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Consumption of a maned sloth (*Bradypus torquatus* Illiger, 1811) by a tiger shark (*Galeocerdo cuvier* Péron & LeSueur, 1822) in southeastern Brazil

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ABSTRACT

We present the first record of maned sloth (*Bradypus torquatus*) consumption by the tiger shark (*Galeocerdo cuvier*). Our record is based on the analysis of stomach contents of a tiger shark captured off the coast of Rio de Janeiro state, southeastern Brazil. Although it is not possible to distinguish between a predation and scavenging event, we consider it likely that the sloth was consumed while dispersing between the islands of the region. We also comment on the heretofore unforeseen risks of aquatic dispersal by xenartrans.

Key words: aquatic dispersal, diet, Pilosa, threatened.

RESUMO – Consumo de uma preguiça-de-coleira (*Bradypus torquatus* Illiger, 1811) por um tubarão-tigre (*Galeocerdo cuvier* Péron & Lesueur, 1822) no Sudeste do Brasil.

Apresentamos o primeiro registro de consumo da preguiça-de-coleira (*Bradypus torquatus*) pelo tubarão-tigre (*Galeocerdo cuvier*). Nosso registro é baseado na análise de conteúdo estomacal de um tubarão-tigre capturado na costa do estado do Rio de Janeiro, sudeste brasileiro. Embora não seja possível diferenciar entre um evento de predação e um de necrofagia, consideramos plausível que a preguiça tenha sido predada enquanto dispersava entre as ilhas da região. Também comentamos sobre os riscos até então não previsíveis da dispersão aquática dos xenartros.

Palavras-chave: ameaçada, dieta, dispersão aquática, Pilosa.

Sloths are strictly arboreal mammals from the order Pilosa (superorder Xenarthra), along with the anteaters (Gibb et al. 2016). The six species of sloths are classified in two families: Megalonychidae (two-toed sloths) and Bradypodidae (three-toed

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sloths). Species of Bradypodidae have an exclusively folivorous diet, being this one of the explanations for their low metabolic rate (Chiarello 2008). Among the four Bradypodidae species two are threatened with extinction, including the maned three-toed sloth, *Bradypus torquatus* Illiger, 1811, an Atlantic Forest endemic classified as Vulnerable by the IUCN (Chiarello & Moraes-Barros 2014).

Bradypus torquatus has a restricted distribution, occurring in forest fragments in four Brazilian states: Sergipe, Bahia, Espírito Santo, and Rio de Janeiro (Hirsch & Chiarello 2012). Despite their arboreal habits, sloths in general are exceptional swimmers and can venture, when necessary, in aquatic environments such as rivers and lakes (Montgomery & Sunquist 1975). Such behaviour is recurrent among Xenarthra species, including armadillos (Taulman & Robbins 1996), sloths (Anderson & Handley 2001), and even anteaters (e.g., *Tamandua mexicana* (Saussure, 1860), Esser et al. 2010), which are generally reported as species that avoid water. Although this behaviour is known for other sloths (Beebe 1926; Worman 1946), there is no evidence to date of maned three-toed sloth swimming in estuarine or marine environments.

The tiger shark (*Galeocerdo cuvier* Péron & LeSueur, 1822) has a circumglobal distribution, inhabiting tropical and temperate waters in all oceans (Ebert et al. 2013). Although they can swim for long distances, *G. cuvier* is often associated with coastal environments, especially shallow waters (Compagno 1984; Gomes et al. 2010). *Galeocerdo cuvier* is a large top predator (Simpfendorfer et al. 2001), reaching up to 5.5 meters long (Meyer et al. 2014) and weighing up to 900 kg (Bornatowski & Abilhoa 2012). *Galeocerdo cuvier* have a varied diet, including a diversity of organisms, such as elasmobranchs (Dicken et al. 2017), crustaceans, molluscs (Simpfendorfer et al. 2001; Bornatowski et al. 2007), fish, snakes, turtles, birds and mammals, including humans (Simpfendorfer et al. 2001; Dicken et al. 2017). The species also consumes carcasses, which is why it is considered a scavenger, feeding on carrion at the sea floor or in the water column (Heithaus, 2001; Bornatowski et al. 2012a, b). However, dietary studies of *G. cuvier* based on analyses of stomach contents fail distinguishing whether these food items are obtained by active predation or by scavenging (Rada et al. 2015). Here we report the capture of a *G. cuvier* by fishermen south of Rio de Janeiro containing a carcass of a maned sloth in its stomach and discuss the ecological implications of the finding.

On March 10th, 2019, a specimen of a tiger shark was caught by industrial fishermen during a longline fishery at a distance of 25 nautical miles (latitude -42.343889; longitude -23.176389) off the coast of Cabo Frio and Arraial do Cabo (Fig. 1), on the east coast of Rio de Janeiro state, southeastern Brazil. The fishing boat arrived on March the 13th at the municipal fish market of Cabo Frio.

The individual was measured, weighed, and had his stomach contents analized. It was an adult male of 3.35 m (total length) and 418 kg (total weight). The analysis of stomach contents revealed the presence of parts of a 38 cm long and 32 cm wide mammal, completely covered by a layer of thick fur. The fragment was immediately placed in a thermal box and later transported to the Laboratory of Ecotoxicology

and Environmental Microbiology of the Federal Institute of Education, Science, and Technology Fluminense, Campus Cabo Frio, where it was analyzed. The analysis revealed 51 small bones, such as ribs, vertebrae, skull, and mandible. The bones were carefully examined, and the specimen was identified as *Bradypus torquatus* based on the inflated pterygoid sinuses (Hayssen 2009) (Fig. 2). The skull and mandible are in good condition and will be deposited in the scientific collection of Universidade Estadual de Santa Cruz (UESC), Ilhéus, Brazil.

We were unable to ascertain whether the sloth was predated by the shark or if it was already dead when consumed. Considering the preference of *G. cuvier* to inhabit coastal environments and the several small islands in the region, our initial hypothesis is a possible predation that occurred near these places, when the individual *B. torquatus* tried to swim from one location to another. A second hypothesis would be that the individual fell dead on the sea or into affluent river and was subsequently ingested by the shark.

Galeocerdo cuvier is a very voracious species that eats everything it finds floating on the surface or in the water column, whether it is natural, alive or dead, or of anthropic origin (Simpfendorfer et al. 2001; Dicken et al. 2017). Several curious objects have been found in its stomach such as cans, plastic, license plates, pieces of sofa, and several others (Simpfendorfer et al. 2001; Dicken et al. 2017). In addition, consumption of an armadillo (*Dasypus septemcinctus*) by *G. Cuvier* was reported in northeastern Brazil, in which it was also not possible to identify whether it was through active predation or scavenging consumption (Barbosa-Filho et al. 2016).

This is the first report of the consumption of a maned three-toed sloth (*B. torquatus*) by a tiger shark (*G. cuvier*). This record is very relevant to the sloth's behaviour, corroborating information from the literature that describe the use of water environments by sloths when necessary. Even though aquatic environments are not geographical barriers for the group, they may contain unforeseen risks for a predominantly terrestrial species such as predation, as suggested here. Additionally, there may be a high energetic cost when using non-forest habitat, as sloths are highly adapted (ecologically and morphologically) to arboreal life.

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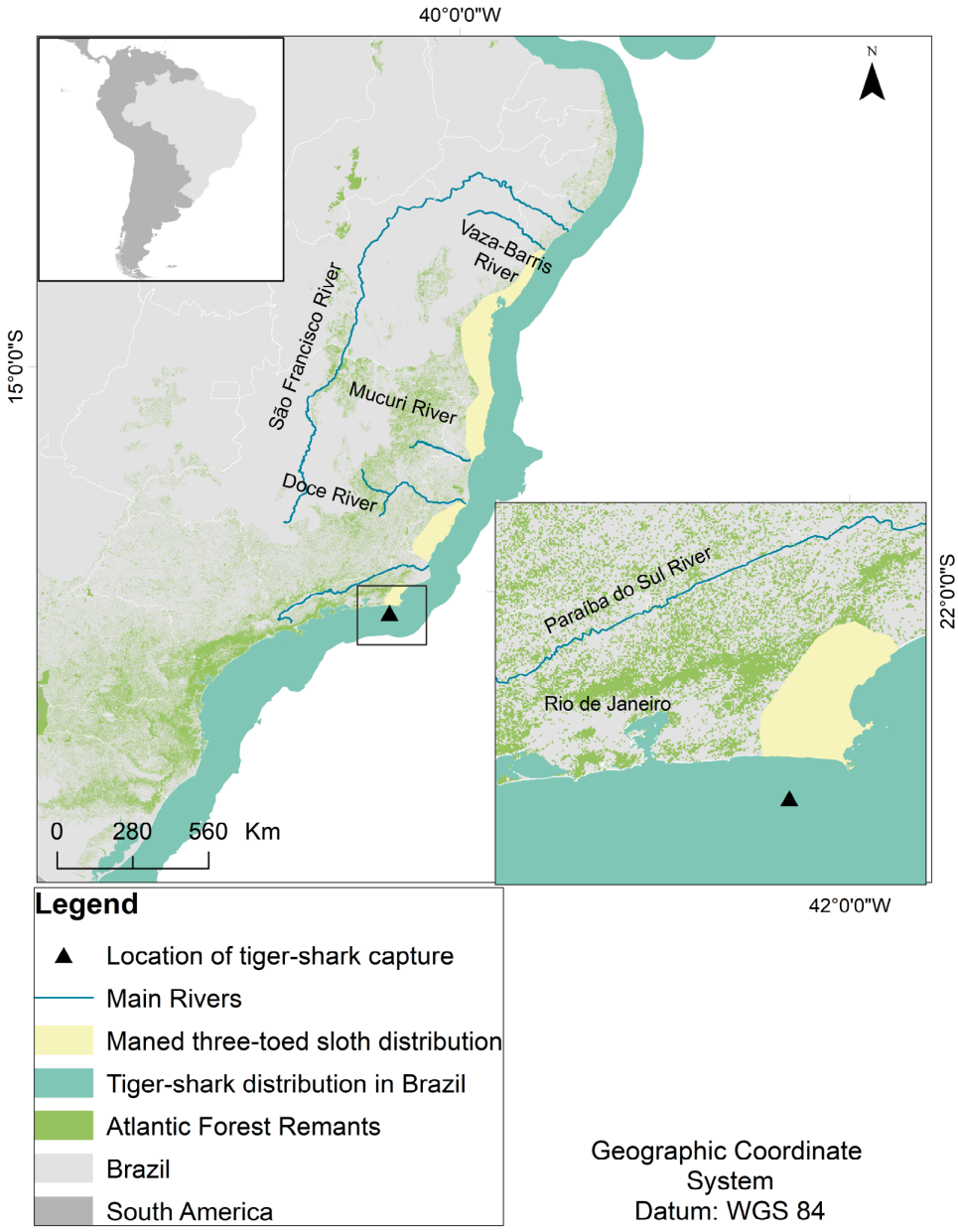

Figure 1. Geographic location of the capture site of the tiger shark (*Galeocerdo cuvier*) that had a maned sloth (*Bradypus torquatus*) carcass in its stomach.

Figure 2. Dorsal and ventral views of the skull and dorsal view of the mandible of a maned sloth (*Bradypus torquatus*) ingested by a tiger shark (*Galeocerdo cuvier*). The material is deposited in the Universidade Estadual de Santa Cruz (UESC), Zoological Collection (Ilhéus, Bahia, Brazil).

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