Variable specificity in the anti-predator vocalizations and behaviour of the white-faced capuchin, *Cebus capucinus*

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Summary

Much research in animal communication is aimed at understanding the functional design features of animal vocal signals. Our detailed analyses of the vocalizations and behavioural responses elicited in white-faced capuchins by predators and other disturbances point to two call variants that differ modestly in their acoustic structure and that are accompanied by functionally distinct behavioural responses. The first variant is given exclusively to avian predators and is almost invariably accompanied by the monkey’s immediate descent from the treetops where it is most vulnerable; therefore, we label this call variant the ‘aerial predator alarm’. The second variant, that differs only slightly but noticeably from the first, is given to a wide range of snakes and mammals, including a range of species that represent no predatory threat to the monkeys. This second call is also associated with more variable responses from calling monkeys, from delayed retreat from the source of disturbance, to active approach, inspection, and sometimes mobbing of the animal involved. We therefore label this variant more generally as an ‘alerting call’. Although some other primate species show a more diverse system of anti-predator calls, and the capuchins themselves may yet be found to produce a greater variety of calls, a system of two call variants with varying degrees of predator specificity and behavioural response is not uncommon among primates and appears functionally appropriate for capuchins. The basic structure of the alerting call allows conspecific listeners to localize the caller and the source of disturbance readily, thereby allowing listeners to approach and assist in mobbing in cases where the disturbance warrants it, or to avoid the area in cases where the disturbance is identified as a predatory threat. Conversely, the aerial predator alarm is inherently less localizable and therefore conveys the
presence of a predator to conspecific listeners nearby while allowing the signaler itself to remain relatively inconspicuous.

**Keywords:** vocalizations, alarm call, alerting call, *Cebus*.

**Introduction**

Much research in animal communication is aimed at understanding the potential adaptive function of vocal signals and the underlying proximate mechanisms that guide both their production in callers and their interpretation by listeners. Vocalizations given in response to encountering predators have been a particular focus of research because these vocalizations mediate events with high adaptive significance and because they are also associated with relatively discrete and unambiguous eliciting stimuli (specific types of predator) and typically precipitate dramatic behavioural responses that are readily observed by researchers. This combination of factors facilitates research into the function of these vocalizations as well as the proximate mechanisms through which the animals themselves perceive, categorize, and interpret elements of the world around them (Cheney & Seyfarth, 1990; Owings, 1994).

Research on many different species has revealed important variation both in the diversity of anti-predator vocalizations that are produced and in the functional behavioural responses that accompany them. For example, seminal work by Marler (1955) identified two structurally and functionally distinct types of call that small birds produce when encountering larger raptorial predators. One variant is given to flying raptors that represent an immediate threat. This call, often called a ‘seet’, is generally a high-frequency, tonal signal with gradual onsets and offsets that is audible to conspecific listeners nearby but is otherwise difficult to localize in space. This combination of features allows the caller to announce the presence of a threatening predator to conspecifics without drawing additional attention to itself. Accordingly, this type of call is also associated with cryptic behaviour such as immediate flight and hiding, or freezing. A second call variant is given to perched raptors that represent no immediate threat but could become a threat if they remain in the area. This call, sometimes also referred to as the ‘chink’ or ‘chert’ call, is generally a short, broad-band (or noisy) signal with abrupt onsets and offsets, which makes it comparatively easy to localize. Notably, this