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Fisherman's trash, cobra's treasure: first evidence of scavenging by a Brown Forest Cobra, *Naja subfulva* Laurent, 1955, in Mozambique

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Scavenging behaviour in snakes is considered rare, largely due to observational limitations and the cryptic nature of many species (Sazima and Strüssmann, 1990; Greene, 1997; Lillywhite, 2014). Although necrophagy has been documented across many lineages (Table 1), records for elapid species remain scarce and are often treated as anecdotal (Sazima and Strüssmann, 1990; Devault and Krochmal, 2002). However, the extent to which large elapid snakes exploit carrion, particularly in tropical ecosystems where observational constraints are greatest, remains poorly understood.

Reports of scavenging in snakes span multiple zoogeographical regions and include a wide range of prey types, such as fish, amphibians, birds, mammals, and other reptiles (e.g., Lillywhite et al., 2002; Marques et al., 2017; Smith and Rojas, 2023). In Australasia, a snake was observed consuming reptile carcasses (Trembath et al., 2007), while in the Nearctic and Neotropics, terrestrial, aquatic, and semi-aquatic species have been observed to consume dead prey, such as fish (e.g., Lillywhite et al., 2002), amphibians (e.g., Smith and Rojas, 2023), birds (e.g., Ucha and dos Santos, 2017), mammals (e.g., Patten and Banta, 1980), and other snakes (e.g., Marques et al., 2017). Similar observations have also been reported in the Oriental and Palearctic Regions, involving the consumption of lizard, fish, bird, amphibian, and snake carcasses by snakes associated with aquatic or terrestrial habitats (Pandirkar et al., 2015; Ventura, 2012; Ayres, 2012; Patel et al., 2018; Wewhare and Pandey, 2021).

In the Ethiopian zoogeographical region, scavenging occurs across multiple snake genera and involves a remarkably broad spectrum of prey, including amphibians, lizards, snakes, birds, mammals, and invertebrates (Rose, 1929, 1954; Yeadon, 1997; Loehr, 2005; Phelps, 2006; Maritz and Maritz, 2020), highlighting that this behaviour is more widespread and ecologically diverse in Africa than previously recognised. Evidence of scavenging behaviour in snakes by other authors has been obtained using several methodological approaches, including direct field observations (e.g., Otto and Miller, 2004; Gomes et al., 2017; Oliveira et al., 2022, 2023; Smith and Rojas, 2023), observations in captivity (Gillingham and Baker, 1981; Shivik and Clark, 1997), stomach-content analyses (Capula et al., 1997), and experimental trials involving the provision of carrion (Sazima and Strüssmann, 1990; Marques and Sazima, 1997).

The Brown Forest Cobra (*Naja subfulva*), a member of the *Naja melanoleuca* complex, is a large-bodied, semi-aquatic snake widely distributed across the Ethiopian biogeographic region of central, eastern, and southern Africa, occurring primarily in closed-canopy coastal and lowland forests (Wüster et al., 2018; Marais, 2022). It is considered a dietary generalist, feeding on mammals, birds, amphibians, fish, and reptiles, including other snakes such as Puff Adders (*Bitis arietans*) and Eastern Green Mamba (*Dendroaspis angusticeps*) (Maritz and Maritz, 2020; Marais, 2022), although many aspects of its natural history remain poorly understood. Here, we report the first confirmed case of scavenging behaviour in *Naja subfulva* from the Zambezi Delta, Mozambique.

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Table 1. Historical records of scavenging behaviour in snakes across different zoogeographical regions. Columns list the zoogeographical region (Region), the types of areas where snakes can be found (Habitat), the prey species (Prey) and type of animal (Prey Type) consumed by scavenging, and the source of the information (Source). Prey type abbreviations include A (amphibians), B (birds), F (fish), I (invertebrates), L (lizards), M (mammals), and S (snakes).

Region	Snake Species	Habitat	Prey	Prey Type	Source
Australasian	*Antaresia childreni*	Terrestrial, semi-arboreal	*Lophognathus gilberti*	L	Trembath et al., 2007
Ethiopian	*Aparallactus guentheri*	Terrestrial and semi-fossorial	Unidentified centipede	I	Maritz and Maritz, 2020
	Bitis arietans	Terrestrial	*Suricata suricatta*, unidentified Muridae	M	Maritz and Maritz, 2020
	Bitis cornuta	Terrestrial	*Meroles suborbitalis*	L	Maritz and Maritz, 2020
	Dispholidus typus	Arboreal	*Chamaeleo dilepis*	L	Maritz and Maritz, 2020
			Dispholidus typus	S	Rose, 1929
	Duberria lutrix	Terrestrial	*Cornu aspersum*	I	Maritz and Maritz, 2020
	Macrelaps microlepidotus	Terrestrial and semi-fossorial	*Amblysomus hottentotus*	M	Yeadon, 1997
	Naja mossambica	Terrestrial and semi-arboreal	*Psammophis mossambicus*, *Phrynomantis bifasciatus*	A, S	Maritz and Maritz, 2020
			Paraxerus cepapi, unidentified frog, lizard, and snake	A, L, S, M	Maritz and Maritz, 2020
	Naja nigricollis	Terrestrial and semi-arboreal	*Psammophis leightoni* (as *P. trinasalis*)	S	Loehr, 2005
	Naja nivea	Terrestrial and semi-arboreal	*Psammophylax rhombeatus*, *Psammophis notostictus*	S	Phelps, 2006
			Bitis arietans	S	Rose, 1954
	Naja subfulva	Semi-aquatic	*Clarias gariepinus*	F	This study
	Psammophis mossambicus	Terrestrial and semi-arboreal	Unidentified snake	S	Maritz and Maritz, 2020
Nearctic	*Agkistrodon piscivorus*	Semi-aquatic	Unidentified fish	F	Lillywhite et al., 2002
	Crotalus ruber	Terrestrial	Unidentified rodent	M	Patten & Banta, 1980
Neotropical	*Boiruna sertaneja*	Terrestrial	*Columbina picui*	B	Sales et al., 2019
	Bothrops atrox	Terrestrial	*Plica plica*	L	Oliveira et al., 2022
	Bothrops jararaca	Semi-arboreal	*Mus musculus*	M	Sazima and Strüssmann, 1990
	Erythrolamprus miliaris	Semi-aquatic	*Rhinella diptycha*, *Boana albomarginata*	A	Sazima and Strüssmann, 1990
			Scinax sp.	A	Gomes et al., 2017
	Erythrolamprus poecilogyrus	Terrestrial	*Leptodactylus* sp.	A	Smith and Rojas (2023)
	Helicops modestus	Aquatic	*Geophagus brasiliensis*, *Astyanax scabripinnis*	F	Sazima and Strüssmann, 1990
	Hydrodynastes gigas	Aquatic and semi-aquatic	*Rhinella diptycha*, *Boana albomarginata*	A	Sazima and Strüssmann, 1990
	Leptodeira ashmeadii	Semi-arboreal	Unidentified hylid frog	A	Oliveira et al., (2023)
	Leptodeira annulata	Semi-arboreal and semi-aquatic	Unidentified frog	A	Mora-Benavides (1999)
	Micrurus corallinus	Terrestrial	*Leposternon microcephalum*	L	Marques and Sazima, 1997
	Micrurus frontalis	Terrestrial	*Bothrops jararaca*	S	Marques et al., (2017)
	Philodryas patagoniensis	Terrestrial	*Furnarius rufus*	B	Ucha and dos Santos (2017)
Oriental	*Fowlea piscator*	Aquatic	*Hylarana bahuvistara*	A	Wewhare and Pandey (2021)
	Naja naja	Terrestrial	*Daboia russellii*	S	Patel et al., (2018)
	Oligodon arnensis	Terrestrial	*Calotes versicolor*	L	Pandirkar et al., (2015)
Palearctic	*Malpolon monspessulanus*	Terrestrial	*Sturnus unicolor*	B	Ventura (2012)
	Natrix maura	Aquatic	*Lissotriton boscai*	A	Ayres (2012)
	Natrix natrix	Aquatic	*Lissotriton boscai*	A	Ayres (2012)
	Vipera berus	Terrestrial	Unidentified vole	M	Boulenger, 1913

In addition to documenting a rare feeding behaviour, we discuss how anthropogenic food subsidies may create predictable foraging opportunities and reveal previously unrecognized trophic plasticity in large tropical elapids.

On the morning of 21 November 2025 between 09:00 and 11:00 h we observed an adult *N. subfulva* (~155 cm total length) along the edge of a small river in the floodplain of Coutada 11, within the Zambezi Delta of southern Mozambique, a Ramsar wetland site (18.6600°S, 35.6820°E; elevation 33 m). Ambient air temperature at the time of the observation was near 30°C. The snake approached the river's edge, submerged for approximately 1 min, and resurfaced holding the head of an African Sharptooth Catfish (*Clarias gariepinus*) in its mouth (Fig. 1).

Taxonomic identification of the prey was based on diagnostic external features, including the dark dorsal coloration of the head and the presence of barbels. It is consistent with the remains of fish that are normally discarded at local fishing sites (ARM, pers. obs). The snake was identified to species based on characteristic colour patterns and its general demeanour. Its brown dorsal colouration gradually darkened toward the tail, with some darker blotches on lighter portions of the body. Lateral and ventral regions of the head were distinctly pale cream-coloured, while the labial scales exhibited dark margins. The event was recorded on video (linked here) from a distance of ca. 7 m. The snake subsequently moved into the dense riverside vegetation, and our observation ended.

Figure 1. *Naja subfulva* retrieving and carrying the head of an African Sharptooth Catfish (*Clarias gariepinus*) in Coutada 11, a Ramsar Wetland Site in the Zambezi Delta, Mozambique. (A) The snake emerges from the water. (B) Carrying the fish head, the snakes moves up the bank of the channel into woody debris. (C) The snake approaches an area near the top of the channel bank and (D) pauses in a head-down posture. The barbels of the catfish are visible in this frame. It appears as if the snake is resting its catch on the wood below its head. Photos taken from a video courtesy of Zambeze Delta Conservation.

Our observation is consistent with scavenging behaviour, given that the snake briefly submerged and retrieved only the head of the catfish. During subsistence fishing practices, fish are commonly processed at the capture site, eliminating the need to clean preparation areas within temporary camps. Consequently, discarded remains may become an important nutrient source for aquatic scavengers, including catfish (e.g., Yogi et al., 2024).

Anthropogenic food subsidies are increasingly recognised as important drivers of ecological and behavioural change in wildlife populations. Human activities such as waste disposal, fish processing, agriculture, livestock farming, hunting, commercial trade, invasive and translocated species becoming prey for native predators, and road traffic generate abundant carrion resources capable of altering trophic interactions, habitat use, movement patterns, and foraging strategies across multiple vertebrate taxa (Marzluff and Neatherlin, 2006; Margalida et al., 2010; Tablado et al., 2010; Oro et al., 2013; Moreno-Opo and Margalida, 2019). Similar effects have been documented in birds, mammals, fishes, and reptiles, where human-derived carrion and organic waste promote aggregation around predictable food sources, increased tolerance to disturbed habitats, and shifts in predator-prey dynamics. In some cases, these subsidies may also create ecological traps by increasing exposure to anthropogenic sources of mortality (Oro et al., 2013; Moreno-Opo and Margalida, 2019).

In reptiles, scavenging associated with anthropogenic resources has been documented in several snake species, particularly involving road-killed prey (e.g., Gillingham and Baker, 1981; Patten and Banta, 1980; Trembath et al., 2007; Platt and Rainwater, 2011; Ucha and dos Santos, 2017; Patel et al., 2018; Maritz and Maritz, 2020). Roads may simultaneously function as carrion sources and mortality hotspots, attracting scavengers to areas with elevated collision risk (Bhupathy et al., 2011). Our observation fits within this broader context, suggesting that discarded fish remains generated by human activities may provide exploitable feeding opportunities even for snake species not typically regarded as necrophagous.

Given the circumstances of our encounter, including the snake's one-minute dive followed by its emergence with only the catfish head, it is highly unlikely that the individual captured a live or moribund fish and consumed only the anterior portion, or that it removed the head from prey previously killed by another predator. Instead, the clean separation of the head is more consistent with human fish processing using a knife or hatchet. Chemical cues released during tissue decomposition likely facilitated prey detection (Devault and Krochmal, 2002).

Although records of carrion consumption in snakes remain relatively uncommon under natural conditions, increasing reports in recent years (e.g., Gomes et al., 2017; Marques et al., 2017; Ucha and dos Santos, 2017; Sales et al., 2019; Oliveira et al., 2022, 2023; Smith and Rojas, 2023) suggest that opportunistic scavenging may be more widespread than previously recognised. Carrion consumption may also represent an energetically advantageous strategy because prey offers no resistance and may occur predictably in specific microhabitats (Sazima and Strüssmann, 1990; Bhupathy et al., 2011).

In this context, our observation represents the first documented case of necrophagy for *N. subfulva*, one of ten such records in the genus *Naja* (Table 1). Previous reports include scavenging behaviour of *N. nivea* in South Africa (Phelps, 2006), road-scavenging of *N. naja* in India (Patel et al., 2018), and several instances of *N. mossambica* documented in social media posts (Maritz and Maritz, 2020). Although carrion consumption has been documented in relatively few snake species, current evidence suggests that necrophagy occurs opportunistically across multiple snake lineages, including taxa not typically associated with scavenging behaviour. Our record therefore expands current knowledge of the feeding ecology of *Naja* species and suggests possible trophic flexibility within the *N. melanoleuca* complex. More broadly, this study highlights the value of opportunistic field observations for improving our understanding of snake feeding ecology in human-modified environments.

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