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First photographic evidence of oceanic swimming behaviour in littoral Snake-eyed Skinks, genus *Cryptoblepharus*, in the Western Indian Ocean

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As the scincid genus with the widest global distribution, *Cryptoblepharus* is often studied for its dispersal abilities (Rocha et al., 2006; Hayashi et al., 2017; Blom et al., 2019). These skinks have successfully colonized many islands and archipelagos across the Indian and Pacific Oceans from their ancestral Indo-Australian range. The long voyage from Indo-Australia to their Western Indian Ocean (WIO) localities was most likely realized via long-distance transoceanic dispersal and is not a result of vicariance (Rocha et al., 2006; Horner, 2007).

The Indo-Australian cluster contains both arboreal and saxicoline *Cryptoblepharus* species. The species in the WIO, however, predominantly inhabit the tidal zones along the coasts of many islands throughout the region (Rocha et al., 2006; Hayashi et al., 2009). Blom et al. (2019) revealed an intimate relationship between the ability to engage in long-distance dispersal and the adaptations to the littoral habitats within this genus. Numerous attributes render these skinks particularly well-suited for oceanic dispersal, including but not limited to tolerance to habitats devoid of freshwater, low metabolic demands, and their distribution along marine coasts (Greer, 1989). These abilities are demonstrated by repeated aquatic dispersal, documented to have occurred from a number of distinct geographic regions (Rocha et al., 2006; Hayashi et al., 2009). Nevertheless, the ability of these lizards to float or swim and disperse without the dependency on natural rafts and thus, the potential of unassisted passive transmarine dispersal, has largely been unexplored in a scientific context.

Reports on aquatic behaviour in *Cryptoblepharus* are scarce. Intentional interaction with water in the form of swimming as a means of escape was only documented by Horner (1984) as an atypical behaviour in the Australian species *C. litoralis* (Mertens, 1958). It was interpreted as atypical, as it would leave them exposed to aquatic predators. Analogous behaviours in the species of the WIO cluster have not been reported to date. One of the few studies dedicated to the behavioural ecology of *Cryptoblepharus* reported a strong avoidance of water in the Malagasy species *C. cognatus* (Boettger, 1881). They were long assumed to be purely terrestrial reptiles, which circumvent contact with water, rain, or even wet surfaces (Fricke, 1970).

On 26 June 2024 at 10:00 h, we were observing *C. ater* (Boettger, 1913) in their typical coastal habitat of exposed volcanic cliffs along Plage de Heroumbili on Grande Comore, the largest island in the Comoros (11.5434°S, 43.4045°E). The setting of the encounter was a sunny morning with a clear sky at low tide, leaving tidal pools along the rocky shoreline and allowing most of the cliffs to be accessible by the skinks. As we were photographing an individual of *C. ater* resting on an isolated protruding rock, we observed it voluntarily choosing to escape the disturbance through a waterbody despite accessible terrestrial escape routes. The lizard swam approximately 1.5 m until it reached another rock.

Further experiments on the following days along the east coast of Grand Comore consisted of placing

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specimens in a waterbody to better understand their swimming abilities. All specimens successfully traversed the waterbodies they were placed into. Their swimming technique is rapid and appears highly efficient: the body is half-immersed, with the head kept above water while the legs are retracted parallel to the longitudinal axis of the body, allowing for a body movement resembling sinusoidal waves that propels them forward on the water surface (Fig. 1A). We observed the skinks exhibiting this swimming behaviour aimed towards rocks at a distance of multiple metres from us. If those rocks were not accessible or the animals were potentially exhausted, they displayed the ability to float seemingly without effort on the water surface tension, retaining a still body position for an extended period. In this passive floating position, the legs were extended and the relaxed tail placed in a neutral position, keeping the head above water (Fig. 1B). The mechanisms facilitating such effortless floating demand further investigation.

Similar opportunistic swimming behaviour in terrestrial skinks has been described from *Chalcides chalcides* and *Riopa albopunctata* in freshwater bodies. Hence, opportunistic swimming behaviour could occur more widely among skinks than previously assumed (Di Nicola et al., 2021; Sajib et al., 2023). Reports of swimming behaviour of skinks in saline waterbodies is largely unknown outside the genus *Cryptoblepharus*. Only *Emoia atrocostata* (Lesson, 1830) was reported to be present in saltwater by Neill (1958). The ability of *Cryptoblepharus* skinks to float and swim, in association with their complex transoceanic dispersal history, could yield interesting implications for their dispersal biology. For example, mapping the directionality of past short-distance dispersal routes along oceanic currents could provide insight into the main drivers of their dispersal, as has been demonstrated with the neotropical iguanid genus *Anolis* (Calsbeek and Smith, 2003). Evaluating the intensity and frequency of gene flow between island populations of a region, as Hayashi et al. (2009) demonstrated, might help answer questions about the mode of passive transmarine dispersal in their evolutionary history. This could challenge currently accepted hypotheses on reptile dispersal such as the dependence on floating structures (e.g., Censky et al., 1998) and would align with the hypotheses of Schoener and Schoener (1984), who deemed floating without the aid of rafts as more probable than previously assumed. While we are cautious to not overestimate the aquatic portion of their behavioural and physiological capabilities, extensively documenting this swimming behaviour for the first time in *Cryptoblepharus* skinks unlocks the possibility for further natural history patterns that should be explored and critically compared. These new observations have the potential to change biological ideas about the prevalent dispersal within the *Cryptoblepharus* skinks, particularly between neighbouring islands (Hayashi et al., 2009).

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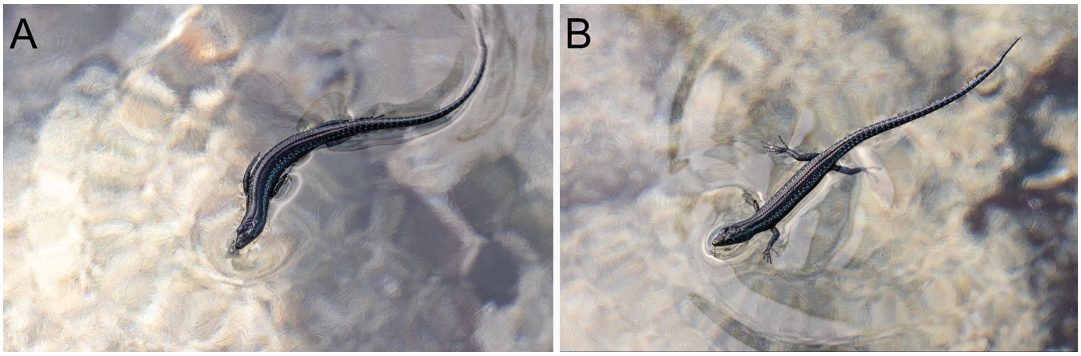

Figure 1. Photographic evidence of aquatic escape behaviour in *Cryptoblepharus ater* on Grande Comore. (A) Swift swimming technique using sinusoidal body movement. (B) Passive floating position with relaxed limbs and tail. Photos by Tim L. Heller.

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