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Deimatic anti-predator behaviour in *Uroplatus henkeli* Böhme & Ibisch, 1990 during predation by *Ithycyphus miniatus* (Schlegel, 1837) on Nosy Be, Madagascar

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Rapid disruptive patterning (RDP), also referred to as dynamic dazzle, startle colouration, flash patterning or deimatic display, is a visually intensive antipredator strategy characterised by the sudden appearance of bold, high-contrast markings (often black-and-white) triggered by acute stress or predatory threat (Drinkwater et al., 2022). Unlike camouflage or background-matching colouration, which aim to conceal an animal, this strategy actively disrupts a predator's ability to track or target the prey, or to startle the aggressor (Umbers et al., 2015). This behaviour is typically employed in high-stakes moments, such as immediately before or during an escape attempt. The ability to employ active colour change and RDP has evolved independently in multiple animal taxa (Cuthill et al., 2005; Stevens, 2007; Stuart-Fox and Moussalli, 2009) and is typically characterised by transient, neurologically controlled changes in body colouration or the sudden exposure of hidden markings. In more advanced examples (e.g., chameleons and cuttlefish), the underlying mechanisms often involve the expansion and contraction of chromatophores, particularly melanophores and iridophores, under autonomic nervous system control (Cooper and Greenberg, 1992; Hanlon, 2007; Teyssier et al., 2015).

The most sophisticated examples of RDP are found in cephalopods such as cuttlefish and squid. These behaviours are particularly well-studied in species like *Sepia officinalis* and *Loligo pealeii*, which can generate flickering, high-contrast body patterns within milliseconds during escape responses, contributing to predator confusion or delayed attack (Hanlon, 2007; Kelman et al., 2007; Barbosa et al., 2008; Langridge, 2009). Similarly, albeit to a less advanced degree, several insects employ forms of rapid pattern change or sudden visual displays that appear to fulfil analogous defensive functions. *Catocala* moths, for example, exhibit cryptic forewings that conceal vividly coloured hindwings, which are suddenly flashed to startle potential predators (Stevens, 2007). In terrestrial vertebrates, however, this phenomenon remains far less understood. Some frogs may reveal bright ventral surfaces or contrasting limb patterns during escape jumps (e.g., *Leptodactylus* and *Scaphiopus* species; Toledo and Haddad, 2009; Pedroso-Santos et al., 2022) and some *Uroplatus* gecko species (e.g., *U. fimbriatus*, *U. henkeli*, *U. sikorae*) can demonstrate impressive gape displays when threatened, exposing a brightly coloured oral cavity as part of their startle display (Gehring, 2020). Whilst chameleons (e.g., *Furcifer pardalis*) provide a well-known example of active colour-change ability in Madagascar, the principal function appears to be social (e.g., for courtship and intraspecific communication) (Stuart-Fox and Moussalli, 2009; Teyssier et al., 2015).

Among reptiles, the genus *Uroplatus* (leaf-tailed geckos) presents a particularly intriguing case. These geckos possess extraordinary camouflage ability, often blending seamlessly with bark and lichen (Glaw and Vences, 2007; Gehring, 2020). Field observations further suggest that when physically disturbed or attacked, some species can undergo a rapid transformation, shifting from cryptic colouration to bold, high-contrast black-and-white blotched or barred patterns. Despite its potential adaptive significance, this phenomenon remains virtually undocumented in the primary literature.

In this note, I report on a case of predation involving the snake *Ithycyphus miniatus* (Schlegel, 1837) and *Uroplatus henkeli* Böhme & Ibisch, 1990. During the predation event, the gecko exhibited a rapid change

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in colouration to a stark black-and-white pattern immediately prior to death (Fig. 1). I suggest that this response may represent an overlooked form of antipredator defence in geckos, analogous to dynamic dazzle displays in cephalopods and flash colouration in amphibians and insects. I discuss the possible functional implications of this behaviour and highlight the need for further study of rapid pattern modulation in reptiles.

The observation took place at 09:20 h on 29 October 2012, on the southeastern peninsula of Nosy Be and within the boundaries of Lokobe National Park (13.4122°S, 48.3353°E) on Nosy Be, an island off the northwest coast of Madagascar. Lokobe is a protected area covering approximately 740–840 hectares of lowland humid evergreen forest and represents the last significant remnant of primary forest on Nosy Be (Goodman et al., 2023). The park is characterised by dense, closed-canopy vegetation with a rich diversity of endemic flora and fauna, including several species of lemurs, amphibians, reptiles, and invertebrates. It harbours a high level of micro-endemism and is known for its exceptionally cryptic herpetofauna (Andreone et al., 2003; Hyde Roberts and Daly, 2014). Both *U. henkeli* and *I. miniatus* are restricted to ranges in northern and western Madagascar and show a significant overlap in distribution (Glaw and Vences, 2007). Whilst *U. henkeli* is strictly arboreal and nocturnal, *I. miniatus* is considered semi-arboreal and crepuscular to nocturnal. Based on the time of day and the gecko's known nocturnal behaviour, it is highly likely that the snake was able to locate its prey while the gecko was asleep, camouflaged against a tree trunk. At the time of the observation, both animals were already on the forest floor, and the gecko was still alive and showing a dark colouration. The snake had coiled

Figure 1. *Uroplatus henkeli* displays a deimatic anti-predator behaviour in a failed attempt to evade predation by *Ithycyphus miniatus*. Photo by Sam Hyde Roberts.

around the gecko's midsection. Just moments prior to succumbing to the constriction, the gecko initiated an extraordinary deimatic display: its body rapidly shifted to a stark black-and-white colouration, producing a high-contrast pattern likely aimed at startling or confusing the predator in a final attempt to escape. Despite this dramatic display, the behaviour was unsuccessful. The entire encounter lasted approximately two minutes, after which the snake consumed the gecko.

While detailed dietary studies on *I. miniatus* are limited, species belonging to the genus are considered generalist predators, consuming a wide range of prey items including frogs, chameleons, rodents, and even small primates (*Microcebus* spp.) (Brygoo, 1982; Glaw and Vences, 2007; Hyde Roberts, pers. obs., 2025). The snake's ability to subdue relatively large and agile prey using constriction and mild venom has been observed on multiple occasions by the author in the field. The present observation suggests that sleeping or otherwise inactive arboreal prey may be especially vulnerable to predation during daylight hours, when they are exposed and less responsive. The failed deimatic display exhibited by *U. henkeli* shortly before its death highlights the selective pressure exerted by visually oriented predators and adds a novel dimension to our understanding of predator–prey dynamics in Madagascar's humid forests.

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