Godoy, C.; Miranda, X.; and Nishida, K. 2006. "Membrácidos de la América Tropical. Treehoppers of Tropical America". INBio. Costa Rica, 352.

Appendix

Family	Subfamily	Tribe	Genus		
Aetalionidae			<i>Lophyraspis</i> <i>Tropidaspis</i>		
Membracidae	Darninae	Cymbomorphini	<i>Cymbomorpha</i>		
		Darnini	<i>Sundarion</i>		
		Hyphinoini	<i>Hanstruempelia</i>		
		Hemikypthini	<i>Hemikyptha</i>		
	Heteronotinae	Heteronotini	<i>Anchistrotus</i> <i>Dysyncritus</i> <i>Heteronotus</i> <i>Nassunia</i>		
		Membracinae	Hoplophorionini	<i>Notogonioides</i> <i>Potnia</i> <i>Umbonia</i>	
				Hypsoprurini	<i>Cladonota</i> <i>Hypsoprora</i> <i>Notocera</i> <i>Philya</i>
				Membracini	<i>Bolbonota</i> <i>Campylenchia</i> <i>Enchenopa</i> <i>Enchophyllum</i> <i>Havilandia</i> <i>Leioscyta</i> <i>Membracis</i> <i>Phyllotropis</i>
	Smiliinae	Amastrini		<i>Amastris</i> <i>Lallemandia</i>	
			Ceresini	<i>Cyphonia</i> <i>Eucyphonia</i> <i>Vestistilus</i>	
			Polyglyptini	<i>Adippe</i>	
			Tragopini	<i>Anobilia</i> <i>Horiola</i> <i>Todea</i>	
		Stegaspidae	Stegaspidini	<i>Bocydium</i> <i>Lycoderes</i> <i>Paracentronodus</i> <i>Stegaspis</i>	

Table 1: Classification of treehopper genera confirmed to occur at TBS



Figure 1: Aetalionidae, *Lophyraspis* sp., adults with nymphs, attended by an ant.



Figure 2: Aetalionidae, *Tropidaspis* sp., adult female nesting, attended by ants.



Figure 3: Membracidae, *Cymbomorpha* sp., adult, lateral view.



Figure 4: Membracidae, *Sundarion* sp., adult, dorsal view.



Figure 5: Membracidae, *Hanstruempelia ceresina*, adult female, antero-ventral view.



Figure 6: Membracidae, *Hemikyptha* sp., adult, antero-lateral view.



Figure 7: Membracidae, *Anchistrotus* sp., adult, lateral view.

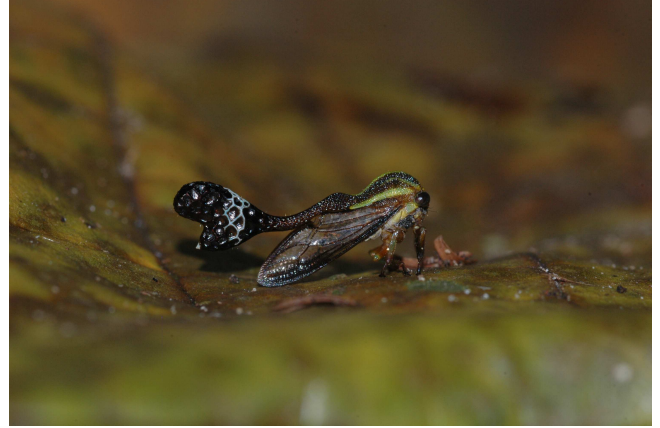


Figure 9b: Membracidae, *Heteronotus lineata*, adult, lateral view.



Figure 8: Membracidae, *Dysyncritus* sp., adult, lateral view.



Figure 10: Membracidae, *Nassunia* sp., adult attended by ant.



Figure 9a: Membracidae, *Heteronotus* nr. *Pompanoni*, adult, lateral view.



Figure 11a: Membracidae, aggregation of *Potnia gladiator*, adults and nymphs.



Figure 11b: Membracidae, *Potnia gladiator*, adult female on nest.



Figure 14: Membracidae, *Cladonota cf. Biclavatus*, adult, lateral view.



Figure 12: Membracidae, *Notogonioides* sp., adult female on nest.



Figure 15: Membracidae, *Hypsoprora* sp., adult, lateral view.



Figure 13: Membracidae, *Umbonia* sp., adult, lateral view.

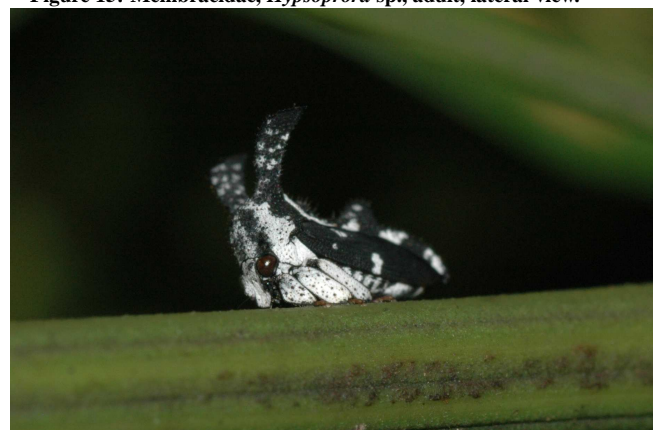


Figure 16: Membracidae, *Notocera* sp., adult, ventro-lateral view.



Figure 17: Membracidae, *Philya* sp., adult, lateral view.



Figure 19a: Membracidae, *Leioscyta* sp., adult female on nest, attended by ant.



Figure 18: Membracidae, *Bolbonota* sp., adult with ant, lateral view.



Figure 20a: Membracidae, *Enchenopa* sp., adult, lateral view.

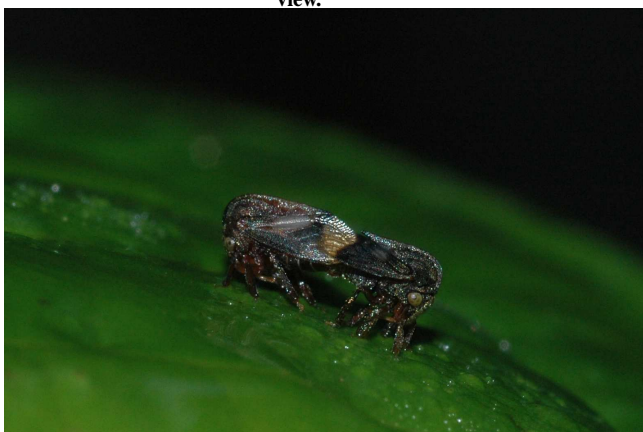


Figure 19b: Membracidae, *Leioscyta* sp. mating, lateral view.



Figure 20b: Membracidae, *Enchenopa* sp., adult with nest, lateral view.



Figure 21: Membracidae, *Enchophyllum* sp., adult, lateral view.



Figure 22: Membracidae, *Campylenchia* sp., adult, lateral view.



Figure 23: Membracidae, *Havilandia* sp., adult with nymph and white exudates.



Figure 24a: Membracidae, *Membracis* sp., adult with wax-covered nymphs.



Figure 24b: Membracidae, *Membracis* sp., adult, lateral view.



Figure 25: Membracidae, *Phyllotropis* cf. *cingulata*, adult, lateral view.



Figure 26a: Membracidae, *Amastris* sp., adult, lateral view.



Figure 28: Membracidae, *Cyphonia* sp., adult, dorsal view.



Figure 26b: Membracidae, *Amastris* sp., adult, lateral view.



Figure 29: Membracidae, *Eucyphonia* sp., adult, lateral view.



Figure 27: Membracidae, *Lallemandia nodosa*, adult, lateral view.



Figure 30: Membracidae, *Vestistilus* sp., adult, antero-lateral view.



Figure 31: Membracidae, *Adippe* sp., adult aggregation with nymph and ant.



Figure 34: Membracidae, *Todea cf. cimicoides*, adult female on nest, with nymphs.



Figure 32: Membracidae, *Anobilia luteimaculata*, adult female on nest, with nymphs, attended by ants.



Figure 35: Membracidae, *Bocydium* sp., adult, lateral view.

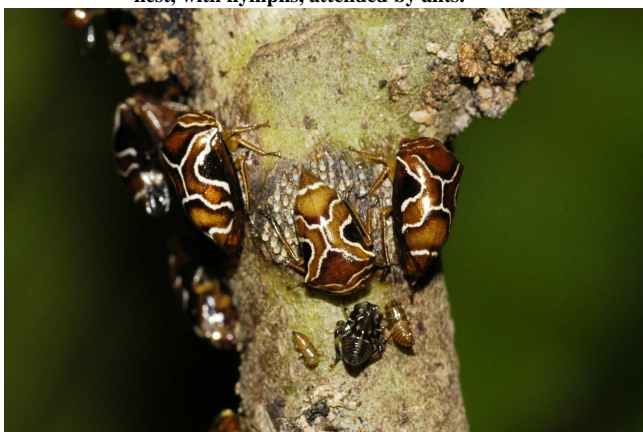


Figure 33: Membracidae, *Horiola* sp., female on nest, adults with nymphs.



Figure 36: Membracidae, *Lycoderes nr. Phasiana*, adult, lateral view.



Figure 37a: Membracidae, *Stegaspis fronditia*, adult female, lateral view.



Figure 37b: Membracidae, *Stegaspis fronditia*, adult male, lateral view.



Figure 38: Membracidae, *Paracentronodus* sp., adult, antero-lateral view.