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Foraging behaviour and echolocation in the rufous horseshoe bat (*Rhinolophus rouxi*) of Sri Lanka

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Summary

In October 1984 foraging areas and foraging behaviour of the rufous horseshoe bat, *Rhinolophus rouxi*, were studied around a nursery colony on the hill slopes of Sri Lanka. The bats only foraged in dense forest and were not found in open woodlands (Fig. 1). This strongly supports the hypothesis that detection of fluttering prey is by pure tone echolocation within or close to echo-cluttering foliage. During a first activity period after sunset for about 30–60 min, the bats mainly caught insects on the wing. This was followed by a period of inactivity for another 60–120 min. Thereafter the bats resumed foraging throughout the night. They mainly alighted on specific twigs and foraged in flycatcher style. Individual bats maintained individual foraging areas of about 20x20 m. They stayed in this area throughout the night and returned to the same area on subsequent nights. Within this area the bats generally alighted on twigs at the same spots. Foraging areas were not defended against intruders. The bats echolocated throughout the night at an average repetition rate of 9.6±1.4 sounds/s. While hanging on twigs they scanned the surrounding area for flying prey by turning their bodies continuously around their legs. On average they performed one brief catching flight every 2 min and immediately returned to one of their favourite vantage points. Echolocation sounds may consist of up to three parts, a brief initial frequency-modulated (FM) component, a long constant frequency (CF) part lasting for about 40–50 ms, and a final FM part again (Fig. 4b, c). Adult males and females emitted pure tone frequencies in separate bands, the males from 73.5–77 kHz and the females from 76.5–79 kHz (Fig. 5). During scanning for prey from vantage points, the bats mostly emitted pure tones without any FM component (Fig. 4a). The last few pure tones emitted before take-off were prolonged to about 60 ms duration. The final FM part was therefore not an obligatory component of the echolocation signals in horseshoe bats. During flight and especially during emergence from the cave, most sounds consisted of a pure tone and loud initial and final FM sweeps. We therefore suggest that the initial FM part might also be relevant for echolocation. From our observations we conclude that the FM components are especially important during obstacle avoidance. In most sounds emitted in the field a fainter first harmonic was present. It was usually up to 30 dB fainter than the second harmonic, but in some instances it was as loud or even distinctly louder than the second one (Fig. 6a). Even within one sound the intensity relationship between the two harmonics may be reversed. We therefore suggest that the first harmonic is an integral part of the signal and relevant for information analysis in echolocation.