Appendix : Sample Spectrographic Analysis

The kind of information that can be obtained from the spectrographic record is shown in Figure 36. This shows two temporally aligned conventional spectrograms of the portion of Gama-BX (Telegraph Wire) corresponding to the first occurrence of *-marraŋu gila gabuŋga.* A spectrogram gives a picture of the time-varying frequency and amplitude content of speech: frequency is shown vertically, time horizontally, and amplitude by the darkness of the trace.

The lower spectrogram uses a wide-band filter to show the frequencies that correspond to perceived vowel and consonant quality. It has a good time resolution which allows events (like stick beats) to be located accurately in time, and accurate duration measurements to be made (for example of phonetic segments). The broad phonetic transcription along the bottom shows the sounds actually sung, with boundaries between acoustic segments marked. Due to factors in the actual performance of singing, these may differ somewhat from the text reported by the speaker. For example, nothing can be heard (or of course seen on the spectrogram) corresponding to the *ŋu* of *-marraŋu* - the *rra* is followed immediately by the filler-syllable *nyay.*

The stick beats can be seen nicely on the wide-band spectrogram as vertical wide bandwidth transients with differing amplitude at the points marked 's'. They occur with a mean interval of 30.5 centiseconds and show considerable isochrony: the longest and shortest intervals only differ by 2.7 centiseconds. It can also be seen that several of the beats are timed to occur at about the same time as the onset of the vowel (in *nyay, ki, buŋ, ga*).

The upper spectrogram is made with a narrow-band filter to show the frequencies (fundamental frequency and harmonics) that are the basic correlates of perceived pitch. With this type of spectrogram

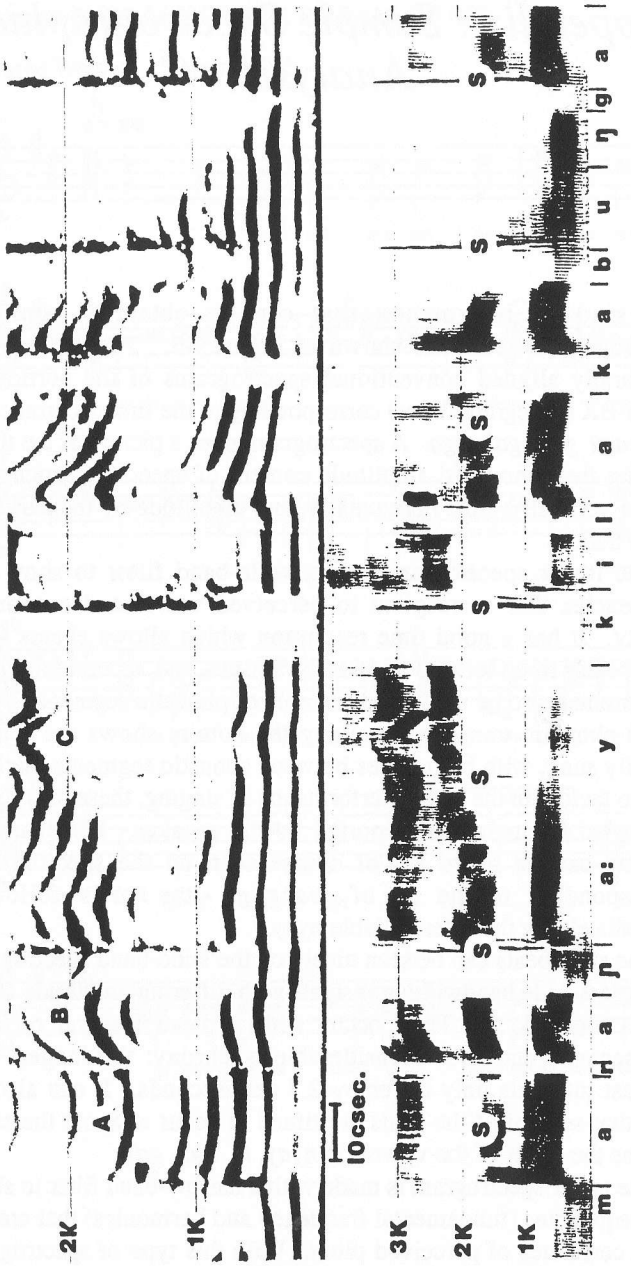

Figure 36: Spectrogram of a portion of Gama-BX, Telegraph wire.

the semitone differences between different frequencies can be determined, and correspondences with the transcribed pitch stated, although it must be emphasised that the relation between perceived pitch and acoustic frequency is far from simple and involves other factors like acoustic correlates of vowel quality. The following are typical measurements from this spectrogram. The jump in pitch from A on *marr* to B on *a* (points 'A' and 'B', both located on the 8th harmonic) corresponds to a jump from 216 to 262 Hz, or 3.34 semitones. The 'tremolo' effect at the end of *nyay* (point 'C', on the 9th harmonic) consists of rapid frequency modulation, from 215 to 235 to 206 to 217 Hz.

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