

THE ECOLOGY, BEHAVIOR AND DESCRIPTION OF A NEW SPECIES OF CRICKET FROM THE OSA PENINSULA OF COSTA RICA¹

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Through the educational opportunity afforded by the Organization for Tropical Studies in Costa Rica, hundreds of graduate students and professional biologists have been able to begin to understand the complexity of the Tropical ecosystem. Through participation in a course in tropical ecology, I had the chance to make a detailed study of the behavior and ecology of a small sword-bearing cricket on the Osa Peninsula of Costa Rica in late February 1969.

Although the Orthoptera form a conspicuous element of the tropical insect fauna, no truly comprehensive faunistic studies have been made for these insects as a group in the New World tropics. Descamps (1970) graphically compared the present state of knowledge of the orthopterofauna of the New World Tropics with that of Tropical Africa pointing out that both regions possess similar diversity indexes but the state of knowledge of the Tropical American fauna is many years behind that of Africa. He began a continuing faunistic study on the grasshoppers of Columbia in 1971.

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Fig. 1 Type locality of *Anaxipha philifolia* Rentz, new species near OTS building on Osa Peninsula, 3.5 mi. S. of Rincon, Costa Rica; fig. 2, allotype on *Heliconia* leaf.

Costa Rica has been visited by several Orthopterists in the past. J.A.G. Rehn began a series of publications dealing with the Orthoptera of Costa Rica in 1904 and subsequently visited the country on two occasions. Unfortunately, these reports were never completed and they are not very extensive in their coverage and amount to little more than a scattering of species descriptions. No noteworthy keys exist to help identify any of the species.

The crickets of the subfamily Trigonidiinae are frequently seen amongst foliage of tropical understory vegetation. Some are terrestrial living in leaf litter and doubtlessly there are species which are peculiar to the forest canopy. Chopard (1968) listed only four species in two genera as occurring in Costa Rica but the Academy collections indicate that at least twice this number may be found there. This is the first published record of the biology of any tropical American species of this subfamily.

Anaxipha philifolia Rentz, new species is a diurnal species living on the surfaces of the leaves of predominantly musaceous plants, mainly species of *Heliconia*. Similarly large-leaved plants of the genus *Calathea* in the Marantaceae are avoided. A few crickets were found on other plants but these individuals always returned to *Heliconia*. Stridulation and mating occurs in the early morning although isolated singing individuals may be heard at other times during the day. Singing was never detected at night. Courtship always occurred on the undersurface of the leaves, possibly to reduce the likelihood of predation, and the courting individuals always oriented parallel to the leaf midrib with heads of both individuals facing toward the axil.

A description of the new species is presented below with more detailed data on the bionomics of the species. A log of the observations is also presented.

Type data.—“Costa Rica, Puntarenas Prov. Osa Peninsula, 3.5 mi. S. Rincón, 28-11-1969, 08°42'N. 83°29'W. D.C. Rentz, collector.”

Type locality.—The exact type locality (fig. 1) is along a small ephemeral creek within a quarter of a mile of the complex of buildings used by the Organization for Tropical Studies owned by the Tropical Science Center. The area is within the Wet Tropical

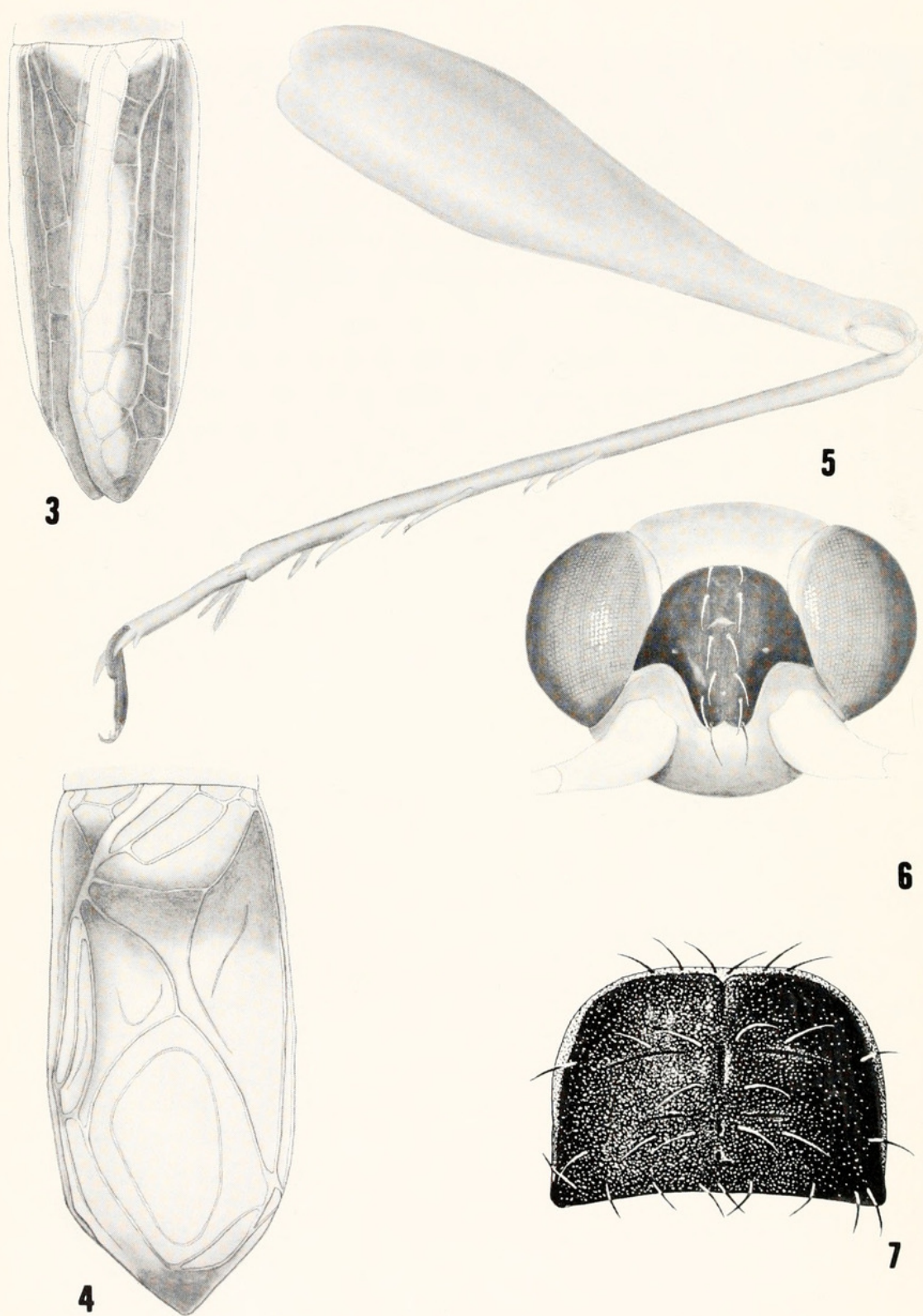


Fig. 3 Tegmina paratype female; fig. 4, tegmina holotype male; fig. 5, hind leg paratype male; fig. 6, frontal view head, paratype male; fig. 7, dorsal view pronotum paratype male. Magnification 50X.

Forest classification of Holdridge (1967). The altitude of the type locality is 15 meters and the area receives over 4,100 millimeters of rain per year with the heaviest rains during December. The average monthly temperature is approximately 27°C. The wet tropical forest vegetation type is found in the lowland areas of southwestern and northeastern Costa Rica. The type series was collected during the middle of the dry season.

Diagnosis.—*A. philifolia* is distinguished from all other species in the genus by its unique color pattern (figs. 2, 3, 4) and structure of the male genitalia. The shining black frons and coal matte black punctate pronotum are not found in any other known tropical American species of *Anaxipha*. The color pattern of *A. philifolia* is more like that seen among species of *Phylloscyrtus* on the basis of the structure of the distal segment of the maxillary palpus which is greatly expanded in *Phylloscyrtus* but slender in *Anaxipha*. The structure of the male genitalia in *Anaxipha* species is apparently species distinct as indicated by Chopard (1956).

Species description.—*HOLOTYPE MALE*. Size moderately large for genus, form attenuate. HEAD: appearing flattened between eyes, but very faintly tumescent and sparsely setose, interocular distance 0.8; eyes very prominent, greatly bulging, (0.82 x 0.61); fastigium smooth, tumid, bearing two parallel rows of six elongate setae confined to the median portion of the triangular black region, projecting for a distance equal to about one-half the length of the first antennal segment; maxillary palpi 1.79 mm in total length, distal segment (0.69) slightly longer than the one preceeding it (0.47), apical one-quarter slightly expanded (fig. 11); antenna very long, six times the length of the body, basal segment (0.41) rectangular, slightly expanded on internal margin, second segment minute, cylindrical 12 mm in length, third segment similar in size and length to second. THORAX: pronotum narrowing anteriorly, a shallow transverse sulcus present in median portion; longitudinal sulcus faintly indicated in median by three impressions (fig. 7); lateral lobes longer than broad (1.00 x .08), ventral margin truncate; surface of pronotum clothed with setae of two sizes, dorsal surface with a number of very long stiff bristles, margins of pronotum bearing a single row of short setae; legs elongate, densely pubescent, especially on tarsi, auditory foramen prominent, elongate, ovoid, two and one-half times longer than broad, open on both faces; fore tibia armed with a single spine, this in apical position on posterior (external) face, median tibia with a pair of apical short spurs, hind tibia armed on dorsal surface with three spines on internal and external margins, apex armed with a pair of spurs on internal margin, the inferior of which is one-third shorter than superior, superior spur little more than half the length of adjacent metatarsus, external surface also bearing a pair of spurs but these minute, the inferior twice the length of the superior which is minute, inferior one-twentieth the length of adjacent metatarsus; all tarsi three segmented, densely pubescent, the metatarsus elongate, longer than other segments combined, second segment cordate, depressed, metatarsus of posterior tibia armed at apex on dorsal surface with a pair of short subapical spines and with two spurs on internal margin, the superior spur minute, inferior elongate, about half the length of the adjacent two segments combined, external margin also with a short quadrate spur in length attaining about half that of second tarsal segment; elytra elongate conforming to

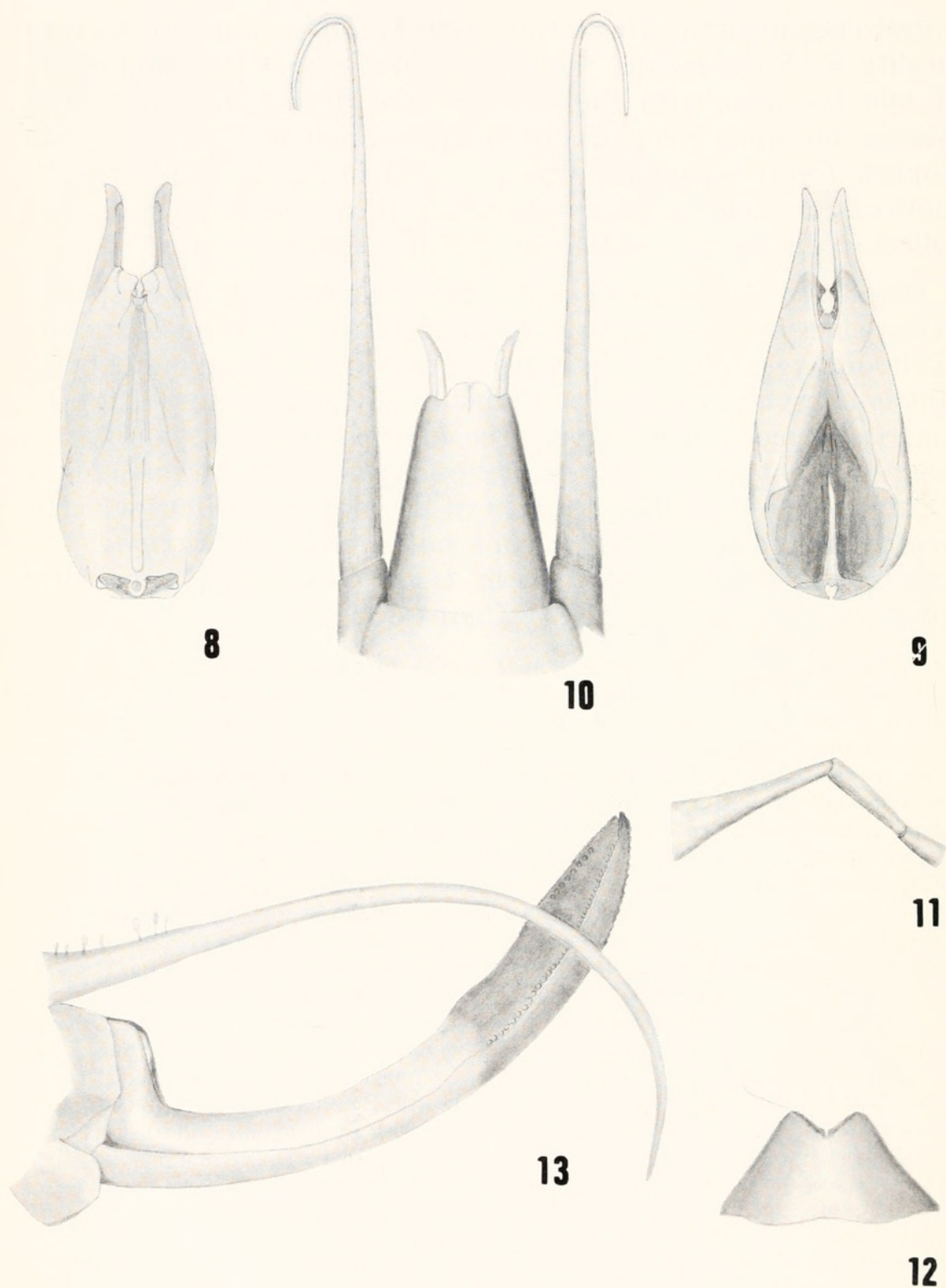


Fig. 8, dorsal view and fig. 9, ventral view, genitalia holotype male; fig. 10, apex of abdomen paratype male, dorsal view; fig. 11, maxillary palpus paratype male; fig. 12, ventral view subgenital plate paratype female; fig. 13, lateral view apex of abdomen paratype female. Magnification 50X.

shape of body, (4.5 x 1.8), venation (fig. 4), tegmina without pubescent wings present, projecting beyond abdominal apex. ABDOMEN: subgenital plate elongate, lateral margins weakly concave; cerci elongate, longer than length of abdomen, apex recurved ventrad, surface of cerci clothed with long thin setae; male genitalia (figs. 8-10). COLORATION: general overall coloration in life pale yellow, this becoming light brown in death; frons (fig. 6) shining black, eye uniform dark brown with faint grey pattern; antenna pale yellow at base becoming darker brown on distal portion of flagellum; pronotum coal black; anterior border and inferior border of lateral lobes yellow; legs uniform yellow brown, hind tibia somewhat darker; elytra greyish or light yellow marked with black (fig. 4).

FEMALE. Similar to male but differs as follows: elytra more cylindrical (3.8 x 1.6) with several nearby parallel longitudinal veins each separated by as many as five horizontal cross veins, wings present; ovipositor (2.1) gradually curved upward (fig. 13), apex and lateral surface serrate; subgenital plate short, broad, pubescent, with shallow median excavation; coloration more intense than male, vertex and femur fusco-testaceous; elytra almost entirely coal black; ovipositor yellow in basal half, apical portion lustrous dark brown.

Specimens studied.—Described from five males, ten females and one nymph all bearing the same data as holotype. The holotype and allotype are deposited in the Academy of Natural Sciences of Philadelphia. Paratypes will be deposited in the U. S. National Museum, British Museum (Natural History), and the Paris Museum.

MEASUREMENTS (IN MM)

	Length body	Length Pronot.	Width Pronot.	Length Tegmen	Length Fem. III	Width Fem. III	Length Metatar. III	Length Ovip.
Males								
Holotype	4.9	0.90	1.0	4.5	5.3	1.25	1.20	
Paratype	5.7	0.95	1.20	4.3	5.9	1.20	1.25	
Paratype	5.3	0.90	1.0	4.3	5.6	1.25	1.02	
Paratype	5.3	0.95	1.0	4.2	5.6	1.20	1.25	
Paratype	5.4	0.95	1.0	4.3	5.6	1.20	1.20	
Females								
Allotype	5.2	1.0	1.25	3.8	5.6	1.25	1.25	2.1
Paratype	4.8	1.0	1.10	3.9	5.2	1.2	1.00	2.1
Paratype	4.70	1.0	1.1	3.9	5.5	1.1	1.1	2.1
Paratype	4.80	0.9	1.0	3.8	5.5	1.2	1.1	2.0
Paratype	5.0	0.9	1.0	3.7	5.4	1.2	1.0	2.0
Paratype	4.80	1.0	1.1	3.8	5.6	1.3	1.1	2.1
Paratype	5.0	1.0	1.0	3.7	5.6	1.2	1.1	2.0
Paratype	5.0	1.1	1.0	3.9	5.6	1.2	1.1	2.1
Paratype	4.9	1.0	1.1	3.6	5.7	1.3	1.0	2.0
Paratype	4.9	1.0	1.1	3.9	5.7	1.3	1.0	2.0

Bionomics.—*A. philifolia* is found only on leaves of larger understory plants, especially those of the banana family, Musaceae (fig. 14). The crickets were not found along the stream margin but always within the forest sometimes in small clearings. *A. philifolia* is distinctly diurnal with stridulation and mating occurring only in the morning, usually shortly after sunrise. Plants of the family Marantaceae (fig. 15), *Calathea* sp., were found in the same habitat but the crickets were notably absent from these plants probably because the crickets are omnivorous scavengers, feeding by day on the particulate matter which is constantly dropping from canopy trees and plants. This consists of animal matter, such as feces and dead or injured insects, and plant material, including blossoms and fruits. Marantaceous plants, such as any of several species of the genus *Calathea*



Fig. 14, Habitat of *Anaxipha philifolia*. *Heliconia* plants in forest clearing; fig. 15, *Calathea* with uplifted leaves at midday at type locality.

which occur in the same habitat as the cricket, lift the normally horizontally held leaves to a vertical position (fig. 15) during the heat of the day. This exposes the whitish undersurfaces of the leaves and reflects light supposedly reducing transpiration. Such particulate matter which might serve as food for the crickets is removed from the leaves by the lifting action. In addition, the lifting action of the leaves might tend to expose mating or courting crickets to predation.

Even though certain host plants such as *Heliconia bihai* grow to heights of many feet, *A. philifolia* was found only between two and four feet from the ground. It was never seen higher nor were any crickets found on the ground.

A. philifolia is locally abundant on the proper host plants. One small plant was seen to harbor four of the crickets per large leaf. Other larger plants had up to eight adults and immatures on a given leaf.

Even though the vegetation of the Osa Peninsula might be classified in the Wet Tropical Forest scheme of Holdridge it should be stressed that at least as far as the Orthoptera fauna is concerned, the area is represented by a different complex of species than found in the other major part of the country classed in this category, the north-western lowlands. Repeated comparisons between the faunas of two such areas (Osa and La Selva) show that there is little in common between these two areas, Duellman (1966 for reptiles), Roberts (1973, for grasshoppers).

LOG OF BIOLOGICAL OBSERVATIONS

The crickets were observed continuously from late in the afternoon of 3 March 1969 until mid-evening. The same crickets were watched from early morning until noon on the following day. Three crickets were captured and marked with non-toxic paint in the afternoon of 3 March.

3-III-69

6:30 P.M. Area in total darkness, crickets completely silent, all on undersurfaces of leaves. Antennae, which are two inches in length or more held laterally and each side moved in a sweeping semi-circle. This behavior was maintained constantly, even though the crickets stayed in the same place on the plant for a much longer time than would normally have been the case during the day. Many predators were present, these consisting primarily of spiders and ground beetles (Carabidae). A single predaceous bug (Ploiariidae) was observed near a cricket but when the cricket detected the bug with its sweeping antennae, it darted away and avoided predation.

7:30 Marked cricket relocated, two feet from original

27°C release.

8:00 All marked specimens located and within a few inches

27°C of original point of release.

4-III-69

5:00 A.M. Dawn approaching. Marked specimens located. One near original point of release, the other six feet away on a dicotyledonous plant. Many, other individuals, adults and immatures located on *Heliconia* surfaces feeding on bits of matter "rained" out of canopy.

5:30 Dawn approaching.

25°C

5:50 Crickets becoming more active, run erratically on leaf surface and feed on bits 25°C of food as encountered. Search in random manner.

6:00 Marked female found on same plant but two leaves away.

25°C A crushed dolichopodid placed on leaf, eaten by cricket as soon as discovered.

7:00 Stridulation begun, dozens of males heard in unison.

- 25.5°C All males sit on undersurface of leaves head toward axis, tegmina raised in right angles to body as in *Oecanthus*.
- 7:17 Stridulating male has attracted two females. Both sit parallel to the male facing axis of leaf. Spermatophore protruding from male.
- 26°C
- 7:34 Female approaches male, spermatophore transferred within a few seconds, female runs away, spermatophore observed from genitalia of female. Male continues calling.
- 26°C
- 7:49 Male produces another spermatophore. No transfer observed.
- 29°C
- 9:00 Stridulation begins to diminish. Same male as above transfers another spermatophore to another female.
- 30°C
- 9:35 Chorus stridulation ceases. Only a few scattered males observed singing.
- 32°C
- 10:00 Courting stopped. Most crickets resting on leaf surfaces. No more courtship observed.
- 32°C

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ABSTRACT

ABSTRACT.—The trigonidiine crickets are a conspicuous element of the tropical insect fauna yet nothing has been written about their bionomics. A new species, *Anaxipha philifolia* Rentz, is described and its diurnal occurrence, feeding and courtship behavior are discussed. The crickets' preference for a single host plant family and the significance of the latter in terms of predation avoidance is presented. David C. Rentz, Academy of Natural Sciences, Philadelphia, PA 19103.

Descriptors: diurnal tropical cricket; bionomics; host association.



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