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## ALARM CALLING IN SRI LANKAN MIXED-SPECIES BIRD FLOCKS

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**ABSTRACT.**—Vocal alarm calls are important to the vigilance and likely the organization of mixed-species flocks, but community-wide studies of alarm calling in flocks are lacking. We investigated which species alarm-call, and the characteristics of their calls, in a large flock system of a Sri Lankan rainforest. We recorded naturally elicited alarm calls during several attacks by *Accipiter* hawks and while following flocks for 10 h. We then artificially elicited alarms by throwing a stick to the side of the flock, in a total of 70 trials at 30 flock sites. The Orange-billed Babbler (*Turdoides rufescens*) was the most frequent caller to both the artificial and natural stimuli, followed by the Greater Racket-tailed Drongo (*Dicrurus paradiseus*). Several other species also called, and multiple species often called to the same stimulus (in 23 trials, and in all of the hawk attacks). The species differed in their rapidity of response and in their sensitivity to different natural stimuli. Calls of the gregarious babbler usually provided a first, unreliable warning of an incoming threat, whereas later calls of other species emphasized the seriousness of the threat. We suggest that birds in mixed-species flocks may be particularly aware of aerial predators for two reasons: (1) a “numbers effect,” whereby nongregarious species are more aware of predators when surrounded by large numbers of other species; and (2) an “information effect,” whereby species differ in the information available in their alarm calls, leading to an accumulation of information in a mixed-species flock. Received 2 May 2003, accepted 25 August 2004.

**Key words:** *Accipiter* hawks, alarm calls, community ecology, *Dicrurus paradiseus*, mixed-species flocks, Orange-billed Babbler, predator vigilance, Greater Racket-tailed Drongo, Sri Lanka, *Turdoides rufescens*.

### Llamadas de Alarma en Bandadas Mixtas de Aves en Sri Lanka

**RESUMEN.**—Las llamadas de alarma son importantes en la vigilancia y probablemente en la organización de las bandadas mixtas, pero existen pocos estudios sobre llamadas de alarma en bandadas a nivel de comunidad. Investigamos cuáles especies presentan llamadas de alarma y las características de sus llamadas en un amplio sistema de bandadas en una selva lluviosa de Sri Lanka. Registramos llamadas de alarma emitidas naturalmente durante varios ataques llevados a cabo por rapaces del género *Accipiter* y mientras seguíamos bandadas por un período de 10 h. Luego inducimos artificialmente llamadas de alarma arrojando una vara sobre el costado de la bandada, en un total de 70 pruebas en 30 sitios. *Turdoides rufescens* fue la especie que llamó con más frecuencia en relación con los estímulos artificiales y naturales, seguida por *Dicrurus paradiseus*. Otras varias especies también llamaron, y múltiples especies comúnmente reaccionaron con el mismo estímulo (en 23 pruebas y todos los ataques de *Accipiter*). Las especies difirieron en su velocidad de respuesta y en su sensibilidad a diferentes estímulos naturales. Las llamadas de

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