

WATER MONITORS REPEATEDLY DIG UP BURIED CARRION

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ABSTRACT - Many top predators feed on carrion, which makes them facultative scavengers. However, none of these are known to dig up dead animals and feed on them. We here document that the water monitor lizard in Sri Lanka (*Varanus salvator*) repeatedly dug up dead dogs that were buried one meter in the ground.

KEY WORDS : Top Predator, Facultative Scavenging, Digging up Dead Carrion,

INTRODUCTION

Ecologists are beginning to realize that many top level predators also consume dead animals as carrion, which makes them facultative scavengers. In a recent review, Wilson and Wolkovich (2011) provide a list of such predators, but lizards as a group are conspicuously absent. Only snakes among reptiles were documented eating carrion. Most examples consist of birds, mammals, and a few insects in terrestrial environments. More importantly, there is not a single example of a facultative scavenger digging up a dead animal that was buried. In early 2015 in North Central Sri Lanka, we document repeated instances of water monitor lizards (*Varanus salvator*) digging up and feeding on buried dog carcasses.

Monitor lizards were apparently missed by Wilson and Wolkovich (2011) because of publication in specialized books or peer reviewed journals often unavailable to western scientists. The water monitor lizard is the second largest species of lizard in the world with a mass of 20 kg in Sumatra where they were hunted for their skins (Shine et al. 1996). It is one of two species of monitor lizards in Sri Lanka. The other is the much smaller land monitor (*V. bengalensis*). In India and Sri Lanka, both

species are considered scavengers as well as predators (de Silva 1998, Daniel 2002). In Malaysia, the water monitor is also considered a scavenger (Traeholt 1994), and in Indonesia feeds on human leftover food (Uyeda 2009). Even the related and larger Komodo dragon (*V. komodensis*) can be attracted to dead goats positioned by people. This enables tourists to observe the dragons feeding (Walpole 2001).

The water monitor can reach enormous size in Sri Lanka where it is protected. Randow (1932) found one with overall length of 3210 mm. It is found in irrigation ditches and rice paddies, and in bodies of fresh water of various size. The lizard consumes birds, small mammals, and probably amphibians in those habitats. In botanical gardens it is documented consuming fish thrown out to provision other predatory fish species in ornamental ponds, and can also climb trees as illustrated in (Karunarathna et al. 2008).

METHODOLOGY

We first documented water monitor scavenging by digging in late January 2015, following an exceptionally strong monsoon season in North Central Sri Lanka in December 2014. Intense flooding caused roads to wash-

out, reducing areas of the two lane Puttalam Road near Wilpattu National Park to one and a half lanes. Sri Lankan dogs are generally quite good at avoiding vehicles on two lane highways, getting out the way at the last second, and drivers generally avoid dogs, resulting in relatively low mortality rate due to vehicle strikes. But the addition of lane reducing barriers resulted in a changed environment to the dogs in which several were killed by vehicles on a small stretch of road. In late January, a female dog came into heat nearby, which may have further distracted the male dogs which were the victims.

We buried the dogs in separate graves about

one meter deep in soil in a banana patch near a road, about 20 m from our residence. We detected water monitor lizards from barking dogs and odors emanating from the graves.

RESULTS

Table 1 gives the chronology of events. The dogs were killed on different days. The first indication of graves opened occurred four days after the first dog was buried and it was this dog's grave that was opened. We sensed it from the foul odor that could be traced to the open grave. We noticed that the dog's intestines were removed, observed maggots, and we saw a water monitor in the area. We reburied the dog.

TABLE 1: Chronological events of dog burials and water monitors

Date	Events	Water Monitor Observation
30 January 2015 evening	First dog killed by vehicle	
31 January morning	First dog buried	
2 February evening	Second dog killed by vehicle	
3 February morning	Second dog buried in separate grave Third dog killed by vehicle	
3 February afternoon	Third dog buried in separate grave	
4 February morning	First dog grave dug up, intestines removed; reburied	One water monitor in area, scurried away
5 February	Two graves dug up, reburied Burned tire and banana leaves	Two water monitors, one with head in open grave
6 February	Third grave dug up, reburied Burned tires and banana leaves	Three water monitors in area, scurried away
7 February	Sprayed insecticide over graves	Three water monitors in area
8 February	Threw stones at water monitors	Three water monitors in area
9 February	Three water monitors in area	The shorter one was on the back on one of the larger monitors
11, 12 February	Two graves unearthed, one with a hole	

The next day (5 February) we noticed that two graves were opened up, and we observed a water monitor with its head below ground in one of the graves. We were advised by rural Sri Lankans to burn a tire and banana leaves to create a smell repulsive to water monitors. We did so after chasing the monitors from the area. There were two 180 *cm* and a 1 *m* size monitor lizards on 6 February, when the third dog grave was also opened. Overall length of 180 *cm* was established by measuring the length of the longer monitor when it climbed a coconut palm and we photographed deformities in the palm (Figure 1). The smaller monitor was slightly greater than half its length. We repeated the burning of the tire and banana leaves.



FIGURE 1: An estimated 180 *cm* long water monitor climbing up and grasping a coconut palm tree. Photograph was taken after the monitor drove a smaller monitor away with its tail.

On 7 February, with the advice of rural Sri Lankans, we applied insecticide to the grave area after driving the monitors away. The moni-

tors returned on 8 February. On 9 February, we saw three monitors in the area, the two long ones and the shorter one. The smaller monitor attempted to copulate with one of the larger monitors. It was presumably the female monitor that climbed the palm to escape the small monitor and drive it away with its tail that was close the ground. Notice the claws on the front feet used to open the graves (Figure 2). The front feet supported most of the mass on the palm (Figure 2), so heavy Sri Lanka clay soil would have been no obstacle in digging up the dogs.



FIGURE 2: Ventral view of monitor showing front and hind feet with claws.

Our observations stopped temporarily when the smaller water monitor mounted one of the two larger ones for five minutes. The larger monitor continuously moved and went to a coconut palm, climbed the tree, and held on with its limbs (Figures 1 and 2). The larger monitor swiped the smaller one with its tail and the smaller monitor eventually moved away. It

is unlikely that successful copulation occurred between water monitors of such different size.

Water monitors were detected in the area again on February 11 and 12. A hole was dug over one of the graves (Figure 3) and the soil over the first grave was removed (Figure 4). They continued to come to this area for two weeks after the initial graves were disturbed.



FIGURE 3: Hole excavated over dog grave by monitor lizard. Hole dimensions are 28 by 20 cm.



FIGURE 4: Excavation of grave is approximately 65 x 50 cm. This excavation occurred after the dog was reburied.

DISCUSSION

The water monitor must have a strong sense of smell to detect decomposing dogs buried one meter underground and covered by dense clay. It took four days for the monitor to find and dig up the first dog after burial. The maggots on the dog were probably acquired while the dead dog lay on the surface of tall grass and weeds overnight the first day. The second dog was dug up in three days, as was the third dog. The difference in days (4 for the first dog and 3 for the second and third dog) probably was involved in the search for food. It may take three days for the decomposition to reach the threshold of smell detection by the water monitors. The second dog had been exposed to flies for 15 hours before burial.

The geographical distribution of water monitors in South and Southeast Asia is in countries affected by monsoons. One of the monsoon seasons in North Central Sri Lanka extends from October through January. Torrential rains fell in December causing flooding and mudslides, perhaps killing birds and small mammals in the process. The sense of smell of water monitors might be shaped by detecting these animals submerged in water or in mud from monsoons. Submerged or buried dead animals may be easier to find and consume than free living prey, which may become more wary under these circumstances.

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