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Predation of an Adult Malaysian Water monitor *Varanus salvator macromaculatus* by an Estuarine Crocodile *Crocodylus porosus*

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Abstract - There are few published accounts which document predation of large adult monitor lizards. Here, we describe an observed case of predation on an adult Malaysian water monitor *Varanus salvator macromaculatus* by an estuarine crocodile *Crocodylus porosus* in Singapore. Estuarine crocodiles may represent the only significant predators of adult water monitors in coastal mangrove environments throughout their range.

Introduction

Widely distributed throughout Southern and Southeast Asia and the Indo-pacific, Asian water monitors belonging to the *Varanus salvator* species complex are large lizards, reaching total lengths (TL) of up to 3.2 m (Randow, 1932), but usually ranging between 1.4 and 2.3 m as adults (Gaulke & Horn, 2004; Horn & Gaulke, 2004). Some natural predators of *V. salvator* have been identified (e.g., Twedie, 1954; De Lisle, 2008), but very few have specifically documented predation on larger adult individuals (Goldthorpe *et al*., 2010; Siler *et al*., 2011). In this brief communication, we describe a case of predation on an adult *V. salvator macromaculatus* by a saltwater crocodile, *Crocodylus porosus* observed at Sungei Buloh Wetland Reserve, Singapore.

Study Site

Sungei Buloh Wetland Reserve is a 130 hectare coastal reserve located in northwestern Singapore. The reserve is largely dominated by mangroves and mudflats formed by the bunds of former prawn ponds, with a rear fringe of freshwater ponds and marshes. Public pathways provide direct access to some of these areas for wildlife viewing and photography.

Apart from serving as a vital stopover point for migratory birds along the East Asian-Australasian flyway, the reserve is a refuge for many locally threatened species such as smooth coated otters, shore pit vipers, and mud lobsters. Since at least 2005 (M.N., pers. obs.), estuarine crocodiles, *C. porosus*, have been regularly spotted in Sungei Buloh Besar- the main waterway running through the reserve which empties into the Straits of Johor, particularly during rising tides. It is unclear, though, whether these animals originate from swamps across the straits or are escapees from nearby crocodile farms.

A large and conspicuous population of *V. salvator macromaculatus* is present at Sungei Buloh Wetland Reserve (e.g., Rashid, 2004; Rashid & Diong, 1999; Kiat, 2007). Despite heavy human foot traffic, monitors are frequently observed in the reserve's mangroves and waterways including Sungei Buloh Besar, along pathways, and around the reserve's visitor's center.

Fig. 1. Sub-adult *Varanus salvator macromaculatus* basking alongside a pathway at Sungei Buloh Wetlands Reserve. Photograph by **Robert W. Mendyk.**

Fig. 2. Juvenile *V. salvator macromaculatus* in a tree hollow at Sungei Buloh Wetlands Reserve. Photograph by **Robert W. Mendyk**

Specimens of all size classes can usually be seen during a single day's visit, with sub-adults and adults reaching 2-2.5 m in total length (TL) usually basking and foraging in open areas and waterways (Fig. 1), and hatchlings and juveniles seeking refuge in, and peering out from tree hollows and crevices (Fig. 2).

Observations

While visiting the reserve for general nature photography, a predation event involving an estuarine crocodile and a water monitor was observed by the senior author and several companions on 15 January 2011 (Fig. 3). A commotion was heard in the water below the pedestrian bridge that spans Sungei Buloh Besar around 1220 h, which turned out to be a *C. porosus* (ca. 2.8-3 m TL) with a *V. salvator macromaculatus* (ca. 1.2- 1.5 m TL) in its jaws, located about 2 m from the riverbank. The initial attack was not witnessed, but it is likely that the crocodile had seized the lizard as the latter foraged close to the shore or in the water.

The crocodile had the upper torso of the monitor seized in its jaws, while it futilely attempted to lash its tail against the crocodile and use its rear limbs to free itself. For the next 10-15 min, the crocodile did not move much, apart from submerging itself every other minute, while the lizard struggled to keep its head above water. After submerging and then disappearing from sight, it resurfaced about 20-25 m upstream from the bridge. Here, it began to process its catch, raising its head and using its jaws to manoeuvre the lizard until it had a grip on its lower torso. At this point the lizard was still very much alive, though it had stopped struggling much and severe wounds and exposed viscera could be seen whenever it was lifted in the air. The crocodile then began to violently thrash the lizard by raising its head and upper body in the air before twisting around rapidly. It repeated this motion every few minutes until it had the lizard's head in its grip and there was no visible fight left in it. When a second, smaller crocodile surfaced nearby, the larger animal submerged itself and was not seen again. Consumption of the lizard was not observed. Total observation time was ca. 45 min.

Discussion

Water monitors of the *V. salvator* species complex and estuarine crocodiles co-occur in many coastal areas of Southeast Asia and the Indo-pacific. Considering that *C. porosus* is an opportunistic predator capable of taking large prey, it is not surprising that *V. salvator*, including adult individuals, fall victim to crocodiles in coastal environments. Although reticulated pythons, *Python reticulatus* (De Lisle, 2007), king cobras, *Ophiophagus hannah* (Siler *et al*., 2011), and smooth coated otters, *Lutrogale perspicillata* (Goldthorpe *et al*., 2010) are

Fig. 3. Estuarine crocodile (*Crocodylus porosus*) predation on an adult *Varanus salvator macromaculatus* in Sungei Buloh Wetlands Reserve, Singapore. Photographs by **Marcus Ng**.

known to prey on adult water monitors, *C. porosus* may represent the only significant predator aside from humans that is capable of taking adult *V. salvator* in coastal mangrove environments, and may therefore play a significant role in limiting their population sizes in these areas.

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