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Animal behaviour

Marked colour divergence in the gliding membranes of a tropical lizard mirrors population differences in the colour of falling leaves

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Populations of the Bornean gliding lizard, *Draco cornutus*, differ markedly in the colour of their gliding membranes. They also differ in local vegetation type (mangrove forest versus lowland rainforest) and consequently, the colour of falling leaves (red and brown/black in mangrove versus green, brown and black in rainforest). We show that the gliding membranes of these lizards closely match the colours of freshly fallen leaves in the local habitat as they appear to the visual system of birds (their probable predators). Furthermore, gliding membranes more closely resembled colours of local fallen leaves than standing foliage or fallen leaves in the other population's habitat. This suggests that the two populations have diverged in gliding membrane coloration to match the colours of their local falling leaves, and that mimicking falling leaves is an adaptation that functions to reduce predation by birds.

1. Introduction

Draco is the only extant genus of lizards with extensible gliding membranes (patagia), supported by elongated ribs. Patagia extend to permit glides between trees but are otherwise kept retracted at the lizard's flank [1,2]. Patagia are often strikingly coloured when extended, and vary markedly among the 42 described species. Given the apparently conspicuous and diverse coloration of patagia, an obvious hypothesis is that patagial function is associated with social communication [2]. An alternative hypothesis for the coloration of patagia in *Draco* is that it provides camouflage during gliding by resembling falling leaves (electronic supplementary material, figure S1) to reduce the probability of detection by predators. The size of *Draco* lizards, and their shape when gliding with outstretched patagia, are comparable to that of falling leaves. Birds probably constitute the greatest risk for *Draco* while gliding owing to their likely vantage points and mobility [3].

To test the hypothesis that *Draco* patagia show local adaptation to the colour of falling leaves, we compared two populations of the Bornean endemic *Draco cornutus*, which have diverged markedly in patagia coloration and occupy two different habitats. *Draco cornutus* occurs in coastal mangrove forest dominated by *Rhizophora apiculata*, which have bright red falling leaves (in contrast to the green standing foliage), similar to the red patagia of resident *D. cornutus* (electronic supplementary material, figure S2). The species also occurs in lowland forest, in which falling leaves range from black to yellowish-green, especially *Calophyllum inophyllum*, and *D. cornutus* has dark brown patagia with extended green body coloration in males. By assessing behavioural footage for several species of *Draco*, we first verified that patagia are rarely extended during display