UNIVERSITEIT•STELLENBOSCH•UNIVERSITY
jou kennisvennoot • your knowledge partner

MEDIA RELEASE ISSUED BY STELLENBOSCH UNIVERSITY, STELLENBOSCH, SOUTH AFRICA

16 July 2016

UNDER EMBARGO UNTIL 10:00 (GMT) 20 JULY 2016

South Africa's great white sharks heading for extinction

Only 353 to 522 great white sharks left in South African waters

The magnificent great white shark (*Carcharodon carcharias L.*) is one of the oldest shark lineages with an evolutionary origin dating back about 14 million years. New research from Stellenbosch University (SU) shows that the South African white shark population is in double jeopardy. Not only do these sharks have the lowest genetic diversity of all white shark populations worldwide; there are also only between 353 to 522 individuals left.

"The numbers in South Africa are extremely low. If the situation stays the same, South Africa's great white sharks are heading for possible extinction," says Dr Sara Andreotti of the Department of Botany and Zoology at SU and lead author of the study published in the journal *Marine Ecology Progress Series*.

The findings are based on six years of fieldwork in South Africa's shark mecca, Gansbaai, and along the South African coastline. It represents the largest field research study on South Africa's great white sharks undertaken to date.

Counting great whites

It is not that easy to find, let alone count, these mysterious animals. Andreotti had to rely on the expertise and logistical support of shark behaviour specialist Michael Rutzen of Shark Diving Unlimited to track down these elusive creatures. He had been operating a white shark cage diving operation at Gansbaai for the past 15 years and is better known as 'Sharkman' – the man who free dives with white sharks to dispel the myth that they are man-eating monsters.

"If you want to count white sharks, you need a boat with a crew and someone who knows where and how to find them," Andreotti explains.

They had to make sure that the animals got close enough to the boat to take a clear picture of the dorsal fin and to collect a biopsy for genetic analysis. The genetic sampling technique comprised poking the shark with a small sterilised biopsy sampler, an operation that is rarely noticed by the sharks.

The field work kept Andreotti and Rutzen busy for six years, sometimes living at sea for up to two months at a time.

Between 2009 and 2011 they collected nearly 5 000 photographs of the dorsal fins of white sharks frequenting Gansbaai. Notches in a great white's dorsal fin are like a unique fingerprint with a specific number of notches on its trailing edge. Andreotti manually organised the photographs into a database, specifically documenting the date when an individual was resighted. To their surprise, once 400 individuals had been identified, they struggled to find new individuals to photograph.

Using mark-recapture techniques, the results from this part of the study indicate with 95% confidence a population estimate of between 353 and 522 individuals. According to Andreotti, this is 52% fewer than what was estimated in previous mark-recapture studies.

However, they needed to be sure that the white sharks that they identified and counted in Gansbaai were representative of the entire white shark population along the South African coastline. Thus they set sail again and spent another four years sailing along the coastline, collecting biopsy samples and photographs of dorsal fins. The subsequent genetic analysis then proved that there is only one population and that the same sharks are roaming the coastline.

The results from the genetic study show that the South African population of great whites is made up of an effective population size of only 333 individuals. The effective population size is the number of individuals in a population who contribute offspring to the next generation.

Andreotti explains: "The genetic analysis is not the same as counting the sharks. Here one estimates the number of successful breeding individuals who generated the sampled population. The results can also be used to indicate the survival potential of a population. Although we don't know if this will be the case for white sharks, previous research on other species indicate that a minimum of 500 breeding individuals are required to prevent inbreeding depression.

"When looking at the number of adults counted with the photo identification work, we have come to the conclusion that South Africa's white sharks faced a rapid decline in the last generation and that their numbers might already be too low to ensure their survival.

"The chances for their survival are even worse than what we previously thought," she warns.

Reasons for the sharp decline

Andreotti says that among the reasons for the sharp decline in white shark numbers are the impact of shark nets and baited hooks implemented on the eastern seaboard of South Africa. Other contributing factors are poaching, habitat encroachment, pollution and depletion of their food sources.

"For example, between 1956 and 1976, the number of large sharks caught in KwaZulu-Natal's shark-netting programme declined by over 99%. Between 1978 and 2008 approximately 1 063 white sharks were killed in shark protection measures," she says.

She says that it is a popular misconception that white sharks are predating uniquely on marine mammals such as seals: "White shark juveniles particularly feed on bony fishes and smaller, commercially fished elasmobranches. But to date we still don't know the minimum amount of food required by our white shark population, and therefore fishery management cannot take it into consideration."

The survival of white sharks in South African water is also threatened by the illegal poaching for trophies (jaw sets) and fins.

Why are great whites so important?

Apart from the iconic status of these magnificent animals, they are apex predators, which means that they do not have many natural predators. The loss of such an apex predator will have a cascade of detrimental effects on the ecological stability of the marine environment.

Great whites are among the few shark species feeding on Cape fur seals. A decrease in white shark numbers will lead to an increase in the seal population, which in turn will have an impact on fish populations and thus on fisheries.

"The survival of South Africa's white shark population and the ecological interactions of the coastline will be seriously compromised if urgent management measures to prevent the decline are not put in place," Andreotti warns.

Future action for the conservation of white sharks

Andreotti says that their study is the first of its kind on white sharks: "Not only did we sample known free-ranging white sharks; we also built a database which links the genetic profile with the photographic identification of each individual shark. Due to the inherent ease of use, the accuracy associated with the method and the ability to 'resight' individuals rapidly within a large photographic database, our noninvasive technique represents a validated and feasible technique for future white shark photo identification studies.

"Our hope is that from now on white sharks will be monitored more closely and that better protection measures will be put in place. Lastly, we hope that delicate arguments such as the estimate of a vulnerable population will henceforth be based on extensive data collections and assessments," she concludes.

Rutzen concurs: "Even internationally nobody really knows how many great white sharks are left in the oceans. Many speculate that population numbers are increasing, but their claims cannot be backed up by solid research or an extensive database like the one created by Dr Andreotti and her team of collaborators.

"We need to replicate the study on an international scale and standardise the techniques for collecting data on population numbers of vulnerable species such as the great white. While everyone is working on their own, the king of the ocean could be on the brink of extinction," he warns.

- The title of the paper is 'An integrated mark-recapture and genetic approach to estimate the population size of white sharks in South Africa', with coauthors Michael Rutzen (Shark Diving Unlimited), Dr Stéfan van der Walt (Department of Applied Mathematics, SU), Dr Sophie von der Heyden and Dr Romina Henriques (Department of Botany and Zoology, SU), Michael Meyer and Herman Oosthuizen (Department of Environmental Affairs, Branch Oceans and Coasts) and Prof. Conrad Matthee (Head: Department of Botany and Zoology, SU).
- The research was made possible with funding from the Department of Botany and Zoology at SU and the financial support and logistical assistance of Michael Rutzen and his company, Shark Diving Unlimited.

Media interviews

Dr Sara Andreotti
Department of Botany and Zoology, Stellenbosch University
T: +27(0)21 808 3229
M: +27(0)72 321 9198
E: andreottisara@gmail.com

Michael Rutzen
Shark Diving Unlimited
T: +27(0)82 441 4555 or +258849364918
E: info@sharkdivingunlimited.com

Prof. Conrad Matthee
Head: Department of Botany and Zoology, Stellenbosch University
T: +27(0)21 808 3957
M: +27(0)84 453 4344
E: cam@sun.ac.za

Media enquiries

Wiida Fourie-Basson
Media: Faculty of Science, Stellenbosch University
T. +27(0)21 808 2684
M: +27(0)71 099 5721
E: science@sun.ac.za

Martin Viljoen
Head: External and internal media relations, Stellenbosch University
T. +27(0)21 808 4921
M: +27(0)82 775 2396
E: viljoenm@sun.ac.za

PLEASE NOTE

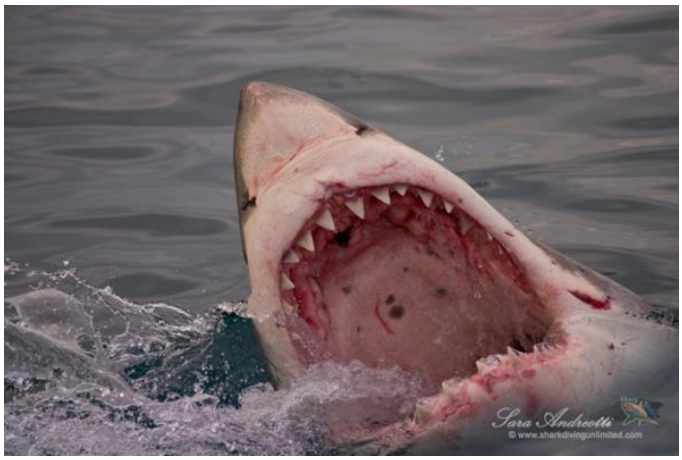
Memory sticks with high-resolution pictures and video material will be made available to journalists attending the media conference on 20 July 2016 at the One&Only in Cape Town. If you cannot attend the media conference but would like to have access to this material, contact science@sun.ac.za or mviljoen@sun.ac.za for a link from where you can download the pictures and videos.

A special word of thanks to the One&Only Cape Town for making their facilities available to Stellenbosch University for the media conference.

One&Only
CAPE TOWN

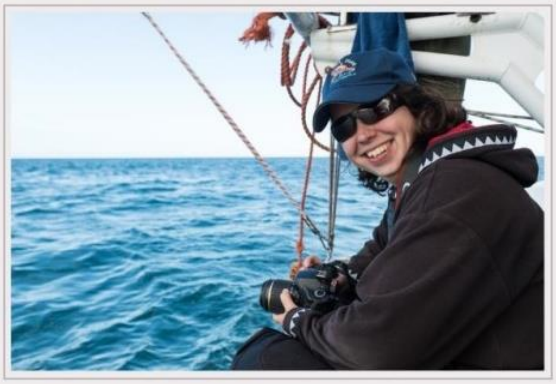
Caption for whiteshark.jpgs

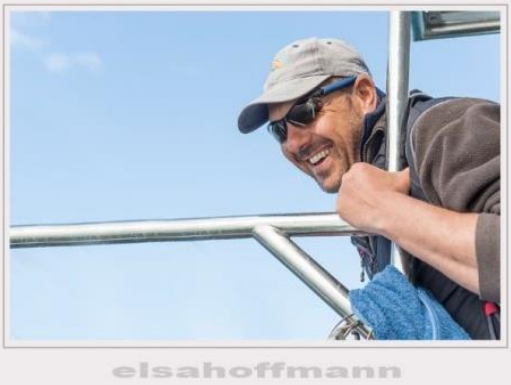
The magnificent great white shark (*Carcharodon carcharias L.*) is one of the oldest shark lineages with an evolutionary origin dating back to about 14 million years. New research from Stellenbosch University shows that the South African white shark population is in double jeopardy. Not only do they have the lowest genetic diversity of all white shark population worldwide, there is also only between 353 to 522 individuals left. *Pictures: Sara Andreotti* © *www.sharkdivingunlimited.com*

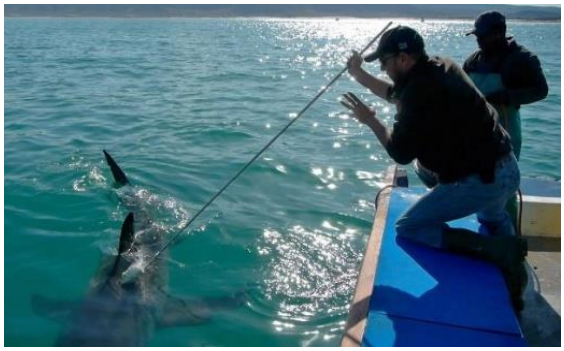


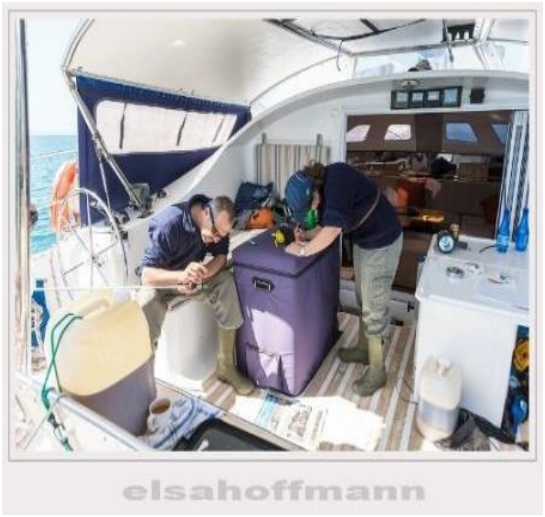
Caption for SaraAndreotti.jpg; MarkRutzen.jpg; sampling_1.jpg; sampling_2.jpg; sampling_3.jpg

Dr. Sara Andreotti from Stellenbosch University had to rely on the expertise and logistical support of shark behaviour specialist Michael Rutzen of Shark Diving Unlimited to track down these elusive creatures. They had to make sure the animals got close enough to the boat to take a clear picture of the dorsal fin and to collect a biopsy for genetic analysis. The field work kept them busy for six years, sometimes living at sea for up to two months at a time. The sampling technique consists in poking the sharks with a small sterilised biopsy sampler, an operation that is rarely noticed by the sharks. *Pictures: © Elsa Hoffmann (www.elsa.co.za) and Götz Froeschke*









Caption for Dorsalfin.jpgs

The database developed by Dr Sara Andreotti from Stellenbosch University and Michael Rutzen from Shark Diving Unlimited contains 4 398 photographic identifications of the dorsal fins of 426 individual great white sharks. When combined with the genetic profile of these and other white sharks along the South African coastline, researchers can answer questions about the shark's historical migrations and population health. Due to the inherent ease of use, the accuracy associated with the method, and the ability to 'resight' individuals rapidly within a large photographic database, their non-invasive technique presents a validated and feasible alternative for future white shark photo identification studies. *Images: Sara Andreotti*

THE END