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Preliminary data on saltwater crocodiles, *Crocodylus porosus* Schneider, 1801, and an updated assessment of threats in the Nilwala River, Matara, Sri Lanka

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Sri Lanka is home to two species of crocodilians, the mugger crocodile (*Crocodylus palustris*) and saltwater crocodile (*C. porosus*), both of which are of conservation concern. Although saltwater crocodiles are not threatened globally, Sri Lanka's Ministry of Environment considers them as endangered nationally (MOER, 2012). Santiapillai and de Silva (2001) reported saltwater crocodiles across Sri Lanka's coastal regions, with the majority of assemblages found along the southern and southwestern coastline. Among the most well-known of these assemblages is that which occupies the Nilwala River in the Matara District, an area which has received an abundance of media attention due to its relatively high frequency of negative human-crocodile interactions (Samarasinghe, 2014). Following numerous historical accounts of crocodiles in the area, de Silva (2008) and Amarasinghe et al. (2015) conducted systematic surveys of the Nilwala River's saltwater crocodiles. Besides the Bolgoda River and Lake, Amarasinghe et al. (2015) observed more crocodiles in the Nilwala River Basin than any other location in southwestern Sri Lanka. Since then, researchers have made several recommendations to mitigate negative human-crocodile interactions in the Nilwala River, based on survey responses from local households (Samarasinghe, 2014; Uluwaduge et al., 2018). However, there have been no updates about the river's saltwater crocodile demographics for over a decade. Here, we provide preliminary data on saltwater crocodile occurrences in the Nilwala River and briefly report on the status of previously addressed threats (Samarasinghe, 2014; Uluwaduge et al., 2018).

On 6 March 2025, we unsystematically surveyed crocodiles by boat, along 6.7 km of the Nilwala River. We began at the river mouth and surveyed upstream, between the hours of 09:00–12:00 h (similar to daytime surveys conducted by de Silva, 2008). When a crocodile was observed, we estimated its total length, using estimated head length as an indicator (assuming a total length of about seven times the head length; Fukuda et al., 2013), and used a handheld GPS device to record the coordinates (GPSMAP 65s, Garman, Olathe, Kansas, USA). To compare our observations to de Silva (2008), we organised our observations into one of three size categories: small (< 2 m), medium (2–3 m), and large (> 3 m). To supplement our data, we downloaded research-grade observations of *C. porosus* from iNaturalist (www.inaturalist.org) on 10 March 2025, filtering for records from 2013 onwards. To visualise the distribution of observations, we plotted each coordinate in Arc GIS Pro (ERSI, 2025).

In total, we observed four small, two medium, and three large crocodiles, with an overall encounter rate of 1.34 crocodiles per km (Fig. 1). Additionally, iNaturalist provided 14 observations within the same 6.7 km stretch of river. However, there may be overlap among individuals recorded in independent iNaturalist observations. Similarly, some individuals may have been recorded both by iNaturalist users and during our survey. During our survey, we observed that many of the previously identified threats—to both humans and crocodiles—remain, including development of the riverbanks, garbage pollution, and occupational reliance on the river.

Approximately 45% of our observations consisted of small crocodiles, with 22% and 33% being medium and large, respectively (we did not observe any neonates). Our results were similar to Amarasinghe et al. (2015), who found that approximately 39% of their Nilwala River Basin crocodile observations were of hatchlings

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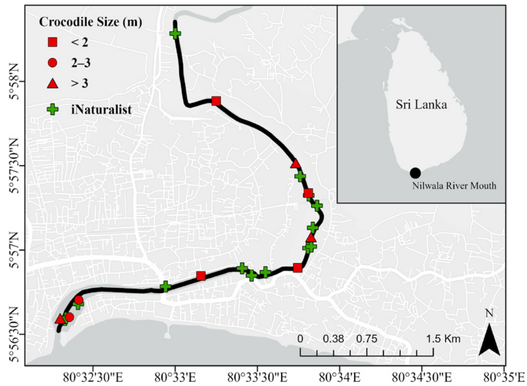

Figure 1. Observations of *Crocodylus porosus* in the Nilwala River, Matara, Sri Lanka (from the river mouth to 6.7 km upstream). The red squares, circles, and triangles represent the size (small, medium, and large, respectively) and locations of observations recorded during an unsystematic boat survey between the hours of 09:00 am and 12:00 pm on 6 March 2025. Green crosses show the locations of research-grade iNaturalist observations recorded since 2013. The black line shows the 6.7 km section of river surveyed.

and juveniles, while 22% and 39% were of sub-adults and adults, respectively. These relatively high proportions of small crocodiles contrast with de Silva (2008), where small crocodiles made up 12% of the observations and large crocodiles 76%. These discrepancies suggest that closer inspection of the Nilwala River's crocodile demographics is needed. Increases in the frequency of small crocodile observations could be caused by increased breeding activity, increased survivorship of neonates, increased mortality of large individuals (e.g., from increased killings of crocodiles), or spatial preferences of crocodiles (e.g., if larger crocodiles migrate to sea). Although reports on saltwater crocodile encounter rates (provided as crocodiles per unit area) remain limited in Sri Lanka, our findings were similar to those reported by Porej (2004), who found an average crocodile encounter rate of 0.94 crocodiles per km in Muthurajawela Marsh, Sri Lanka.

Researchers have recommended the installation of crocodile exclusion enclosures (CEEs) in the area to prevent crocodile attacks (de Silva, 2008; Samarasinghe, 2014; Uluwaduge et al., 2018). While de Silva (2008) reported 70 total CEEs (abandoned and in use), we did not observe any within the 6.7 km of river that we surveyed. We did, however, observe many crocodile exclusion fences (CEFs) along the river (Fig. 2). While CEFs are effective at preventing crocodiles from accessing community member's properties and attacking pets, care should be taken to provide the crocodiles with adequate space to access the bank for basking (de Silva, 2008). Despite this, many of the CEFs we observed were built directly along the water's edge. Similarly, urban development was prevalent along the survey area's bank, drastically reducing the amount of habitat available to crocodiles. We also observed large amounts of garbage in the river and several dead fish floating nearby areas of wastewater runoff, suggesting pollution may also be threatening one of the crocodiles' primary food sources. Despite a lack of support from many community members (Samarasinghe, 2014; Uluwaduge et al., 2018), locally operated crocodile tours now provide environmental tourism opportunities (Fig. 2). These efforts could provide some economic incentive to limit riverine development and pollution, protecting crocodile habitat. Additionally, tour operators are likely familiar with the demographics and distribution of crocodiles in their patrol areas. Incorporating their local knowledge, along with that of fisherfolk and others whose livelihoods depend on the river, could help inform the development of research and conservation priorities, while promoting the inclusion of those most affected by the crocodiles.

Overall, our data demonstrates the need for rigorous research on the Nilwala River's crocodile demographics, habitat preferences (e.g., preferred nesting, basking, and foraging areas), and spatial distribution. Similarly, researchers should focus on studying the river's pollutants and how they may affect the river's trophic dynamics, along with the potential impacts of environmental tourism efforts. A comprehensive view of these topics will be necessary to adequately inform negative human-crocodile interaction mitigation strategies in a manner that will benefit both humans and crocodiles.

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Figure 2. Observations made during an unsystematic boat survey in the Nilwala River (from the river mouth through 6.7 km upstream) on 6 March 2025. The images show: (A) a crocodile swimming near the bank, (B) ongoing human development along the bank (altered to hide the faces of the builders), (C) public advertisement for a crocodile watching tour, (D) a crocodile exclusion fence built along the bank, (E) a dead fish (*Oreochromis* sp.) floating in the river, and (F) sand bags places to prevent coastal erosion. Photos by T.L. Proctor and P. Rathnasiri.

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