Katydids of Dominica

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Introduction

Katydids (family Tettigoniidae) are a diverse group of insects within the order Orthoptera. Most species are tropical in distribution, although katydids can be found in many parts of the world. The vast majority are herbivorous, but a few have been reported to feed on other insects. Important predators of katydids include bats, birds, spiders, various insects, monkeys, rodents, and lizards. Nearly all katydids remain still and hidden from predators during the day. Nighttime is when they become active and is the best time to study them. Feeding, singing, mating, and oviposition all take place after dark (Nickle 1992).

Much of the research that has been done on katydids has involved their complex acoustical interactions. Males produce acoustic calls by running a sharpened edge at the base of the right tegmen against a row of teeth on the underside of the left tegmen. This process is called stridulation (Nickle 1992). The songs function mainly to attract females for mating, although katydids may also produce aggressive or alarm sounds. Typically, the male remains stationary while calling and females approach him if interested. Since the songs are responsible for mate recognition, they are species-specific. Different songs produced by different species may vary in rhythm, speed, intensity, frequency, duration, or time between calls (Triplehorn and Johnson 2005). Humans can hear most katydid calls, but a few are completely ultrasonic, and many contain some frequencies above the range of human hearing. This is especially true for older people, because the ability to hear high frequencies declines with age (Capinera et al. 2004). Some katydids also communicate by drumming their abdomens in a particular rhythm on the substrate, producing vibrations that the females can feel and respond to. This is called tremulation,

and likely evolved to reduce detection by predators such as bats that locate katydids by listening for their calls. Tremulation is not audible to humans (Nickle 1992). Orthoptera contains two suborders. Suborder Caelifera includes grasshoppers, which have short antennae, short ovipositors, and hearing organs located on the side of the abdomen. Members of the suborder Ensifera (katydids and crickets) have long antennae, long ovipositors, and hearing organs located on the foretibia. Katydids have blade-shaped ovipositors, while crickets have needle-shaped ovipositors. Crickets produce simple "musical" sounds with a definite pitch, while the more complex calls of katydids sound "noise-like" because they contain a wide band of frequencies produced simultaneously. These characteristics should make it easy to differentiate among katydids, crickets, and grasshoppers (Triplehorn and Johnson 2005).

The four subfamilies of katydids discussed in this paper can also be readily distinguished. Phaneropterinae (bush katydids) are the largest group and can be distinguished by their lack of prosternal spines. In addition, the hindwings are usually longer than the forewings, and they are attracted to lights. Almost all Phaneropterines are green and they vary widely in size. Some oviposit into the soil, some insert their eggs into leaves, and some lay them on the outside of leaves or twigs. The most unusual characteristic of this subfamily is that when males call, interested females respond with a small tick sound and remain stationary while males come to the source of the sound. Females in other groups of katydids do not normally produce sounds in the context of mating. All known Phaneropterines are phytophagous and typically feed on young leaves and flowers (Nickel 1992, Triplehorn and Johnson 2005).

Pseudophyllinae (true katydids) are another large group and they are normally green or brown. They have prosternal spines, and their auditory spiracles are exposed behind the pronotum. Most are phytophagous, but some of these katydids are known to feed opportunistically on other insects. Most Pseudophyllines oviposit in the bark or woody tissue of plants. Tremulation is known to occur in this group (Nickle 1992).

Copiphorinae (cone-headed katydids) can be distinguished by their conical fastigium, large head, and massive mandibles. People handling these insects may be bitten! Many are seed eaters, and a few are thought to be carnivorous. Species that call in open areas are typically quite loud and often polymorphic with both green and brown forms. Females often have very long ovipositors and usually oviposit in the stems of pithy plants or the bases of grasses. Forest species have been known to communicate through tremulation (Nickle 1992).

Listroscelinae is a very little known group. All are predaceous and generally found only in the tropics. They have large eyes and long spines on their forelimbs. Males of the genus *Phlugis* produce completely ultrasonic calls, in the range of 20-80 kHz (Nickle 1992, Triplehorn and Johnson 2005).

Katydids have yet to be well studied. Some studies have been published on their taxonomy, physiology, and bioacoustics. However, most of the information currently available on these animals is based on studies involving North American species, while most live in the tropics (Nickel 1992). Considering the rapid pace of deforestation currently occurring in tropical areas of the world, it is important to learn more about these insects soon, before too much of their diversity is lost due to habitat destruction.

Even less is known about the katydids of Dominica. Only 11 species have ever been recorded on the island, half of which are endemic (Otte and Naskrecki 2004). Many more probably occur, but have never been studied. This project is the beginning of a survey of some of the common katydids in Dominica, which I hope can be continued in the future by other researchers.

Materials and Methods

Many katydids were collected when attracted to lights at the research station at night. Often, they were found high up on the beams or roof of the porch. A net was sometimes used to collect them, but simply placing a jar or plastic bag over the katydid seemed to be the easiest way. Other times, I located katydids in vegetation at night by listening for their calls. I used an EC-5 Cardioid Condenser microphone and a Marantz PMD 222 recorder to record calls. A flashlight or headlamp is needed to spot them in the dark, and the katydids seem to find red light less disturbing than white light. The software program Raven was used to edit sound files of recorded calls and create spectrograms.

Some katydids were kept in captivity in an attempt to record their calls. I used wire cages topped with screen, with some foliage and pieces of carrot inside.

Photographing live katydids proved quite tricky. After some experimentation, a system was devised where the photographer stood inside a mosquito net with the katydid to prevent escape and avoid shooting through glass. All photos were taken using a Nikon D1x, 60 mm macro lens, and flash.

Nickle's Katydids of Panama (1992) and www.tettigonia.com were used for identifications.

Measurements are from the head to the tip of wings, or to the tip of the abdomen on immature specimens.

Results

Phaneropterine A

These very large (approximately 80-90 mm), leafy green katydids were commonly found around lights at Springfield. A distinctive white stripe near the eye was present in both sexes. The females have relatively short ovipositors that curve upwards.

Phaneropterine B

Only one adult female of these small (35 mm), delicate looking katydids was collected. It was green and narrow in shape. The ovipositor curves upward.

Phaneropterine C

These katydids, about 50 mm in length, were also attracted to lights. Both the males and females were green with dark red markings on the top of the abdomen. Since this area is normally concealed by the wings, this coloration could possibly be used in a startle display.

Phaneropterine D

Only one of these medium sized (approximately 50 mm), plain green, leaf-like katydids was found.

Phaneropterine E

This small nymph, 20 mm, was collected from vegetation along the road at night, in the same area where Copiphorine A was calling. It had an upcurved ovipositor and no prosternal spines.

Phaneropterine F

One adult male was collected. It was approximately 60 mm long, and plain green with a white underside and white eyes.

Pseudophylline A

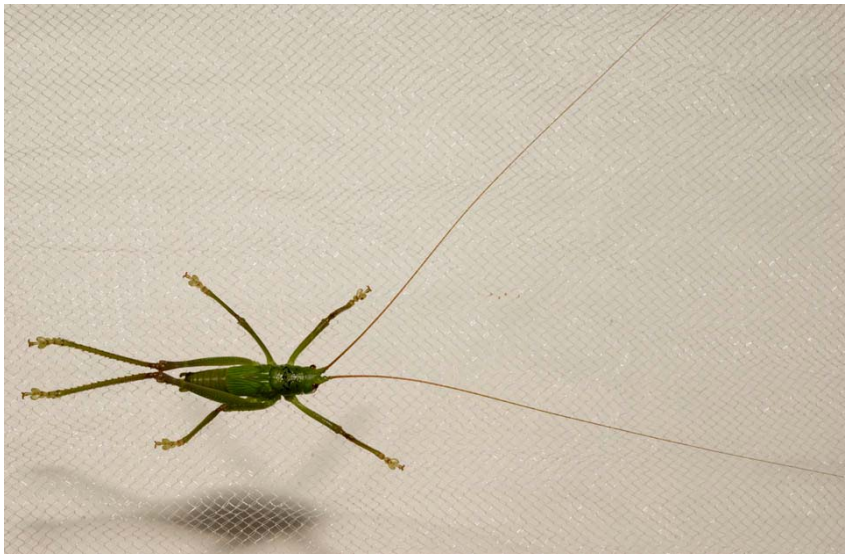
A single adult female of this extremely large species (approximately 85 mm) was collected. It was brown with a very thick, straight ovipositor that extended beyond the end of the wings. It was very defensive and tried to bite me when I held it. It had very long antennae, distinct prosternal spines, and unusual padlike tarsi.

This species is likely *Xerophyllopteryx fumosa* (previously recorded on Dominica). It also resembles *Nesophyllidium fulvicosta,* from Dominica, and *Haemodiasma tesselata*, from Panama. These three species are all from tribe Pleminiini.

Pseudophylline B

I collected two immature male specimens, one down the road near Springfield and one at Titou Gorge. The body was bright green and about 40-50 mm long. Both the mouthparts and the extremely long antennae were pink. The eyes were also quite unusual, bright yellow with a black stripe in the middle. When I found one, it was holding completely still, pressed against a leaf during the day. The other was walking around the water's edge at the gorge, during the day. These katydids were impossible to handle without being bitten. They looked overall very similar to the adult Pseudophylline

A, with the large prosternal spines and padlike tarsi. Possibly, this is the immature form of Pseudophylline A, or something very closely related.

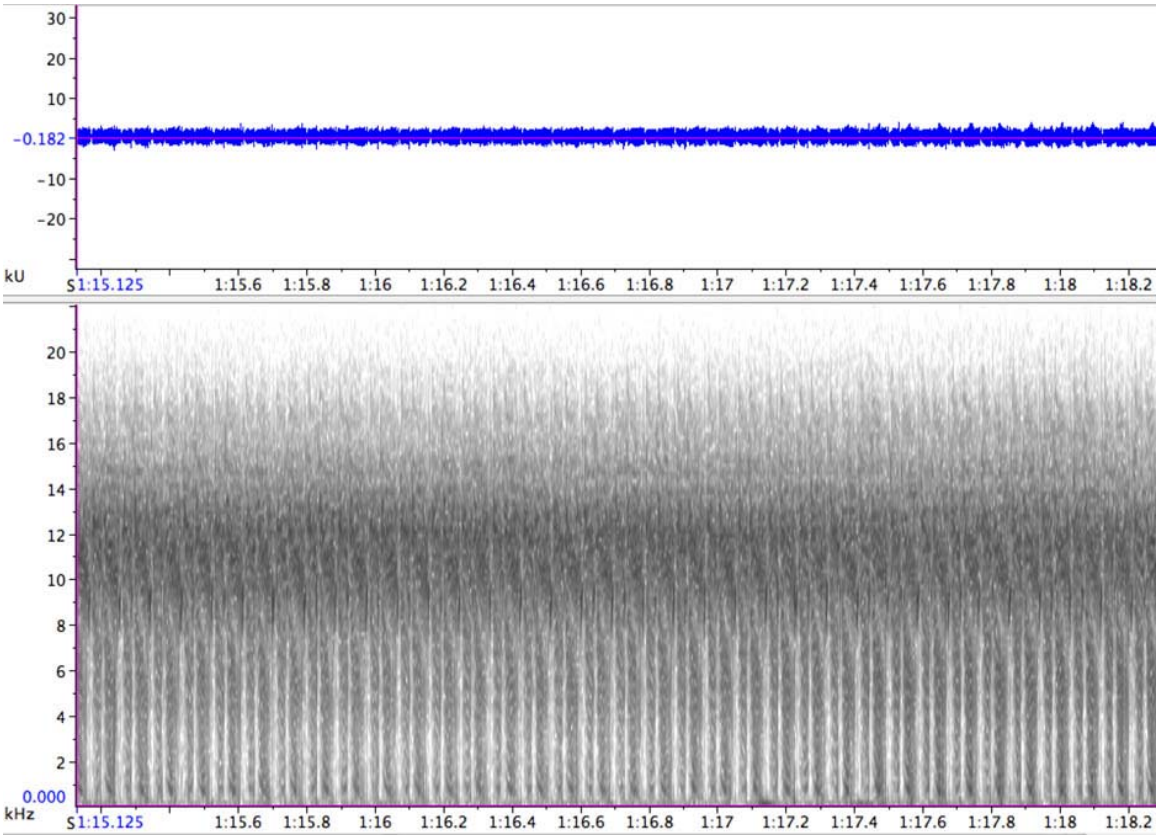


Copiphorine A

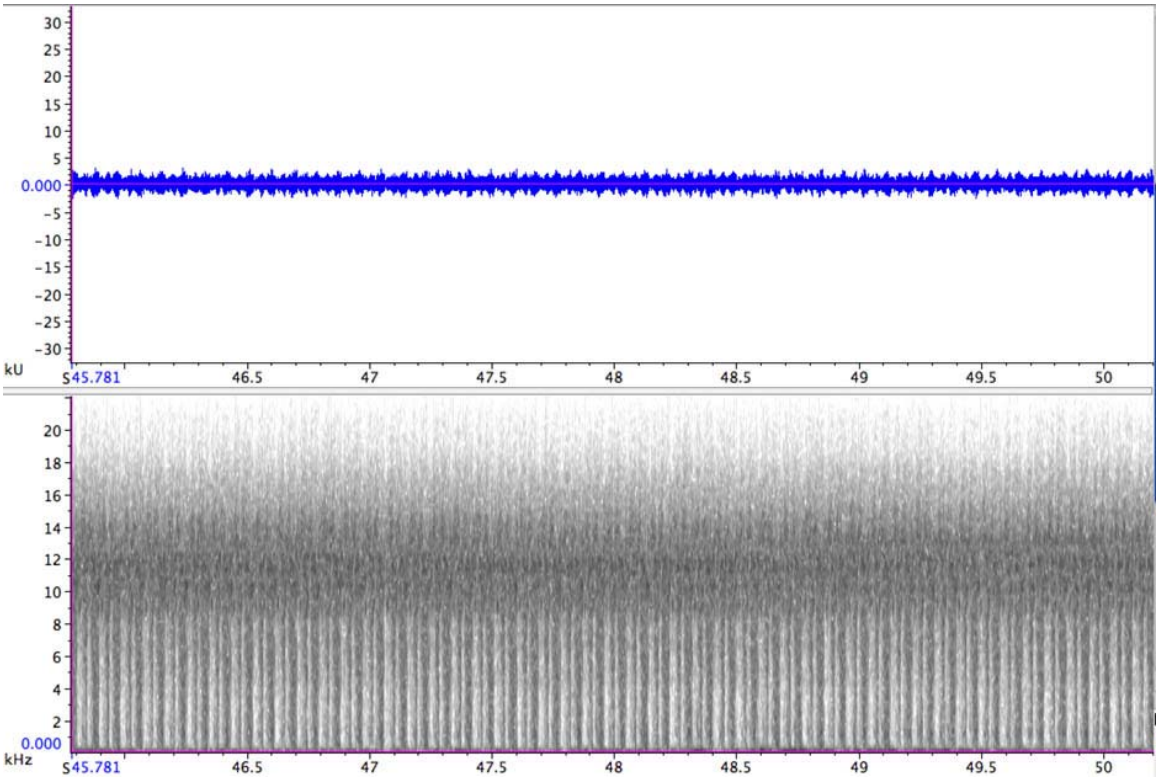
These are fairly defensive animals and will try to bite anyone who handles them. They are rather long and narrow in shape, about 50-60 mm, and they have red mouthparts. These are also the katydids most commonly heard at Springfield. The males make a loud buzzing or rattling noise that lasts approximately 30-50 seconds. While I

observed them, it seemed that when one male would begin to call, others nearby would start to sing too. Normally they would wait about 15-20 seconds between calls, but disturbances (such as a car driving by) resulted in longer pauses. Both bright green and yellowish brown morphs of this species were recorded and their calls were found to be identical. A large group of both sexes was found in the low-growing vegetation, a foot or two off the ground, all along the road near the gate to Springfield and near the gate to Mount Joy. The females are larger than the males and have very long, straight ovipositors. They seemed to be harder to collect than the males, and whenever I found one it would quickly fly away. I caught one immature female that had just molted and observed it eat its exuviae and change from pure white to brown. I also observed several individuals feeding on the plants.

This katydid is probably from the genus *Neoconocephalus* (several species recorded from Dominica) and also resembles *Caulopsis* (found in Panama).



Spectrogram 1. Segment from brown male's call (pictured above, on left)



Spectrogram 2. Segment from green male's call (pictured on previous page, on right)

Listrosceline A

Unfortunately, this odd-looking katydid escaped before I had the chance to photograph or measure it. It was tiny (probably 20-30 mm) and pale green with very long spines on the forelimbs and huge eyes. It was found in the raspberry field at Mount Joy.

Discussion

I ran into many difficulties in the course of this project. First, I attempted to keep katydids alive in captivity to see if I could record their calls. None called in captivity, aside from a brief, weird noise (not the normal call) from two of the Copiphorine males. Many of the captive katydids escaped, ate each other, or died and were quickly eaten by

ants. Getting katydids to call in captivity isn't easy, and I don't think it is worth the effort to try if you only have a short time to complete a project.

Another problem was that I had no way to accurately identify the katydids beyond subfamily. Currently, keys are available only for North America and Panama. I tried using the key to Katydids of Panama, but Panama doesn't have the same katydids as Dominica. Genera and species that have previously been found in Dominica were not included in the Panama key. For instance, *Xerophyllopteryx fumosa* is found only in the Lesser Antilles (Otte and Naskrecki 2004). There may be many endemic species in Dominica which have yet to be described.

Also, many of the katydids I found were immature. Initially, I thought that a katydid with developed genitalia was mature, but many of these were found to be nymphs upon inspection of the wing veination.

However, I think this project was worthwhile because several species of katydids were found that have never been recorded in Dominica. For example, no Phaneropterines have been previously recorded. I hope to add my information to the world database of katydids, www.tettigonia.com. Additionally, I found that recording a singing male katydid and then catching it is quite hard with some species and quite easy with others. With katydids that call from trees or thick vegetation, it will be difficult. Often, katydids will fly away or stop calling when approached. However, the Copiphorines that I found were quite easy to locate, record, and collect. If there is interest in a future project on bioacoustics, focusing on this species would possibly work well. A directional shotgun microphone would also be more useful for recording calls.

Acknowledgements

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Literature Cited

Capinera, J. L., R.D. Scott, and T.J. Walker. 2004. Field guide to grasshoppers, katydids, and crickets of the United States. Cornell University Press.

Nickle, D.A. 1992. Katydids of Panama (Orthoptera: Tettigoniidae): Insects of Panama and Mesoamerica, pp. 142–184.

Otte, D. and P. Naskrecki. 2004. Orthoptera species file online. http://www.tettigonia.com

Triplehorn, C. A. and N. F. Johnson. 2005. Borror and Delong's introduction to the study of insects, seventh edition. Thomson Brooks/Cole.