PERUVIAN TREEHOPPER BEHAVIOR (HOMOPTERA: MEMBRACIDAE)[1]

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During the summers of 1968 and 1970, I had the opportunity to make observations on the behavior of three species of treehoppers (Membracidae) in east-central Peru. This paper deals with ecological data for *Umbonia ataliba* Fowler, *Enchenopa caruata* (Fabricius) and *Heteronotus nodosus* (Germar). Mating in *Heteronotus* and the adult emergence of *Enchenopa* is also described. Some miscellaneous observations on the behavior of various treehoppers of the Peruvian rain forest are also described.

The studies reported in this paper were carried out on the Neguachi River (Province Oxapampa, Department Pasco) upstream from Puerto Bermudez. The river is bordered by low bushes which comprise ideal habitat for treehoppers.

I first visited the area in 1968 as part of an expedition to Peru by the Biology Department of Andrews University led by Dr. Asa Thoresen. The information on *Umbonia ataliba* was obtained that summer. In 1970 I spent most of the time from 20 June to 12 August in the area and made the rest of the observations reported here.

Methods and Materials

Collecting was done by hand picking and sweeping. Approximately 160 hours (mostly in 1970) were spent observing treehoppers

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and making notes. All of my observations were carried out on insects in low bushes, since I had no method of getting into the tree tops.

My main study area was a stretch of rocky river bank where several species of low plants grow. *Calliandra angustifolia* Spruce ex Benth. (Fabaceae), a wide spreading shrub up to three meters in height, grows in rocky areas and is the host of *Heteronotus nodosus* and *Umbonia ataliba*. Although I found both species on it in 1968, in 1970 only *H. nodosus* was present. In 1968 *U. ataliba* was by far the most abundant insect on *C. angustifolia*. Its complete absence in 1970 remains a mystery. In 1970 I looked on several species of plants in different areas for *U. ataliba*. Also, I inspected leaf litter and humus along the river bank, but no specimens were found. (It should be mentioned that in 1968 *C. angustifolia* was not flowering when I was there; in 1970 it was flowering.)

Butcher (1953) mentions that *Umbonia crassicornis* Amyot and Serville was found on *Calliandra surinamensis* in Florida as well as on several other plants. I did not find *U. ataliba* on any plants besides *C. angustifolia*.

Enchenopa caruata was found near the top of the plant on vertical stems on two species of broad leaf plants: *Acalypha mapirensis* Pax (Euphorbiaceae) and an unidentified species. Both plants they were found on were more soft-stemmed than *C. angustifolia*.

Life History Information

The mating position of *Heteronotus nodosus* and *Umbonia ataliba* was as has been reported for other Membracids (Funkhouser, 1917). The male and female are oriented in opposite directions with their posterior ends opposed.

The whitish eggs of *U. ataliba* were always deposited on the underside of the twigs in double rows. The bark grows abnormally around the clutch of eggs, but the terminal portion of the branch doesn't die. Other authors (Butcher, 1953 and Goding, 1930) have mentioned that *U. crassicornis* caused damage when it is very abundant. Butcher says that "the surprising thing was that injury was not more severe."

Female *Umbonia ataliba* remain on their eggs after laying as do many other treehoppers (Funkhouser, 1917). Funkhouser suggests that the main benefit to be derived from this practice is prevention of dessication. This is probably correct except that in the rain forest it

would seem less important than in a less humid region. It would be interesting to determine if removal of the female altered hatching time.

As far as I was able to determine, only females incubate eggs. No males were seen incubating. The incubating females are not easily disturbed. I could remove a female from her set of eggs and put her back on again, and she would settle onto the eggs, whereas females not on eggs and males would fly away when approached.

Apparently *U. ataliba* females do not recognize their own clutch of eggs. Four females were found sitting on eggs on 12 July 1968 near each other. Each was marked with India ink on the pronotum and then moved to a different egg set. Two days later on 14 July they had not returned to their own eggs.

Hatching occurs in not less than eight days. One set of eggs first observed on 9 July hatched six days later on 15 July. Two days later two more sets of eggs also seen first on 9 July had not hatched.

Mating in *Heteronotus nodosus*

On 17 July 1970, mating of *Heteronotus nodosus* was observed. A male and female were on separate twigs near each other. The male had the posterior process of the pronotum missing. Observation began at 1003 hrs.

The female was facing the base of the branch about 45.0 cm. from the tip. The twig was in the sun from 1003 until 1334, after which it was shaded until 1642 when observation stopped. The female was in the shade of the twig during observation at the three o'clock position (on the right side of the twig as I faced the tip).

At 1022 hrs. the male flew away. At 1148 hrs. a different male (who had the posterior process intact) landed on the twig behind the female (toward the tip). He walked around the twig and toward the base until he was opposite the female in the sun at nine o'clock (on left side of the twig). He flicked his wings sideways several times, vibrated his whole body and then flicked his wings sideways again.

At 1151 the male moved sideways under the twig to the side of the female and then back to his original position facing the base. During the next few minutes he flicked his wings sideways several times: at 1152 an unknown number of times, 1153 five times, 1154 nine times. He then moved to the lower side of the twig, and one minute later he

moved over to the female's side and then went back to nine o'clock almost immediately and flicked his wings four times. At 1157 he flicked his wings several times again.

The female raised her abdomen away from the twig at 1202 and lowered it almost immediately. At 1205 the male vibrated his whole body, then flicked his wings a minute later. At 1208 he moved lower on the twig after vibrating his wings four times. A minute later he went to the side of the female and then back to his original position and flicked his wings twice. At 1210 the female gave an answering flick with her wings, moved lower on the twig and raised her abdomen from the twig.

At 1216, 1218, 1218:30 and 1219 the male flicked his wings three times, eight times, nine times and seven times respectively. All the wing flicking seems to be sideways except the last flick of each group. Then the wings appear to go up over the back more.

At 1220 the male flicked his wings five times and immediately moved under the twig, head first. The female raised her abdomen, and one minute later the male turned around and extended his penis to his left into the genital chamber of the female. Slowly their abdomens were lowered to the twig. They were situated in the shade at four o'clock. The male faced the tip of the twig and the female faced the base.

They remained in this position until 1308 hrs. (47 minutes) when the male withdrew his penis and turned tround. He walked toward the base of the twig and flew away. The female was observed for another three and one-half hours (until 1642). She sat motionless except for minor movements, such as, at 1309 she flicked her wings, at 1418 and 1430 she raised and lowered her abdomen, and at 1545 she flexed her legs.

On two different days (9 August and 10 August 1970) I saw attempted matings of *H. nodosus*, but these were not completed. On 9 August one male *H. nodosus* tried to mate with a female three times. One of those times another male tried to mate with the same female at the same time, one above and one below the female who was on the side of the twig. In the majority of these cases the mating attempt was preceded by wing flicking (by the male). One difference between these aborted attempts and the successful mating was that in the unsuccessful attempts, the male always remained facing the same direction as the female. When the male extended his penis under the

female's abdomen, she did not raise her abdomen or react in any other way. The male would remain in that position briefly and then return to the other side of the twig.

Another thing that was noted in these aborted mating attempts was what appeared to be a threat posture. After an unsuccessful mating attempt or when another male *H. nodosus* would come too close, the male would extend his wing laterally and move sideways or backwards.

Emergence

Emergence of adults was observed only in *Enchenopa caruata.* Evidently molting usually occurs in the morning. On several occasions I arrived about noon at the area where the treehoppers were found and discovered that some last instar nymphs had just emerged as adults.

The three emergences observed started at 0728, 0958 and 1112 hrs. Emergence and attainment of adult coloration takes about two and one-half hours. From the time the skin first split until all structures are the proper adult size was 35 minutes and 26 minutes respectively in the first and third emergences that were observed. The second emergence was already in progress and could not be timed.

The insect always assumed a head upward position, usually on a leaf blade or midrib, parallel with the midrib. Often they were on the underside of upper leaves near the leaf tip. The cast skin was left intact on the leaf, and the teneral adult stayed on the skin for a variable length of time. In the first emergence observed, the teneral adult stayed on its cast skin for one hour until a grasshopper landed near him and knocked him off. In another emergence, the teneral adult stayed on its cast skin for only thirteen minutes after completely folding its wings (which is considered to be the end of the actual emergence). However, it was impossible to be sure that these insects were not disturbed by the human observer.

The following description is a composite description of three emergences. The numbers refer to number of minutes elapsed from the start. Numbers in parentheses indicate a range.

0000-Nymph arrives at the leaf tip and settles down.

0008-(0003-0014)-Split starts along the pronotum, from anterior to posterior, then on to mesonotum.

0009-Posterior pronotal horn comes through, followed by anterior horn about 15 seconds later. Posterior horn is tan; anterior horn is brown.
0010-Thorax splits.
0011-The two halves of the horn skin split wide open. The split continues anteriorly to a point between the eyes. The pronotum is yellow, head greenish, eyes dark with red borders.
0013-Head and beak now free. Abdomen starts to pull out. Wings also pull free.
0017-Front legs pull free. Insect leans back from the skin.
0018-Middle legs pull free.
0019-Back legs are now free. Insect leaning far back.
0022-Wings protrude from body. Appear to be rolled up. About one mm. long. Horns 2 mm. long.
0023-Wings unrolling.
0024-Wings now 1.5 mm. long. Wings being flexed. Back legs holding onto the skin.
0025-Middle legs holding onto skin. Abdomen free of skin. All legs on skin.
0026-Wings now 2 mm. long. Front wing straight.
0027-Front wings 3 mm. long. Thirty seconds later front wings 4 mm.; back wings 2 mm.
0028-Front wings 4 mm.; back wings 2.5 mm.
0030-(0029-0032)-Wings are being fanned every seven to ten seconds.
0031-Pronotum begins enlarging rapidly. Posterior horn begins to bend up sharply at very tip. Horns 2.8 mm. long (from anterior tip to posterior tip).
0032-Anterior horn bending down over the metopidium (this was seen only in the third emergence).
0033-Horns 3 mm. long. Fifteen seconds later they were 4 mm. long. Front wings (4.5 mm. long) are now longer than the abdomen. Posterior horn straightening. At the half minute the anterior horn is straightening.
0034-Posterior horn reaches to end of abdomen. Horns 5 mm. long. Both horns are straight and fully developed. Anterior horn is light brown; posterior horn and rest of pronotum, light green. Wings straight, begin folding under pronotum. Wings clear and veins prominent.
0041-(0038-0042)-Wings completely folded into normal adult position. This marks the end of the emergence proper. Now begins a period of varying length as has been noted above during which the structures attain their proper color and the pronotum hardens.

In the three adult emergences observed the pronotal horns were still soft when the adults were collected five, three and one-half, and two and one-half hours respectively after the wings were completely folded. Hardening may take up to ten hours, judging from the amount of hardening which took place in five hours. The new chitin of *Enchenopa lanceolata* hardens within about two hours (Haviland, 1925:235).

Predation

Little new information was obtained in this study on predation of treehoppers. I did not make a direct study of predation, so I will only relate a few observations.

On one occasion in 1968 an *Umbonia ataliba* hopped off the twig and inadvertantly landed on the surface of a shallow pool. A small fish immediately snapped him up.

On 27 July 1970, I was looking at a female *Heteronotus nodosus* in the six o'clock position. She was facing the base of the twig. Suddenly a spider jumped on her (I didn't see where it came from). After a brief struggle she flew away leaving the spider on the twig.

On 28 July 1970, a female *H. nodosus* was observed in the three o'clock position facing the tip in the shade. At 1152 a light-colored spider (about the same size as the treehopper) was seen stalking along the lower side of the twig from behind the treehopper. He stopped about one inch away. About thirty seconds later he jumped on her (actually ran along the twig). There was a two or three second struggle, and then she flew away.

Communal Life

Many treehoppers are gregarious in habit, living in loose colonies during the adult stage, nymphal stage or both.

I found adult and immature *Amastris simillima* Stal with adult and immature *Tragopa luteimaculata* Funkhouser. I also found adult *Enchenopa caruata* with adult *Aphetea affinis* Haviland incubating eggs on *Acalypha mapirensis* and *E. caruata* (adults and nymphs) on an unidentified plant.

Umbonia ataliba (adults and nymphs) are gregarious in Peru but were not found with other species. Another species of that genus, *U. crassicornis* was reported as being gregarious in southern Florida (Butcher, 1953) and in Panama (Goding, 1930). This agrees with Funkhouser's observation (1917:410) that the species of a genus usually agree in showing a communal or solitary life. Another species in Peru gregarious in both adult and immature stages was *Bolbonota pictipennis* Fairmaire.

Heteronotus nodosus seems to resemble *Ceresa bulbalus* (Funkhouser, 1917:405) in that it is found in groups in the nymphal stages

but solitary in the adult stage. This would seem to be the natural result of an egg mass hatching, and the members being scattered later.

There was one major exception to the solitary habits of *H. nodosus*. Toward the west end of the study area was a clump of the *Calliandra angustifolia*. In most places the bushes were strung out in a line, but there they were clumped. In the center of this clump was a section of limb which I called "commune" due to the large number of *H. nodosus* which usually could be found there. From two to six adults (mean 3.75) could be found on a foot-long section of branch. No immatures were seen in this region.

Adult *H. nodosus* were observed in the "commune" on seven different days over a twelve-day period. The ratio of males to females (1.8:1) in the "commune" area is comparable to that obtained by random sweeping of all the *C. angustifolia* in the area (1.7:1).

H. nodosus used this area for feeding. I saw them pass honeydew several times. Some attempts at mating were observed here, but these were unsuccessful. Why this special branch was used for feeding remains a mystery. As far as could be determined, there was nothing about the branch or its location to make it different from other branches. Even its protected location in the center of the clump was shared by many nearby twigs. It could hardly be its protection from the sun because on sunny days the branch was in sunlight for about two hours.

One interesting social interaction noticed in this area was the defense reaction. This could be stimulated in a treehopper which was sitting motionless on a limb by another treehopper walking by on that twig or a nearby twig. When the moving treehopper came toward a motionless, feeding insect, the motionless one usually began jerking back and forth from one side to the other. Then the moving insect would start jerking from side to side, too. This would usually keep up until the moving one stopped or continued down the twig.

The degree of crowding which sometimes exists in certain species is interesting to note. On the unidentified plant which was host to *Enchenopa caruata*, I once counted ten adults and five nymphs at the apex of the plant—nine of the adults were within one and one-half inches of each other, and the nymphs were close by.

In this case, grouping of the treehoppers seems to be the result of common attraction to a place rather than attraction to other insects as is usually implied when the term "social behavior" is used. Social be-

havior in treehoppers does not mean the same thing as social behavior in some species of Hymenoptera (Funkhouser, 1917:405).

Large groups of *Umbonia ataliba* were found on the twigs of *C. angustifolia.* Many sections of twig would be crowded while next to them would be much longer stretches of twig without treehoppers. One section of twig four inches long had fourteen adults and one nymph on it. Another three-inch section had six adults and five nymphs grouped on it.

Attendance by Ants

It is well known that ants visit several species of treehoppers for their anal excretions. (Funkhouser, 1917: Haviland, 1925 and Dennis, 1964). Dennis (1964) states that ants attend those treehoppers which are feeding in groups and ignore individual ones.

The case of *Heteronotus nodosus* seems somewhat different. *H. nodosus* nymphs are well attended by ants (sometimes five ants per nymph) even when they are found separately. The ants seem to attend many parts of the body, not just the anal tube. Conversely, adults were never observed with ants attending them even when several were together. On several occasions ants bumped into adults, and the adults began to jerk the posterior back and forth violently. This always seemed to discourage the ants.

Often the ants attending treehoppers are found in shelters made of vegetable fibers (Haviland, 1925:273). Usually immature *H. nodosus* were found just outside these shelters. Shelters were also observed for *Tragopa luteimaculata.* One that was broken open contained nineteen nymphs and one adult *T. luteimaculata* as well as many ants.

Two genera of ants were observed attending the treehoppers of the Neguachi River area, *Pheidole* sp. and *Crematogaster* sp. Both genera of ants are known to be honeydew feeders (Funkhouser, 1917: 402; Haviland, 1925:273). In my study I found the *Crematogaster* sp. attending *Tragopa luteimaculata* and both *Crematogaster* sp. and *Pheidole* sp. attending immature *Heteronotus nodosus.*

I found ants attending the following forms: *Heteronotus nodosus* (nymphs), *Enchenopa caruata* (adults and nymphs), *Tragopa luteimaculata* (adults and nymphs), *Amastris simillima* and *Aphetea affinis.*

Protective Coloration and Shape

It has been stated that treehoppers are camouflaged and are usually found on twigs of the same color as the insect (Haviland, 1925: 276). However, I found *Enchenopa caruata* (brown) only on green twigs and leaf petioles. I did find some green species on green twigs (*Aphetea affinis*, *Amastris simillima* and *A. maculata*), but I also found some species which weren't green on green twigs. Following is a list of treehoppers found on green twigs. The general color of each treehopper is in parenthesis following the name: *Erechtia* sp. (black), *Bolbonota pictipennis* (black) and *Tragopa luteimaculata* (dark brown).

My observations on *Bolbonota pictipennis* agree with Haviland's (1925:277). She found them on broad leaves and very conspicuous. Concerning this genus Poulton (1903:278) says they "would be well concealed upon rough bark." In my experience they were never found on rough bark; indeed, the bushes they were found on were far removed from any rough-barked trees.

Umbonia ataliba presents an interesting example of how laboratory studies can lead to wrong interpretations. When a pinned specimen is examined, the conclusion that is usually reached is that this species resembles red-striped thorns (Poulton, 1903:279). Poulton says that what is needed is exact observations of living insects. Haviland (1925: 277) states that although *U. ataliba* had been collected at Kartabo, she did not collect it herself and so had made no personal observations on its habits. She did not see any plants with red-striped thorns.

The twigs of *Calliandra angustifolia* do not have thorns resembling *U. ataliba*, nor did I see any red-striped thorns in the area. *Calliandra angustifolia* has a few long thin thorns. My observations of living *U. ataliba* show that they are not camouflaged but are quite conspicuous. It is likely that the color pattern of *Umbonia ataliba* is an example of warning coloration. Certainly the sharp pronotum would be painful for a predator to swallow.

The general color of *H. nodosus* adults is brown, and they are found on brown stems. They are much better camouflaged than most other species, and the nymphs are still more camouflaged. They are dark and usually hide under a leaf stipule which makes them difficult to find even on close examination. The nymphs of *Enchenopa caruata* are also well-camouflaged. They are green and are usually found on

green twigs in the axils of leaves. They very closely resemble the axillary buds of the host plant. However, with both of these nymphs the ruse is spoiled by the presence of ants. Usually two or three ants would be swarming around each nymph, making them easy to find.

Only one of the genera which I studied has been mentioned as mimicking another insect. It has been suggested that various members of the genus *Heteronotus* resemble ants (Poulton, 1903:275; Haviland, 1925). An adult *Heteronotus* spp. does look somewhat like an ant, but live insects lose any resemblance to ants by their sedentary habits. While ants are scurrying around on the twigs, the *Heteronotus* spp. are sitting still.

As a general conclusion on protective resemblance I would agree with Haviland (1925:276) who says that among the myriad of plants and animal forms found in the tropical forest nearly any odd-shaped insect could escape notice.

Miscellaneous Observations

DEFACATION PROBLEMS

Treehoppers often rest or feed head downward on the lower side of horizontal twigs. "This would appear to present problems in defecation" (Dennis, 1964:459).

Heteronotus nodosus has solved this problem in a practical way. I observed about 25 instances of defecation in the following manner: The treehopper was usually at or below the three o'clock position. The wings and anterior part of the abdomen were raised away from the twig, and the anal tube was extended to the side below the wings (ventrally). From one to six drops (average 2.5) of clear honeydew were given off, missing the body and wings completely. One nymph was observed to defecate in a similar manner.

On ten occasions the adults were observed to catch a drop from the anal tube between their back feet. Then the back feet and legs would be rubbed on the middle legs and subsequently they on the front legs. Usually the inside and outside wing surfaces were also rubbed by the back legs.

This seems very difficult to understand. In Oklahoma, Dennis (1964) observed a female *Stictocephala bubalus* (Fabricius) pass honeydew while in a head downward position in much the same man-

ner as described above, although he didn't mention her raising her wings. He notes that missing the body is important to prevent mold growth. Here in Peru in the rain forest it would seem doubly important to prevent mold growth. In 1968 a dead *Umbonia ataliba* was discovered on a twig covered with white mold.

Perhaps the explanation of wing and leg rubbing with honeydew could be in the rubbing. On several occasions adults of *H. nodosus* rubbed their legs together and rubbed their wings without first collecting honeydew from the anal tube. Perhaps the insect keeps the honeydew off the abdomen and pronotum by the process described above and then applies it to the wings and legs to clean them. Usually after rubbing the legs and wings the twig was rubbed. It could be that the sticky honeydew is used to clean foreign material from the legs and wings, and then this is subsequently rubbed off onto the twig.

I also saw a teneral adult *Enchenopa caruata,* whose emergence I observed, rub legs and wings in much the same manner; but it didn't catch a drop from the anal tube first.

One female *H. nodosus* was observed to give off sixteen drops of honeydew in three hours and forty-five minutes. Ten drops of that was extruded during a forty-minute period. Also, twice during that forty minutes she picked up a drop from the anal tube with her legs.

RIGHTING MECHANISM

Dennis (1964) suggests that the high pronotal crest of treehoppers would be a disadvantage to them should they become inverted on a surface. This doesn't seem as if it would present much of a problem to most treehoppers in the field. If they did become inverted, it probably would not be on a smooth flat surface, and they should be able to catch hold of irregularities in the surface with the feet and right themselves.

Dennis (1962) described a head-stand mechanism for *Telamona unicolor.* This was accomplished by one front leg gripping the surface and one back leg pushing down on the surface to raise the body to the head-stand position.

Heteronotus nodosus attains a head-stand position in a rather different manner. Three observations were made on each of two females on 17 July 1970. For these observations the insects were placed upside down on a smooth plastic notebook cover. The two lateral spines

of the posterior pronotum and the two supra-humeral processes (Sakakibara, 1968) provide a firm four-point position when the creature is inverted. In five of the tests the insect buzzed all four wings rapidly, which pushed her into the head-stand position. She then grabbed the surface with her front feet and pulled herself over on to all six feet. Once the wing buzzing pushed her over on to her left side. She caught a grip with her feet and righted herself. Becoming inverted does not seem to present much of a problem to *H. nodosus*.

TREEHOPPER ACTIVITY

The longest period that I observed a treehopper was seven hours and eleven minutes. It was a male *Heteronotus nodosus* which I observed from 0856 hrs. to 1607 hrs. on 3 Aug. 1970. The only movements he made during that time was jerking the posterior end of the abdomen laterally about forty times as another male walked by on his twig twice. Because he gave off four drops of honeydew, I conclude that he was feeding during part of this time, at least. Several treehoppers were observed for three to four hours. The males observed seemed to walk around more while the females' movements seemed to be restricted to flexing legs and raising the abdomen.

Most of my observations of *H. nodosus* behavior were carried out on females. This would seem to support the conclusion that females are more stationary than males, especially in light of the fact that the ratio of males to females collected by random sweeping of the net was 1.7:1 (twelve males:seven females).

ORIENTATION

Some authors have noted that treehoppers usually orient themselves on branches with the head toward the base or downward. Funkhouser, without specifying species (1917:392), states that a test revealed 90% sitting in this fashion. *Heteronotus nodosus* is found more often facing towards the tip of the branch. Seventy per cent of the *H. nodosus* which I observed were in this position, and only 30% faced the base of the branch. *H. nodosus* usually clings to the underside of the twig parallel with it, which conforms to Funkhouser's observations (1917:393).

Summary

This paper has reported observations on the behavior of a number of treehopper species.

1. The wing flicking of *Heteronotus nodosus* would seem to represent courtship behavior.

2. Several treehopper species studied seem to be rather gregarious in habit, but this is interpreted (in most cases) as an attraction to a place (good food plant or suitable place on the plant) rather than attraction for other individuals of the species.

3. Ants often attend treehoppers, especially nymphs, for their anal secretions. This often makes the treehoppers very conspicuous.

4. From observations of living treehoppers and at least one predator, I would conclude that many species of treehoppers are not made inconspicuous by their coloration and shape. The coloration of some treehoppers may be warning coloration.

5. Treehoppers seem to be well-fitted for life on the twigs. Since they are usually found in open places, or at the edge of clearings, it would be interesting to know if they also inhabit the sunlit region in the canopy of the forest.

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2.0176 Peruvian treehopper behavior (Homoptera: Membracidae.)

ABSTRACT.—This paper reports observations on the behavior of treehoppers in the rain forest of east central Peru. *Calliandra angustifolia* Spruce ex Benth. (Fabaceae) is the host of *Umbonia ataliba* and *Heteronotus nodosus*. *Acalypha mapirensis* Pax (Euphorbiaceae) is the host of *Enchenopa caruata*.

Mating of *Heteronotus nodosus* is preceded by wing flicking, mostly by the male. Adult emergence of *Enchenopa caruata* takes about one-half hour. Miscellaneous observations are recorded for several species of treehoppers, including the strange behavior of *H. nodosus* in rubbing honeydew onto the legs and wings. —DAVE EKKENS, *Department of Biology, Graduate School, Loma Linda University, Loma Linda, CA 92354.*

DESCRIPTORS: Membracidae; Peru; treehoppers, ecology and behavior.