

INSIDE JEB

Castaway cottonmouths depend on rain to slake thirst



A cottonmouth snake (*Agkistrodon conanti*) basking on a Cedar Keys beach.
Photo credit: Mark Sandfoss.

Castaways usually meet their fate by washing ashore on a desert island, but not the cottonmouth pit vipers (*Agkistrodon conanti*) of the Cedar Keys, Florida. ‘Our understanding is that these islands formed in the recent past as relic sand dunes that were connected to the mainland via dry land until sea levels rose’, says Mark Sandfoss from the University of Florida, USA. And when the reptiles found themselves cut off from sources of fresh water, they really were left high and dry. ‘Cottonmouths are almost exclusively found in freshwater habitats’, explains Sandfoss; which made him and his thesis advisor, Harvey Lillywhite, wonder how the marooned serpents manage their thirst when surrounded by undrinkable seawater.

‘Harvey has been collecting drinking data on free-ranging cottonmouths for decades’, says Sandfoss, describing how Lillywhite picks up the vipers with a hook, weighs them and offers them a bowl of water to drink. He then reweighs the animals immediately after they have slaked their thirst to determine how much water they have consumed. After joining

Lillywhite’s lab in 2013, Sandfoss began comparing Lillywhite’s observations of how likely the snakes were to drink with the amount of rainfall on the islands and found that the animals that had experienced the longest drought gulped down the largest volume, while snakes that had experienced rainfall in recent days were less eager to drink. However, when the scientists compared the island cottonmouths’ drinking habits with those of their mainland cousins, which live in swamps and rivers, 64% of the island animals were dehydrated while only 24% of their mainland cousins needed a drink. The duo realised that the island cottonmouths depend on rainwater and go thirsty between rainfalls.

The scientists then wondered whether the water-deprived castaways were able to suppress their thirst more than the mainland population, so Sandfoss allowed island and mainland snakes to go thirsty and then recorded the animals’ mass when they decided that they needed a drink. ‘We found a large variation in the thirst responses of snakes from the two populations, with some snakes drinking

after losing less than 2% mass while others from the same population did not drink until they had lost more than 12%’, says Sandfoss. However, when the scientists compared the two groups of animals, there was no difference in their thirst threshold, so the castaways don’t seem to have altered their thirst tolerance in response to their tropical-island lifestyle.

The pair then investigated how the two populations would react when offered a drink of salt water. ‘We know that even the most well-adapted sea snakes require fresh water for drinking and this made us think that insular cottonmouths would not be able to rely on seawater’, says Sandfoss. Discovering quickly that both populations turned up their noses at full-strength – and even 25% – seawater, Sandfoss then offered thirsty mainland and island cottonmouths increasingly dilute saltwater drinks and found that most of the island snakes (19) refused the salty drinks: only 7 chanced a sip. However, the mainland cottonmouths were far less discriminating, with 6 sipping the saltiest (30%) water and only 7 holding off until they were offered fresh water. Also, when the duo compared the water preferences of newborns, it seemed that the island youngsters had inherited their parents’ aversion to salt water.

Castaway cottonmouths have evolved the ability to detect and avoid drinking seawater, even though the prospect may seem tempting when the rains fail, but do not suppress their thirst, and Sandfoss is keen to find out how the marooned snakes sniff out the difference between fresh and salt water when feeling parched.

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