THE BITE

Progress Report 2018

Contents

Unless otherwise stated, photographs are owned by Support Our Sharks

For more information on topics discussed in this report, go to www.supportoursharks.com

Overview

We continue to support our sharks through science-based conservation, research and education. To achieve our mission, we promote awareness through conservation campaigns that discourage the consumption of sharks and encourage increased protection of threatened species. We continue to publish our scientific research studies in international journals, and we actively participate in the scientific community. Furthermore, we continue to be proactive in communicating science and conservation to the world through engagement with the media and the public. This document provides a progress report of our achievements, a description of SOS programs, objectives, activities and results that were generated with your support. We hope you continue to support our work in the future.

- 52% USA
- 17% Australia
- 7% UK
- 4% Canada
- 20% 205 Other Countries

Mission: To Support Healthy Oceans By Promoting Better Protection For Sharks And Rays

SOS MEMBERS
3,336
Total Members of the SOS Email List

SOS FILMS
2 Million+
Total Views on Facebook & YouTube

SOCIAL MEDIA
172,549
Total Followers on Facebook and Twitter

NEWS ARTICLES
350+
Media Appearances

PUBLICATIONS
19
Scientific Journal Papers Published

PRESENTATIONS
500+
Public Presentations

“Without sharks, you take away the apex predator of the ocean, and you destroy the entire food chain.”

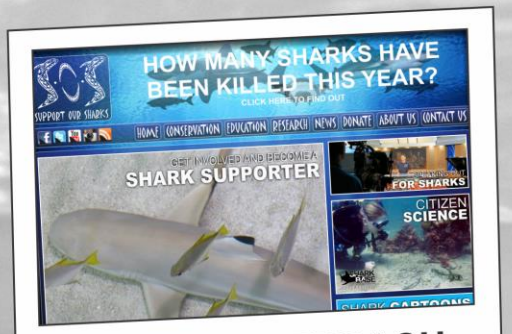
Peter Benchley

Education

Engaging the public is a huge part of our work and providing the most current science-based information is our goal. We continue to participate in community outreach events, the creation of short conservation films, and the development of new and engaging online awareness tools. Through social media, live exhibitions, and public presentations, we have reached well over 2 million people with our conservation, education, and research activities.

9000+

Attendants at Public Presentations



ONLINE OUTREACH

Through the SOS website, we are able to connect with an international audience and share our latest research. To increase interaction, we have developed a range of fun and engaging online educational tools to inspire people to protect sharks, including quizzes, cartoons, teaching guides, films and much more.

SCHOOL VISITS

Our shark scientist, Dr. Ryan Kempster, regularly visits local schools, throughout Western Australia, and international schools, via our Skype in the Classroom program. We also invite students and the public to join us in the lab to get hands-on research experience with our sharks and learn form our expert scientists.

CITIZEN SCIENCE

We have created a world first global shark encounter database helping to map the distribution and structure of shark populations worldwide using the help of citizen scientists. The program encourages the public to get involved in shark conservation by submitting their shark encounters to our open online database, SharkBase.

PUBLIC TALKS

SOS is a science-based shark conservation organisation, and as such, we regularly speak at public events to share our expert knowledge and latest research findings. We believe in sharing our science with the public to foster a better understanding of the importance of research.

See www.supportoursharks.com (search 'Events') for more information on our outreach activities

EDUCATION SPOTLIGHT

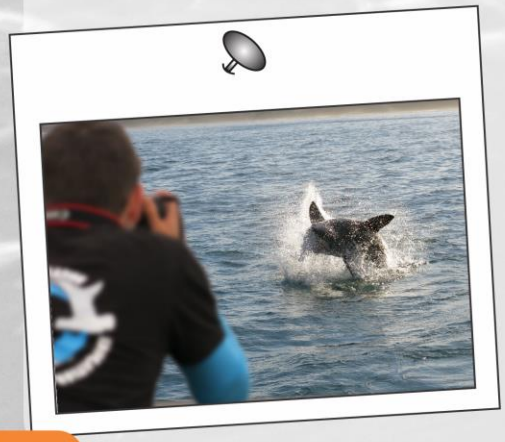
SHARK BASE
CITIZEN SCIENCE

SHARK-BASE.COM

Following the success of our outreach and science communication programs, we saw a great opportunity to involve the public directly in the scientific process through the development of the SharkBase Citizen Science project. Under the direction of our founder, Dr. Ryan Kempster, SharkBase was launched on 6th April, 2015.

SharkBase is a global shark encounter database helping to map the distribution and structure of shark populations worldwide. We developed this project to allow members of the public the opportunity to become Citizen Scientists by submitting their shark encounters to a central database that can be freely accessed by researchers and the public alike.

Even if someone has never seen a shark in the wild, they can still contribute to SharkBase by submitting sightings that they see in the news or on the internet. Participants can also assist our scientists in the verification process by assessing the accuracy of sightings submitted by other users.



The goal of SharkBase is to make it easier for sightings to be collated, checked by users and our experts, and make the data freely available to support research and decision-making at local, national, and global levels.

On the following page you will see a summary of the project's success since it's inception. We entourage you to explore the website (Shark-Base.com) and learn more about how our users are helping to better understand these amazing species.

EDUCATION SPOTLIGHT

At the time of publishing this document, over 2000 users had registered with the SharkBase website to log their sightings. These users collectively contributed 5225 verified sightings, which included 148 different species, recorded from Norway to Fiji.

5225
Verified Sightings

148
Species Identified

Top 10 Species Identifed

Photo Credits: Ashley Lemmon (Blacktip Reef Shark); Rowan Watt-Pringle (Bluespotted Ribbontail); Gina Mascord (Bull Shark); Nick Kermode (Whale Shark); Gina Mascord (Grey Reef Shark); Jordan Hennessey (Nurse Shark); Gina Mascord (Sand Tiger Shark).

See www.shark-base.org for more information on this program


“The sea, once it casts its spell, holds one in its net of wonder forever.”
Jacques Cousteau

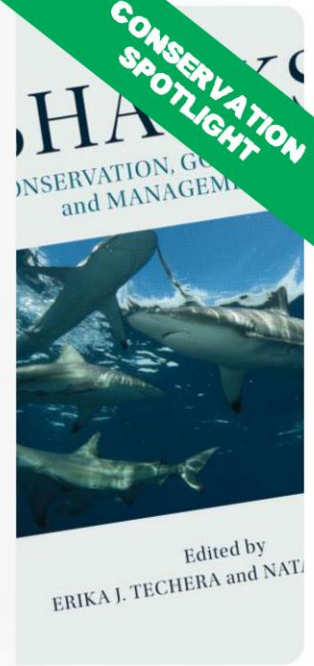
Conservation

As apex predators, sharks fulfill a key role in maintaining balance in ocean ecosystems by keeping other populations in check. Unfortunately, shark species around the world are being overfished at levels never before seen in human history. A lack of proper management is pushing many species to the brink of extinction. SOS actively promotes shark conservation around the world and encourages others to get involved and protect these incredibly important animals.

CONSERVATION SPOTLIGHT

[Book] 'Sharks: Conservation, Governance, and Management'

To help guide conservation efforts for sharks and their relatives, SOS Founder, Dr. Ryan Kempster, coauthored a book, with leading experts, to explore the global conservation and management of sharks. There has been a rapid decline in populations of many shark species, while new science has emerged of the critical role they play in marine ecosystems. In this book, Dr. Kempster, and his fellow authors, show that conservation law and policy has been slow to develop, with only a small number of iconic species being protected worldwide. The book explores our current knowledge and status of the law and science in relation to sharks, with a particular focus on improving frameworks for their conservation and management. The efficacy of current listing processes for endangered species and fisheries regulations is also examined. Tourism is explored as an alternative to fishing and the risks and impacts associated with this industry are analyzed.



CONSERVATION SPOTLIGHT

SOS, WWF, and WildAid Lobby for Better Protection of Dusky Sharks

In response to the National Marine Fisheries Service's (NMFS) disappointing decision not to list the Dusky Shark as "threatened" under the Endangered Species Act (ESA), despite this species being listed as "Endangered" by the IUCN, and listed on appendix II of CITES, we joined forces with WWF, WildAid and nine others major conservation organisations to fight for better protection of this species. Through the combined support of our millions of members, we continue to push for improved protection for this, and other vulnerable, species.

Dr Ryan Kempster, Founder of Support Our Sharks, said: "Dusky sharks are one of the slowest growing species of shark, making them extremely vulnerable to even a small amount of fishing pressure. Listing this species as 'Threatened' on the Endangered Species Act will go a long way to help reduce threats to this species and increase their abundance in the North West Atlantic".

CONSERVATION SPOTLIGHT

Australia's Reservation to CITES Listing of Threatened Sharks

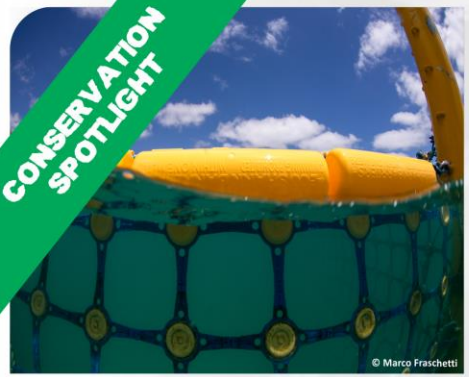
SOS and ten other leading conservation organizations (including Pew, HSI, and WWF) joined forces to petition the Australian Government to reconsider their Reservation against the listing of three species of thresher sharks and two species of hammerhead sharks.

Under CITES rules, a Reservation allows any Party (member State) to make a unilateral statement that it will not be bound by the provisions of the Convention relating to trade in a particular species listed in the Appendices.

We considered the lodging of a reservation by Australia to be a significant backwards step in the conservation of migratory sharks and will continue to fight to protect sharks both domestically and internationally. The signal it sends to the broader international community, despite Australia's assertions that it remains committed to international action, is empty without prioritized domestic action.

See www.supportoursharks.com (search 'Campaigns') for more information on SOS campaigns

CONSERVATION SPOTLIGHT



Survey Shows 97% of Experts Oppose Lethal Shark Control

Scientists and experts from all over the world descended upon Durban, South Africa to attend the Sharks International conference. The conference was an opportunity for the world's shark experts to share their latest research findings and discuss developments in shark conservation. We took this opportunity to raise the issue of shark control and ask the delegation of more than 300 attendees what their expert views were on the management of sharks to mitigate the risks posed to ocean users.

Unfortunately, many scientists and experts often choose not to enter into the shark control debate through fear of losing their job or funding for their research. Therefore, to ensure we collected views from all sectors, we allowed conference delegates to anonymously complete our survey, giving individuals the freedom to speak out on the issue.

We found that 97% of experts were opposed to any form of lethal control and 89% were supportive of non-lethal control measures.

Frequently, delegates highlighted that culling programs are detrimental to many forms of marine life, not just sharks, and that culling is an outdated control method.

To conclude, we found that there was a clear concern amongst global shark experts that current lethal control policies being employed in Australia, South Africa, and worldwide are no longer appropriate given advances in modern technology and our greater understanding of the important role sharks play in marine ecosystems. Greater investment in research, public education, and non-lethal shark management strategies is seen as the best way forward.

Bringing Together the World's Shark Experts to Oppose Shark Drum Lines

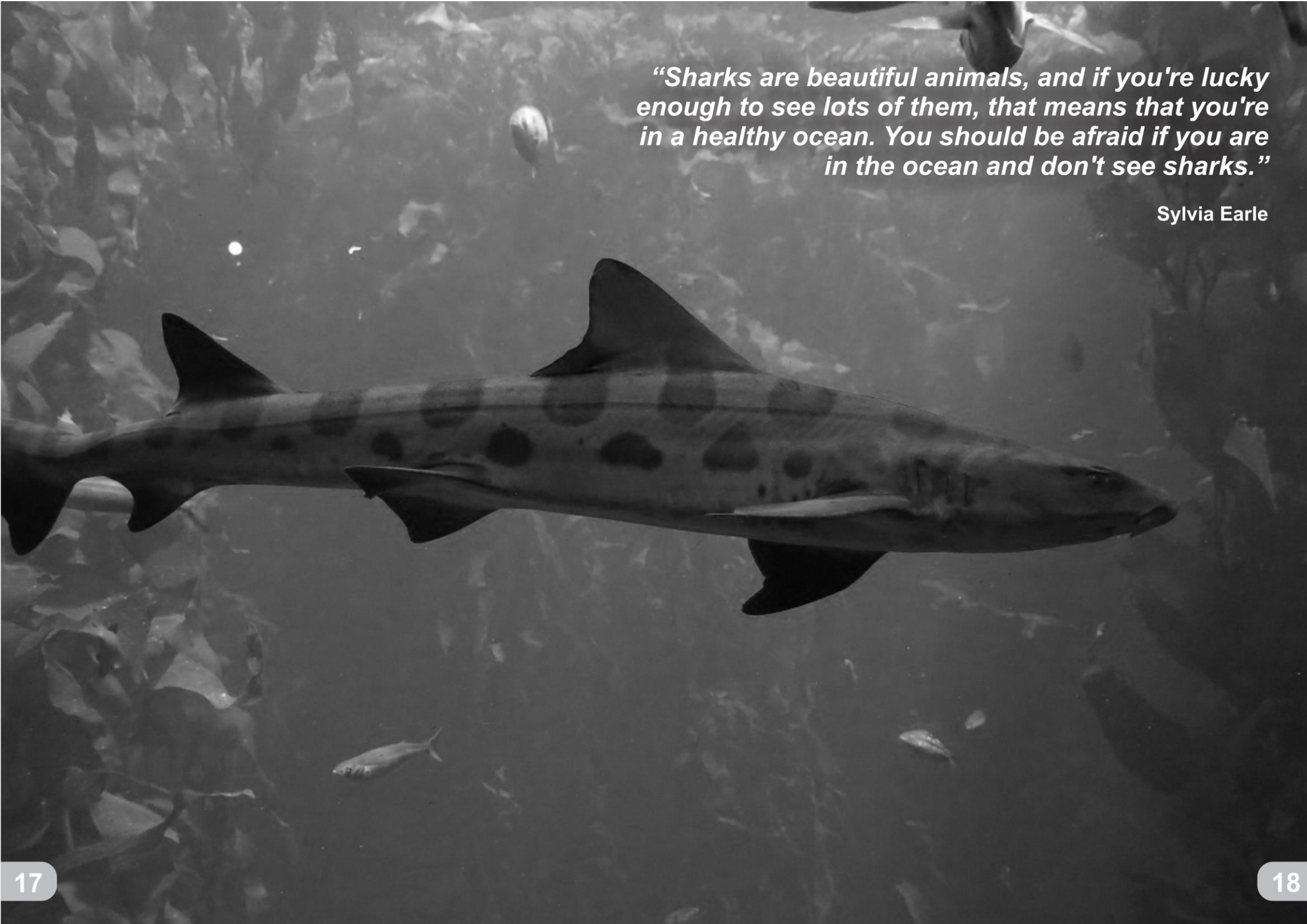
CONSERVATION SPOTLIGHT

In an effort to bring an end to Western Australia's controversial shark culling program, SOS brought together the might of the world's leading shark experts to petition the WA Government. With the collective expertise and guidance of over 300 international scientists and professionals, we penned two separate letters of recommendation advising the Government on more effective approaches to shark control.

We advised the Government that their proposal to mitigate shark hazards through the implementation of a lethal drum line program was not scientifically supported. The impacts on targeted wildlife and regional ecosystems were unquantified and had the potential to be significantly damaging. Given the range of demonstrably effective non-lethal strategies available to mitigate risk and improve our understanding of shark distributions and behavior, we pushed the Government to move beyond lethal options.

Shortly after submitting our petitions, the Environmental Protection Authority (EPA) recommended that the state's controversial shark culling program not be extended, citing "a high degree of scientific uncertainty" about the impact of drum lines on the great white shark population. The program was immediately terminated and has since resulted in funding being redirected to non-lethal programs throughout the state.

See www.supportoursharks.com (search 'Campaigns') for more information on SOS campaigns



“Sharks are beautiful animals, and if you're lucky enough to see lots of them, that means that you're in a healthy ocean. You should be afraid if you are in the ocean and don't see sharks.”

Sylvia Earle

Research

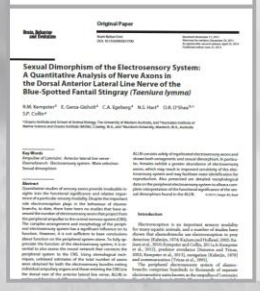
Advances in scientific research are essential to the conservation of any animal. We are committed to doing our part to engage with the public, political figures, and the media to share our scientific work and help improve the reputation of sharks. Better understanding will inevitably lead to better protection for sharks as people begin to realise the important role they play in keeping our oceans healthy.


Dietary partitioning by five sympatric species of stingray (Dasyatidae) on coral reefs


ARTICLE IN PRESS
Zoology
ZOOLOGY
A comparison of the electrosensory morphology of a euryhaline and a marine stingray


Survival of the Stillest: Predator Avoidance in Shark Embryos


First record of the mandarin dogfish *Cirrhigaleus barbifer* (Chondrichthyes: Squalidae) from Western Australia


Original Paper
Sexual Dimorphism of the Electrosensory System: A Quantitative Analysis of Nerve Axons in the Dorsal Anterior Lateral Line Nerve of the Blue-Spotted Fantail Stingray *(Taeniura lymma)*

PUBLICATIONS

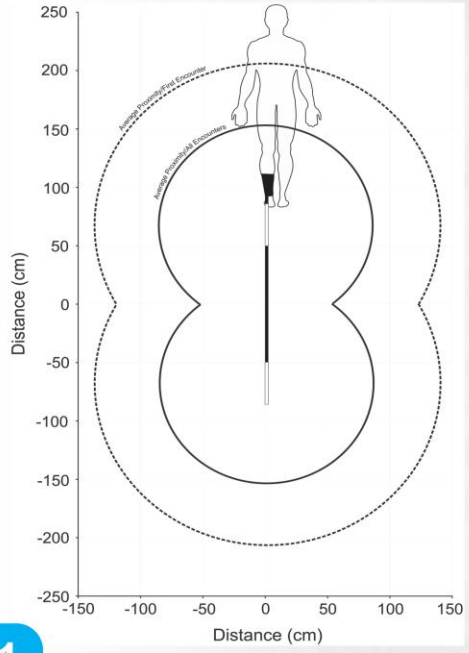
1. Ryan LA, Chapuis L, Hemmi JM, Collin SP, McCauley RD, Yopak KE, Gennari E, Huveneers C, **Kempster RM**, Kerr CC, Schmidt C, **Egeberg CA** and Hart NS (2017) *Effects of auditory and visual stimuli on shark feeding behaviour: the disco effect.* Marine Biology 165: 11.
2. **Kempster RM**, **Egeberg CA**, Hart NS, Ryan L, Chapuis L, Kerr CC, Schmidt C, Huveneers C, Gennari E, Yopak KE, Meeuwig J and Collin SP (2016) *How close is too close? The effect of a non-lethal electric shark deterrent on white shark behaviour.* PLoS One 11(7): e0157717
3. Collin SP, **Kempster RM** and Yopak KE (2015) *How Elasmobranchs Sense their Environment. In: (Shadwick RE, Farrell AP and Brauner CJ eds.) Physiology of Elasmobranch Fishes: Structure and Interaction with Environment.* Academic Press 34(1): 422
4. Garza-Gisholt E, **Kempster RM**, Hart NS and Collin SP (2015) *Visual Specializations in Five Sympatric Species of Stingrays from the Family Dasyatidae.* Brain, Behavior and Evolution 85(4): 218-233
5. **Kempster RM**, **Egeberg CA**, Hart NS and Collin SP (2015) *Electrosensory-driven feeding behaviours of the Port Jackson shark (Heterodontus portusjacksoni) and western shovelnose ray (Aptychotrema vincentiana).* Marine and Freshwater Research 67(2): 187-194
6. Schifiliti M, McLean DL, Langois TJ, Birt MJ, Barnes P and **Kempster RM** (2014) *Are Depredation rates by Reef Sharks Influenced by Fisher Behaviour?* PeerJ PrePrints
7. **Egeberg CA**, **Kempster RM**, Theiss SM, Hart NS and Collin SP (2014) *The Distribution and Abundance of Electrosensory Pores in Two Benthic Sharks: the wobbegong shark Orectolobus maculatus, and the angel shark Squatina australis.* Marine and Freshwater Research 65(11): 1003-1008.
8. **Kempster RM** and Collin SP (2014) *Iconic Species: White Sharks, Whale Sharks and Basking Sharks In: Sharks: Conservation, Governance and Management* (Eds. E. Techera and N. Klein).
9. **Kempster RM** (2014) *The role of electroreception in elasmobranchs.* Ph.D. Thesis, University of Western Australia, Australia.
10. Camilieri-Asch V, **Kempster RM**, Collin SP, Johnstone R and Theiss SM (2013) *A comparison of the electrosensory morphology of a euryhaline and a marine stingray.* Zoology
11. **Kempster RM**, Garza-Gisholt E, **Egeberg CA**, Hart NS, OShea OR and Collin SP (2013) *Sexual dimorphism of the electrosensory system: A quantitative analysis of nerve axons in the dorsal anterior lateral line nerve of the blue spotted fantail stingray (taeniura lymma).* Brain , Behavior and Evolution
12. O'Shea OR, Thums M, van Keulen M, **Kempster RM** and Meekan MG (2013) *Dietary partitioning by five sympatric species of stingray (Dasyatidae) on coral reefs.* Journal of Fish Biology
13. **Kempster RM**, Hunt DM, Human BA, **Egeberg CA** and Collin SP (2013) *First record of the mandarin dogfish Cirrhigaleus barbifer (Chondrichthyes: Squalidae) from Western Australia.* Marine Biodiversity Records.
14. **Kempster RM**, Hart NS and Collin SP (2013) *Survival of the stillest: Predator avoidance in shark embryos.* PLoS One 8(1): e52551
15. Fitzpatrick J, **Kempster RM**, Daly-Engel T, Collin SP and Evans J (2012) *Postcopulatory sexual selection in elasmobranchs.* Journal of Fish Biology 80(5): 1141-1158
16. **Kempster RM**, McCarthy ID and Collin SP (2012) *Phylogenetic and ecological factors influencing the number and distribution of electroreceptors in elasmobranches.* Journal of Fish Biology 80(5): 2055-2088
17. **Kempster RM** and Collin SP (2011) *Electrosensory pore distribution and feeding in the basking shark, Cetorhinus maximus (Lamniformes: Cetorhinidae).* Aquatic Biology 12:33-36
18. **Kempster RM** and Collin SP (2011) *Electrosensory pore distribution and feeding in the megamouth shark, Megachasma pelagios (Lamniformes: Megachasmidae).* Aquatic Biology 11:225-228
19. **Kempster RM** (2007) *Distribution of ampullary pores in elasmobranchs in relation to feeding ecology and phylogeny with specific reference to Mustelus asterias and Mustelus mustelus (Triakidae).* M.Sc. Thesis, University of Wales, Bangor

RESEARCH SPOTLIGHT

Research Reveals Effective Shark Deterrent

In a world first study, our research team travelled to South Africa to test the effectiveness of the commercially available Shark Shield deterrent. We concluded that the Shark Shield produced an effective deterrent field an average of 1.3 metres from the device's electrodes. It was found to prevent white sharks (*Carcharodon carcharias*) from interacting with a static bait 100% of the time on their first approach.

It was only after subsequent approaches that the rate dropped slightly to 90% of the time, showing signs of habituation to the Shark Shield, which decreased the effectiveness of the deterrent field by an average of 12 centimetres per approach by the same shark. However, despite an increase in tolerance, white sharks continued to be deterred from biting or interacting with the bait if an active Shark Shield was present.



Dr Ryan Kempster said that “although the effectiveness of the Shark Shield likely varies between species, the fact that white sharks are implicated in the majority of fatal incidents globally suggests that a deterrent that effectively deters this species should be an important safety consideration for ocean users”.

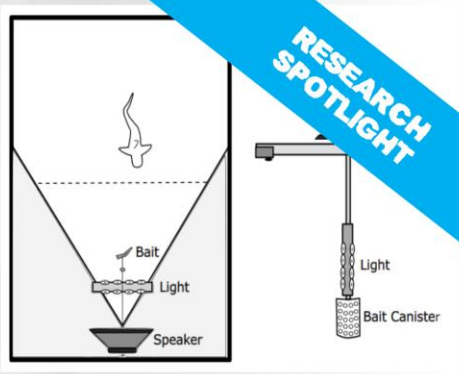
Study coauthor, Prof. Shaun Collin, added that “this device is no guarantee of 100 per cent protection from any species of shark but at present, under the conditions in which we tested it, the Shark Shield is the most effective shark deterrent device currently on the market.”

Kempster RM, Egeberg CA, Hart NS, Ryan L, Chapuis L, et al. (2016) How Close is too Close? The Effect of a Non-Lethal Electric Shark Deterrent on White Shark Behaviour. PLoS ONE 11: e0157717.

Repelling Sharks with Lights and Sounds

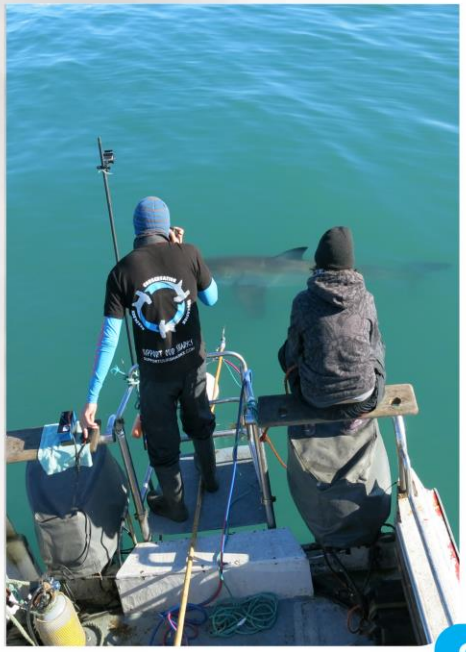
RESEARCH SPOTLIGHT

In a further attempt to develop a non-lethal shark deterrent, we tested a series of artificial sounds and lights to see if the behavior of free-swimming sharks could be altered. Unlike the very positive results we observed with the Shark Shield electronic deterrent, we did not observe a significant deterrent response to the artificial sounds when presented alone. Neither did we observe any significant deterrent response when the sharks were presented with just a flashing strobe light. However, when the auditory and visual stimuli were presented in combination, white sharks (*Carcharodon carcharias*) spent significantly less time in close proximity to the presented bait. Furthermore, this effect was even more pronounced in smaller benthic shark species that we tested.



Despite the ineffectiveness of the light or sound source alone, the combined effective shows great potential for a non-lethal deterrent device. Specifically, there may be valuable applications for this approach in deterring specific species from fishing hooks or nets to reduce fisheries bycatch.

Ryan LA, Chapuis L, Hemmi JM, Collin SP, McCauley RD, Kempster RM, et al. (2017) Effects of auditory and visual stimuli on shark feeding behaviour: the disco effect. Marine Biology 165: 11.



“When you see a shark underwater, you should say, how lucky I am to see this beautiful animal in his environment!.”

Eugenie Clark

Media Coverage

As scientists, we believe it is important for us to facilitate good communication of our research findings to ensure the effectiveness of future conservation and management plans. We regularly speak out for the protection of sharks and rays in the international media to spread awareness and share our expert knowledge with the public. In 2013, we appeared in two international documentaries, a number of major newspapers and magazines, and took every available opportunity to speak out for the protection of sharks and rays.

The New York Times

BBC NEWS

SCIENTIFIC AMERICAN

WIRED

NOVA

NATIONAL GEOGRAPHIC

Science AAAS

News

NewScientist

SELECTED MEDIA

© Gina Mascord

Shark's Sixth Sense Aid Attacks from Below

Wobbegong (*Orectolobus maculatus*) and angel sharks (*Squatina australis*) have evolved unique electrosensory pores that aid attacks on unsuspecting prey from beneath. Channing Egeberg and Dr Ryan Kempster compared and analysed the distribution and abundance of these pores in both spotted wobbegong and Australian angel sharks to determine their importance. They found both species feature large clusters of pores dorsally and ventrally, aiding their benthic lifestyle and ambush hunting style.

"Both species will sit motionless on the seafloor and wait for unsuspecting prey to pass over their head, at which point they strike with incredible speed," Ms Egeberg says.

"We looked at their sensory biology to see if electroreception was being used to facilitate this type of hunting behaviour. We found that both species have independently evolved a similarly unique distribution of electrosensory pores, unlike any other shark species, that would certainly assist in their ambush feeding strategy."

Originally Published as "Shark's Sixth Sense Aid Attacks from Below" by Phys.org

MEDIA SPOTLIGHT

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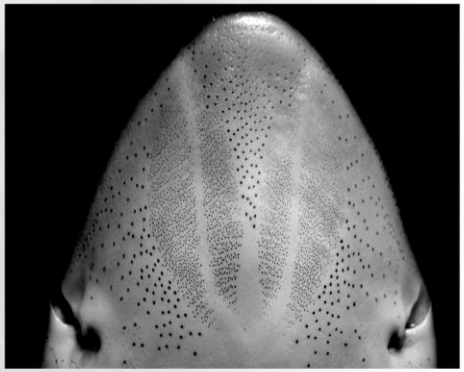
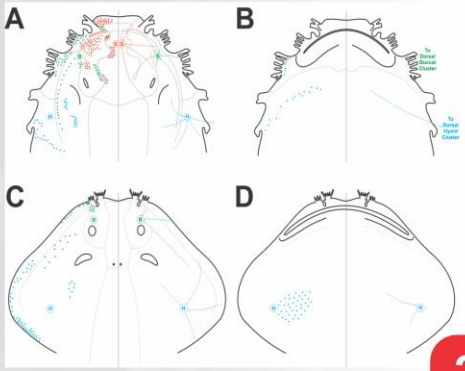
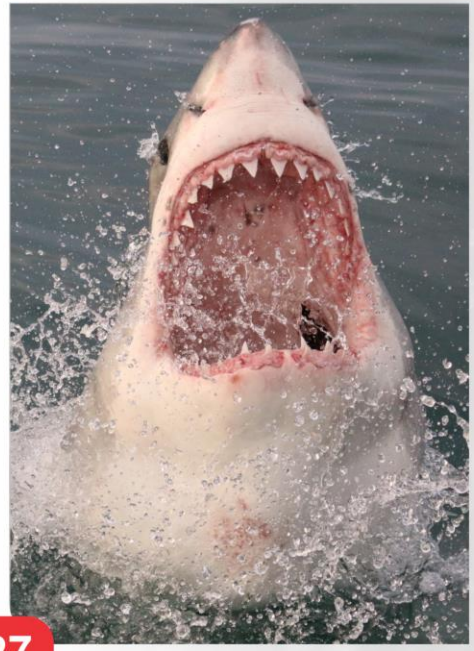




See www.supportoursharks.com (search 'Media') for a complete list of SOS media coverage

MEDIA SPOTLIGHT

Great White Shark Deterrent



Study found great whites turned away from a baited canister attached to an active Shark Shield upon first encounter at an avg. distance of 1.3m. Only one out of 43 encounters featured a great white touching the canister after several approaches.

Shark Shield is a wearable electric shark deterrent, attached to users at the ankle like a surfboard leash, and trails a 2.2m-long antenna in the water. It generates an electric field thought to over-stimulate the shark's electrosensory system, a system used by sharks to sense the vibrations of their prey and other objects in the ocean.

"The fact that [great] white sharks are implicated in the majority of fatal incidents globally suggests that a deterrent that effectively deters this species should be an important safety consideration for ocean users," Dr Ryan Kempster, lead researcher on the paper.

The researchers did find that sharks became used to the Shield. On subsequent encounters, the same shark would come roughly 12cm closer each time, with some individuals approaching up to seven times. However almost none came closer than 0.9m said study coauthor Prof Shaun Collin.

The research also found no evidence that the Shark Shield attracted sharks from a greater distance, which is a common belief shared by surfers. Some research has previously demonstrated that sharks can be attracted to electrical fields, but also show they can be repelled when an electric stimulus differs in frequency or strength from the bioelectric fields produced by the sharks' prey.

Originally Published as "Great White Shark Deterrent almost 100 per cent effective" by Australian Geographic (australiangeographic.com.au)

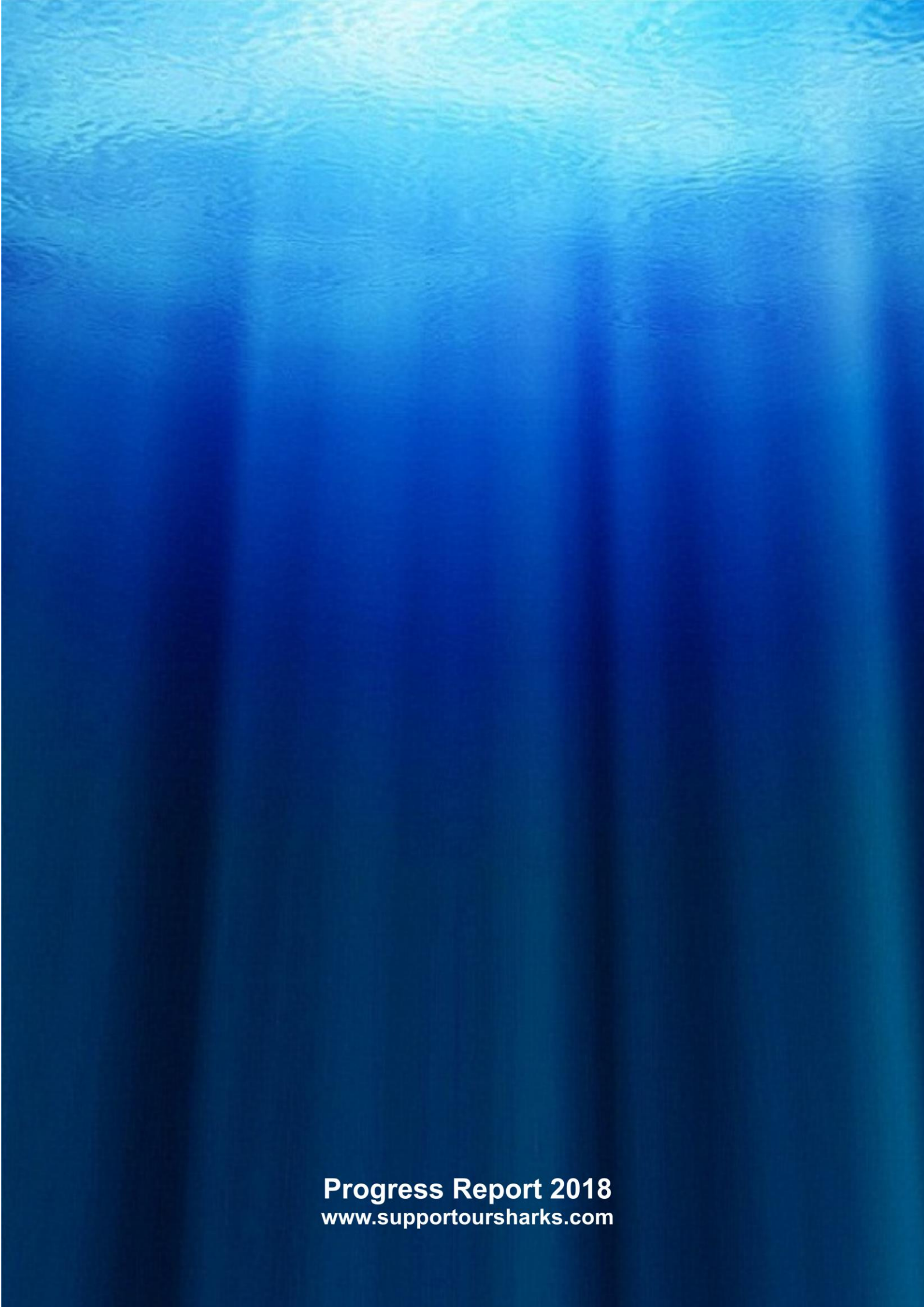
Become a Citizen Scientist

I want to take the opportunity to introduce you to an exciting global shark database: SharkBase. This is your chance to get involved and become a Citizen Shark Scientist! In order to protect sharks, we need to learn more about them. Effective management of sharks starts with an understanding of their population status, which can then tell us about their future conservation and how we can help protect them.

Through SharkBase, we are building a global network of Citizen Scientists collecting vital information about these important animals. Using the data gathered by SharkBase, we will not only be able to map the distribution of sharks globally, but, as sharks play a vital role in marine environments, we can also use this information to infer patterns of marine ecosystem health. All data is freely available to download from the SharkBase website, and is used by researchers around the world to assist in the management of shark populations.

Originally Published as "Become a Citizen Scientist with SharkBase" by The Ocean Conservancy (oceanconservancy.org)

MEDIA SPOTLIGHT



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