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Conspicuous animal signals avoid the cost of predation by being intermittent or novel: confirmation in the wild using hundreds of robotic prey

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Social animals are expected to face a trade-off between producing a signal that is detectible by mates and rivals, but not obvious to predators. This trade-off is fundamental for understanding the design of many animal signals, and is often the lens through which the evolution of alternative communication strategies is viewed. We have a reasonable working knowledge of how conspecifics detect signals under different conditions, but how predators exploit conspicuous communication of prey is complex and hard to predict. We quantified predation on 1566 robotic lizard prey that performed a conspicuous visual display, possessed a conspicuous ornament or remained cryptic. Attacks by free-ranging predators were consistent across two contrasting ecosystems and showed robotic prey that performed a conspicuous display were equally likely to be attacked as those that remained cryptic. Furthermore, predators avoided attacking robotic prey with a fixed, highly visible ornament that was novel at both locations. These data show that it is prey familiarity-not conspicuousness-that determine predation risk. These findings replicated across different predator-prey communities not only reveal how conspicuous signals might evolve in high predation environments, but could help resolve the paradox of aposematism and why some exotic species avoid predation when invading new areas.

1. Introduction

The classic expectation that standing out in the environment increases predation can be traced back to the observation that crypsis appears widespread in nature [1]. Yet many prey species are not cryptic and extravagance seems to be the norm for many animals that rely on conspicuous communication for reproduction [2]. In the latter instance, the general assumption is that social animals simply bear the cost of increased predation in order to communicate effectively with conspecifics. While there are notable cases of conspicuous behaviour and ornamentation being exploited by predators to target prey [3,4], the relationship is often not straightforward [5-7]. For instance, peacocks are iconic symbols of sexual selection [8], and their massive feather trains and loud courtship calls were thought to both attract predators and handicap escape [8,9]. Nonetheless, new evidence suggests peacock locomotion is not impeded by the train [10,11] nor are males disproportionally predated upon in the wild [12]. Communicating animals might also resolve the trade-off between effective signalling and evading predation by using 'private' signal channels that are obvious to mates and territorial rivals (but not to predators) [13,14] by reducing signalling