

Sea turtles of South Africa exposed

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Nicky: Hey, hey, Nicky here and welcome to yet another episode of ScienceMatters on SAfm! Today, Themba T and I will be chatting to some South African researchers from the Nelson Mandela Metropolitan University in Port Elizabeth studying sea turtles nesting in KwaZulu-Natal, South Africa...

Themba: Woah, wait, Nicky...Sea turtles? In South Africa? I didn't even know there are sea turtles nesting in South Africa.

Nicky: Yes, Themba, there are only seven species of sea turtles in the world alive today and we are so lucky to have two of those species nest right here in South Africa! In this episode a marine biologist, Dr Ronel Nel will inform us on the biology of these charismatic creatures and the very successful sea turtle conservation programme in Kosi Bay and two students, doing their research there, from NMMU will be chatting to us about their research projects.

RN: Thanks, Nicky and Themba. I am Dr Ronel Nel I lecture at NMMU and also work closely with EKZN Wildlife in conserving the marine turtles of South Africa. And, like Themba, there are so many South Africans that don't know sea turtles exist in South Africa. The nesting beaches in South Africa are restricted to Kosi Bay, in the northern coast of KZN, and continue past the Mozambique border. As Nicky has just mentioned, two species of sea turtles nest in South Africa, namely the loggerhead and leatherback turtles. We also often encounter green turtles that feed in our warmer seas. Turtles occur in areas with water temperatures around and above 20°C. Marine turtles are reptiles and like most reptiles they rely on environmental conditions to survive. When it is cold, reptiles become less active and when it becomes warmer, their bodies warm up and they become more active. That's why on a hot day, for example snakes are seen more casually and active than on cooler days. Similarly with sea turtles, they become inactive in cold waters which may lead to drowning and hunger. That's why you don't find sea turtles in colder regions like the Atlantic Sea, unless they were swept by strong currents.

Nicky: So, just a quick question, Ronel, I'm confused. You just told us reptiles can't survive the cold, but leatherbacks are deep divers, right? It's very cold down there...

RN: That's correct, Nicky. An average dive for a leatherback is about 60m for 10 minutes, but they can reach depths of over 350m. Hence, the leatherback is the only

living reptile that can regularly maintain their body temperature up to 8 degrees above that of water temperatures when necessary.

Themba: It's amazing how brrrrrrilliant their bodies are! (laugh) And how is it to work with sea turtles?

MB: To work with sea turtles are fantastic and can be lots of fun if you like long walks on the beach, and the smell of dead hatchlings! We go out each night and patrol the beach on foot for 10km to find turtle females about to nest. When we see a turtle coming up the beach, we wait and try not to disturb her as sea turtles are very sensitive to any kind of disturbance. We patiently wait and check what she is doing by slowly creeping up behind her, and keep in mind that at times we do this during pitch darkness! We never use our headlamps until we do measurements since sea turtles are very sensitive to light.

JT: Yes, sea turtles use the moonlight to navigate, and other cues such as smell and hearing, but they spend most of their life under the water, so it takes a lot of effort for them to pull their large bodies across the sand and their senses are weak when they come on land. More interestingly, the females only come ashore to nest and the males never ever come ashore. Even mating occurs in shallow waters, and males can mate with different females. Back on the shore, the female will choose a proper nesting location, and before digging the nest chamber, she clears away surface debris and forms a body pit. It almost looks like she is swimming in the sand, flippers and sand flying everywhere! (laugh)

Nicky: Wow, that's really interesting. So, Melissa Boonzaaier is the student working on the effect of nest temperature on the loggerhead turtles, hey? Can you tell us why this is worth researching?

MB: Yeah, sure, thing. You see, with most organisms sex chromosomes are genetically carried over from two parents when they are conceived. Like, in humans and other mammals, the XX sex chromosomes are female and the XY sex chromosomes are male. Most reptiles that lay eggs, including all sea turtles, don't have these sex chromosomes and rely on the environmental temperature to determine the sex of the embryos. The scientific term is Temperature-dependent Sex Determination or in short, TSD.

Themba: So, the sex is dependent on the temperature...Clever!

MB: Yes, in sea turtles, temperatures above 29°C produce females and below 29°C produce males. In the middle third of the incubation period, sex is determined, and this time frame is called the thermal sensitive period. And for loggerheads, the incubation period is about 60 days, so the thermal sensitive period is between day 20 and 40.

Nicky: So, what does this mean regarding global warming?

RN: In Melissa's case, she is in the second year of her Master's degree and completing it this year, and for last year's season the nest temperatures of ten nests during the thermal sensitive period were above 29°C, so we can assume that females are mostly being produced. And Melissa will examine dead hatchlings and embryos from the nests to determine what sex they are to confirm our assumptions. In the light of global climate change, sand temperatures are increasing leading to the production of more and more females. That is why her project, along with Jenny's, is so important for conservation purposes in South Africa and globally. If we can predict the sex ratios, we can aid conservation strategies.

Themba: And Jenny, what is your project about?

JT: Hi, there, my name is Jenny Tucek. I am from Germany and just started with my PhD with Ronel. Basically, Themba, I am tackling the same project as Melissa, which is the effect of nest temperature, but on leatherbacks. I will also be looking at sea turtles, both loggerheads and leatherbacks, on a much deeper level. I will be examining the relationships between hatchlings, their mother, and see how many males contributed their sperm to the female. For this, I only need a small tissue sample of the female and hatchlings, but that's a whole other episode!

Nicky: That is really fascinating, Jenny. Wow, I'm learning so much from all of you. So, how did it get to a point that sea turtles are endangered?

JT: Well, marine turtles are very charismatic and humans exploited marine turtles commercially especially by poor, fishing communities for hundreds of years. Marine turtles are harvested for their meat, eggs and even shells that are used to make jewellery. Pollution is also one of the major threats. Plastic bags floating in the sea look like jellyfish to sea turtles which is their favourite food, and by eating the plastic, it gets stuck in their throat. They can die of suffocation or hunger because food can't be ingested. Sea turtles survived several climatic changes since the Age of Dinosaurs, but with the current global changes, the climate is changing too fast for them to adapt due to human activities emitting greenhouse gasses into the atmosphere. That's not the only thing they worry about. In addition, they have natural predators such as the ferocious honey badger. What is more shocking is that only one out of a thousand hatchlings survives and reproduce, which is in 30 to 40 years depending on species.

Themba: I never knew our actions are affecting sea turtles that much! What is being done about this, Ronel?

RN: Global awareness for the protection of sea turtles is slowly coming around, and in South Africa, we have a very well-managed conservation programme and strict regulations. The sea turtle conservation programme of Ezemvelo KZN Wildlife and iSimangaliso Wetland Park is the second longest running sea turtle conservation programme in the world and has been running for more than 50 years now. As South Africans, we can be very proud of this achievement, and not only has this

programme been successful in protecting these majestic animals, but we are learning so much of their biology from our research as you have heard from the students.

Nicky: Amazing stuff! Sea turtles really give meaning to the word “perseverance”. We should consider ourselves lucky when we see a sea turtle, they survived many years and endured many dangerous situations to get where they are. Thanks to the sea turtle research team from NMMU in PE, and catch all of you next time on another episode of ScienceMatters with Themba and I...

Themba & Nicky: Cheers!