# SAVE OUR SEAS FOUNDATION ANNUAL REPORT 2019







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# **"AS LONG AS THERE ARE PEOPLE WHO CARE AND TAKE** ACTION, WE CAN AND WILL MAKE A DIFFERENCE." THE FOUNDER I SAVE OUR SEAS FOUND





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# CEO'S FOREWORD

Hello, my name is James and I am humbled to be writing this foreword as the new CEO of the Save Our Seas Foundation (SOSF). Although I only assumed this role late in 2019, the foundation has been very close to my heart since I started my professional career as a shark biologist with the SOSF back in 2007. Sharks and rays are my absolute passion and I am honoured to have this opportunity to help make a genuine difference to their conservation. Rejoining the foundation feels like coming home and I wish to thank outgoing CEO Michael Scholl for his tireless dedication to helping build the SOSF into the internationally recognised leader in shark conservation that it is today. I am honoured to be now entrusted with this legacy and all of us at the SOSF wish Michael every success with his future endeavours.

Through its support for research and education projects that aim to effect real, positive change, the SOSF is a beacon of hope for sharks, rays and other threatened marine life that face an uncertain future. Having supported more than 300 projects to date, the foundation plays an integral role in the conservation of sharks and rays on a global scale. In 2019 we funded 40 different projects, in addition to our long-term support of our partners like the Manta Trust and Bimini Shark Lab, and the three SOSF centres in Seychelles, South Africa and the USA. With over 300 projects supported to date, the foundation plays an integral role in the conservation of sharks and rays on a global scale.

SOSF project leaders produced almost 40 different research publications in 2019, with a particular highlight being the first ever collaborative global analysis of how shark movements overlap with international fisheries. The results were published in *Nature*, the world's top scientific journal, and provide crucial insight into how fisheries can be managed to reduce overlap with shark hotspots. Another highlight was the first mapping of the white shark genome from our own SOSF Shark Research Center, published in the *Proceedings of the National* Academy of Sciences. This astonishing feat, revealing the inner secrets of Jaws itself, provides untold insights into the biology and longevity of the white shark and may have important applications for its conservation as well as for human medicine. This story alone had an estimated global media reach of more than 1.2 billion views.

2019 also saw the foundation continue its focus on shark-like rays (primarily sawfishes, guitarfishes and wedgefishes), which constitute some of the most critically endangered fish species in the world. The value of our dedicated support for a global community of projects focusing on shark-like rays is reflected by the successful listing of all guitarfishes and wedgefishes in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 2019. This restricts all international trade in these species and will be a powerful conservation tool for reducing their future exploitation.

In addition, the foundation adopted a new communication strategy in 2019, with a motivated drive to engage a general audience and more actively promote awareness of the issues surrounding the conservation of sharks - why they need our help and what we as individuals can do to make a difference. Our in-house magazine Save Our Seas, which helps to achieve this, won silver and bronze awards in the Magazine Online and Magazine Print Edition categories respectively at the 10th International Creative Media Awards, highlighting the quality of SOSF outreach materials. The communication strategy also includes a particular focus on Seychelles, where we have a strong history of supporting marine research and education projects. To date we have secured regular, prominent newspaper articles about the foundation's activities and conservation efforts. We also have detailed plans for a coordinated online outreach strategy that is due to be implemented in 2020.





Top: SOSF researchers helped decode the white shark genome in 2019. Above: SOSF projects had a special focus in 2019 on sawfishes and quitarfishes, such as this bowmouth quitarfish Opposite: James with a great hammerhead shark in The Bahamas.





This year also saw the foundation continue its focus on shark-like rays, which constitute some of the most critically endangered fish species in the world.

Opposite: James photographing a manta ray in Seychelles. Below: Blue sharks regularly overlap with international fisheries, as revealed by research led by SOSF Project Leader David Sims and published in Nature.

The SOSF truly embodies our hope for a sustainable future and I look forward to 2020 with great excitement as we forge a new path for the foundation. While preserving its core as a highly respected supporter of world-class research, I am keen to position the SOSF as the primary advocate of awareness and outreach for shark conservation in the world today. Through a multifaceted approach of engaging and inspiring digital content, combined with supporting innovative research and education initiatives, I firmly believe that together we can secure a brighter future for our oceans.

anesha Dr James Lea

Chief Executive Officer



# **16 YEARS OF THE** SAVE OUR SEAS FOUNDATION

SINCE ITS INCEPTION IN 2003, THE SAVE OUR SEAS FOUNDATION HAS FUNDED MORE THAN **300 PROJECTS** IN OVER **60 COUNTRIES** WORLDWIDE AND HAS REMAINED ON THE PULSE OF CURRENT RESEARCH. CONSERVATION AND EDUCATION PROJECTS THAT FOCUS ON SHARKS AND RAYS



#### SOSF D'Arros Research Centre

Showcasing the ecological diversity and importance of D'Arros and St Joseph, with 22 targeted projects and six long-term monitoring programmes to date.

#### **SOSF Shark Education Centre**

Engaging local communities in marine conservation – more than 5000 visitors in 2019.

#### SOSF Shark Research Center

World-leading genetics laboratory, sequencing the first white shark aenome in 2019.



**Bimini Biological Field Station Foundation** 

#### The Manta Trust

Shark Spotters

#### North Coast

**Cetacean Society** 

The Acoustic Tracking Array Platform







### **Species funded**



turtles

narine

**50**<sup>+</sup> of the shark and ray

SPECIES FUNDED can be considered VULNERABLE TO EXTINCTION.

# $300^+_{\text{projects in}} 67_{\text{countries}}$



### projects each year

Average number of projects supported each year. Small Grants  $\leq$  18 months  $\pm$  US\$5000/vear Keystone Projects < 3 years ± US\$25000/year Long-term partnerships +5 years



### Average age of early career professionals supported by Small Grants.

years old

**Grant recipients** 50.5% women 49.5% men

#### SOSF CENTRES

- 1 SOSF D'Arros Research Centre, Seychelles
- 2 SOSF Shark Education Centre, South Africa
- 3 SOSF Shark Research Center, USA

#### AFRICA

#### ANGOLA

4 Sharks and rays, Ana Lucia Furtado Soares

#### SENEGAL

5 Sawfish survey, Nigel Downing

#### SEYCHELLES

- 6 Turtle monitoring, Jeanne Mortimer SOUTH AFRICA
- 7 Shark Spotters, Sarah Waries
- 8 The Acoustic Tracking Array Platform, Paul Cowley
- 9 White shark population, Dylan Irion WESTERN INDIAN OCEAN
- 10 Guitarfish conservation, Dave Ebert

### AMERICAS

#### BRAZIL

11 Pollutants in guitarfishes and angelsharks, Mariana Martins

#### CANADA

12 Cetacea Lab, Janie Wray

#### EASTERN PACIFIC

13 Mobulid ray fisheries, Josh Stewart ECUADOR

#### ECUADI

14 Shark fisheries, Kirsty Shaw GUYANA

#### 15 Shark fisheries, Diego Cardeñosa HONDURAS

- 16 Shark fisheries, Gabriela Ochoa **MEXICO**
- 17 Sawfish conservation, Ramón Bonfil
- 18 Shark fisheries, Luz Saldaña-Ruiz

#### PUERTO RICO

19 Shark genetic diversity, Glorimar Franqui Rivera

#### SAINT VINCENT AND THE GRENADINES

- 20 Shark fisheries, Catherine Macdonald THE BAHAMAS
- 21 Bimini Biological Field Station, Matthew Smukall

- 22 Lemon shark genetics, Andria Beal23 Lemon shark home ranges, Evan Byrnes
- 24 Tiger shark movements, Matthew Smukall

#### USA

- 25 Blacktip shark genetics, Dominic Swift
- 26 Bonnethead shark habitat use, Cheston Peterson
- 27 Great hammerhead shark fishery, Jill Brooks & Hannah Medd
- 28 Mobulid ray fisheries, Don Croll & Melissa Cronin
- 29 Sawfish nurseries, Gregg Poulakis
- 30 Smalltooth sawfish habitat use, Tonya Wiley
- 31 White shark predation, Gregory Skomal

#### ASIA

#### BANGLADESH

32 Sawfish fisheries, Alifa Bintha Haque

#### INDIA

- 33 Shark fisheries, Ravi Ranjan Kumar MALDIVES
- 34 Whale sharks and microplastics, Alina Wieczorek & Giula Donati

#### THE PHILIPPINES

35 Bottlenose wedgefish fishery, AA Yaptinchay

#### EUROPE

- ALBANIA 36 Shark fisheries, Rigers Bakiu
- SPAIN
- 37 Angelshark surveys, Jake Davies
- 38 Spiny butterfly ray nursery,

#### Jaime Penadés-Suay THE MEDITERRANEAN

39 Ray fisheries, Chrysoula Gubili

#### OCEANIA AUSTRALIA

- 40 Ray surveys, Kevin Crook
- 41 Sawsharks, Jane Williamson & Paddy Burke

#### PAPUA NEW GUINEA

42 Sawfish survey, William White

#### WORLDWIDE

- 43 Sawfish eDNA, Colin Simpfendorfer
- 44 Sawfish genetics, Nicole Phillips
- 45 Shark fisheries, Derek Kraft
- 46 The Manta Trust, Guy Stevens
- 47 White shark finprinting system, Benjamin Hughes & Michael Scholl

#### CONFERENCES

- Sponsorship: Conference | European Elasmobranch Association EEA, 2019
- Sponsorship: Conference | America Elasmobranch Society AES, 2019
- Sponsorship: Conference | Oceania Chondrichthyan Society OCS, 2019
- Sponsorship: Conference | Southern African Shark and Ray Symposium SASRS, 2019
- Sponsorship: American Elasmobranch Society AES, Eugenie Clark Award 2019
- Sponsorship: Conference | Latin American Conference of Sharks, Rays and Chimaeras; National Symposium of Sharks and Rays, 2019

EASTERN PACIFIC

13

25

3 27 29 30

21 22 23 24

Angelshark sur Spiny butterfly

# WHERE WE WORK 2019

The Save Our Seas Foundation was established in 2003 with a mission to protect our oceans by funding and supporting research, conservation and education projects around the world, focusing primarily on charismatic threatened wildlife and their habitats.

In that time, the foundation has sponsored over 300 projects in more than 60 countries, proudly supporting outstanding researchers, educators and conservationists who have contributed to the continued existence of more than 110 of our planet's precious marine species.

To find out more about our funded projects visit: saveourseas.com/projects

2 7 8 9

43 44 45

46 47

## OUR CENTRES REPORTS FROM THE SAVE OUR SEAS FOUNDATION CENTRES AROUND THE WORLD

D'ARROS RESEARCH CENTRE I SEYCHELLES
SHARK EDUCATION CENTRE I SOUTH AFRICA
SHARK RESEARCH CENTER I USA

SAVE OUR SEAS FOUNDATION ANNUAL REPORT 2019

And the states







### save our seas d'arros research centre

## **SOSF D'ARROS RESEARCH CENTRE**

#### 2019 SUMMARY

The Save Our Seas Foundation (SOSF) D'Arros Research Centre (SOSF-DRC) strives to achieve its vision as a centre of excellence for marine and tropical island conservation. Its mission is to preserve and showcase the ecological integrity of D'Arros Island and St Joseph Atoll through research, monitoring, restoration and education. It is this mission that motivates the activities and research undertaken on this small island of the Amirantes group in Seychelles. Primary among the activities to report in 2019 has been the publication of SOSF-DRC research in scientific journals and the showcasing of these results to a global audience.

#### THE RESEARCH CENTRE'S ONGOING OBJECTIVES ARE TO:

- Demonstrate that D'Arros Island and St Joseph Atoll harbour unique ecosystems and species assemblages and that they constitute vital components of the region's natural heritage.
- Minimise harmful disturbance from human activities to the area through continued effective management and regular surveillance.
- Utilise innovative technology to monitor long-term trends in population numbers of sensitive species, important ecosystem processes and climate change.







Left: Roseate terns at St Joseph Atoll. Middle: Blacktip reef shark at D'Arros Island.

Right: Hawksbill turtle foraging on the reefs of D'Arros. Opposite: Whale shark in the waters of Mahé.

- Identify, propose, implement and manage pertinent targeted research projects.
- Restore certain ecosystems to a more natural, biodiverse and productive state.
- Establish collaborative partnerships with universities, local NGOs, neighbouring islands in the Amirantes group and other key role players, and share data.
- Promote conservation in Seychelles through environmental education, collaboration and media productions and by sharing expertise.
- Produce peer-reviewed scientific publications, popular articles and useful managerial aids.

To reach its objectives and fulfil its vision, the SOSF-DRC comprises full-time staff as well as researchers, and it collaborates with universities, other external research institutes and Seychelles NGOs.

In 2019, lab managers Ryan and Clare Daly moved on to new opportunities, resulting in limited research activities during the year. For this reason, the 2019 annual report details the remote research, results and publications of SOSF-DRC staff and project leaders. The centre is scheduled to re-open in 2020.

#### REMOTE RESEARCH ACTIVITIES

Dr James Lea, now CEO of the SOSF, maintains a network of 88 acoustic receivers (VR2W-69 kHz, VEMCO), which is significant as the only network of its size and kind in the region. Acoustic receivers enable researchers to track tagged sharks and rays across the region by 'listening' to the ping emitted from the tags of passing sharks. Multiple research projects rely on this acoustic array to meet a variety of study objectives. Data from the receivers was downloaded in April and November 2019 and will help to guide improved understanding of where, how often and over what distances sharks and rays are moving in Seychelles. This kind of information is needed to meet several of the SOSF-DRC's key objectives, in particular the continued effective management and regular surveillance of sensitive species and the monitoring of long-term trends in their population numbers, as well as in essential ecosystem processes and climate change. Many of the papers published in 2019 derived their data from this array.

PhD student Madeleine Emms from the University of Cambridge studied reef fish genetics, comparing local populations to those in the Red Sea. She aimed to investigate how these reef fishes may survive and recover from severe bottlenecks (such as during the last glacial period), where a population may have undergone a sudden drop in numbers.





Manta rays reefing in the waters around D'Arros Island.

#### PUBLICATION OF LONG-TERM SOSF-DRC RESEARCH

Much exciting new research from the SOSF-DRC made its way into peerreviewed publications during the course of 2019. The results described in 10 publications support ongoing management recommendations for the region and inform future research at the SOSF-DRC. These studies ranged from identifying and describing essential habitats for juvenile blacktip reef sharks and sicklefin lemon sharks (Weideli et al. 2019a) to the description of a unique event where 30 individuals of three shark species (tiger, bull and tawny nurse) were recorded scavenging on a sperm whale carcass [Lea et al. 2019]. The range of species studied around D'Arros Island and St Joseph Atoll covered the minute (the description of a new species of dwarfgoby, *Eviota dalyi*, is important to understanding just how much biodiversity thrives in this region; Greenfield and Gordon 2019) and the microscopic (in the form of a parasite recorded for the

first time on sicklefin lemon sharks; Daly et al. 2019), as well as the very large (reef manta rays were highlighted as important nutrient cyclers in the coral reef system, and their reliance on D'Arros Island in particular was shown; Peel et al. 2019a and b).

The generous support of the SOSF also meant that poorly studied species like the porcupine ray could be tracked and studied (Elston et al. 2019), and that even very popular and important fisheries species like the bonefish could be understood better in order to show that its management should change to one that reflects its vulnerability to catch-and-release fishing (Moxham et al. 2019). The contribution of so many publications in a single year, across a range of species and habitats, is exciting both for the region and as a contribution to scientific research on topical conservation themes globally.



Aerial shot of St Joseph Atoll, clearly showing the extensive reef flat.

#### PUBLICATION LIST FROM RESEARCH RELATED TO THE SOSF-DRC IN 2019

Daly R, Keating-Daly CA, Hounslow JL, Byrnes EE. 2019. New host record for the marine leech, Pontobdella macrothela (Hirudinida: Piscicolidae) from sicklefin lemon sharks. Negaprion acutidens (Chondrichthyes: Carcharinidae) in St. Joseph Atoll, Republic of Seychelles, West Indian Ocean. Comparative Parasitology 86(1): 58-60.

Elston C, Cowley PD, Von Brandis RG. 2019. Movement patterns of juvenile porcupine rays *Urogymnus asperrimus* at a remote atoll: a potential nursery ground within a proposed marine protected area. Environmental Biology of Fishes 102[12]: 1485-1498.

Gadoutsis E, Daly CA, Hawkins JP, Daly R. 2019. Post-bleaching mortality of a remote coral reef community in Seychelles, Western Indian Ocean. Western Indian Ocean Journal of Marine Science 18(1): 11–18.

Greenfield DW, Gordon L. 2019. Eviota dalyi, a new dwarfgoby from the Amirante Islands, Seychelles (Teleostei: Gobiidae). Journal of the Ocean Science Foundation 33: 9–15. Lea JS, Daly R, Leon C, Daly CA, Clarke CR. 2019. Life after death: behaviour of multiple shark species scavenging a whale carcass. Marine and Freshwater Research 70[2]: 302-306.

Moxham EJ, Cowley PD, Bennett RH, Von Brandis RG. 2019. Movement and predation: a catch-and-release study on the acoustic tracking of bonefish in the Indian Ocean. Environmental Biology of Fishes 102(2): 365-381.

Peel LR, Daly R, Keating Daly CA, Stevens GMW, Collin SP, Meekan MG. 2019a. Stable isotope analyses reveal unique trophic role of reef manta rays [Mobula alfredi] at a remote coral reef. R. Soc. open sci 6: 190599.

Peel LR, Stevens GM, Daly R, Daly CA, Lea JS, Clarke CR, Collin SP, Meekan MG. 2019b. Movement and residency patterns of reef manta rays Mobula alfredi in the Amirante Islands, Seychelles. Marine Ecology Progress Series 621: 169–184. Weideli OC, Papastamatiou YP, Planes S. 2019a. Size frequency, dispersal distances and variable growth rates of young sharks in a multi-species aggregation. *Journal of Fish Biology* 94[5]: 789–797.

Weideli OC, Kiszka JJ, Matich P, Heithaus MR, 2019, Effects of anticoagulants on stable isotope values ( $\delta$ 13C and  $\delta$ 15N) of shark blood components. Journal of Fish Biology 95(6): 1535-1539





save our seas shark education centre



CLOVA MABIN

## SOSF SHARK EDUCATION CENTRE

DR CLOVA MABIN

#### 2019 SUMMARY

2019 was my first year at the Save Our Seas Foundation Shark Education Centre and I have loved every minute of it! My predecessor, Eleanor Yeld Hutchings, left in January and I took over as manager in March, aware that since its inception in 2008 the centre has grown as an ambassador for marine conservation and is fostering a deep connection between the public and sharks. Although I was on maternity leave for several months, I maintained regular contact with the staff and am pleased to report on a successful year of reflection and much-needed maintenance. Unfortunately the education coordinator also resigned in 2019, but Tom Campbell provided plenty of help during my leave period.

Due to the changes in management, we decided to make this year about reviewing our status quo. This included an assessment of administrative processes and educational content and materials, as well as the physical space we work in. The aim was to improve efficiency and identify ways to further increase our impact in line with our mission statement.

As an education centre, the number of people we reach each year is an important statistic. In 2019 we taught a total of 2,867 pupils from 42 schools. This is similar to the figure for 2018, with a continuation of the upward trend seen in previous years. The centre receives wonderful feedback on a daily basis, but it







Opposite: The Save Our Seas Foundation Shark Education Centre overlooks the Dalebrook beach, which is part of a marine protected area in False Bay.

Left: Schoolchildren learning about the important role Shark Spotters play in Cape Town. Right: Wisaal giving a lesson on sharks and their very special dermal denticles

Dalebrook rocky shore visits and the highly interactive Treasure Hunt app on the Ipads remain firm favourites with school groups.

is clear that the Dalebrook rocky shore visits and the highly interactive Treasure Hunt app on the lpads remain firm favourites with school groups. We also had 25 non-school groups visit the Shark Education Centre, totalling 755 children and adults. Our open afternoon sessions saw a total of 1,587 members of the public come through the doors, with a record of 77 visitors on one day alone in January 2019.

In addition to the school and public visitors, we hosted several independent workshops, including the WildOceans Marine Protected Area (MPA) youth group, the WWF South Africa Sustainable Seafood Initiative (WWF SASSI) and the Long-term Intertidal Monitoring through Participation Evaluation and Training (LIMPET) programme. The Cape Town Environmental Education Trust (CTEET) also requested a customised workshop for teachers from its Eco-Schools programme. The feedback from this event was such that we hope not only to make it a regular addition to the calendar, but also to encourage the teachers to return with their schools.

In 2019 we taught a total of 2,867 pupils from 42 schools.

The interactive touch table where each player drives their own shark research boat is a big hit with visitors of all ages.





Above: A school group learning about shark senses while playing the Treasure Hunt app. Right: Learning to work as a team while exploring the centre. Opposite: What does the skin of a marine animal feel like? Children exploring the touch panels at the Shark Education Centre.









Our Marine Explorers programme continued this year with children from Capricorn Primary School and Muizenberg Junior School. A total of 23 children [aged 10–11 years] completed the programme, which involved six months of surfing and snorkelling sessions with our team, with the assistance of the wonderful volunteers from the UCT underwater club. The programme culminated with a Marine Awareness camp at the Soetwater Environmental Centre on the Cape Peninsula. Camp activities included lessons on marine ecology, a night hike, interactive snake and bird experiences and of course plenty of team-building opportunities.

The results of a Monitoring, Evaluation and Learning (MEL) assessment were revealed in 2019. Using a theory of change model, key messages had been identified in 2018 and questions were developed to assess how students received these messages. We now know that in 2018, before visits, approximately 60% of students answered these questions correctly. The proportion increased to 80% after the visit. As expected, the groups that had less prior knowledge showed the greatest increase in learning. These results indicate that we are on the right track, but also highlight which areas require more attention in 2020. As a consequence, we have decided to adapt our lesson content to include a stronger conservation message. This will continue to be a focus for us in the years ahead, as will a targeted campaign to reach more under-resourced schools.

Previous spread: The Save Our Seas Foundation Shark Education Centre in the heart of False Bay is perfectly located to promote experiential learning.

Left: Catching a wave during the Marine Explorers programme. Below: Time to dive beneath the surface and meet some sea creatures on the Marine Explorers programme.





Left: Did you know that many seaweed species are edible? A child on a school outing tastes a small piece of sea lettuce. Right: A shark egg case (or mermaid's purse) is discovered on the rocky shore.

Before visits, approximately 60% of students answered these questions correctly. The proportion increased to 80% after the visit.







A beautiful nudibranch is an exciting find in a rock pool.

We have decided to adapt our lesson content to include a stronger conservation message.

Previous spread: A school group gets an introduction on how the scientists do it, learning how to count creatures on the rocky shores.

Opposite: A school group enjoying some experiential learning in the rockpools at Dalebrook beach, across the road from the Shark Education Centre.

The centre exhibits see a considerable amount of wear and tear each year at the hands of our many visitors and as a result, regular maintenance is essential. We replaced the bench on which our microscope and bio-viewers stand and undertook a major revamp of the main aquarium. In addition to the repairs, we introduced some new features, including the eco-code mural on a wall close to the school group snack area. This code states the conservation actions we take as a centre to lessen our environmental impact. By painting this in an area that is visible to school groups during snack time, we hope to inspire change in the children who read it. In addition, our 'swimming' hammerhead shark sculpture on Kalk Bay main road was lifted so that it is more visible to passing traffic and pedestrians. Our water-wise garden continues to thrive despite the drought and in order to further improve the aesthetic of the garden, we enclosed the rainwater collection tanks with wooden panels.

During 2019, the offices of the Education and Communications team were moved upstairs to make way for the development of the downstairs rooms into





Opposite: The team at the Shark Education Centre, from left to right: Clova, Lillian, Zanele, Tom and Claire.

Above: Clova showing a learner how to gently handle the creatures that live in the Dalebrook rock pools.

educational exhibits. These installations are currently being designed in collaboration with Heidi de Maine from Sunfish Consulting – we can't wait to see them take shape.

The changes to the centre in 2019 were not limited to the interior; we also repaired and painted the roof and gave the external façade an instant face-lift with a new paint colour. Unfortunately, scheduled power outages continue to be an issue in South Africa as the national electricity provider struggles with reduced capacity. As a result, several of our systems in the centre suffered, including the sump tank that catches the overflow from our main aquarium. A back-up system has been installed for the tank and we have ordered batteries to store the charge from our solar panels. This will enable us to run selected appliances for several hours in the event of a power failure.

Over the course of 2019 the staff attended several external conferences and workshops. The 2019 South African Marine and Coastal Educators Network (MCEN) conference was held in January in the Southern Cape area. The conference provides an opportunity for educators from organisations all over South Africa to meet and motivate each other by sharing their work, their ideas for lessons and educational activities and their experiences. We were also very





Above: Claire guiding a team through the Treasure Hunt app. Left: Tom teaches a school group about life on the rocky shores.







Opposite: An outreach group visit to the Shark Education Centre. Following spread: High-spirited learners prepare to explore the rocky shore at Dalebrook beach.

fortunate to attend the 5th Southern African Shark and Ray Symposium in 2019, which had as its theme 'Elasmobranchs in the Blue Economy'. The talks were excellent and it was wonderful to learn about the latest research coming out of southern Africa and to network with key scientists and NGO and industry professionals. This event also provided an opportunity for the inaugural meeting of the Southern African Shark Conservation forum, which we hope to be a part of in future years.

Looking back, 2019 was a year for finding our feet. Now we are all looking forward to 2020, which we expect to be filled with positive impacts, calm seas and, of course, big smiles on the faces of the children we teach!

Now we are all looking forward to 2020, which we expect to be filled with positive impacts, calm seas and, of course, big smiles on the faces of the children we teach!



![](_page_23_Picture_0.jpeg)

![](_page_24_Picture_0.jpeg)

![](_page_24_Picture_3.jpeg)

save our seas shark research center

![](_page_24_Picture_5.jpeg)

MAHMOOD SHIVJI

## SOSF SHARK **RESEARCH CENTER**

DR MAHMOOD SHIVJI

#### 2019 SUMMARY

The Save Our Seas Foundation Shark Research Center (SOSSRC), one of three global centres of the Save Our Seas Foundation, also functions as an academic unit of Nova Southeastern University, Florida, USA, and has a dual mission of conducting advanced marine science research and providing university-level student education.

The SOSSRC uses a multi-disciplinary approach to research, employing methods from genetics, genomics and field ecology. This operational strategy is based on our philosophy that a reliable, holistic understanding of the biology of animals to aid conservation is best obtained using tools from different disciplines, used in an integrative manner.

#### IN 2019, THE SOSSRC CONTINUED ITS GLOBALLY WIDESPREAD RESEARCH ON SHARKS IN THREE BROAD AREAS:

- 1. We extended a major effort to decode entire genome sequences of sharks to obtain a highly detailed view of the genetic basis underlying the biological traits and ecological functioning of these extraordinary but threatened animals.
- 2. We continued our work on determining the population genetic dynamics of several large species of exploited sharks.

3. We completed a study investigating the seasonal movements of the smooth hammerhead shark.

#### **1. SHARK GENOMES RESEARCH**

**A** | In the first of two programmes, the SOSSRC led an international collaboration of scientists to complete the first genome sequence of the great white shark. This effort resulted in the publication of a pioneering research study in the prestigious science journal *Proceedings of the National Academy of Sciences, USA*, in February 2019. Because of the novel discoveries made, this research received a huge amount of widespread media coverage for the SOSF brand, including major international media venues such as Reuters, Yahoo News, *Newsweek*, the World Economic Forum, the BBC, ABC (Australia), CBC (Canada), Voice of America, XinhuaNet (China), *Tapei Times* (Taiwan), *The Japan Times, International Business Times* (India), *Der Spiegel* (Germany), ABC (Spain), *TIEDE Magazine* (Finland), *Politiken* (Denmark), CNET Español, *Focus* (Italy) and *Financial Mail* (South Africa). More than 400 media outlets covered this work, with a potential reach of 1.253 billion people (print and broadcast) and Advertising Value Equivalency of US\$11,596,463.

Decoding the white shark's genome revealed many genetic innovations that could explain the evolutionary success of this species and possibly sharks in general. It also has potential relevance for improving human medicine. One of the highlight discoveries was specific DNA changes indicating advantageous molecular adaptation (also known as positive selection) in numerous white shark genes that play critical roles in the maintenance of genome stability and integrity. These adaptive DNA sequence changes were found in genes intimately tied to key cellular functions involving DNA repair, DNA damage response and DNA damage tolerance, among others. The importance of this discovery is underscored by the fact that the opposite phenomenon – that is, the *lack* of genome stability/ integrity, which results from continuous processes that damage DNA in all species – predisposes cells to numerous cancers and age-related diseases.

Decoding the white shark's genome revealed many genetic innovations that could explain the evolutionary success of this species. Below: Save Our Seas Foundation Shark Research Center graduate student, Sydney Harned, conducting genetics research. Opposite: Save Our Seas Foundation Shark Research Center Lab.

![](_page_25_Picture_6.jpeg)

![](_page_25_Picture_7.jpeg)

![](_page_25_Picture_10.jpeg)

![](_page_26_Picture_0.jpeg)

![](_page_26_Picture_5.jpeg)

Furthermore, there was an enrichment of several of these genome-stability genes, highlighting the novelty of this genetic fine-tuning in the great white shark. Another highlight of this research was the discovery of positive selection and gene content enrichments involving several genes tied to fundamental biochemical processes in wound healing, indicating that these genetic adaptations may be a major factor underlying the vaunted ability of sharks to heal so efficiently from even large wounds.

There's still lots more to be learned from this amazing group of animals. A robust understanding of the DNA adaptations in sharks requires more detailed investigations of their whole genome. This area of research is now a significant focus of the SOSSRC because in addition to gaining biological knowledge to aid conservation planning, it has the potential to provide medically useful information that may possibly be applied to develop treatments to fight cancer and age-related diseases and improve wound healing in humans.

**B** | We substantially expanded our efforts to generate the additional data needed to produce a high-quality reference genome sequence of the great hammerhead shark Sphyrna mokarran. This species' IUCN Red List status of

Critically Endangered makes it imperative for us to have the best and most comprehensive information on its biology and population history to better guide international management, conservation and restoration measures. To achieve this goal, we generated a massive new dataset of long-read DNA sequences based on the latest genomics technology and bio-informatically combined these data with our existing short-read sequence dataset to produce a draft hybrid assembly of the great hammerhead shark's genome. We also started work to further refine the contiguity of this draft genome by performing additional genomics techniques known as proximity ligation and associated computational analyses. The result of all this high-technology genomics and bio-informatics work will be the production of the first and very high-quality genome assembly for the great hammerhead shark, which can be used as a reference by the global science community to better understand the biology of this Critically Endangered species and implement improved conservation measures utilising the most up-to-date scientific information available.

![](_page_27_Picture_0.jpeg)

![](_page_27_Picture_4.jpeg)

Sampling a fin tissue clip for genetic studies from a satellite-tagged shortfin mako shark just before release.

#### 2. POPULATION GENETIC DYNAMICS OF LARGE, EXPLOITED SHARK SPECIES

We continued work using genomics tools to identify genetically distinct populations and levels of genetic diversity in three species of large-bodied, apex predator sharks that are globally exploited and of high conservation concern: tiger shark (IUCN Near Threatened), scalloped hammerhead shark (IUCN Critically Endangered) and shortfin mako shark (IUCN Endangered). This genetics knowledge is essential because individual populations of each species living in different geographic regions can become adapted at the DNA level to their specific environments. These genetic adaptations are critical for providing the species as a whole with the ability to survive ongoing changes in the environment, thus giving it an evolutionary resilience against extinction. The identification and preservation of such genetically unique populations is urgent given the rapid changes occurring in the earth's climate and oceanic ecosystems.

/

*This research* [...] *provides a direct* science-based strategy to aid conservation of this species in this region.

Below: Great hammerhead shark. Opposite: Part of the Save Our Seas Foundation Shark Research Center's genome research team, from left to right: Xin Sun, Hao Meng Professor Shu-Jin Luo, Professor Mahmood Shivji, Sydney Harned, Marissa Mehlrose.

![](_page_28_Picture_2.jpeg)

![](_page_28_Picture_6.jpeg)

#### **3. SEASONAL MOVEMENTS OF THE SMOOTH HAMMERHEAD SHARK**

The successful conservation of populations of exploited sharks requires knowledge of their migration patterns and how they use their habitat. In 2019, the SOSSRC team, working in collaboration with the Guy Harvey Research Institute, completed the first examination of the movement ecology of smooth hammerhead sharks (IUCN Vulnerable) in the western Atlantic. The results revealed clear seasonal patterns of shark movements and residency areas. The sharks also displayed high overlap of their winter area residency with an area off the US mid-Atlantic coast that for seven months of the year is closed to bottom-longline fisheries. Importantly, the study revealed that, based on the timing of shark movements and residency and the closure period of this fishing area, protection for smooth hammerheads from commercial fishing could be dramatically increased by beginning the official closure period one month earlier than the current schedule. This research, in addition to revealing the first detailed information about the movements of smooth hammerhead sharks in the western North Atlantic, provides a direct science-based strategy to aid conservation of this species in this region.

#### Scientific papers published by the SOSSRC in 2019

Marra NJ, Stanhope MJ, Jue N, Wang M, Sun Q, Bitar PP, Richards VP, Komissarov A, Rayko M, Kliver S, Stanhope BJ, Winkler C, O'Brien SJ, Antunes A, Jorgensen S, Shivji MS. 2019. White shark genome: ancient elasmobranch adaptations associated with wound healing and the maintenance of genome stability. Proceedings of the National Academy of Sciences USA 116[10]: 4446-4455. https://doi.org/10.1073/ pnas.1819778116

Gorman J, Marra N, Shivji MS, Stanhope MJ. 2019. The complete mitochondrial genome of an Atlantic Ocean shortfin mako shark, Isurus oxyrinchus. Mitochondrial DNA B. Volume 4, Issue 2. https://doi.org/10.1080/23802359.2019.1677524 Byrne M, Vaudo JJ, Harvey G, Johnston M, Wetherbee B, Shiviji M. 2019. Behavioral response of a mobile marine predator to environmental variables differs across ecoregions. *Ecography* 42: 1569–1578. https://doi.org/10.1111/ecog.04463

### **OUR PARTNERS** REPORTS FROM THE SAVE OUR SEAS FOUNDATION CENTRES AROUND THE WORLD

**BIMINI BIOLOGICAL FIELD STATION FOUNDATION I MATTHEW SMUKALL** 

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- 5 THE ACOUSTIC TRACKING ARRAY PLATFORM | PAUL COWLEY

![](_page_29_Picture_8.jpeg)

![](_page_30_Picture_0.jpeg)

Setting a gill net in the Bimini lagoon at sundown. Our PIT survey consists of gill netting in the lagoon for 12 nights in order to thoroughly sample the shark population.

![](_page_30_Picture_3.jpeg)

![](_page_30_Picture_4.jpeg)

MATTHEW SMUKALL

## **BIMINI BIOLOGICAL FIELD STATION FOUNDATION**

MATTHEW SMUKALL

#### 2019 SUMMARY

### CONSERVATION IMPACT, REGIONAL SIGNIFICANCE AND SCIENTIFIC IMPORTANCE

One of the overarching goals of the Bimini Biological Field Station Foundation (BBFSF) is to improve our understanding of marine animals, with a focus on the elasmobranch fauna. This includes investigating the behavioural, biological, ecological and physical mechanisms underlying the life history of elasmobranchs. Such information is essential for the establishment of effective conservation and fisheries management strategies in The Bahamas and throughout the western North Atlantic. We aim to disseminate these findings so that information gathered by the BBFSF can be utilised to improve elasmobranch conservation efforts worldwide.

Many elasmobranch species are experiencing declines and accelerated pressures from a combination of overexploitation, mortality relating to by-catch, changing climate and ocean currents, and habitat modification. Anticipating the responses of shark and ray populations to these pressures is crucial for designing effective multi-species conservation or management plans.

During 2019 we continued our long-term efforts to assess the impact of habitat modification on lemon shark populations; to define core areas of

distribution and habitat use for multiple elasmobranch species around Bimini; to monitor population trends of large coastal shark species by conducting fisheries-independent long-line surveys; and to determine the level of connectivity for large sharks between The Bahamas and the USA. We have initiated new projects, such as determining the impact of anthropogenic noise on juvenile lemon sharks, investigating the predator-prey dynamics of great hammerheads and rays, and clarifying the temporal and spatial overlap of great hammerheads with commercial long-line fisheries.

The BBFSF believes that important aspects of conservation are to ensure that the general public is kept informed about research findings and that the next generation of marine scientists is well trained. To this end, we have continued our outreach programmes by providing daily tours and open days for the local community, engaging on social media and disseminating our research through written and visual media. We hosted five university courses (80 students], 59 members of the public on research experiences or naturalist courses and 44 station interns. Education and outreach will be critical to ensuring that our research and conservation initiatives spread to future generations and around the world. Thus the BBFSF, with the funding support of a Save Our Seas Foundation Keystone Continuation Grant, has provided significant spill-over benefits that contribute to a diversity of conservation efforts.

Below: BBFSF staff and volunteers obtaining weight and length measurements as well as biologica samples from juvenile lemon sharks during the annual PIT population census Opposite: Juvenile lemon sharks are held in a temporary enclosure to ensure they are not recaptured during the survey.

![](_page_31_Picture_3.jpeg)

![](_page_31_Picture_4.jpeg)

![](_page_31_Picture_8.jpeg)

Anticipating the responses of shark and ray populations to these pressures is crucial for designing effective multi-species conservation or management plans.

![](_page_32_Picture_0.jpeg)

Opposite: A juvenile lemon shark takes refuge in the shallow mangrove habitat of Bimini, The Bahamas. Below: Researchers with the BBFSF set gill nets to catch juvenile sharks for their long-term population census.

![](_page_32_Picture_6.jpeg)

![](_page_32_Picture_7.jpeg)

#### MILESTONES AND ACTIVITIES 25th annual lemon shark census (PIT)

In May and June, 193 juvenile lemon sharks Negaprion brevirostris were captured during our 12 nights of surveys in the North Sound and Sharkland nursery areas of Bimini lagoon. These numbers are below historic levels and are contributing to our understanding of the long-term effects of the modification of lemon shark habitat.

#### Long-line census

Throughout the year, 11 standard long-line and 10 tiger long-line sets were deployed for 24 hours, adding up to 37,800 total hook hours. In the 2019 surveys we have captured blacknose shark *Carcharhinus acronotus* (n=1), blacktip shark C. limbatus (n=18), tiger shark Galeocerdo cuvier (n=31), nurse shark Ginglymostoma cirratum (n=28), lemon shark (n=21) and Atlantic sharpnose shark Rhizoprionodon terraenovae [n=2].

#### Acoustic- and satellite-tagged elasmobranchs

To date, lemon shark (n=65), bull shark *C. leucas* (n=20), blacktip shark (n=16), nurse shark (n=20), great hammerhead Sphyrna mokarran (n=30, including external and internal transmitters), tiger shark (n=51), Caribbean reef shark C. perezi (n=19), southern stingray Hypanus americanus (n=20) and green turtle Chelonia mydas (n=54) have been tagged with acoustic transmitters by BBFSF and various collaborators. Information acquired from tagged animals continues to contribute to a variety of studies that aim to identify biotic and abiotic drivers of movements, space use and migration, as well as key hotspots for species management and conservation.

![](_page_33_Picture_0.jpeg)

Education and outreach will be critical to ensuring that our research and conservation initiatives spread to future generations and around the world.

Left: Planting with local school children to help educate about the importance of mangroves in the local ecosystem. Opposite: BBFSF, partnering with Sharks4Kids, hosts several open days each year for the local schools in order to educate students about marine research and conservation.

![](_page_33_Picture_6.jpeg)

![](_page_34_Picture_0.jpeg)

#### Hammerhead fisheries interaction

In combination with a concurrent grant from National Geographic, 10 SPOT tags have been deployed on five great and five scalloped hammerhead sharks. Regional movements are being investigated to identify spatial and temporal hotspots. Fisheries landings provided by NOAA and the National Marine Fisheries Service are being assessed to determine areas of greatest risk.

#### Impacts of anthropogenic noise on lemon sharks

As part of Clemency White's doctoral dissertation, trials were conducted to determine the effects of noise on the behaviour of juvenile lemon sharks (n=20) and the sharks were monitored for chronic stressors. The activity and behavioural responses to boat engine noise were recorded and blood samples were collected to assess for stress parameters.

#### Tiger shark ecology

To date, 51 tiger sharks have been tagged with acoustic transmitters and six with fin-mounted SPOT tags. Ultrasonography has been conducted on 12 tiger sharks. Fin, muscle and blood samples were sent to the University of Windsor for ongoing stable isotope analysis. Energy storage has been assessed for tiger sharks to determine the impact of seasons, size and trophic position on health.

### 10 SPOT tags have been deployed on five great and five scalloped hammerhead sharks.

Left: A great hammerhead is secured to the side of our research vessel for the BBFSF team to implant a Vemco acoustic transmitter and fin-mounted satellite tag.

Below: Great hammerheads have unique ventral patterning, which is one characteristic BBFSF uses to identify individuals. Opposite: Tiger sharks in The Bahamas

![](_page_34_Picture_10.jpeg)

![](_page_34_Picture_15.jpeg)

#### Student support

Principal Investigator Vital Heim (University of Basel, Switzerland) continues work on his three-year term in residence at the BBFSF for his dissertation 'Fishery interactions of marine apex predators and potential ecosystem implications'. Principal Investigator Clemency White (University of Exeter, UK) continues work on her three-year term in residence for her dissertation 'The effect of anthropogenic disturbance on the spatial and sensory capabilities of the lemon shark Negaprion brevirostris around Bimini, the Bahamas, and the efficacy of local ecosystem management'.

Principal Investigator Maurits van Zinnicq Bergmann (Florida International University, USA) completed all his field work during the summer of 2019. His PhD dissertation focused on habitat movement and partitioning in the multi-species elasmobranch community in Bimini.

#### Visiting students

Evan Byrnes. Murdoch University, Australia. 'Home range scaling in lemon sharks *Negaprion brevirostris* through ontogeny: tests of bioenergetics mechanisms'.

Megan Mickle. University of Windsor, Canada. 'Noise influence on southern stingrays Hypanus americanus'.

Sarah Driscoll. Antioch University, USA. 'Influence of spatial patterning of seagrass meadows and mangroves on mobile marine vertebrates'.

Madicken Akerman. Stockholm University, Sweden. 'How lemon sharks *Negaprion brevirostris* respond to antipredator shapes'.

Andria Beal. Florida International University, USA. 'Epigenetics as a new frontier to improve shark nursery conservation in Bimini'.

Riley Beach. University of Windsor, Canada. 'Stable isotope analysis to determine food web ecology around Bimini, Bahamas'.

#### Education activities

volunteer internships at the BBFSF.

VOLUNTEER INTERNSHIP PROGRAMME | 44 volunteers resided at the field station in 2019. UNIVERSITY COURSES | Eckerd University Florida, USA. Sixteen undergraduate students attended each course in January and March. Coastal Carolina University South Carolina, USA. Eighteen undergraduate students in May. University of Minnesota, USA. Seventeen undergraduate students in August. Florida Southern College, USA. Fifteen undergraduate students in October. BBFSF COURSES I Naturalist course (open to general public). Seven participants attended in April. ALF THOMPSON MEMORIAL SCHOLARSHIP I Two Bahamian scholars were selected for one-month

#### Outreach activities

SHARK LAB PUBLIC TOURS | The BBFSF hosted more than 2,000 guests in 2019.

OPEN DAYS I Two open days were held at the Shark Lab for students from Bimini's local schools. We also participated in career day for the local high school and spoke three times to the primary schools.

GOOGLE HANGOUT - SHARKS4KIDS | We partnered with Sharks4Kids to speak with schoolchildren around the world about shark biology, research and conservation. In 2019 we engaged with more than 2,000 students.

RESEARCH EXPERIENCE PROGRAMME | Eight five-day research experiences were offered in 2019, providing an opportunity for 52 members of the public to immerse themselves in ongoing BBFSF research activities.

NASSAU PALMDALE VETERINARY CLINIC I We hosted the Palmdale Veterinary Clinic to provide care to local pets and address the overpopulation of stray cats and dogs on the island. TRASH CLEAN-UPS | We partnered with the Ministry of Tourism to conduct beach, road and reef clean-ups throughout the year. TORTUGA MUSIC FESTIVAL I The BBFSF hosted a booth at the Tortuga Music Festival in Ft. Lauderdale, Florida, which partners with the Rock The Ocean Foundation to increase public awareness about the issues impacting the world's oceans and to support scientific research, education and ocean conservation initiatives. Our booth provided different activities to introduce visitors to our research through interactive games and video clips of field research, while volunteers, staff and Principal Investigators engaged in conversation with them.

#### Media

SOCIAL MEDIA I We continued to expand our social media presence on Instagram (76,686 followers), Facebook (19,925) and Twitter (10,700) platforms.

TELEVISION PRODUCTIONS | Four television production crews filmed with the BBFSF this year: BBC Blue Planet II Live. C2K Tiger Beach Virtual Reality, Animal Planet's The Aquarium and National Geographic's Sharkfest.

#### Scientific outputs

#### PUBLICATIONS |

Lear K, Whitney N, Morgan D, Brewster L, Whitty J, Poulakis G, Scharer R, Guttridge T, Gleiss A. 2019. Thermal preference responses in free-ranging elasmobranchs depend on habitat use and body size. *Physiological Ecology* 191: 829–842. Mylniczenko N, Sumigama S, Wyffels J, Wheaton C, Guttridge T, DiRocco S, Penfold L. 2019. Ultrasonographic and hormonal characterization of reproductive health and disease in wild, semiwild, and aquarium-housed southern-stingrays (Hypanus americanus]. Amer. Jour. Vet. Sci. 80:10. 931-942.

Smukall M, Kessel S, Franks B, Feldheim K, Guttridge T, Gruber S. 2018. No apparent negative tagging effects after 13 years at liberty for shark implanted with acoustic transmitter. Journal of Fish Biology.

Dhellemmes F, Finger JS, Laskowski K, Guttridge T, Krause J. In review. Behavioral syndromes are plastic and predicted by ecological conditions in a free-ranging predator. Animal Behavior.

Dhellemmes F, Finger JS, Smukall M, Gruber S, Guttridge T, Laskowski K, Krause J. In review. A conditional link between personality and life-history trade-offs in juvenile lemon sharks [Negaprion brevirostris]: Fast explorers grow faster and have lower survival in predator-poor environments. Journal of Animal Ecology.

![](_page_35_Picture_17.jpeg)

Left: A nurse shark is measured during capture on our long-line survey. Each shark captured during the survey is measured, various biological samples are collected and the shark is then tagged for identification.

Opposite: A student swims with southern stingrays at a local congregation site. The BBFSF is studying the movement of southern stingrays and their role as a meso-consumer in the local ecosystem.

![](_page_35_Picture_23.jpeg)




Opposite: Aerial view of North and South Bimini at sunrise. Above: The team during the annual PIT census as the sun rises over the mangroves in the lagoon.

#### Oral presentations

Smukall M, Mylniczenko N, Seitz A, Gruber S, Guttridge T. 2019. Body condition and energy stores in juvenile tiger sharks *Galeocerdo cuvier*. Oral presentation. American Elasmobranch Society. Snowbird, Utah.

McClain M, Drymon M, Frazier B, Gallagher A, Grubbs RD, Guttridge T, Hammerschlag N, Smukall M, Daly-Engel T. 2019. Ohana means family: kinship analysis of tiger sharks reveals natal philopatry and age-dependent structure in the Western North Atlantic. American Elasmobranch Society. Snowbird, Utah.

Deadman S, Grimmel H, Bullock R, Guttridge T, Bond M, Gruber S. 2019. Assessment of faunal communities and ecosystem interactions within a shallow water system using non-invasive BRUVs methodology. American Elasmobranch Society. Snowbird, Utah.

White C, Van Zinnicq Bergmann M, Guttridge T, Franks B, Stump K, Gruber S. 2019. Using biotelemetry to infer ontogenetic shift and assess the impact of anthropogenic development on the lemon shark Negaprion brevirostris. American Elasmobranch Society. Snowbird, Utah. Hansell A, Curtis T, Carlson J, Cortes E, Fay G, Cadrin S. 2019. Stock assessment of the lemon shark [Negaprion brevirostris] in U.S. waters of the Northwest Atlantic. American Elasmobranch Society. Snowbird, Utah.

Mylniczenko N, Smukall M, Wheaton C. 2019. Measurement of serum 1a-hydroxycorticosterone [1αOH-B], the elasmobranch stress hormone, in select shark species. International Association of Aquatic Animal Medicine.

Wheaton CJ, Burns C, Smukall MJ, Mylniczenko ND. 2019. Measurement and preliminary validation of the 1a-hydroxycorticosterone (1aOH-B) stress hormone in elasmobranchs. 7th International Society of Wildlife Endocrinologists Conference, Kruger National Park, South Africa.







**GUY STEVENS** 

# **THE MANTA TRUST**

DR GUY STEVENS

#### 2019 SUMMARY

A new decade has arrived and the Manta Trust continues to fulfil its mission, resulting in important conservation gains. Our Global Strategy and Action Plan and the scientific publication Research Priorities to Support Effective Manta and Devil Ray Conservation guide our charitable efforts, creating a conservation roadmap for our international network of mobulid researchers, scientists, educators, media experts and conservationists.

#### CONSERVATION ACHIEVEMENTS AND LEGISLATIVE ACTION

In June 2019 the Indian Ocean Tuna Commission passed a proposal for the safe release of live mobulids and to phase out artisanal mobulid fisheries by 2022. This proposal was driven by the Maldives government, greatly aided by the Manta Trust's Daniel Fernando. In November 2019 the Mexican government announced greater protection for all mobulid species. Dr Ramón Bonfil, friend of the Manta Trust, and Karen Fuentes, the founder of the Manta Caribbean Project, played a key role in securing this victory.

The total recorded oceanic manta ray population in the Maldives is now more than 700 individuals, almost double that of 2018.

#### Below: This reef manta ray we named Babaganoush was photographed in November 2018 (upper photo) with a severe boat propeller injury. Just six months later, when it was photographed again in May 2018, the wound had almost healed. Opposite: Reef manta rays in Hanifaru Bay Atoll, Maldives.

#### **RESEARCH ACTIVITIES AND SCIENTIFIC PUBLICATIONS**

Since 2005 the Manta Trust's Maldivian Manta Ray Project (MMRP) has identified 4,661 reef manta rays Mobula alfredi from almost 64,000 sightings - the world's largest population! To publicise these findings, we have created easy-to-understand infographics that are extremely popular with our online following.

In 2019 the Manta Trust's Maldives Oceanic Manta Ray Project (MOMRP) conducted its first extensive research field trip to Fuvahmulah Atoll. The total recorded oceanic manta ray population in the Maldives is now more than 700 individuals, almost double that of 2018. The proximity of this population to the manta fishery in Sri Lanka (less than 1,000 kilometres) is of concern, especially as this fleet fishes intensively throughout the region. The MOMRP will return to Fuvahmulah Atoll in March 2020.

Our IDtheManta project gained momentum thanks to several initiatives. Firstly, we completed phase one of the 'matching' software, which identifies individual manta rays by their spot patterns. Currently this software uses images only, but we are in discussions with Google's DeepMind to analyse video content. Secondly, 20,000 photo-ID sightings have now been entered into the IDtheManta database. In 2020 we will create the front-end website to interface with the database. The final step will be to create an app for smartphone use.















Previous pages: Manta rays filter-feeding at Maayafushi, Falhu Ari Atoll, Maldives, with their gill rakers visible. Opposite: An oceanic manta ray off the coast of Peru. Above: Divers with an oceanic manta ray in the Maldives. The Manta Trust has produced a code of conduct for swimming with manta rays.

In September 2019 we collaborated with affiliate projects in Peru and Indonesia to reduce mortality in mobulid rays as a result of bycatch in gill-net fisheries. This project will trial new technologies and make recommendations to stakeholders at national and international levels.

Joanna Harris, the leader of our Chagos Manta Project, started her PhD in September 2019 and successfully completed her first field trip in December. Joanna will undertake a second trip in March 2020.

Last year saw the publication of six research documents of which Manta Trust scientists were the lead authors. Notable among these were a publication by Dr Giuseppe Notarbartolo di Sciara on long-horned pygmy devil rays Mobula eregoodoo and another, with Dr Josh Stewart as lead author, described field work in Mexico and the Maldives that made use of the National Geographic Society's specially designed 'Crittercams'. Josh is an associate director of the Manta Trust. A third publication, led by the Manta Trust's Annie Murray, uses video analysis of human-manta interactions in the Maldives and informed our Swimming with Manta Rays Code of Conduct. In addition, the journal Coral Reefs published 'Preliminary insights into the population characteristics and distribution of reef [Mobula alfredi] and oceanic [M. birostris] manta rays in French Polynesia'.



Betty Laglbauer, of the Mobula Project Indonesia, talking with local fishermen.

We collaborated with affiliate projects in Peru and Indonesia to reduce mortality in mobulid rays as a result of bycatch in gill-net fisheries.



An Indonesian fisherman carrying devil rays ashore.

Below: Betty and Didik Rudianto measuring a slaughtered mobula. Bottom: Betty tagging.





#### AWARENESS AND EDUCATION

At the end of 2018 we launched a new fundraising platform called The Cyclone. Since then we have seen this community grow to 168 members and raise £8,000 in unrestricted funds, all via an exclusive area of our website.

Moodhu Madharusaa, meaning Ocean School, is our Marine Education Programme (MEP). It is now a fully fledged marine biology syllabus incorporating six core modules. The programme was completed by 82 students during 2019, and one of our greatest successes has been to get girls involved. Scientific evidence shows that increasing women's ability to manage their land and water is hugely beneficial to nature and people. In 2019 Zoona Naseem, the Maldives' first female PADI course director, became a Patron of the Manta Trust. Known for breaking gender barriers, Zoona is a strong advocate for marine conservation.

We also set our sights on our ever-expanding online audience. Women currently outnumber men roughly 3:2 in our 94,000+ social media following. Sarah Richard, the founder of Girls that Scuba, was therefore another ideal choice as a Patron.

2019 also saw the MMRP, in collaboration with the Baa Atoll UNESCO Biosphere Reserve, Four Seasons Resorts Maldives and local councils and schools in Baa Atoll, organise the second Baa Manta Festival. The vice-president of the Maldives attended, along with 250 students from 14 schools.

In March, the Manta Trust helped organise the first Latin American Congress of Sharks, Rays and Chimaeras in Planetario de Playa del Carmen, Mexico. In Guam, the Micronesian Conservation Coalition (MCC), founded by Julie Hartup, an affiliate project leader at the Manta Trust, held its first Ocean Gala evening.

Throughout the year we continued to engage with supporters at dive shows and educational events. In June Dr Guy Stevens, the CEO, reached new supporters by featuring in the 'Trees a Crowd' podcast.

Below: Expedicao Margarita, a manta festival in Los Organos, Peru. Opposite: Manta Caribbean Project team and volunteers, July 2019. Karen Fuentes is on the far right with Annie Murray next to her, while Bex Carter is third from left and Guy Stevens sixth from left.













Opposite: A whale shark in Hanifaru Bay, Baa Atoll, Maldives, Above: Paul Jackson with a manta ray in Hanifaru Bay.

### GLOBAL NETWORK AND COLLABORATIONS

The Manta Trust's global network of affiliate projects continues to grow. In 2019 we welcomed Manta Catalog Azores, ConnectOcean in Costa Rica and the Raja Ampat Manta Project to the family. The Raja Ampat Manta Project helped to bring about a nationwide fishing ban on manta rays in Indonesia by working with stakeholders to implement protective legislation while securing sustainable alternative fisheries for local people.

In 2019 we have also: secured funding from the Wildlife Conservation Society and Ernest Kleinwort Charitable Trust; expanded the Trust's website (now available in French and Spanish); recruited a team for the ASICS London 10k event in July; created a new corporate sponsorship brochure; and set up the Commercial Supporters initiative.

While the Trust's core operations team and our extended network of staff, collaborators and volunteers have all worked incredibly hard, none of this would have been possible without our funders. So, all that is left to say is a huge 'thank you' to the Save Our Seas Foundation for your fantastic support. We hope that you will continue this journey with us in 2020 as we strive for a sustainable future for the oceans, where manta rays and their relatives thrive in healthy and diverse marine ecosystems.



The spotters' hut at Caves, Kogel Bay. This remote but popular surfing spot on the eastern side of False Bay had recorded two shark bites prior to spotters being positioned there.





SARAH WARIES

# **SHARK SPOTTERS**

SARAH WARIES

#### 2019 SUMMARY

The core mandate of Shark Spotters is to reduce potential conflict between people and sharks by implementing environmentally and socially responsible shark bite mitigation measures. In 2019 this was again achieved by the deployment of shark spotters at beaches around Cape Town that have a high risk of sharks, as well as the operation of the unique Fish Hoek shark exclusion barrier. Operating 365 days a year, the spotters completed more than 16,000 hours of spotting in 2019 at between four and eight of the most popular beaches around False Bay (depending on the season) and thus acted as an early warning system to the presence of large, potentially dangerous sharks in the inshore zone. While we have experienced an unprecedented low in white shark activity, with no white sharks recorded in False Bay for the whole year, the spotters continued to look out for other large sharks close to shore and registered sightings of 101 bronze whaler sharks. Although these sharks pose less of a risk of unprovoked bites to humans than white sharks, it was still necessary to implement temporary beach closures for 51% of the sightings to ensure the safety of beach goers. The award-winning Fish Hoek shark exclusion barrier was deployed a total of 121 times during 2019, successfully excluding sharks and other large marine animals from the swimming zone, with zero environmental impact.



*Fish Hoek shark exclusion barrier was* deployed a total of 121 times during 2019, successfully excluding sharks and other large marine animals from the swimming zone, with zero environmental impact.

In September, the low level of white shark activity persuaded Shark Spotters to reduce temporarily the number of operating beaches for the 2019/2020 summer season to six instead of the usual eight. In order to retain the skills and expertise of the spotters within the programme, the team members who usually worked at the two unwatched beaches were redeployed within the organisation to strengthen the education and research teams. In conjunction with the City of Cape Town's Coastal Management department, they also carried out important marine conservation work along the coast.

The programme continued to share safety advice and information on an international stage, meeting with officials from the Department of Primary Industries of New South Wales, Australia, in April. In addition, CEO Sarah Waries was a keynote speaker at the International Conference on Drowning Prevention in October.

Opposite and below: Crew deploying the exclusion net at Fish Hoek beach Right: Scuba divers prepare to retrieve receivers near Robben Island.











Previous pages: The Shark Spotters exclusion net at Fish Hoek. Right, above: Shark spotters receiving training on how to take compass

bearings.

Right, below: Shark spotters talking to

learners at a local career expo.

Shark Spotters employed 41 people during 2019, 95% of whom come from disadvantaged communities in our operating areas. Skills development was again a key focus for the programme and the team received ongoing training throughout the year, as well as focused training events covering marine ecology (predator–prey relationships with a special focus on sharks and orcas), compass and orientation training, mental health workshops, refreshers on general and shark bite first aid and major medical incident management, and a snake awareness workshop.

The lack of white sharks has not hampered our applied research programme, with three new projects officially launching in 2019. These were the project to develop automated shark detection software for fixed cameras, a project funded jointly by South Africa and the European Union that was featured at the Eureka Global Innovation Summit in the UK in May (MSc project); the bronze whaler project, which aims to better understand the behavioural ecology of bronze whaler sharks and their complex role in the dynamic False Bay ecosystem (PhD project); and a social study looking at the human dimension of shark risk, focusing on general risk perceptions, understanding of the Shark Spotters programme and behavioural responses to various levels of risk indicated by the flags (MSc project).

We continued to operate our private array of 18 acoustic receivers around Cape Town, as well as maintain six further acoustic receivers as part of the ATAP network, providing data from a wide variety of species to scientists across the country. We also persisted with our collaboration with scientists from a number of different institutions, including universities, government agencies and private research institutes in order to gain a more comprehensive understanding of our changing marine environment, particularly in respect of fluctuating white shark activity along the entire South African coast.





Shark Spotters employed 41 people during 2019, 95% of whom come from disadvantaged communities in our operating areas.

In 2019 we published in Ecosphere Journal a peer-reviewed paper (Running scared: when predators become prey] on the sevengill-orca interactions observed in False Bay and contributed to two other scientific publications. Our team also presented two scientific talks at the Southern African Shark & Ray Symposium in October.

The Shark Spotters' education programme continued to expand in 2019, reaching more than 3,000 individuals from pre-school to university level and beyond. The education programme focuses on teaching people about shark safety and marine conservation, with a special emphasis on providing individuals with the tools to make informed decisions on shark risk when coming to the beach so that they can improve their own personal safety. A number of new partnerships were formed this year, including participation in the University of Cape Town's







Opposite: Members of the Shark Spotters crew during a team-building exercise. Above: The Shark Spotters team.









Shark Spotters' outreach event at a local school.

Shark Spotters also partnered with schools trialling the Education Department's new Marine Sciences subject for Grades 10–12, creating curriculum-based lessons with a focus on shark safety and diversity.

100-UP programme, which takes the brightest pupils from schools on the Cape Flats and exposes them to university-level lectures in order to encourage more of them to follow tertiary education. Shark Spotters also partnered with schools trialling the Education Department's new Marine Sciences subject for Grades 10-12, creating curriculum-based lessons with a focus on shark safety and diversity. In January 2019 the CEO and research manager presented a lecture as part of the 'Secret Life of Sharks' course at the University of Cape Town's Summer School, which was very well received by participants.

We continue to engage with the public daily through our strong social media presence, blog posts, press releases and media interviews. In 2019 our engagement with the public encompassed:

- two press releases
- 12 blog posts
- two popular articles written by our team •
- >100 media articles
- >30 radio and TV interviews

Furthermore, our Shark Spotters app has recorded more than 20,000 downloads and has become an invaluable tool for water users in Cape Town.

In 2019 Shark Spotters was awarded the Environment & Conservation Award at the prestigious Community Chest Impumelelo Social Innovation Awards. This was wonderful recognition for the hard work the Shark Spotters programme has put in over the past 15 years to provide a balance between recreational water users and white shark conservation in Cape Town. Despite low white shark activity in 2019, the programme has continued to go from strength to strength, demonstrating its effectiveness and importance for marine conservation on a global as well as a local platform.



# **THE NORTH COAST CETACEAN SOCIETY**

JANIE WRAY

#### 2019 SUMMARY

The North Coast Cetacean Society (NCCS) was founded in 2001 and is a non-profit, charitable whale-research organisation that for 19 years has been committed to conducting research into the whales that occur along the north and central coast of British Columbia, as well as protecting them and educating the public about them. With the permission and support of the Gitga'at First Nation of Hartley Bay, the NCCS built the Fin Island Whale Research Station, which focuses on the populations and habitat use of humpback whales, fin whales and orcas. Our research includes land- and boat-based surveys, drone surveys and acoustic monitoring of the area by means of an underwater hydrophone network that enables us to localise the travel route of whales.

The NCCS operates two land-based stations along the north coast of British Columbia and, in partnership with OrcaLab, a third station further to the south in Johnstone Strait. In 2019, land-based scans were carried out from the Fin Island station for 2,240 hours over 156 days between 11 May and 31 October. In this period, we conducted 1,818 systematic 20-minute scans of the study area and, using these sightings, we mapped the location and characterised the group size and behaviour of humpback whale (n=3,444), fin whale (n=538), orca (n=232), Dall's porpoise (n=2,994), harbour seal (n=190), elephant seal (n=30) and







Above, left and middle: Building the Fin Island Whale Research Station. Above, right: The view from Craycroft Station. Opposite: Fin Island in the mist, showing the research station.

From the deck of this station, interns conducted 691 systematic 20-minute scans.

Stellar's sea lion (n=156). When humpback whales travelled close to the station, we were able to photograph and identify 115 individuals. To increase our range of data collection, we also conducted 29 marine surveys and identified an additional 134 humpback whales, about 35 fin whales (final figure still pending) and 55 orcas.

In Caamano Sound, 25 kilometres (16 miles) south of Fin Island, we built a seasonal out-camp located at the Wall Islets. Although well known for its high abundance of cetacean activity, this location is closer to the open ocean and weather systems are unpredictable, making marine surveys difficult. For this reason the station was built, providing a land-based window into the whale activity of this remote location. From the deck of this station, interns conducted 691 systematic 20-minute scans of the study area between 6 June and 30 September. Using these sightings, we mapped the location and characterised the group size and behaviour of humpback whale (n=671), fin whale (n=221), orca (n=118), Dall's porpoise (n=429), harbour seal (n=42) and Stellar's sea lion (n=195).

In 2018 lead researcher Janie Wray was asked by OrcaLab, the pioneers of land-based whale research and acoustic monitoring, to assist with a new



protocol relating to data collection. This partnership was developed to increase our understanding of the travel and foraging patterns of orcas and humpback whales between our respective research zones. The same land-based protocol was followed by OrcaLab to enable us to compare results. Observations were made from OrcaLab for 1,188 hours over 81 days between 24 June and 16 September. During this time, volunteers conducted 973 systematic 20-minute scans of the study area. Using these sightings, we mapped the location and characterised the group size and behaviour of humpback whale (n=1,113), orca (n=557), Dall's porpoise (n=485), harbour seal (n=831), Pacific white-sided dolphin [n=222] and Stellar's sea lion [n=2,515].

To complement visual sightings, the NCCS installed an array of four hydrophones that transmit whale vocalisations back to the Fin Island station, where all calls are recorded, live, for 24 hours a day. In partnership with the Gitga'at First Nation and WWF, we developed a localisation strategy and algorithms that determine the time difference of arrival (TDOA) between all four hydrophones and a spatial model for TDOAs based on 3D acoustic ray tracing. The model incorporates the local sound speed profile, the bathymetry of the ocean floor and the surface and bottom parameters in Squally Channel. The outcome enables us to localise the vocal signatures of whales and follow their acoustic underwater pathways. For the first time we are able to follow the tracks of whales underwater and determine both their behaviour and their habitat use by means of a passive acoustic technique that has no impact on the whale during the study.

For the first time we are able to follow the tracks of whales underwater and determine both their behaviour and their habitat.

Below: An older humpback female named Triangle. Bottom: Our dog Cohen meets a resident humpback whale. Opposite: Humpback in Verny Pass.









Three species were recorded vocally during our 2019 field season: the humpback whale Megaptera novaeangliae, orca Orcinus orca and fin whale Balaenoptera physalus. In total, 56,684 target signals from all three species were detected automatically and analysed. Subsequent localisation yielded the spatial positions of whales from 8,198 signal sources. Analysis of the call rate showed that all three species were present throughout the recording period from the beginning of May to the end of October. The acoustic activity of fin and humpback whales generally increased from deployment in May and peaked for different call types between mid-August and mid-October. A general decline in acoustic activity of fin whales towards the end of October may suggest that this species is not present in Squally Channel during the winter months, but larger seasonal coverage and more years of data are needed to confirm this hypothesis. Substantial diel trends in acoustic activity were found for humpback whale bubble-net feeding calls (higher call rates during daylight), fin whale 20 Hz calls (peak call rates at midnight and in the late afternoon) and fin whale 40 Hz calls (higher night-time call rates).



Previous spread: Humpback whales bubble-net feeding. Below: An orca family. Opposite: A bald eagle takes flight at Fin Station.





Above: Catching a drone from the boat. Right: Fin whales, taken from a drone.

The support of the Save Our Seas Foundation ... has made 2019 such a successful season by strengthening our knowledge base to ensure the continued recovery of whales.







During the 2019 season the NCCS launched a drone-based project to study humpback and fin whales non-invasively from the air. Blow samples were collected from both humpback and fin whales and the DNA was extracted and sequenced to determine where these whales come from genetically, linking relatedness patterns across the NCCS study region, sexing the sampled whales and determining site fidelity of calves returning to these feeding grounds (via understanding how many generations we document feeding within the area). Blow samples were collected from 88 humpback whales and 26 fin whales.

The second part of the drone project implemented LIDAR morphometrics by using a custom-designed GPS and LIDAR laser device attached to a Mavic 2 Pro to take measurements of the whales we film from the air. This enables us to assess the nutritional health status, pregnancy rates and recovery from a long fast on breeding grounds (for humpbacks) over time. LIDAR morphometrics were collected from 221 humpback whales (some individuals more than once), 26 fin whales and 61 orcas.

The NCCS continues to operate an internship programme that is open to students worldwide and we also run an effective awareness programme that informs recreational and ecotourism vessels in the vicinity about the whale-watching protocols that should be followed to ensure the safety of whales within the region. We have developed strong partnerships with coastal First Nation communities and the Coastal Guardian Watchmen programme, as well other research organisations that focus on protecting marine space for whales. The mandate of the NCCS is to strengthen these valuable partnerships to combine diverse layers of experience in the specialised field of cetacean monitoring.

It is the dedicated teamwork and collaboration of a number of people, with the support of the Save Our Seas Foundation, that has made 2019 such a successful season by strengthening our knowledge base to ensure the continued recovery of whales.







PAUL COWLEY

# THE ACOUSTIC TRACKING ARRAY PLATFORM

DR PAUL COWLEY

#### 2019 SUMMARY

South Africa's Acoustic Tracking Array Platform (ATAP), hosted by the South African Institute for Aquatic Biodiversity (SAIAB), provides a backbone of acoustic telemetry hardware to facilitate the large-scale and long-term monitoring of acoustically tagged marine animals. The ATAP and its collaborating partners, with financial support from the Save Our Seas Foundation, maintain a nationwide network of receivers. Data downloaded from the network are managed by the ATAP, which in turn provides a sustainable, cost-effective means for researchers to collect data on their tagged animals and at a far greater scale than they would achieve independently. The platform also fosters multi-institutional collaboration at both a national and an international level. Currently the ATAP provides support to no fewer than 58 individuals (including nine post-graduate students) from 27 different organisations.

The ATAP receiver network spans some 2,200 kilometres (1,370 miles) of the southern African coastline, with 16 core monitoring sites situated between False Bay (Cape Town) and Ponta do Ouro on the Mozambique border. In addition, 21 estuaries throughout the region are equipped with moored receivers. In its current format, the large-scale array design enables researchers to address a number of key questions pertaining to animal movement. These include

estuarine-marine connectivity, inter-estuary connectivity, bay-scale movements, movements in relation to marine protected area boundaries, large-scale annual migrations, trans-boundary movements and a host of ecological aspects, such as spawning aggregation dynamics and predator-prey interactions.

Since its inception in 2011, the ATAP has witnessed steady growth in the number of species and individuals tagged. To date tags have been deployed on approximately 1,300 individual animals from 40 species, with considerable focus on estuarine-dependent fishery species, large sharks (such as white, bull and broadnose sevengill sharks) and, more recently, on batoids (guitarfish and stingrays]. Many of the tags on the sharks and rays have a battery life of up to 10 years, which in time will yield unprecedented insights into the habits of these animals that can be used for improved management and conservation.



The current ATAP array stretches from the Berg Estuary in the west to Ponta do Ouro in the east.



Number of animals tagged by ATAP-associated researchers since 2007.

The cumulative number of animals tagged by ATAP-associated researchers since 2007, with new species tagged each year highlighted below that year.





Currently the ATAP provides support to no fewer than 58 individuals (including nine post-graduate students) from 27 different organisations.

It is envisaged that the use of the platform will continue to grow in the near future, as the ATAP will be providing infrastructure and data management support to two newly funded projects managed by the WildOceans programme of the WILDTRUST. These will see more than 200 new animals being tagged. The new projects will be investigating the movements and migrations of selected South African threatened endemic elasmobranchs, as well as trans-boundary movements and marine protected area connectivity by selected species.

At a global level, the ATAP is recognised as a mature cooperative telemetry network and continues to be mentioned in the international literature. In 2019, it featured in scientific manuscripts highlighting the need for a permanent Belgian Acoustic Receiver Network (Reubens et al. 2019); how to approach fisheries management in the bio-logging decade (Lowerre-Barbieri et al. 2019]; how animal-borne telemetry is an integral component of the toolkit for observing ocean species (Harcourt et al. 2019); movement patterns of black musselcracker in South Africa (Murray et al. 2019); and a chapter in a book by Carrier et al. (2019) entitled Shark Research: Emerging technologies and applications for the field and laboratory. The ATAP was also the primary source of data for two projects that led to publications in 2019. These were a paper on multi-seasonal spatio-temporal dynamics of a giant trevally aggregation in southern Mozambique (Daly et al. 2019) and using mark-recapture methods to estimate the population size and survival of pyjama sharks in Mossel Bay (Grusd et al. 2019].

Previous spread: Tsitsikamma coastline, South Africa. Opposite: A diver from the Oceanographic Research Institute retrieving an ATAP receiver. Below: ATAP technical assistant Willy Kokose.



During 2019, the ATAP received 41 requests for data reports from its stakeholders/beneficiaries – a significant increase on the 28 requests made in 2018. The increasing trend for data requests provides testimony of data maturity and we anticipate that in the near future a number of publications will result from the data currently being collected.

In contrast to a quiet conference year in 2018, 2019 saw members of the ATAP community attending a number of conferences. These included the 5th International Conference on Fish Telemetry in June in Arendal, Norway; the 5th Southern African Marine Linefish Symposium in July in Mpekweni, Eastern Cape, South Africa; and the 5th Southern African Shark and Ray Symposium in October in Cape Town.



Published literature in 2019 that either made mention of the ATAP [Carrier et al., Harcourt et al., Lowerre- Barbieri et al., Murray et al. and Reubens et al.) or made use of data collected by the ATAP [Daly et al. and Grusd et al.]



SAVE OUR SEAS FOUNDATION ANNUAL REPORT 2019

Besides its primary role of supporting scientific research, the ATAP engages with the public in many different ways. Over the past few years affiliated researchers have been attending a number of recreational beach fishing competitions, which provides an opportunity to tag additional animals, particularly large stingrays. During the year, ATAP researchers managed to tag six duckbill rays *Aetomylaeus bovinus* and 17 diamond rays *Gymnura natalensis* in Algoa Bay and at Struisbaai. Also in 2019, the ATAP once again hosted an interactive exhibition during the annual SciFest Africa Expo in Makhanda (formerly Grahamstown), which attracted thousands of young school learners. In addition the ATAP team, in collaboration with two other SAIAB platforms, hosted the third annual SAIAB Summer School, which was attended by students mainly from historically disadvantaged universities around South Africa. The aim of the summer school is to provide the students with hands-on experience in acoustic telemetry field techniques and introduce them to the research methodology.

In October 2019 the ATAP created an anonymous survey to assess its service provision to the greater acoustic telemetry research community in South Africa. The survey included questions on motivation for joining, intensity of use, effectiveness of the array, data sharing, service satisfaction, communication and suggestions for improvement. Results were varied, but overall extremely positive. We received feedback from 17 respondents with 65% of those respondents finding the ATAP to be essential for science conservation and monitoring. Almost 60% of users have been working with the ATAP for between five and eight years and those respondents indicated that they would be using the ATAP's services for the next 10 years. Almost all (94%) of respondents joined the ATAP for improved data collection and increased collaboration, and 95% indicated that receiver coverage was fair (18%) to good (77%).



Left: Summer School participants enjoying some boating time. Right: Manually tracking blue stingrays in Algoa Bay.

The aim of the summer school is to provide the students with hands-on experience in acoustic telemetry field techniques and *introduce them to the research methodology.* 



SAIAB Summer School participants enjoying a well-earned break.





Left: The calm before the storm. Above: A diamond ray getting surgically equipped with a long-life acoustic transmitter.



#### Acknowledgements

The ATAP's acoustic telemetry hardware has been secured from the Ocean Tracking Network, National Research Foundation capital equipment grants and the Shallow Marine and Coastal Research Infrastructure. Running expenses and costs linked to servicing the hardware are provided by the Save Our Seas Foundation and the African Coelacanth Ecosystem Programme. Collectively, the support from these organisations has enabled us to establish and operate successfully a significant marine science platform that has gained an international reputation. We are extremely grateful to all our funders and will continue to acknowledge their contributions.

# **PROJECT LEADERS** INTRODUCTION TO OUR PROJECT LEADERS WHO WERE FUNDED IN 2019.

#### **KEYSTONE PROJECTS | CONTINUATION**

- 1 RIGERS BAKIU I ALBANIA
- 2 RAMÓN BONFIL I MEXICO
- EVAN BYRNES I BIMINI, BAHAMAS
- 4 NIGEL DOWNING | SENEGAL
- 5 BENJAMIN HUGHES & MICHAEL SCHOLL SOUTH AFRICA
- 6 DYLAN IRION I SOUTH AFRICA
- 7 JEANNE MORTIMER I D'ARROS ISLAND AND ST JOSEPH ATOLL, SEYCHELLES
- NICOLE PHILLIPS I WORLDWIDE
- 9 GREGG POULAKIS | USA
- COLIN SIMPFENDORFER | WORLDWIDE
- 11 WILLIAM WHITE I PAPUA NEW GUINEA

# KEYSTONE PROJECTS | NEW

- 12 JILL BROOKS AND HANNAH MEDD | USA
- 13 DIEGO CARDEÑOSA I GUYANA
- 14 DON CROLL AND MELISSA CRONIN | EASTERN PACIFIC
- 15 DAVID EBERT I WESTERN INDIAN OCEAN
- (16) CHRYSOULA GUBILI I THE MEDITERRANEAN
- 17 RAVI RANJAN KUMAR I ANDAMAN AND NICOBAR ISLANDS
- 18 CATHERINE MACDONALD | SAINT VINCENT AND THE GRENADINES
- 19 KIRSTY SHAW | ECUADOR
- 20 GREGORY SKOMAL | USA
- 21 MATTHEW SMUKALL | USA
- 22 JOSHUA STEWART I EASTERN PACIFIC
- 23 ALINA WIECZOREK AND GIULIA DONATI REPUBLIC OF MALDIVES
- 24 TONYA WILEY | USA
- 25 JANE WILLIAMSON AND PADDY BURKE AUSTRALIA
- **26 AA YAPTINCHAY** | THE PHILIPPINES

# **SMALL GRANT PROJECTS**

- 27 ANDRIA BEAL I USA
- 28 KEVIN CROOK | AUSTRALIA
- 29 JAKE DAVIES I CANARY ISLANDS AND UNITED KINGDOM
- **30** GLORIMAR FRANQUI RIVERA I PUERTO RICO
- 31 ANA LUCIA FURTADO SOARES I ANGOLA
- 32 ALIFA BINTHA HAQUE | BANGLADESH
- 33 DEREK KRAFT | WORLDWIDE
- 34 MARIANA MARTINS | BRAZIL
- 35 GABRIELA OCHOA I HONDURAS
- **36** JAIME PENADÉS-SUAY I SPAIN
- 37 CHESTON PETERSON | USA
- 38 LUZ SALDAÑA-RUIZ I MEXICO
- 39 DOMINIC SWIFT | USA



#### **PROJECT LEADERS KEYSTONE PROJECTS | CONTINUATION**



#### **RIGERS BAKIU**



### **BEGINNING SHARK CONSERVATION IN** ALBANIAN TERRITORIAL WATERS BY **CONDUCTING A FISHERIES SURVEY AND** SENSITISING COMMUNITIES.

Albanian Centre for Environmental Protection and Sustainable Development | 2017, 2018, 2019

ALBANIA | RESEARCH, CONSERVATION | SHARKS AND RAYS

Although Albania has an extensive coastline, very little is known about the country's elasmobranchs. Rigers is collecting catch data from fishers and aquaculture workers and encouraging authorities to protect these vulnerable species. He is also engaging with coastal communities to sensitise them to the plight of Albania's sharks.





# RAMÓN BONFIL

#### CONSERVATION AND ECOLOGICAL RESEARCH **OF SMALLTOOTH AND LARGETOOTH SAWFISHES** IN MEXICO.

Océanos Vivientes A. C. | 2017, 2018, 2019

MEXICO | RESEARCH, CONSERVATION | SMALLTOOTH AND LARGETOOTH SAWFISHES PRISTIS SPP.

Sawfishes are among the ocean's most endangered species and until very recently they had never been studied in Mexico. Ramón is using new technologies and a multidisciplinary approach to find and eventually protect Mexico's smalltooth and largetooth sawfishes.



# EVAN BYRNES

### HOME-RANGE SCALING IN LEMON SHARKS THROUGH ONTOGENY; TESTS OF BIOENERGETICS **MECHANISMS.**

Murdoch University | 2017, 2018, 2019

BIMINI, BAHAMAS I RESEARCH I LEMON SHARK NEGAPRION BREVIROSTRIS

Does body size influence how much energy a shark needs? Evan is investigating how this is linked to the home range size of lemon sharks, and how they use their habitat.







#### NIGEL DOWNING

### STATUS OF SAWFISH IN THE CASAMANCE RIVER, SENEGAL, WEST AFRICA.

Henley on Thames, Oxfordshire, United Kingdom | 2017, 2018, 2019 SENEGAL | CONSERVATION, RESEARCH | SAWFISHES

In the 1970s, Nigel discovered a treasure trove of sharks and rays that were using the Casamance estuary in Senegal as a nursery ground. He also found an abundance of sawfishes. More than 40 years on and every indication is that the sawfishes in the region are all but extinct. Nigel is going back to find out if those indicators are riaht.



# BENJAMIN HUGHES AND MICHAEL SCHOLL

### **FINPRINTING: AN INTERNATIONAL WHITE SHARK** PHOTOGRAPHIC IDENTIFICATION CATALOGUE SYSTEM.

Save Our Seas Foundation | 2015, 2016, 2017, 2018, 2019

WORLDWIDE | RESEARCH, CONSERVATION | WHITE SHARK CARCHARODON CARCHARIAS

The objective is to promote a better understanding of white shark biology at regional and global scales. The project seeks to do this by providing a collaborative online platform for identifying, managing and sharing large-scale and multi-group photographic white shark mark-recapture data.







#### DYLAN IRION

#### ESTIMATING THE ABUNDANCE OF THE WHITE SHARK IN SOUTHERN AFRICA WITH AN INTEGRATED POPULATION MODEL.

Oceans Research | 2017, 2018, 2019

SOUTH AFRICA | RESEARCH | WHITE SHARK CARCHARODON CARCHARIAS

Dylan aims to bring together several photo-ID datasets in a massive collaboration of white shark researchers throughout South Africa. He will combine the data with information collected by acoustic receivers to arrive at the first reliable estimate of abundance for great whites in southern Africa.



#### JEANNE MORTIMER



#### **COMMUNITY MONITORING OF NESTING SEA** TURTLES AT D'ARROS ISLAND AND ST JOSEPH ATOLL, SEYCHELLES.

SOSF D'Arros Research Centre | 2011-2019

D'ARROS ISLAND AND ST JOSEPH ATOLL, SEYCHELLES RESEARCH, CONSERVATION, EDUCATION | TURTLES

The beaches of D'Arros Island and St Joseph Atoll are very important places for female sea turtles to come ashore and lay their eggs. Jeanne is training Seychellois monitors to observe nesting turtles and collect data about them.



NICOLE PHILLIPS

#### **COMPARISON OF LEVELS OF GENETIC DIVERSITY** IN HISTORIC AND CONTEMPORARY SAWFISH **POPULATIONS.**

The University of Southern Mississippi | 2017, 2018, 2019

WORLDWIDE | RESEARCH. CONSERVATION | LARGETOOTH AND GREEN SAWFISHES PRISTIS SPP.

Not only the most distinctive feature of a sawfish, the prehistoric-looking saw also contains vital information. By analysing samples from around the world, Nicole is investigating the genetic health of largetooth and green sawfishes and will estimate how much genetic diversity has been lost during the declines sustained by these species.





#### **GREGG POULAKIS**



#### **USING ENVIRONMENTAL DNA TO DETECT SMALLTOOTH SAWFISHES IN CURRENT AND** HISTORICAL NURSERY SITES.

Florida Fish and Wildlife Conservation Commission 2017. 2018. 2019

USA | RESEARCH, CONSERVATION | SMALLTOOTH SAWFISH PRISTIS PECTINATA

Gregg uses environmental DNA (eDNA), a scientific method that marine biologists have only recently begun to employ, to track smalltooth sawfishes in Florida. He will determine whether they still use the same nursery areas that they used in the past and learn about their range and whether that range is expanding.



#### **COLIN SIMPFENDORFER**



### SOSF GLOBAL SAWFISH SEARCH.

James Cook University | 2017, 2018, 2019 WORLDWIDE | RESEARCH, CONSERVATION | SAWFISHES

In order to protect the five species of endangered sawfishes, we need to know where they can still be found today. Colin is working with sawfish experts around the world to undertake a global sawfish survey using environmental DNA (eDNA).



# WILLIAM WHITE

# INVESTIGATION INTO THE STATUS OF SAWFISHES IN PAPUA NEW GUINEA.

Commonwealth Scientific and Industrial Organisation | 2017, 2018, 2019

PAPUA NEW GUINEA | RESEARCH, CONSERVATION | SAWFISHES

Sawfishes have vanished from much of their historical range, but reports from Papua New Guinea suggest that it might be one of the few remaining sawfish strongholds. With help from local students, Will is trying to identify where the animals can still be found and how they fit into the local culture and economy.





PROJECT LEADERS KEYSTONE PROJECTS | NEW



#### JILL BROOKS AND HANNAH MEDD

#### SURVIVAL OF GREAT HAMMERHEAD SHARKS RELEASED FROM THE FLORIDA LAND-BASED RECREATIONAL FISHERY.

Fish Ecology and Conservation Physiology Lab & American Shark Conservancy | 2019

**USA** | RESEARCH | GREAT HAMMERHEAD SHARK SPHYRNA MOKARRAN

Working together with anglers in Florida, Jill and Hannah are trying to understand what the impact of catch-and-release recreational fishing is on Endangered great hammerhead sharks in Florida. Their findings will help draft better practices for the future.



# DIEGO CARDEÑOSA

### FROM THE BOAT TO THE VOTE - BASIC FISHERY DATA TO INFORM CITES AUTHORITIES IN **GUYANA.**

Fundación Colombia Azul I 2019 **GUYANA** | CONSERVATION | SHARKS AND RAYS

Little is known about the shark and ray fisheries of Guyana. Diego is using a variety of methods to understand the status of shark fishing and trade, helping Guyana to make the best decisions for its ocean life.









DAVID EBERT



#### PLAYING FOR TIME: GUITARFISHES AND VIOLYN SHARKS. IS THIS THE LAST DANCE?

Moss Landing Marine Laboratories | 2019

WESTERN INDIAN OCEAN | RESEARCH | GUITARFISHES AND WEDGEFISHES

The shark-like rays are some of the most threatened species in the sea. In the Western Indian Ocean, Dave is untangling their taxonomy, getting to know where they live and investigating their fisheries status in order to inform better conservation strategies.



**CHRYSOULA GUBILI** 



#### **BATOIDS ON YOUR PLATE: SPECIES COMPOSITION** OF THE MEDITERRANEAN RAY TRADE.

Fisheries Research Institute, Hellenic Agricultural Organisation – DEMETER | 2019

THE MEDITERRANEAN | CONSERVATION | SKATES AND RAYS

Protecting rays and skates (batoids) is challenging, especially where there are inadequate fisheries regulations. Chrysoula is identifying which batoids are caught in the Mediterranean to understand the effects of fishing practices and what illegal, unreported and unregulated fishing means for vulnerable species.



**RAVI RANJAN KUMAR** 



#### SHARKS AND RAYS OF ANDAMAN AND NICOBAR ISLANDS.

Society for Marine Research & Conservation, India | 2019 ANDAMAN AND NICOBAR ISLANDS | RESEARCH | SHARKS

In spite of 30 years of eye-witness reports of sharks being landed commercially in the Andaman and Nicobar islands, next to nothing is known about the status of sharks and their fisheries. Ravi is scouring fish markets and landing sites to provide accurate species identifications and gather information about the shark trade, and thus inform management plans.



**CATHERINE MACDONALD** 



**COLLABORATIVE COMMUNITY-BASED** MONITORING AND MANAGEMENT OF SHARK **POPULATIONS IN SAINT VINCENT AND THE GRENADINES.** 

Rosenstiel School of Marine and Atmospheric Science, University of Miami | 2019

SAINT VINCENT AND THE GRENADINES | RESEARCH | SHARKS

Shark fishing is becoming increasingly important in St Vincent, but little is known about the shark populations there. Catherine is figuring out which sharks live there and how they are utilised by local communities. She's working with fishermen to achieve sustainable management of these fisheries.



KIRSTY SHAW



#### LAB-ON-A-CHIP TECHNOLOGY FOR RAPID, **ON-SITE IDENTIFICATION OF THREATENED** SHARK SPECIES.

Manchester Metropolitan University | 2019 ECUADOR | CONSERVATION | SHARKS

A portable, cost-effective way to identify sharks in the field could improve the current methods of monitoring which threatened species are being caught and sold, of reducing illegal fishing and of tracking CITES-restricted shark products. Kirsty is testing a Lab-on-a-Chip system in coastal communities in Ecuador.





#### **GREGORY SKOMAL**

**QUANTIFYING WHITE SHARK PREDATION RATES ON PINNIPEDS OFF CAPE COD,** MASSACHUSETTS, TO MITIGATE CONSERVATION CONFLICTS.

Massachusetts Division of Marine Fisheries | 2019

**USA** | RESEARCH | WHITE SHARK CARCHARODON CARCHARIAS

As gray seal populations have recovered, the coastal waters off Cape Cod have become the only known aggregation site for white sharks in the western North Atlantic. Greg is estimating seasonal predation rates of white sharks on seals and identifying which environmental conditions are associated with predatory behaviour in order to improve public safety practices.




## MATTHEW SMUKALL

## **REGIONAL MOVEMENT, REPRODUCTIVE STATUS** AND BODY CONDITION OF TIGER SHARKS WITHIN **POTENTIAL PUPPING GROUNDS.**

Bimini Biological Field Station Foundation | 2019 USA I RESEARCH I TIGER SHARK GALEOCERDO CUVIER

What's driving where tiger sharks move within a shark sanctuary? The body condition and reproductive status of female tigers might give some clue, helping to identify important pupping areas. Matt is tracking the movements of large, mature female tiger sharks and combining that information with what is known about their body condition.





## JOSHUA STEWART

## IMPROVING POST-RELEASE SURVIVAL OF **MOBULID RAYS IN PURSE-SEINE FISHERIES.**

The Manta Trust | 2019

EASTERN PACIFIC | RESEARCH | MOBULID RAYS

With no real information about whether or how mobulid rays survive after being released from purse-seine fishing nets in the Eastern Pacific, Josh is training fishery observers to assess the impact of this fishery on these by-catch species and to create best-practice release guidelines to improve the survival rate of the rays.



ALINA WIECZOREK AND GIULIA DONATI

MICROPLASTICS A MACRO-DISASTER: A THREAT TO THE LARGEST FISH OF OUR SEAS.

National University Ireland Galway | 2019

**REPUBLIC OF MALDIVES** | RESEARCH | WHALE SHARK RHINCODON TYPUS

Endangered filter-feeding whale sharks are at risk from the plastic invisible to most of us in the seas. Alina and Giulia are investigating how these sharks are scooping up microplastics as they feed and trying to find out where these plastics might be coming from.





**TONYA WILEY** 



**INVESTIGATING THE USE OF TAMPA BAY BY** ENDANGERED SMALLTOOTH SAWFISH.

The Ocean Foundation on behalf of Havenworth Coastal Conservation | 2019

USA I RESEARCH I SMALLTOOTH SAWFISH PRISTIS PECTINATA

The smalltooth sawfish populations that once spread from Texas to North Carolina have vanished, except for a small reserve in South Florida. However, it seems that protection measures in recent years might be helping these sawfishes to recover. Tonya is searching for clues in Tampa Bay, the first place where recovering sawfish populations would extend their range north.



JANE WILLIAMSON AND PADDY BURKE



## **DIVERSITY, DYNAMICS AND DESTINATIONS OF** SAWSHARKS FROM SOUTH-EASTERN AUSTRALIA.

Macquarie University | 2019

AUSTRALIA I RESEARCH I COMMON SAWSHARK AND SOUTHERN SAWSHARK PRISTIOPHORUS SPP.

Managing sawshark populations requires good information on where they move and what their relative abundance is. Jane and Paddy are using a variety of methods to improve our understanding of the conservation status and management of common and southern sawsharks threatened by fishing in south-eastern Australia.



**AA YAPTINCHAY** 



**BOTTLENOSE WEDGEFISH AND OTHER RHINID** FISHERY ASSESSMENT AND CONSERVATION **PROGRAMME DEVELOPMENT IN THE PHILIPPINES.** 

Marine Wild Fauna Watch of the Philippines, Inc | 2019

THE PHILIPPINES | RESEARCH | BOTTLENOSE WEDGEFISH RHYNCHOBATUS AUSTRALIAE

With more than 200 species of sharks and rays around the Philippines and little known about the conservation status of most of them, it's no wonder that some species have been ignored. AA is trying to close the information gaps for bottlenose wedgefish and other rhinid species to help inform better management for these species.



### ANDRIA BEAL



## **EPIGENETICS AS A NEW FRONTIER TO IMPROVE** SHARK NURSERY CONSERVATION IN BIMINI. THE BAHAMAS.

Florida International University | 2019

USA | RESEARCH | LEMON SHARK NEGAPRION BREVIROSTRIS

What is pollution doing to sharks on a developed coastline in The Bahamas? Andria is using the latest in genetic analysis to understand its longterm impacts on lemon sharks.





## **KEVIN CROOK**

## BIRDS-EYE VIEW: USING DRONES TO ASSESS THE **ROLES OF RAYS IN COASTAL SANDFLATS.**

James Cook University | 2019 AUSTRALIA | RESEARCH | RAYS

Rays are common in tropical seas, but not much is known about their basic ecology or their roles in marine ecosystems. Kevin is keeping an eye from the sky on foraging rays on the Australian coast.





JAKE DAVIES



TRIAL BAITED REMOTE UNDERWATER VIDEO SYSTEMS BRUVS TO MONITOR CRITICALLY ENDANGERED ANGELSHARKS.

Natural Resources Wales | 2019

CANARY ISLANDS AND UNITED KINGDOM | RESEARCH | ANGELSHARKS SQUATINA SQUATINA

Could cameras help scientists understand the ecology of angelsharks in Welsh waters? Jake is piloting an initiative of testing BRUVs in the Canary Islands and replicating it in Wales.





## **GLORIMAR FRANQUI RIVERA**

## USING DNA BARCODING TO DOCUMENT THE **DIVERSITY OF SHARKS IN PUERTO RICO.**

University of Puerto Rico Mayaguez Campus | 2019 PUERTO RICO | RESEARCH | SHARKS

To find out which shark species occur in Puerto Rican waters, Glorimar is using genetics and getting samples from fish markets. She also relies on the assistance of local fishers. Filling this fundamental knowledge gap will help to assess local consumption of sharks and build up the community's understanding of how sharks function in the marine ecosystem.



ANA LUCIA FURTADO SOARES



THREATENED SHARKS AND RAYS OF WEST **AFRICA: ASSESSING THE IMPACTS OF ARTISANAL FISHERIES IN ANGOLA.** 

Gulf Elasmo Proiect | 2019

#### ANGOLA | RESEARCH | SHARKS AND RAYS

At the northern extent of the hugely productive waters of the Benguela Ecosystem, Angola's rich waters support a huge artisanal fishing fleet. Ana is unlocking information about sharks and rays in the region, building the baseline for managing and protecting these species in West African waters.



ALIFA BINTHA HAQUE



MAPPING CRITICAL SAWFISH HABITAT AND BY-CATCH TREND ANALYSIS FOR SPECIES-SPECIFIC HABITAT CONSERVATION IN BANGLADESH.

Department of Zoology, University of Dhaka | 2019 **BANGLADESH** I CONSERVATION I SAWFISHES

Annual encounters with the four sawfish species found in Bangladesh are reported to have been declining drastically over the past five years. Alifa is training local fishers to help map where these Critically Endangered species were found and what habitat is essential for their survival today.



DEREK KRAFT



### DNA FINGERPRINTING TO IDENTIFY HARVEST LOCATION IN THE SHARK-FINNING INDUSTRY.

Hawaii Institute of Marine Biology | 2019

WORLDWIDE | RESEARCH | SILKY SHARK CARCHARHINUS FALCIFORMIS

The silky shark is the second most harvested shark species on the planet and one of the most abundant in the shark-finning industry. Its numbers have plummeted in the past 20 years. Derek is using an atlas of genomic diversity to work out which areas of the ocean are fished and to understand the origins of silky shark fins in the Hong Kong market, the centre of the shark-finning industry.





### MARIANA MARTINS

### **POLLUTANT SCREENING OF ENDANGERED GUITARFISHES AND ANGELSHARKS OFF** SOUTH-EASTERN BRAZIL.

Universidade Federal do Rio Grande | 2019 **BRAZIL** | RESEARCH | GUITARFISHES AND ANGELSHARKS

We tend to think only of overfishing when it comes to explaining shark declines, but might pollutants also be killing marine wildlife? Mariana is looking at what heavy metals and contaminants are accumulating in endangered angelsharks and guitarfishes.



GABRIELA OCHOA



### **DOCUMENTING A REGIONALLY IMPORTANT EMERGING SHARK FISHERY IN THE REMOTE MOSKITIA REGION, HONDURAS.**

MarAlliance | 2019

HONDURAS | RESEARCH | SHARKS AND RAYS

Although Honduras banned shark fishing in 2011, this decision was repealed in 2016 for the Moskitia region. Gabriela is working with Miskito fishers to get a handle on the scale of shark fishing in this area.



## JAIME PENADÉS-SUAY

## STUDY OF AN UNDESCRIBED NURSERY AREA FOR THE CRITICALLY ENDANGERED SPINY **BUTTERFLY RAY IN THE MEDITERRANEAN.**

Associació LAMNA per a l'estudi dels elasmobranquis a la Comunitat Valenciana | 2019

SPAIN | RESEARCH | SPINY BUTTERFLY RAY GYMNURA ALTAVELA

Not much is known about the Critically Endangered spiny butterfly ray in the Mediterranean, and even less about how tourism in this popular sea is impacting its population. Jaime is diving in to understand this species, using photos and videos to make its presence known to ocean-goers.



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CHESTON PETERSON



**EFFECTS OF PREY AND PREDATOR** DISTRIBUTION ON MOVEMENT AND HABITAT USE **OF BONNETHEAD SHARKS.** 

Florida State University Coastal and Marine Lab | 2019

USA | RESEARCH | BONNETHEAD SHARK SPHYRNA TIBURO AND BULL SHARK CARCHARHINUS LEUCAS

Do sharks move to follow their prey or to avoid the areas where their predators are most abundant? Cheston is looking at what effect the densities of blue crabs (the prey) and bull sharks (the predator) have on where bonnethead sharks choose to move.



LUZ SALDAÑA-RUIZ



DESCRIPTION OF ARTISANAL CHONDRICHTHYAN FISHERY IN THE NORTHERN LIMIT OF MEXICAN PACIFIC COAST.

Centro de Investigación Científica y de Educación Superior de Ensenada, Baja California | 2019

MEXICO | RESEARCH | SHARKS, RAYS AND CHIMAERAS

Popotla, the northernmost fishing camp on the Mexican Pacific coast, is where rarer species like prickly sharks and chimaeras are caught. Luz is monitoring catch sites and interviewing fishers to improve our understanding of how this artisanal shark fishery operates.



DOMINIC SWIFT



**POPULATION GENOMICS ASSESSMENT OF BLACKTIP SHARKS IN THE GULF OF MEXICO AND** WESTERN NORTH ATLANTIC OCEAN.

Texas A&M University-Corpus Christi | 2019

USA | RESEARCH | BLACKTIP SHARK CARCHARHINUS LIMBATUS

To really understand how vulnerable sharks are to fishing in localised areas, we need to know the genetic variation across large areas. Dominic is investigating this in blacktip sharks, one of the dominant shark species caught in US Atlantic and Gulf of Mexico fisheries, to understand population connectivity across the Caribbean Sea and between these regions.

# OUR TEAM CONSISTS OF A PASSIONATE GROUP OF PEOPLE WHO ARE DEDICATED TO MARINE CONSERVATION. OUR CORE OPERATIONS ARE HANDLED BY A SMALL NUMBER OF PEOPLE LOCATED IN VARIOUS OFFICES AROUND THE WORLD.

1 SOSF HEADQUARTERS | GENEVA | SWITZERLAND

- 2 SOSF SHARK EDUCATION CENTRE | KALK BAY | WESTERN CAPE | SOUTH AFRICA
- 3 SOSF SHARK RESEARCH CENTER | FLORIDA | USA
- 4 SOSF ISLAND SCHOOL | MAHÉ | SEYCHELLES





#### MICHAEL SCHOLL

#### CHIEF EXECUTIVE OFFICER-JANUARY 2019 NOVEMBER 2019

As the chief executive officer of the Save Our Seas Foundation, Michael was able to merge decades of experience in science, conservation and education and his lifelong passion for conserving sharks and the oceans.

Born in land-locked Switzerland along the shores of Lake Geneva, Michael's love for the ocean transcended his personal geography. He attended the University of Lausanne in Switzerland and graduated from the University of Aberdeen in Scotland with a BSc in zoology.

His initial field experience with sharks began in 1995 at the Bimini Biological Field Station in The Bahamas. He then spent the next decade studying the population and ecology of white sharks around Dyer Island in South Africa. In 2002, he founded the White Shark Trust to support research, education and conservation projects focused on white sharks. His genetic, tagging and fin-printing studies were integral to discovering a link between South African and Australian white shark populations. This work was a major factor in the decision to list white sharks on CITES in 2004.

Michael's research and conservation efforts have been featured in numerous television documentaries produced by the likes of BBC, National Geographic and Discovery Channel, as well as publications such as *Science*, *Nature*, *BBC Wildlife Magazine*, and *Africa Geographic*. In 2006, Michael co-authored *South Africa's Great White Sharks* (Struik Publishers) with photographer Thomas P. Peschak.

Michael taught bilingual high school and IB level biology, mathematics and physics classes in Lausanne, Switzerland, and worked for South African explorer Mike Horn on the Pangaea Expedition, assisting Young Explorers worldwide to establish environmental and social projects.



## JAMES LEA

#### CHIEF EXECUTIVE OFFICER - DECEMBER 2019

James is the chief executive officer of the Save Our Seas Foundation. He has had a fascination for the marine realm from a young age and it was this that sparked his ambition to explore the oceans. Having been humbled by encounters with various shark species, he became keen to learn as much as he could about their behaviour and ecology.

James gained a first-class Honours degree in biological sciences from the University of Oxford and then volunteered as a shark researcher at the Bimini Biological Field Station. At Bimini he cut his teeth catching, tagging and tracking sharks, and working with them so closely consolidated his passion and further motivated him to fight for marine conservation.

He then moved to work as a research scientist for the Save Our Seas Foundation, before completing a PhD in marine biology at the University of Plymouth in collaboration with the D'Arros Research Centre. His primary research focus was a comprehensive tagging programme tracking almost 200 sharks of seven different species in Seychelles, aiming to determine the factors that drive their movement behaviour and use this knowledge to inform effective conservation strategies. James's research has helped to contribute to the design of marine protected areas and has revealed previously unknown open ocean migrations of tiger and bull sharks, highlighting the challenge of managing shark populations that span ocean basins. He continues his research as part of the Evolutionary Ecology Group at the University of Cambridge.

James fully realises the importance of actively promoting awareness of marine conservation issues, so he is particularly excited to lead the Save Our Sea Foundation team to help ensure that we can live with healthy oceans for generations to come.



#### NADIA BRUYNDONCKX

#### EXECUTIVE ASSISTANT AND SCIENTIFIC ADVISOR

Nadia is a doctor in biology who joined the team of the Save Our Seas Foundation in spring 2013. Based in Geneva, she works with Michael Scholl as an executive assistant and scientific advisor.

Animals and nature have fascinated Nadia since her childhood so it was a natural progression for her to study biology to better understand the wonders of the animal kingdom. For her PhD she researched the conservation and co-evolution of bats and parasites using several molecular tools. Bats, she established, are fascinating animals that can help to explain the role of scientists and make people sensitive to conservation and other environmental issues. Having completed her own PhD, Nadia became the coordinator of a doctoral programme, organising courses and workshops for PhD students in ecology and evolution.

In 2012 she took over the administration of a biology department, dealing with finances and human resources. A field biologist familiar with unpopular animals, Nadia also has solid expertise in administrative management. But it was while qualifying for her advanced diver certificate that she became sensitive to the vulnerability of the oceans and the importance of preserving them. After several years in science and administration, she decided to use her diverse skills to help to promote the conservation and protection of marine environments.

## KALK BAY I WESTERN CAPE I SOUTH AFRICA



### AURÉLIE GROSPIRON

#### DIRECTOR OF COMMUNICATION

Born and raised in the French Alps, Aurélie developed a strong connection with the natural elements: mountains, lakes and the ocean. She became an expert skier, sailor and diver, loves adventure and also enjoys contact with people who are passionate about nurturing a vision for a better world. Environmental issues, the legacy for the next generation and educational objectives are what matter to this dynamic woman.

Aurélie graduated from an international business school in Paris in 1992 and went on to work mainly with premium brands such as Rolex, Oakley and Dynastar. Her fields of expertise are public and media relations, sponsoring, advertising and event management.

In April 2019, after a career in the sport and luxury industries, she felt it was time for her to reconnect with her personal aspirations and follow a new professional direction. She joined the Save Our Seas Foundation in Geneva to handle its communications strategy and make the organisation's activities and ambitions better known to the general public. For Aurélie it's a new reality that makes perfect sense, a role that matches her preference for exploration, conservation and innovation.



## JADE ROBYN SCHULTZ

## DIGITAL CONTENT MANAGER

From a young age when she and her family would go on holiday to nature reserves and the seaside, Jade has felt a very strong connection to the natural world and a great appreciation for its overwhelming beauty. With time however, she realised that this was a view few others shared. Having experienced in particular how little other people know about the wonders of the ocean, she became acutely aware that they know even less about the dangers that the marine realm faces.

With a background in marketing and media experience, Jade understands that the media is extremely powerful when it comes to spreading a message and raising awareness – and, in fact, in today's digital world it is an invaluable conservation tool. She believes that the knowledge and experience that she is able to bring to the Save Our Seas Foundation's Conservation Media Unit, together with the passion and dedication of the other team members, can and will make a positive difference in the mindset of the public – and, ultimately, the health of our oceans.



#### LAUREN DE VOS

#### SCIENTIFIC CONTENT RESEARCHER, WRITER AND EDITOR

Lauren's curiosity about the natural world was fostered by frequent forays into the wilderness areas of her home country, South Africa. This fascination with all things 'wild and wonderful' resulted in a fairly eclectic academic background: she holds a BSc in environmental science, a BSc Honours in zoology (her thesis looked at human-wildlife conflict and the behavioural ecology of Chacma baboons) and an MSc in conservation biology. She's completed stints studying in the Kruger National Park, but ultimately fell in love with the ocean when using underwater cameras to figure out which fish lived where, and why, in a marine protected area on South Africa's southern coast. Lauren went on to lead a project funded by the Save Our Seas Foundation to develop cost-effective camera monitoring tools for marine protected areas along South Africa's coast and ran a programme of skills-sharing workshops to communicate her findings with conservation agencies, reserve managers and rangers. She recently completed a PhD that involved using cameras to document patterns of marine biodiversity in South Africa's largest bay.

Lauren's scientific interests have always been balanced by a passion for inspiring change, right from undergraduate days spent building up activism and action on her campus to her work of developing educational tools and lessons for children. She loves turning science into stories, untangling the complexities of research to translate its relevance to a wide audience. In addition to her work for the foundation's website and magazine, she currently teaches undergraduate students.

#### CALIFORNIA. USA

## SCIENTIFIC COMMITTEE



#### **STEFAN KUBICKI**

#### IT AND WEB OFFICER

Stefan grew up in North Dakota, about as far away as it's possible to get from the coast in the USA. He first developed a fascination with sharks and the underwater world thanks to nature documentaries and well-worn issues of National Geographic. He began his career as an analyst at a UN-based NGO in New York before moving to London, where he worked as a web developer and advisor to several startup companies. He joined the Save Our Seas Foundation in 2010. Aside from his work for the foundation, Stefan is an award-winning filmmaker whose films have screened at festivals around the world.



## SARAH FOWLER

## SCIENTIFIC ADVISOR

Sarah has a first class joint honours degree in zoology and marine zoology from the University College of North Wales, an MSc in conservation from University College London and 30 years of professional experience as a marine biodiversity conservation expert. She has worked in various capacities for government departments, national and international NGOs and a biodiversity consultancy. Having been appointed to the IUCN Shark Specialist Group in 1991, she chaired it for many years and is now its vice-chair for international treaties.

Sarah founded the European Elasmobranch Association and its UK member, the Shark Trust (and is a trustee of the latter]. She was appointed Officer of the Order of the British Empire for services to marine conservation in 2004, and a Pew Fellow in Marine Conservation in 2005. She became principal scientist for the Save Our Seas Foundation in 2011.



#### **DEAN GRUBBS**

#### SCIENTIFIC ADVISOR

Dr Dean Grubbs is a fish ecologist with interests in the biology of exploited and poorly studied estuarine and marine taxa. Much of his research addresses specific gaps in biological knowledge necessary for the management and conservation of coastal and deep-water sharks and rays. Dean specialises in the use of fishery-independent surveys to study population dynamics and the drivers of distribution patterns of fishes and to facilitate studies of life histories, reproductive biology, trophic ecology and systematics. Dean has also tagged and released more than 10,000 sharks representing over 40 species during the past 25 years. He employs a variety of tagging and telemetry techniques to examine movement, migration and patterns of habitat use and to delineate essential and vulnerable habitats for exploited, threatened or poorly studies species.

Dean is a native of Florida and his early years spent fishing and exploring the waters of the north-eastern Gulf of Mexico led to an early interest in marine biology. He received Bachelor's degrees in marine science and biology from the University of Miami and a doctoral degree in Fisheries Science from the College of William & Mary's Virginia Institute of Marine Science. Dean was a post-doctoral researcher and faculty member at the Hawaii Institute of Marine Biology before moving to Florida State University (FSU) in 2007. He is a member of the IUCN Shark Specialist Group, the National Oceanographic and Atmospheric Administration (NOAA) Office of Protected Resources' Smalltooth Sawfish Recovery Team and NOAA's SouthEast Data Assessment and Review Advisory Panel for Highly Migratory Species. Dean is currently the associate director of research at the FSU Coastal and Marine Lab, where he mentors graduate and undergraduate students and maintains an active research programme on the ecology of deep-water and coastal fishes. His research has been featured in many television documentaries, including National Geographic TV, National Geographic Wild, Discovery Channel and the US Public Broadcasting System.



## ANDREW CHIN

#### SCIENTIFIC ADVISOR

Dr Andrew Chin is a fisheries scientist whose work focuses on shark and ray biology and ecology, and how the information from this research can be translated into conservation and sustainability. Specifically, Andrew is interested in how fishes use coastal and marine habitats and how patterns of use affect their vulnerability to pressures such as fishing, habitat loss and climate change. His recent research spans the life history and biology of sharks by means of tagging and acoustic telemetry, as well as risk assessment. As an applied scientist, Andrew is also very interested in how fishes, sharks and rays interact with people and how their populations can be managed, as well as in impacts on their populations.

Andrew grew up in South-East Asia but currently lives in Queensland, Australia, where he received his PhD from James Cook University. He has a diverse marine background, having worked as a marine biologist in the tourism industry and as an education officer in a public aquarium. He also spent 10 years working at the Great Barrier Reef Marine Park Authority, the Australian federal agency charged with protecting the Great Barrier Reef. In 2017, Andrew launched SharkSearch Indo-Pacific, an effort that blends formal research, citizen science and public outreach, and aims to develop a scientifically robust shark diversity checklist and conservation account for every country and territory in the Pacific by 2022. He is also one of the founders of the Oceania Chondrichthvan Society and a member of the IUCN Shark Specialist Group.

## SOSF ISLAND SCHOOL MAHÉ I SEYCHELLES



#### **TERENCE VEL**

#### PROJECT ADVISOR AND EDUCATOR

Before joining University of Seychelles in 2015 as a science laboratory technician and a field lecturer for BSc environmental science students, Terence Vel spent 16 years as a laboratory technician in various secondary schools. Twentyone years ago he became a founder of Wildlife Clubs of Seychelles and during this time has managed the organisation's projects and coordinated environmental programmes in 40 schools on Mahé, Praslin and La Digue. In 2000 he worked as a technician on a project called 'Avian ecosystems in Seychelles', which was funded by the Global Environment Facility and implemented by the former BirdLife Seychelles. The project involved two distinct phases: in the first, ecological research was carried out on a number of the Seychelles' Inner Islands to investigate their biology and conservation potential; during the second, endemic Sevchellois birds were translocated from certain islands to others that were more suitable. In 2008 Terence embarked on studies for a diploma in environmental education and social marketing at the University of Kent's School of Anthropology and Conservation. This led him to The Darwin Initiative Rare Pride Campaign to work on a project called 'Investing in island biodiversity: restoring the Sevchelles paradise flycatcher'. The project was based on La Digue Island and aimed to translocate a small population of birds on Denis Island. Terence also conducts outreach programmes that focus on marine education for youth groups from the community.



## **CLOVA MABIN** SHARK EDUCATION CENTRE MANAGER

Originally from Scotland, Clova became fascinated by sharks while working as a diving aquarist in an aquarium that housed ragged-tooth sharks. She came to South Africa in 2005 to work with tiger sharks on the east coast before joining the White Shark Trust in Gansbaai as a research assistant. While in South Africa, she became involved in the wildlife film industry, where she learned the basics of communicating science to a wider audience. Keen to further her education, she went on to complete an MSc in conservation biology and then a PhD focusing on the status and management options for marine species that have invaded South African shores. This applied research made her realise how inaccessible most science is to the general public and how this contributes to the many conservation issues we face today.

Clova loves to travel, but when in South Africa she spends her free time outdoors on the water or in the mountains. She is a certified PADI dive master and South African commercial diver. As a volunteer for several organisations that focus on environmental education and the mother of a nature-loving daughter, she enjoys teaching children about ecology and sustainable lifestyle choices. She is passionate about sharing her love and knowledge of the marine environment, as she believes this is the only way we can change our future.



## **CLAIRE METCALF**

## FACILITIES ADMINISTRATOR

Raised in various small West Coast fishing and mining towns of South Africa and Namibia, with parents whose free-range approach to parenting meant lots of time outside exploring beaches. Claire is a firm believer in the power of experiential education in moulding future generations to become effective conservationists. Claire joined the Save Our Seas Foundation Shark Education Centre in May 2016 after almost eight years with Liberty Life Financial Services as a franchise business support administrator. With a diploma in administration and legal studies from Montrose Business College in Cape Town, in her role as the facilities administrator she brings a high level of organisation and structure to the dynamic working environment that is the Shark Education Centre. She is enjoying every minute of the varied opportunities this role brings and, in addition to seeing to facilities maintenance and administration, she has become a vital part of the team, joining school groups as they learn about, explore and appreciate the ocean. She has also made it her personal mission to convince the education centre's resident puffadder shysharks to eat their food. With a family that has earned - and continues to earn - its income almost entirely from the sea. Claire has a vested interest in the conservation of the oceans for current and future generations. She believes that she is in exactly the right place to be able to contribute to this.



#### TOM CAMPBELL

#### FDUCATOR

Tom graduated from the University of Cape Town with a BSc degree, majoring in zoology and geography, and then completed a Bachelor of Education degree at Rhodes University in South Africa's Eastern Cape. He spent his working years teaching natural science and mathematics at primary schools in Grahamstown and Cape Town.

A passionate educator. Tom took as much interest in his learners as he did in their surroundings and enjoyed creating innovative lesson material. His interactive, handson investigative lessons in his classroom laboratory and his numerous excursions and camps in the outdoors inspired generations of children to develop an interest in nature and conservation. He co-wrote several series of natural science textbooks for schools and developed a particular interest and knowledge about the seashore ecosystem.

Tom is married with four adult children and four grandchildren. Recently retired, he enjoys family time and spends his spare time gardening, cycling, cooking and hiking.



### NTOMBIZANELE MAYIYA

#### ASSISTANT EDUCATOR

Zanele was born in the northern part of South Africa's Eastern Cape. Even as a young girl she enjoyed cooking very much, so when she completed her matric she decided to make hotel and catering management her career. In March 2008 she started working for SOSF as a housekeeper.

By reading SOSF books and watching videos about the ocean environment. Zanele became interested in marine life. In June 2009 she joined Alison Kock on the research boat to Seal Island in False Bay and there she saw a great white shark for the first time in her life. By the end of that trip she had fallen in love with the sea and decided to become an educator so that she can pass her enthusiasm on to the young generations of South Africa.

#### SOSF SHARK RESEARCH CENTER FLORIDA I USA



## MAHMOOD SHIVJI

## DIRECTOR

Mahmood is professor of marine science at Nova Southeastern University's (NSU) Oceanographic Center in Florida and a director of the SOSF Shark Research Center. He received his undergraduate degree in biological sciences at Simon Fraser University in Canada, his Master's from the University of California, Santa Barbara, and his PhD from the University of Washington. He has been a faculty member at NSU since 1993 and a director of the SOSF Shark Research Center since 2010.

Mahmood credits his life-long fascination with biology to growing up in Kenya, where he was routinely exposed to African wildlife and undersea environments as a child and teenager. His interests in marine science in particular were boosted when as an undergraduate student he assisted one of his professors with kelp-bed ecology research in a pristine part of British Columbia. That experience proved transformative, leading to a career in marine and conservation science and education.

In addition to leading the research and education programmes of the shark research centre, Mahmood directs the Guy Harvey Research Institute, emphasising collaborative projects between the two entities to achieve larger and more impactful research and conservation outcomes. He specialises in integrating laboratory genetics-based and field-work approaches to study and solving problems pertaining to the management and conservation of sharks and rays, billfishes and coral reef ecosystems.

Mahmood's work consistently receives worldwide attention. His research developing rapid DNA forensic methods to identify shark body parts is being used by US and other national fisheries management agencies to reduce the illegal fishing of threatened species. This work is also on exhibit at the Smithsonian Museum's Sant Ocean Hall in Washington DC, and his team's research discoveries have been widely reported in the national and international media.



#### **RICHARD DODGE**

#### DIRECTOR

Having conducted research on coral reefs worldwide, Dr Richard E. Dodge is a recognised authority on reef ecosystems. With expertise involving reef ecology and ecology, he is also the author of many publications in scientific literature. His interests include the study of natural and man-induced impacts on coral reefs from factors including climate change, ship groundings and oil spills with their related mitigation. pollution and sedimentation; coral skeletal growth and sclerochronology; coral reef restoration; reef mapping and assessment: and Habitat Equivalency Analysis.

Richard gained a BA degree from the University of Maine in 1969 and an MPhil and PhD in geology and geophysics from Yale University in 1973 and 1978. He is dean of the Nova Southeastern University Oceanographic Center as well as executive director of the center's National Coral Reef Institute, which is dedicated to providing management research outcomes on reef monitoring, assessment and restoration.

## **FUNDING SUMMARY** SUMMARY OF ALL THE PROJECTS FUNDED BY THE SAVE OUR SEAS FOUNDATION DURING 2019

#### SOSF CENTRES

SOSF D'Arros Research Centre | CLOSED SOSF Shark Education Centre | Yeld Hutchings + Mabin SOSF Shark Research Center | Shivji SOSF Island School Seychelles | UniSey

#### SOSF PARTNERS

Bimini Biological Field Station Foundation BBFSF | Elasmobranch research, education and conservation in Bimini, Bahamas | Smukall

Manta Trust | A global strategy and action plan for the long-term conservation of mobulid rays | Stevens

North Coast Cetacean Society NCCS | Cetacea Lab | A voice for whales | Wray

The Acoustic Tracking Array Platform ATAP | A nationwide marine science platform | Cowley

Shark Spotters | Finding the balance between recreational water-user safety and white shark conservation | Waries

#### SOSF SPONSORSHIPS

228   Conference   European Elasmobranch Association EEA   2019	448 IMA
229   Conference   American Elasmobranch Society AES   2019	44
255   Conference   Oceania Chondrichthyan Society OCS   2019	450
330   Natural History Museum   Lausanne, Switzerland	451 Aid 453 Isla
333   Conference   Southern African Shark and Ray Symposium SASRS   2019	
335   American Elasmobranch Society AES   Eugenie Clark Award 2019	
338   Support   University of Seychelles UniSey   Lab component	
338   Support   University of Seychelles UniSey   Salary component	
444   Book   Genie: The Life & Recollections of Eugenie Clark   Castro	
445   Books   Shark Biology and Conservation   A Handbook for Enthusiasts, Educators, and Anyone Else Fascinated by These Magnificent Beasts   Abel & Grubbs	
446   Conference   World Conference of Science Journalists WCSJ   2019	
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**YAPTINCHAY** | Bottlenose wedgefish and other rhinid fishery assessment and conservation programme development in the Philippines

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