

11. Advertisement Calls of Amphibians at Lackunda Estate, Coorg, Karnataka.

Katie Hampson and Daniel Bennett

Of the 21 species of amphibian recorded at Lackunda, 18 were heard making advertisement calls, which were recorded with a Sennheiser 240 microphone onto cassette tape via a Sony WMD6C recorder. Air or water temperature at the calling point were noted and the recordings deposited at the British Library of Wildlife Sounds. For most species encountered this appears to be the first attempt at recording advertisement calls. Calls of some species suggested the presence of additional, cryptic species, similar to *Microhyla rubra* and *Limonectes limnocharis*. Because all the species are easily recognised by ear, detailed analyses of the sounds have not been performed. Rather key elements of calls are described, all of which can be heard on the tape/CD accompanying this volume.

Definition of terms

The *call* is a discrete unit of vocalisation composed of one or more separate bursts of sound and temporally distinct from similar units.

Fig 1.1 A 'call' made up of 23 chirps

Fig.1.2

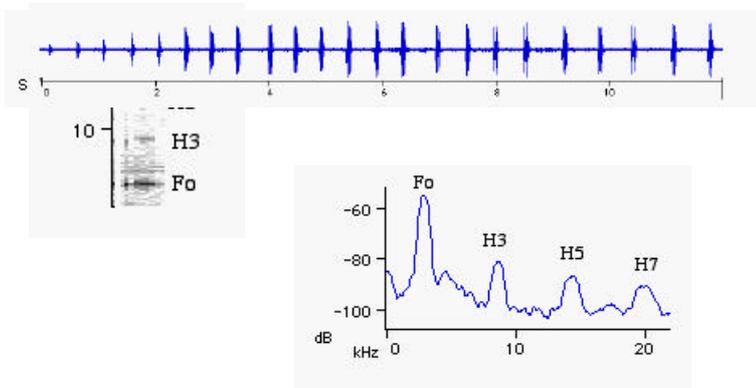
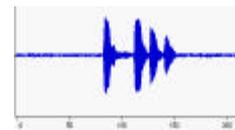


Fig. 1.3

Fig. 1.4

A *pulse* is a physical unit of sound energy, comprising of a number of *waveform cycles* in a simple undivided wave train, rising to a single peak in amplitude and then falling. Figure 1.2 illustrates a chirp composed of four pulses. Pulses may be produced singly, as groups or as an extended series. Both a single pulse or a brief finite series is termed a chirp..

The *fundamental frequency* is the lowest frequency of vibration, and the *dominant frequency* is that spectral band with the greatest energy output. *Harmonics* are frequency bands that are integer multiples of the fundamental frequency, generated by different modes of vibration, generally forming a harmonic series, with the fundamental frequency as the first harmonic. Spectral sidebands of the call are not necessarily multiples of the dominant frequency. Usually the fundamental frequency

is the dominant frequency.. Figure 1.4 illustrates an FFT spectrum of a single chirp with the associated spectrogram (figure 1.3) showing harmonics 3, 5 and 7 each with decreasing amplitude from the dominant frequency.

***Microhyla rubra* type 1**

The advertisement call is made from the ground, usually in grassy areas close to water. The call has a dominant/fundamental frequency of 3.67kHz, with energy concentrated between 2.5 and 4.7kHz (Figure 1b), and consists of a series of chirps (Figure 1a), each with an average length of about 0.9 seconds. Each chirp is composed of about 80 pulses with an average length of 0.006 seconds (Figure 1c). This call bears little resemblance to that described by Kanamadi *et al.* (1994) for *M. rubra*, nor with the call of *M. rubra* type 2 considered here (Figure 1d).

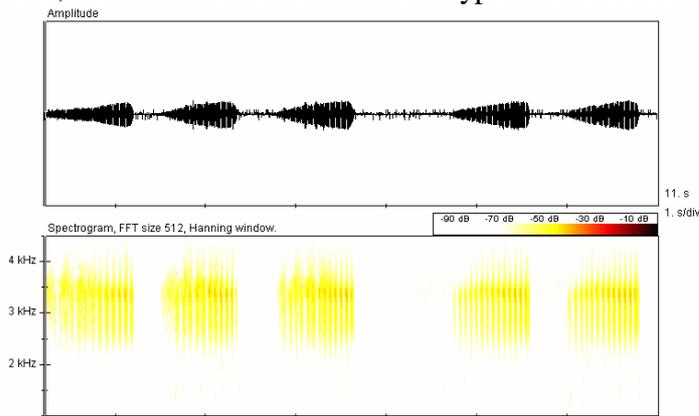
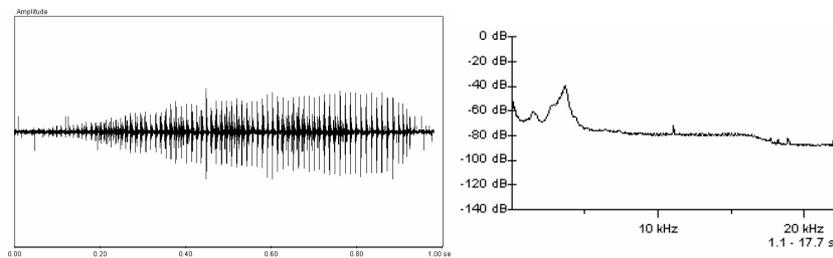
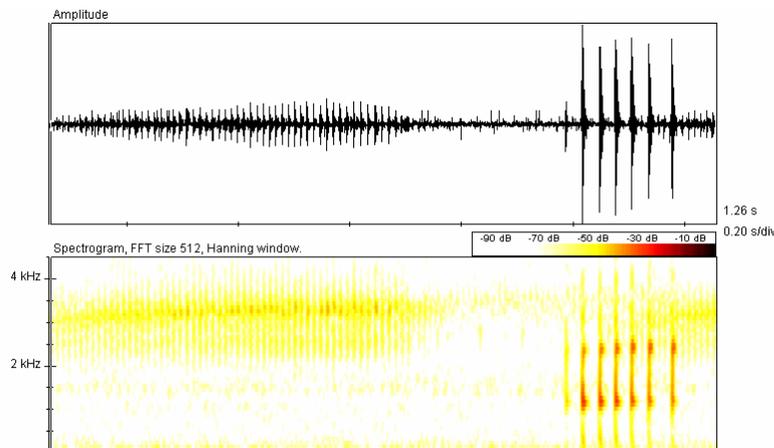


Figure 1a. Advertisement call of *Microhyla rubra* type 1.



Pulse from call of *Microhyla rubra* type 1 Power spectrum for *Microhyla rubra* type 1



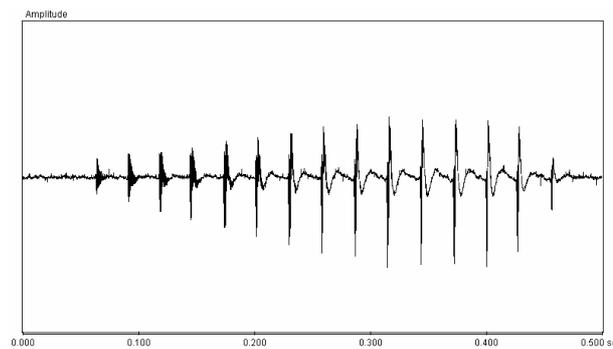
Call of *M. rubra* type 1 followed by *M. rubra* type 2

***Microhyla rubra* type 2**

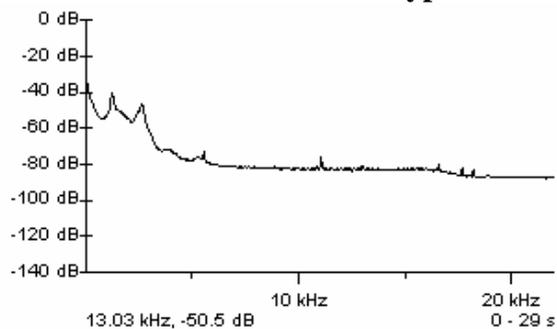
The advertisement call is made from the ground, usually in grassy areas close to water. The call has a dominant/fundamental frequency of 1.29kHz with another strong peak at 2.56kHz and weaker spectral sidebands at 5.52 and 11.06kHz. Most energy is between 0.81 and 2.86 kHz. The call is made up of a series of chirps with a duration of about 0.5 seconds. Each chirp contains about 15 pulses, with an average length of 0.006 seconds. The call is similar to that described by Kanamadi *et al.* (1994) for *M. rubra*.



Call of *Microhyla rubra* type 2



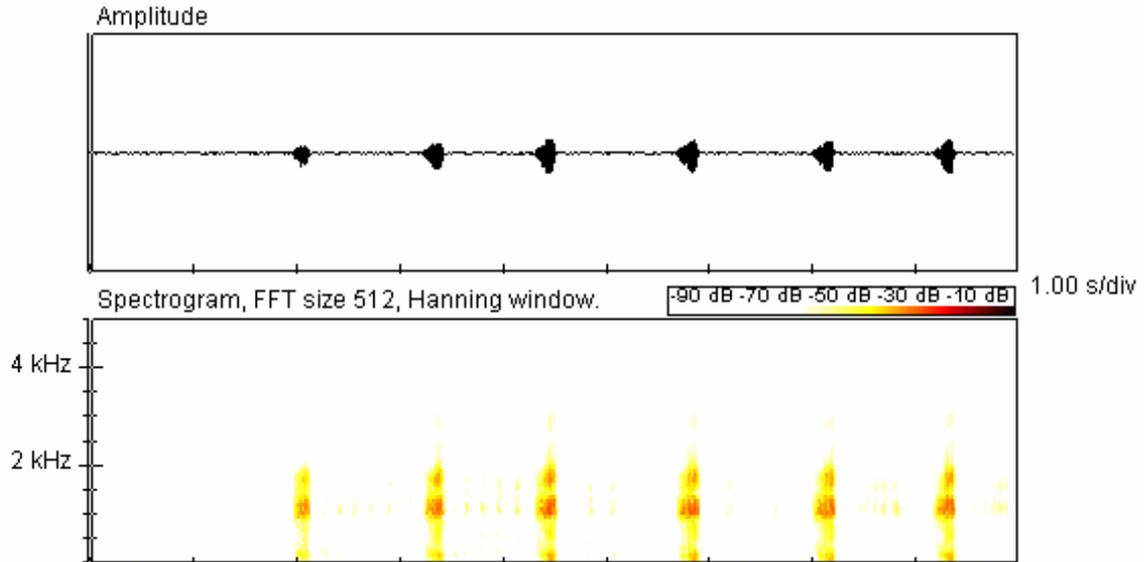
Pulses from call of *M. rubra* Type 2



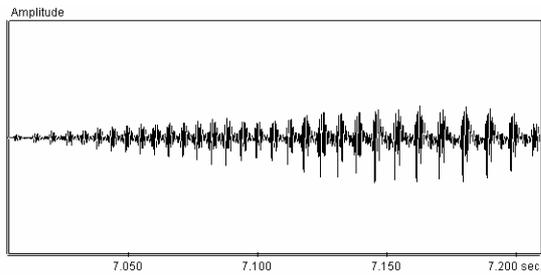
Power spectrum for *M. rubra* Type 2.

Ramanella triangularis

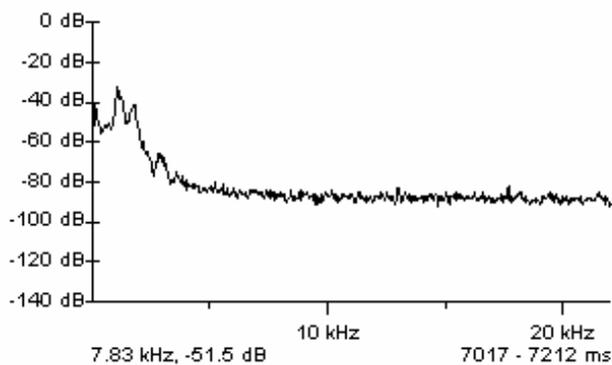
This species was not recorded in the wild. Recordings were obtained from two males in a plastic container in the presence of a female. Chirps have an average duration of about 0.22 seconds. Each is composed of about 29 pulses which increase in amplitude at the call progresses. Dominant frequency is at 1.07 kHz with spectral sidebands at 1.76 and 2.9 kHz. Call energy is concentrated between 0.055 and 3.4kHz.



Call of *Ramanella triangularis*



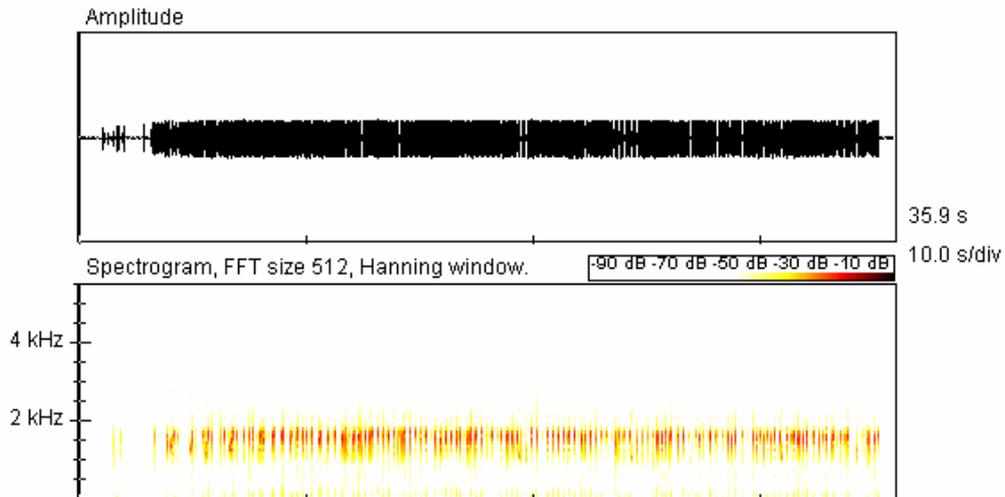
Pulses in call of *R. triangularis*



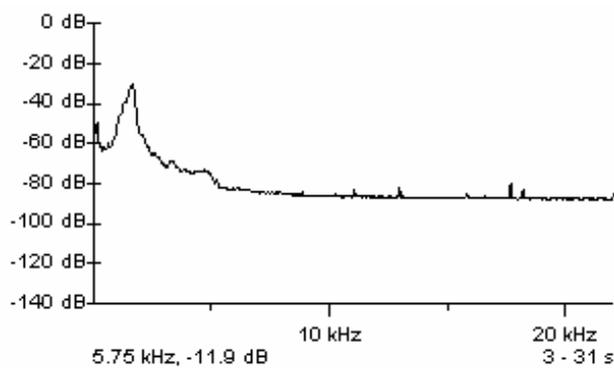
Power spectrum of *R. triangularis*

***Bufo melanostictus*.**

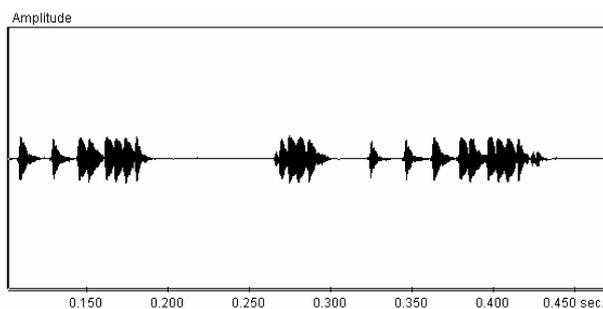
The call consists of a long series of chirps produced intermittently (every 15 minutes). Each call last about 40 seconds (Figure 3a). Dominant frequency is 1.59kHz with energy concentrated between 0.55 and 5.3kHz (Figure 3b). The call is composed of a repeated series of a single pulse with four overlapping pulses that increase in speed and amplitude over time. A chirp of four pulses lasts about 0.02 seconds.



Call of *Bufo melanostictus*



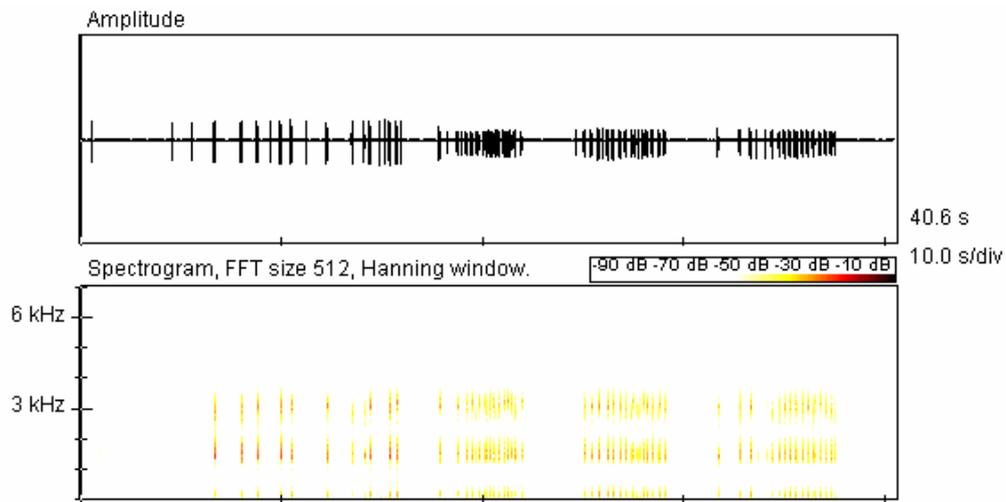
Power spectrum for *Bufo melanostictus*



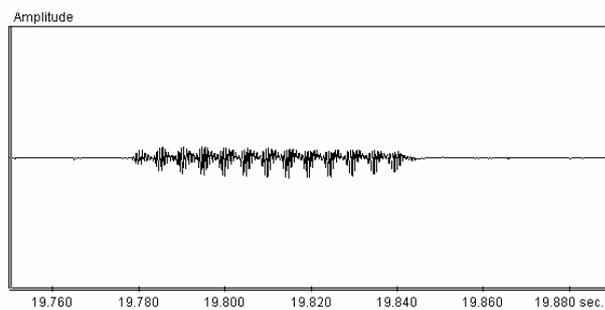
Pulses from call of *B. melanostictus*

Limnonectes limnocharis

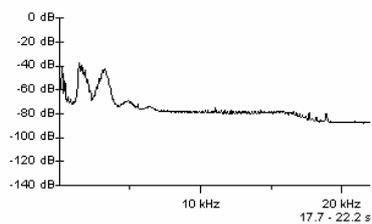
The call of “typical” *L. limnocharis* has energy concentrated between 0.93 and 3.75 kHz with a dominant frequency at 1.44kHz and strong spectral sideband at 3.04kHz. Individual calls last about 0.07 seconds and contain 9-13 pulses, each lasting about 0.004 seconds.



Call of *Limnocharis limnonectes*



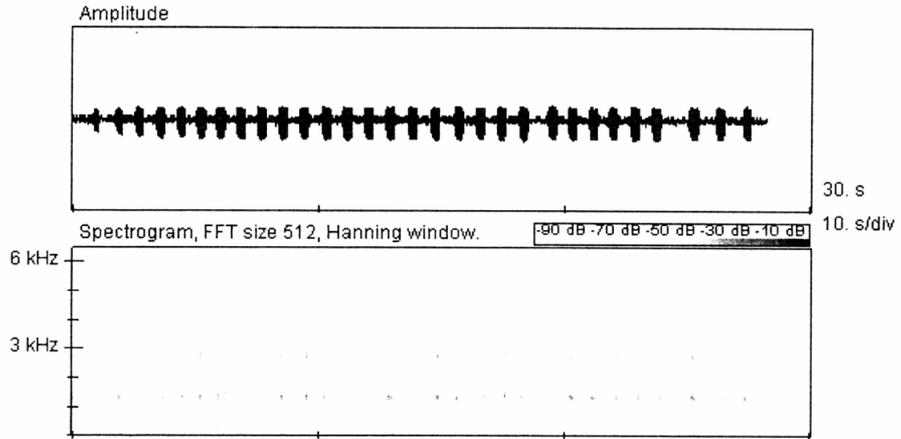
Pulses from call of *L. limnocharis*



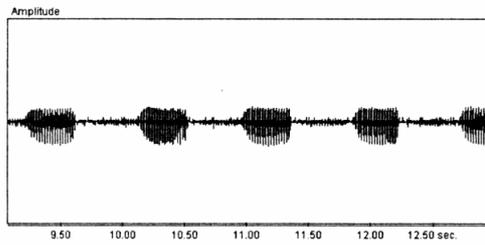
Power spectrum of *L. limnocharis*

***Limnonectes limnocharis* Type WG032**

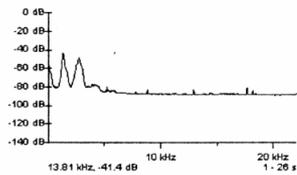
Dominant frequency at 1.33kHz with a strong spectral sideband at 2.8kHz and weak sidebands at 4.1, 5.3, 8.9, 13.0, 17.8 and 18.2 kHz. The call consists of a long series of similar chirps about 0.4 seconds long, each containing about 19 pulses with an average length of about 0.013 seconds.



Call of *Limnonectes limnocharis* Type WG032



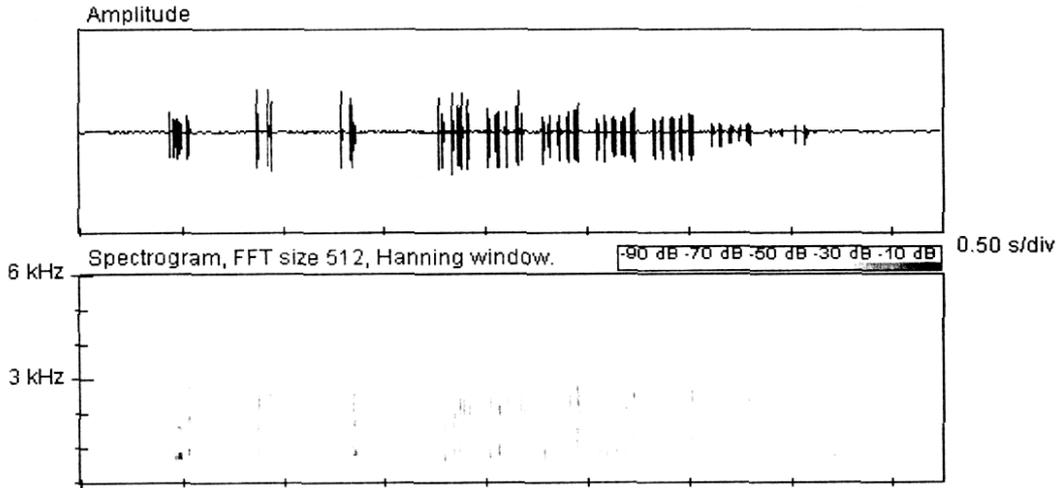
Pulses from call of *L. limnocharis* WG032



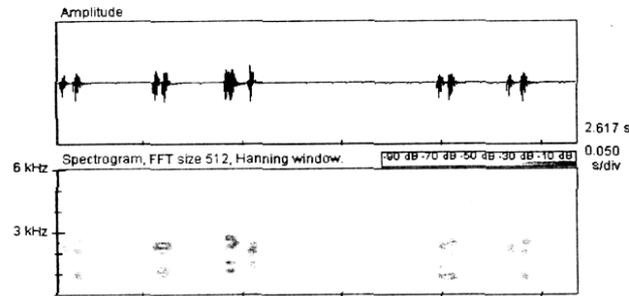
Power spectrum for *L. limnocharis* WG032

***Limnonectes limnocharis* WG024**

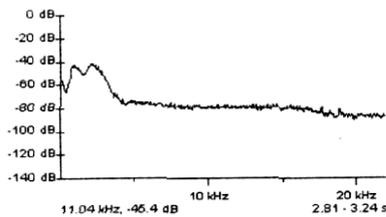
This frog produces a watery croak with energy concentrated between 0.42 and 3.34kHz. Fundamental frequency is 0.87kHz with another strong peak (dominant?) at 2.3kHz. The call rises somewhat in amplitude before decreasing towards the end of the sequence. Call phrases contain 4-13 pulses. Towards the end of the call pulses are paired or in triplets.



Call of *Limnonectes limnocharis* WG024



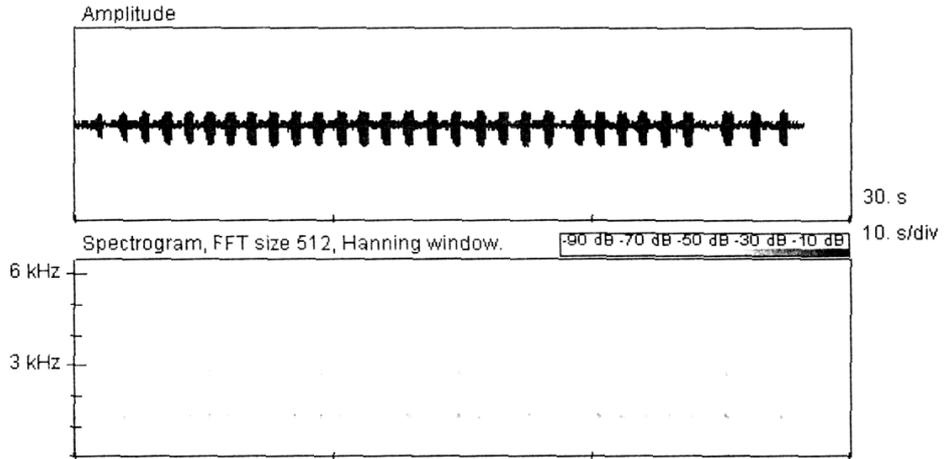
Pulses from call of *L.limnocharis* WG024



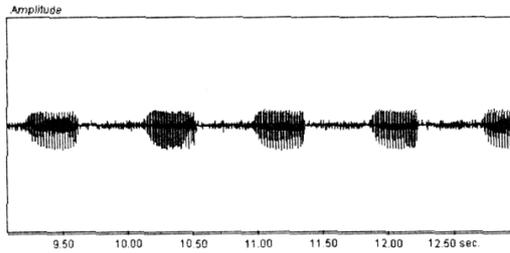
Power spectrum for *L.limnocharis* WG024

***Limnonectes limnocharis* Type WG032**

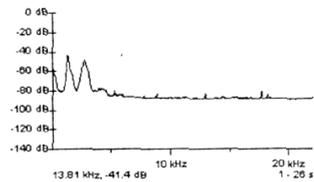
Dominant frequency at 1.33kHz with a strong spectral sideband at 2.8kHz and weak sidebands at 4.1, 5.3, 8.9, 13.0, 17.8 and 18.2 kHz. The call consists of a long series of similar chirps about 0.4 seconds long, each containing about 19 pulses with an average length of about 0.013 seconds.



Call of *Limnonectes limnocharis* Type WG032



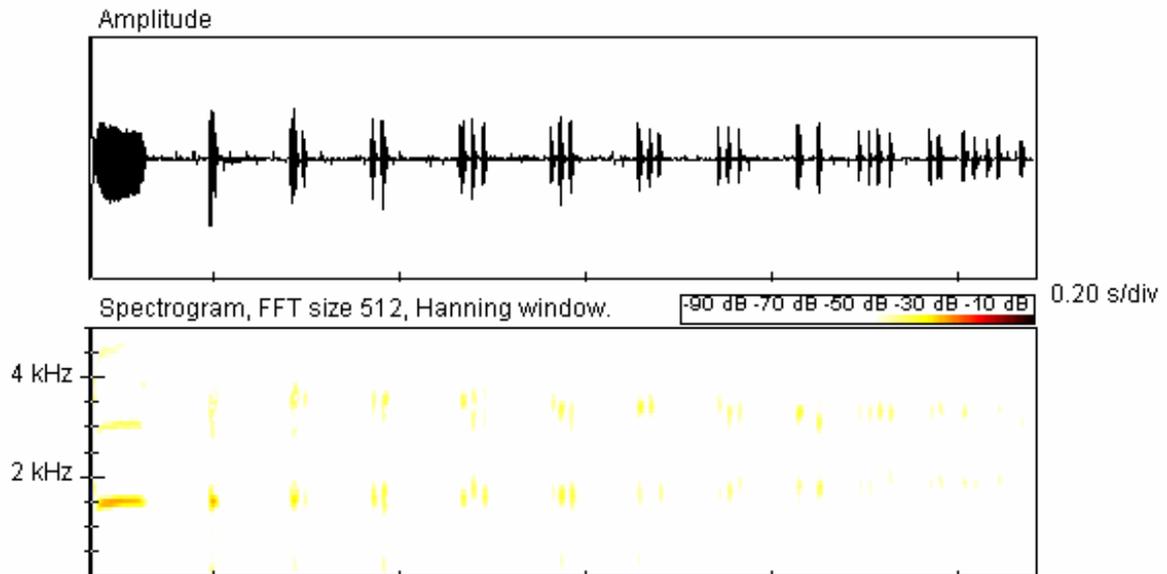
Pulses from call of *L. limnocharis* WG032



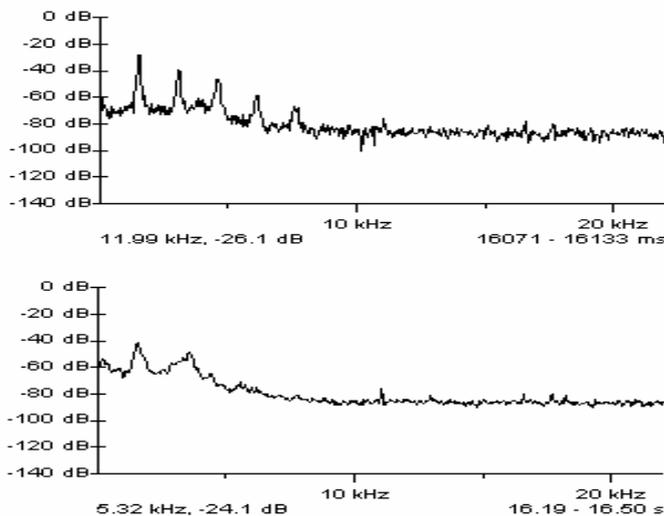
Power spectrum for *L. limnocharis* WG032

Nyctibatrachus sp (“white spot frog”)

The call is made from slow flowing streams or from the banks of streams. Average length is about 1.3 seconds and is composed of about 16 chirps. The introductory chirp is a squeak consisting of a long continuous pulse with a dominant frequency of 1.59kHz and strong spectral sidebands at 3.4, 4.7, 6.1, 7.7 and 11.1 kHz. Energy is concentrated between 0.05 and 4.8 kHz. The remainder of the call has strong peaks at 1.5 and 3.7 kHz and consists of pulses grouped mainly as triplets (0.28 seconds each, 0.6 seconds apart) until they merge into single pulses of about 0.005 seconds duration towards the end of the call



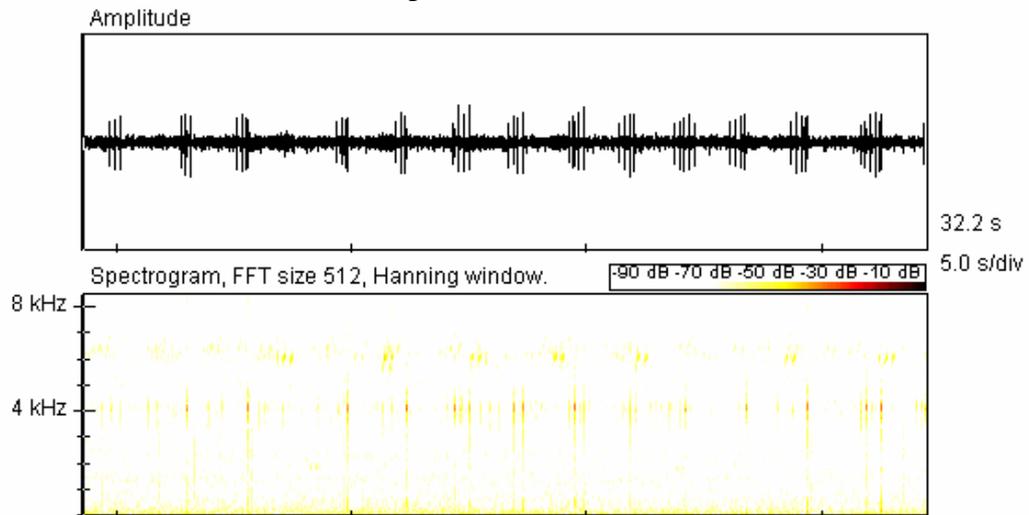
Call of *Nannobatrachus*



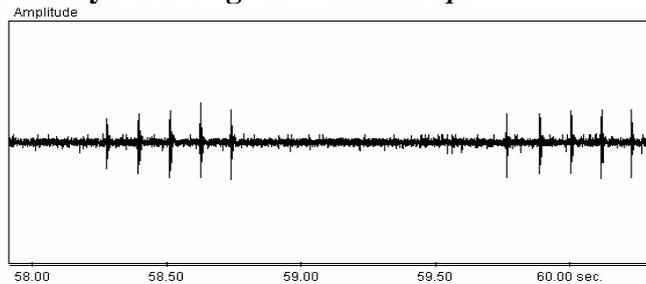
Power spectra of *Nannobatrachus* sp. Top is introduction, bottom is rest of the call

Yellow thighed *Philautus* sp.

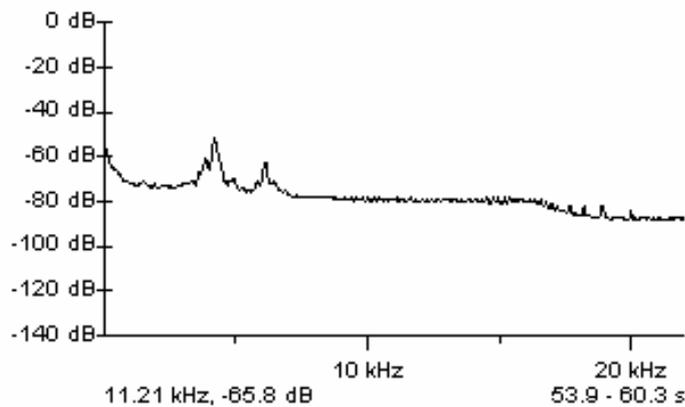
Dominant frequency at 4.28 kHz with a strong spectral sideband at 6.1 kHz. Energy is concentrated between 3.2 and 6.7 kHz. Each chirp has an average length of about 0.5 seconds and consists of about five pulses.



Call of yellow-thighed *Philautus* sp.



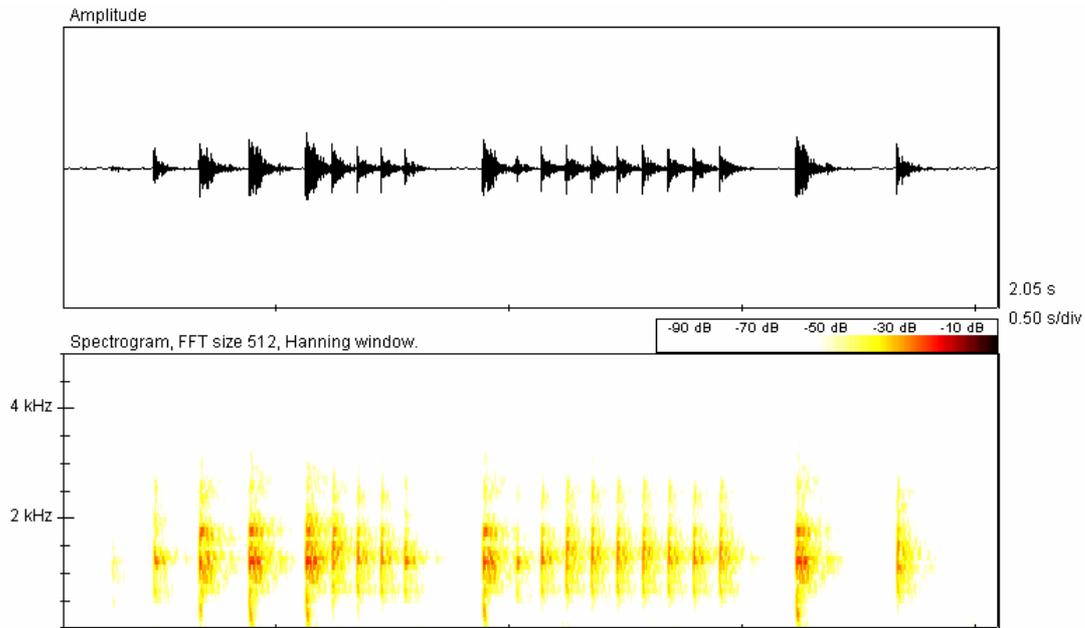
Pulses from call of yellow-thighed *Philautus* sp.



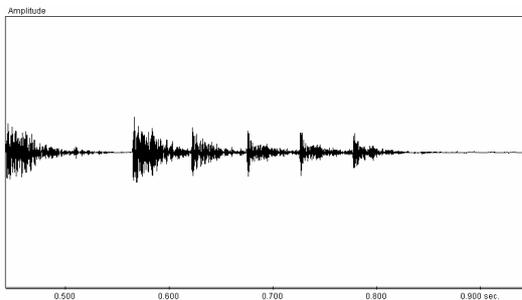
Power spectrum for yellow-thighed *Philautus* sp.

Rhacophorus malabaricus

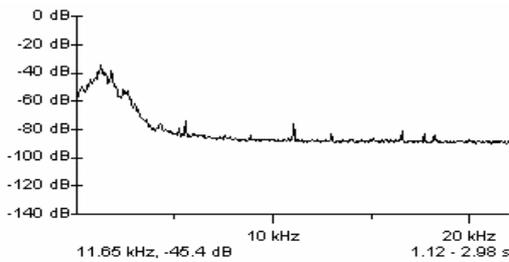
This species has a variable calling pattern. Usually the call is made up of a series of loud pulses of about 0.03 seconds duration, interspersed either by a silent interval or by a train of lower amplitude pulses. Energy is concentrated between 0.07 and 1.79kHz, with dominant frequency at 1.26kHz, a strong spectral sideband at 1.79kHz and weaker sidebands at 5.50, 11.03, 12.99, 17.65 and 18.19kHz.



Call of *Rhacophorus malabaricus*



Pulses from call of *R. malabaricus*



Power spectrum of *R. malabaricus* call

Golden *Philautus* sp.(WG008)

The call of this frog consists of a rapidly repeated (about three times per second) “chink”, sometimes preceded by a trill. Chinks consist of up to 20 pulses, typically 6 or 7, and have a duration of about 0.32 seconds. Trills consist of 9 short chirps of about 0.015 seconds duration, each composed of 2-3 pulses. Dominant frequency is at about 2.65kHz with spectral sidebands at 5.20, 8.88, 11.0 and 12.99kHz. Energy is concentrated between 1.94 and 2.38kHz.

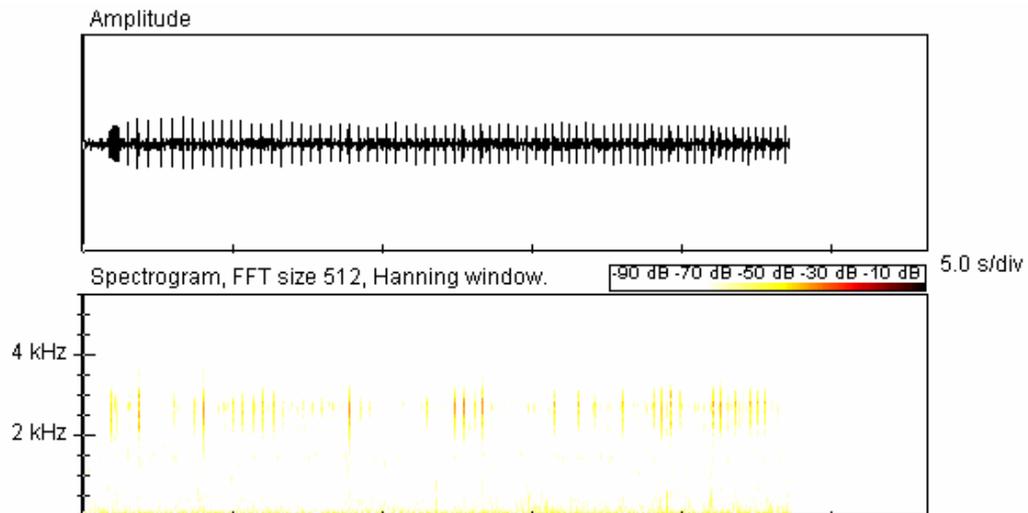


Figure 1 Call of golden *Philautus* sp.

Pulses from chirp of golden *Philautus* sp.

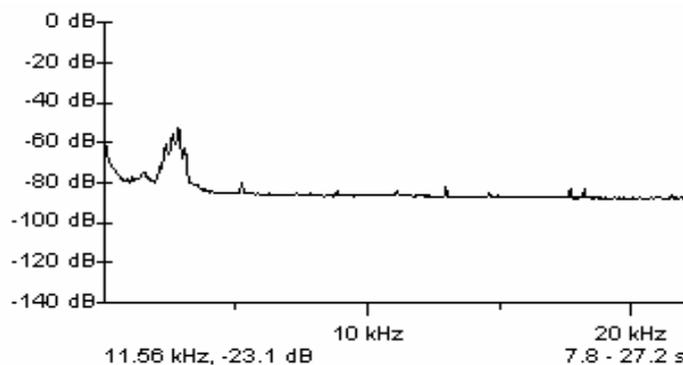
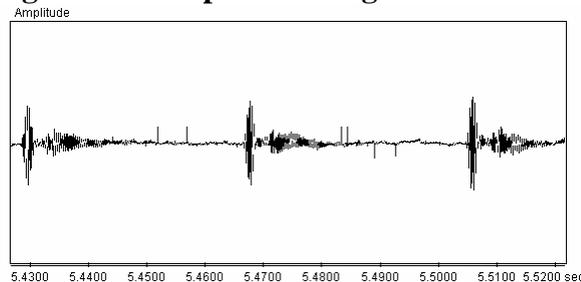


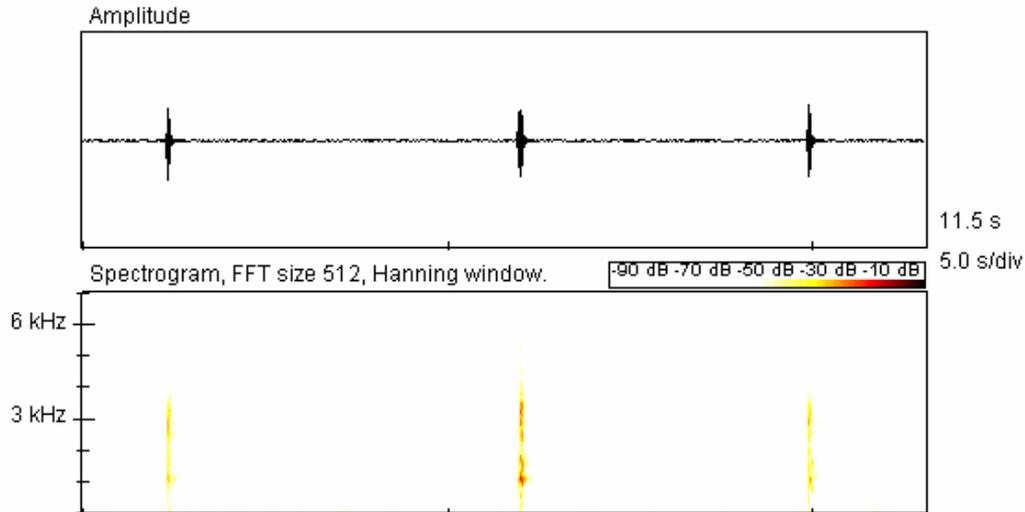
Fig. **Power spectrum of golden *Philautus* sp.



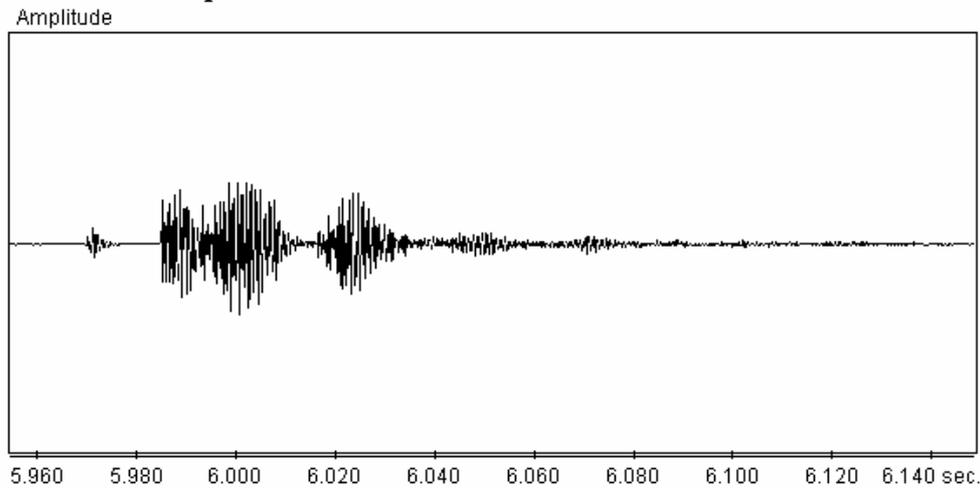
Pulses from trill of golden *Philautus* sp.

Rana temporalis

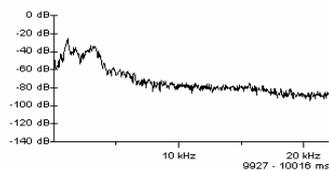
The call of this frog consists usually of a single croak lasting about 0.1 seconds, with a dominant frequency of 3.1kHz and strong spectral sideband at 3.1kHz. Most of the energy is concentrated between 0.24 and 3.87kHz. Calls consist of 3-4 pulses, with a duration of 0.005 - 0.26 seconds. The frog also makes some characteristic squeaking noises at irregular intervals.



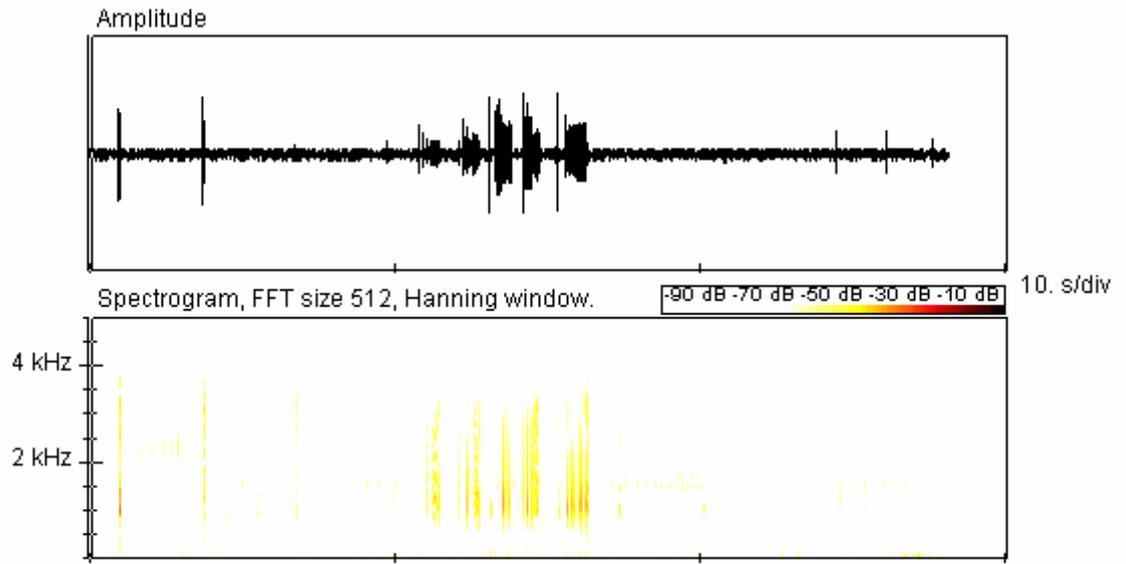
Call of *Rana temporalis*



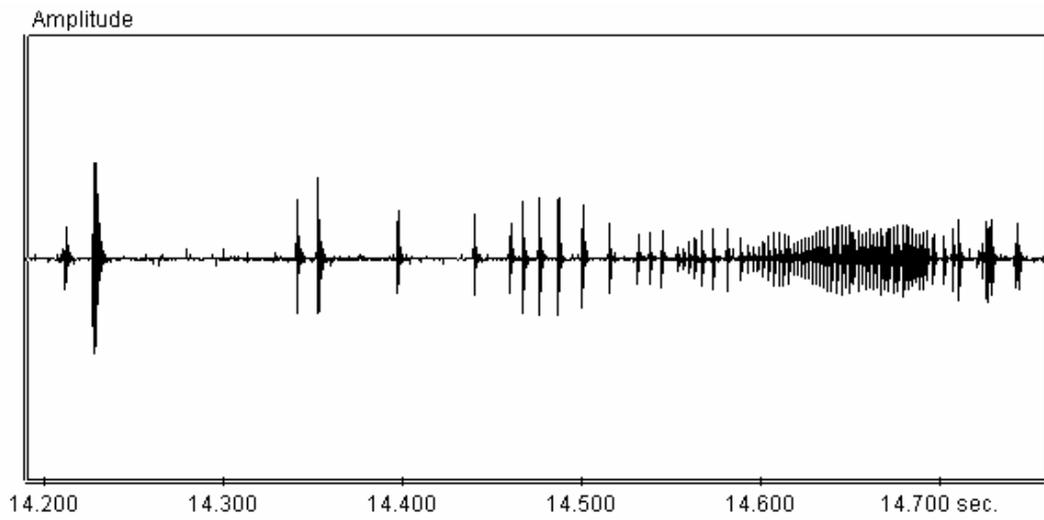
Pulses from call of *Rana temporalis*



Power spectrum for *Rana temporalis*



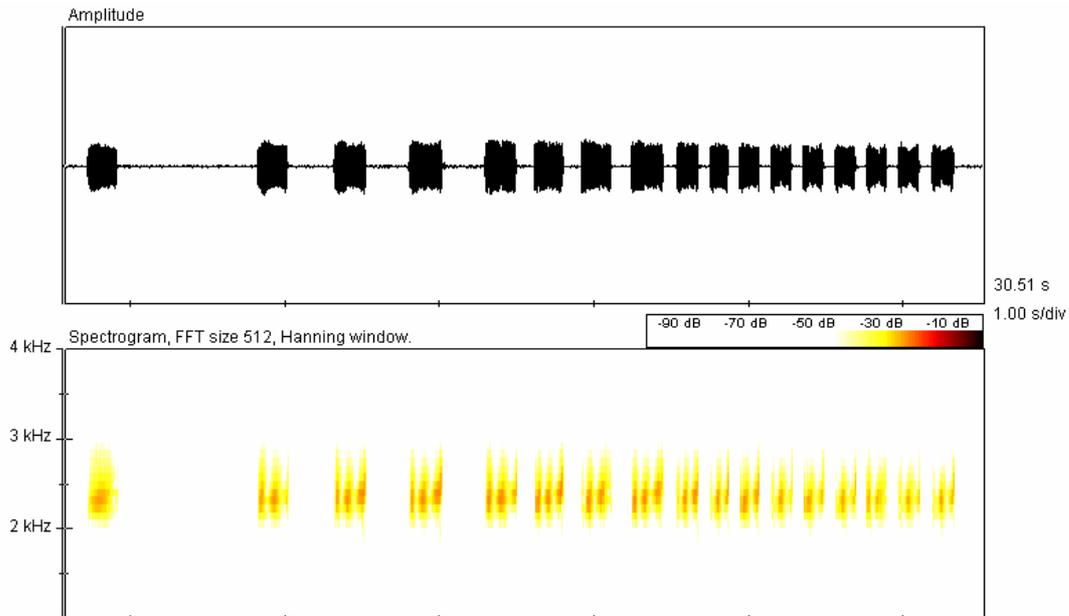
Squeaks from *Rana temporalis*



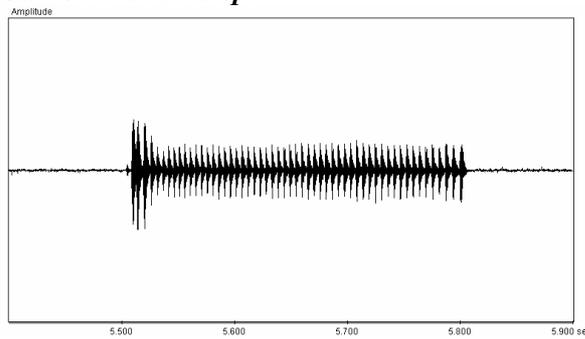
Pulses from squeak of *Rana temporalis*

Indirana sp.

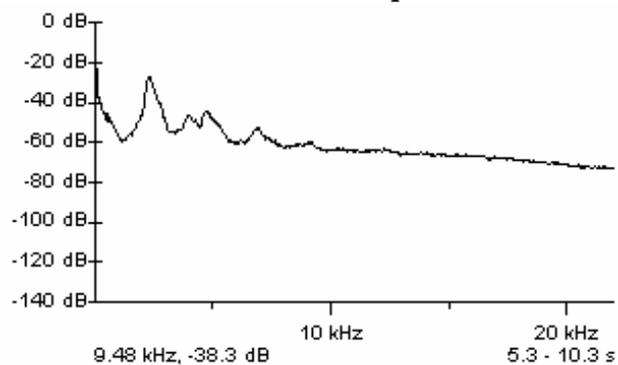
The call has a dominant frequency of 2.3kHz with spectral sidebands at 4.2 and 5.1 kHz. Each chirp of the call lasts about 0.2 seconds and contains about 20 pulses with an average duration of .007 seconds. The pulses tend to speed up towards the end of the call.



Call of *Indirana sp.*



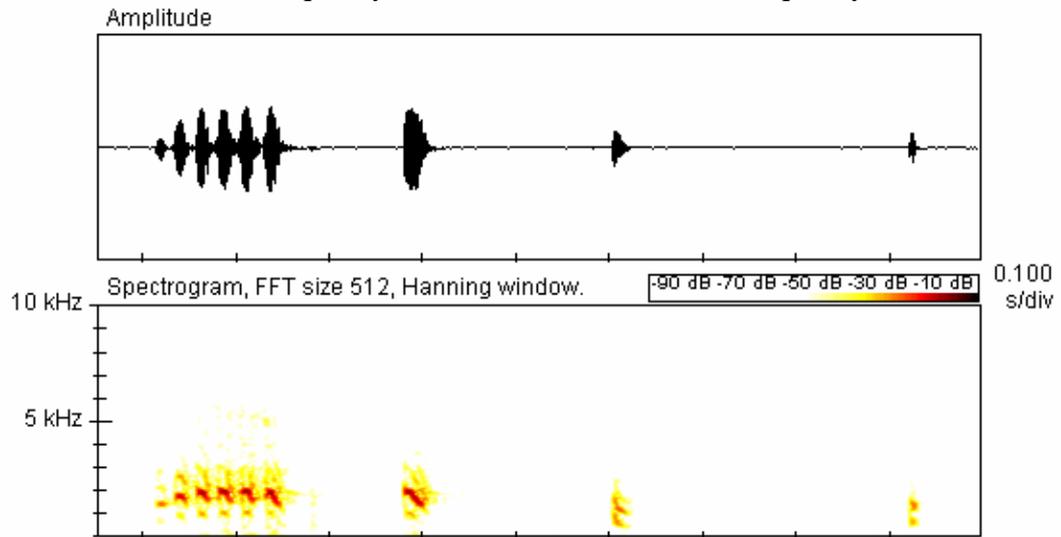
Pulses from call of *Indirana sp.*



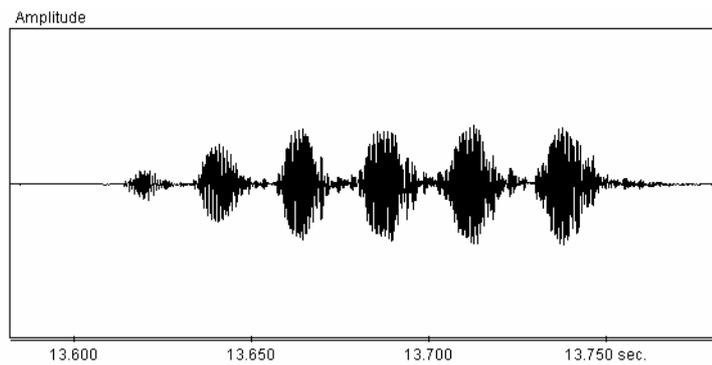
Power spectrum of *Indirana sp.*

Polypedates pseudocruciger

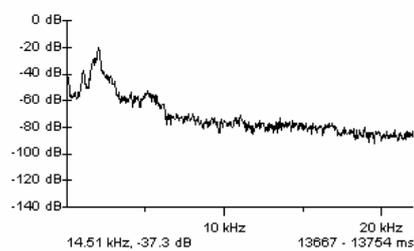
The call of this species is very variable. Energy is concentrated between 0.64 and 3.3kHz. Fundamental frequency is 0.98kHz with dominant frequency at 1.94kHz.



Call of *Polypedates pseudocruciger*



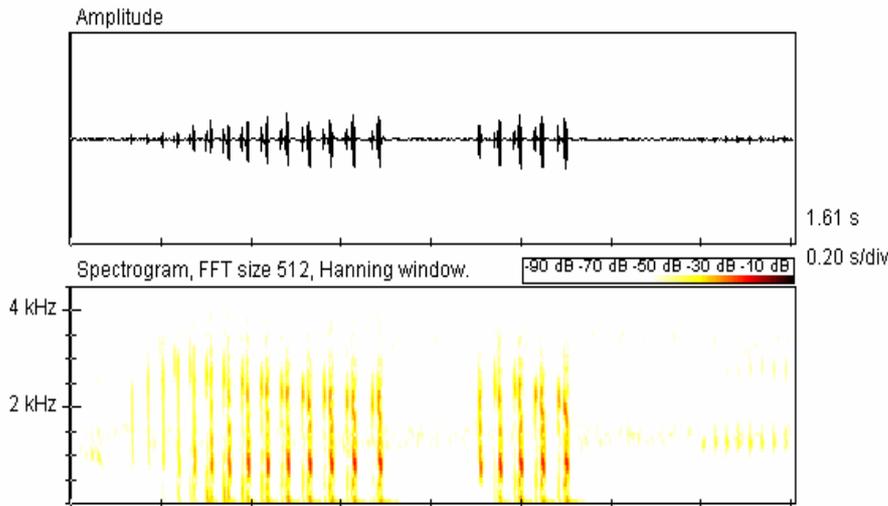
Pulses from call of *P. pseudocruciger*



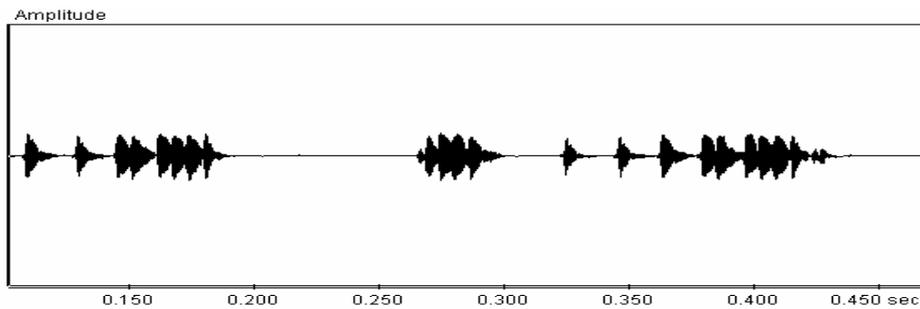
Power spectrum for *P. pseudocruciger*

Euphlyctus hexodactylus

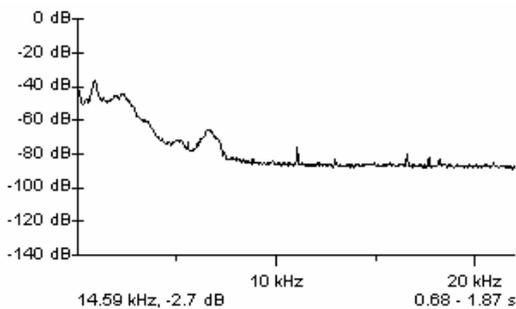
The call is made from the water and consists of a single long watery croak, made up of about 23 pairs of pulses, the first of about 3ms duration and lower in amplitude, the second longer (9ms) and increasing in amplitude with time. Pulses have a dominant/fundamental frequency of 0.9kHz, with spectral sidebands at 2.1, 6.5 and 11.1 kHz. Calls last about .02-0.6 seconds. A different call is made when another male is in close proximity, with energy concentrated between 0.55 and 3.7 kHz. One such call, lasting 4.6 seconds, was composed of pulses from 0.02 to 0.06 seconds which increased in amplitude, culminating in an attack on the intruding male (see figure below). The alarm call of this species is a blood-curdling screech.



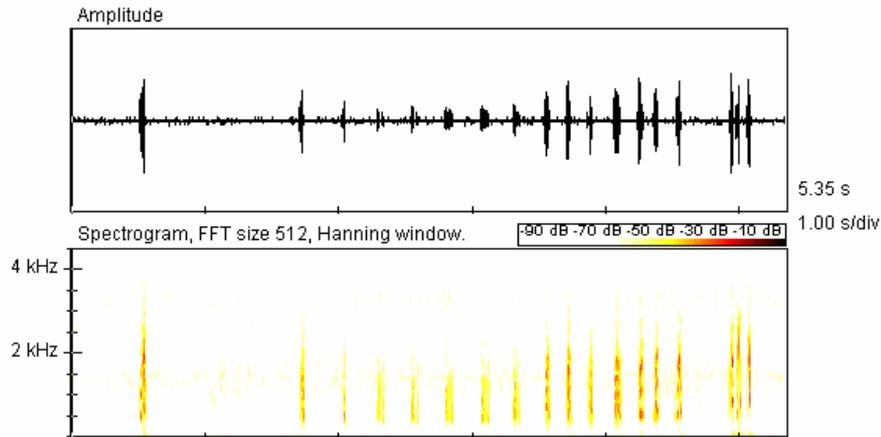
Advertisement call of *E. hexodactyla*



Pulses from advertisement call of *E. hexodactylus*



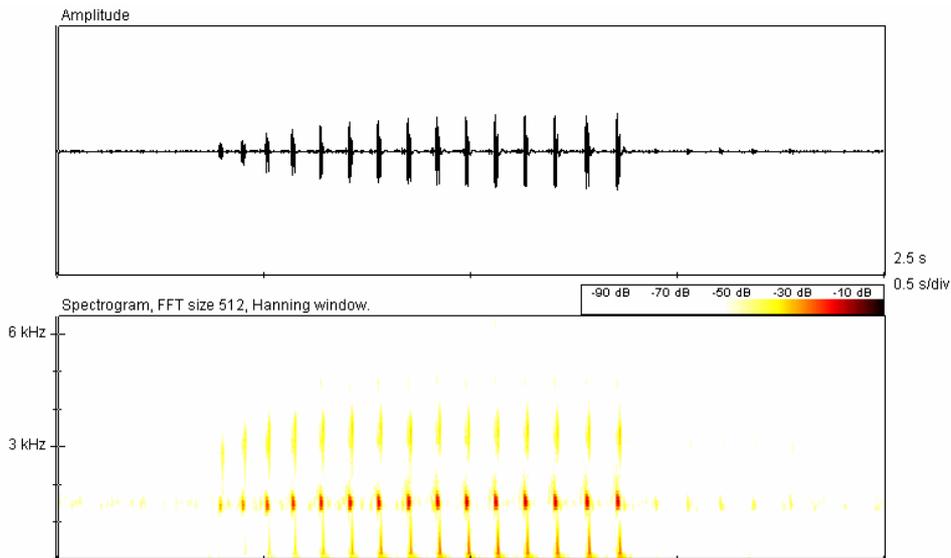
Power spectrum for *E. hexodactylus*



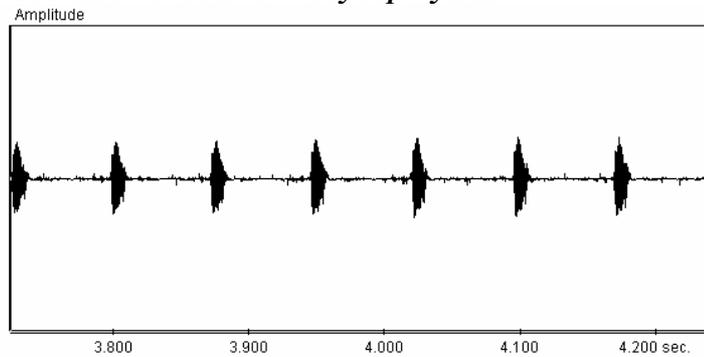
Territorial call of *E. hexodactylus*

Euphlyctus cynophlyctus

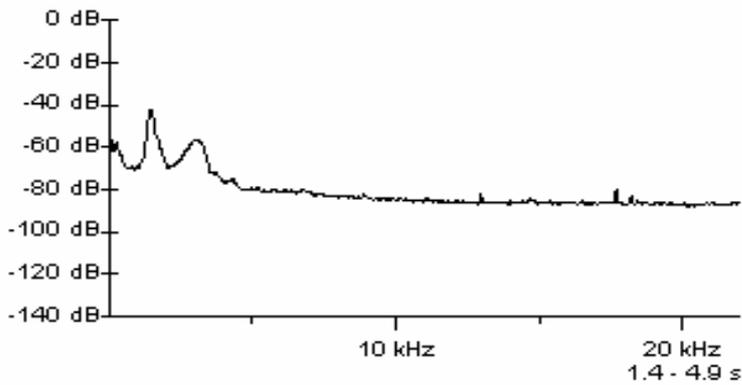
The advertisement call of this frog is a trill lasting about 1-1.5 seconds. It is composed of about 15 chirps, each consisting of a single pulse, with a fundamental frequency of 0.13kHz, a dominant frequency of 1.5kHz and strong spectral sidebands at 3.3, 4.7 and 6.3kHz . Average pulse length is about 0.012 seconds with mean interval of about 0.065 seconds.



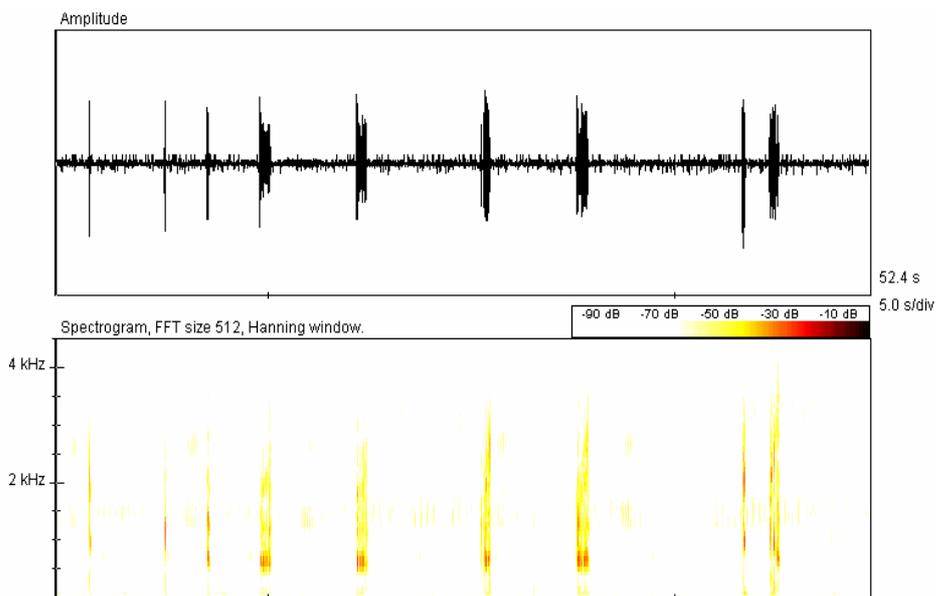
Advertisement call of *E. cynophlyctus*



Pulses from advertisement call of *E. cynophlyctus*



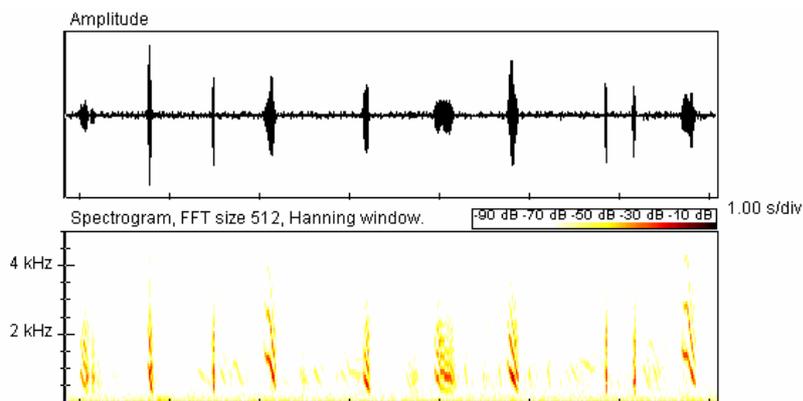
Power spectrum of advertisement call of *E. cynophlyctus*



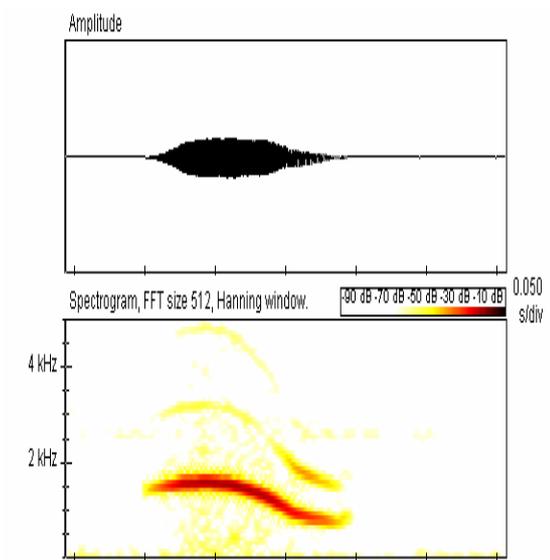
Territorial call of *E. cynophlyctus*

Rana curtipes

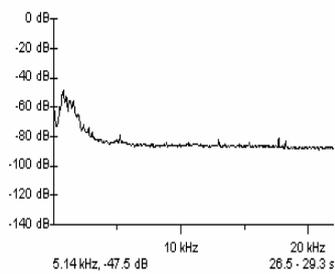
The call of this frog is complex and very variable. Call energy is concentrated between 0.2 and 3.5 kHz with a dominant frequency at 0.7kHz and strong spectral sideband at 1.4 kHz. The calls consist of single pulses with complex frequencies lasting 0.64 - 1.16 seconds. Many chirps contain downward sweeps of frequency.



Call of *Rana curtipes*



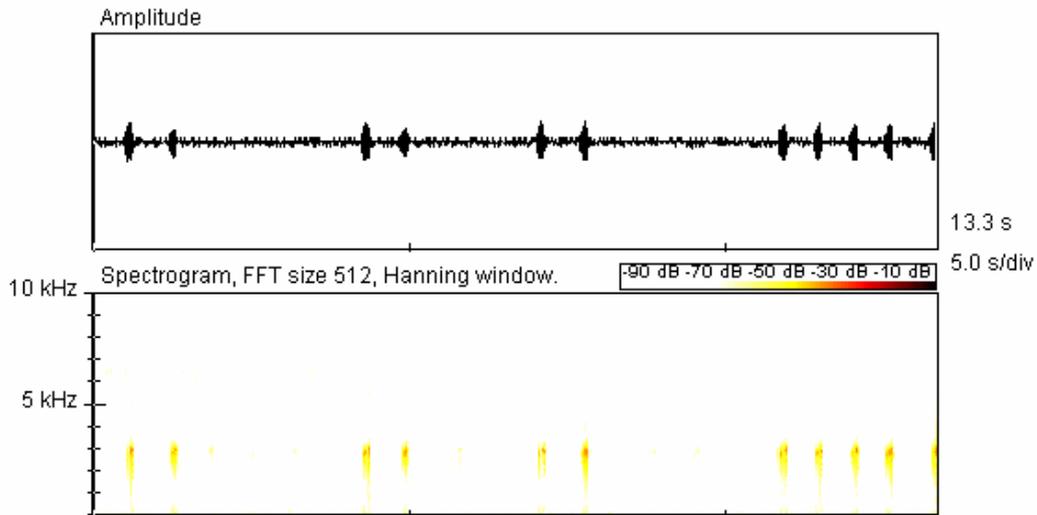
Details of a pulse from call of *Rana curtipes*



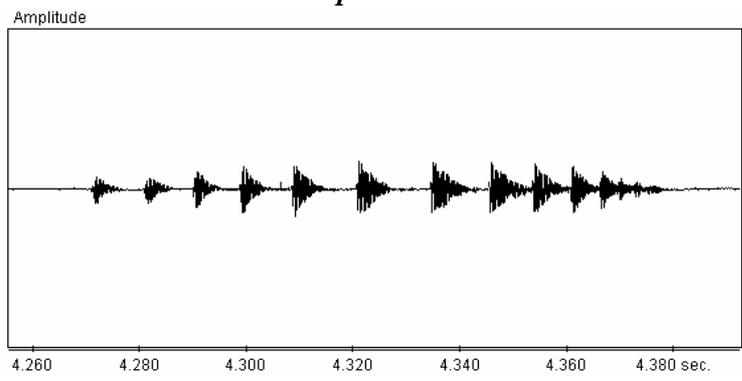
Power spectrum for *Rana curtipes*

Bronze *Philautus sp.*

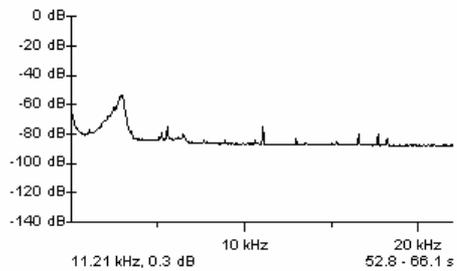
The call of this frog has a dominant/fundamental frequency of 2.90kHz, with strong spectral sidebands at 5.21, 5.56, 6.49, 11.12, 13.02, 16.52, 17.62 and 18.19kHz. Most of the energy lies between 2.0 and 3.25kHz. Calls have a duration of about 0.11 seconds and are composed of about 11 pulses, with an average length of 0.006 seconds.



Call of bronze *Philautus* sp.



Pulses from call of bronze *Philautus* sp.



Power spectrum of bronze *Philautus* sp.