



SAVE OUR SEAS FOUNDATION

10TH ANNIVERSARY ANNUAL REPORT 2013

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"AS LONG AS THERE ARE PEOPLE WHO CARE AND TAKE ACTION, WE CAN AND WILL MAKE A DIFFERENCE."

THE FOUNDER | SAVE OUR SEAS FOUNDATION



CEO'S NOTE

In 2013, the Save Our Seas Foundation celebrated its 10th anniversary. Supporting ocean conservation, research and education projects has been our primary objective.

Since its inception, the Foundation has stayed close to the pulse of current scientific and conservation projects focused on elasmobranchs. In addition, we have given special attention to early career scientists and promoted their work beyond the obscure scientific journals in which information is all too often hidden from the public eye.

We are fortunate to be able to work with leading scientists, innovative conservationists and dynamic educators worldwide, along with the best photographers and writers to present their achievements and reports from the field. With this 10th Annual Report, we celebrate the people behind the incredible and fascinating stories: our project leaders.

2013 marks the first year the Foundation moved to a biennial rhythm for its Keystone Grants, while launching the application for its annual Small Grants designed for early career professionals. We funded 59 projects, four research and education centres, and several students to attend scientific conferences.

We have refined our mission and vision statements to include current needs for a more holistic conservation-based science approach with clearly defined outcomes.

The Foundation's success rests on a team of a dozen people who are passionate about enriching our understanding of charismatic marine megafauna, bringing change to the public's perspective and upholding the original vision of the Founder.

MICHAEL SCHOLL | CHIEF EXECUTIVE OFFICER



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SUMMARY OF THE FOUNDATION

SUNNYE COLLINS

Ten years ago one man, our Founder, embodied Sylvia Earle's words. He backed his passion for sharks and the ocean with action to protect them. On 23 September 2003, the Save Our Seas Foundation was created to safeguard the future of the oceans, particularly for sharks. A tall order, to be sure, but with every project funded we make positive steps towards realising this goal.

This year we celebrate a milestone: 10 years of providing financial and practical support to projects invested in improving the health of our oceans. In the past decade we have assisted more than 150 projects in 44 countries. Emerging as well as established scientists, conservationists and educators all over the world have benefited from the support of the Foundation. In return, the Foundation has been defined by the ingenuity and tireless work of the project leaders.

It is easy to get bogged down in all the ways in which humans are degrading the sea. The challenge lies in being a driver of optimism. What difference can one organisation make in the vast realm of ocean conservation? We have spent the past decade trying to address this question.

Though all our projects are ultimately focused on conservation, we subdivide them into three major categories: research, education and conservation. Over the years, nearly 60 marine species have been the centrepiece of our projects, of which 57% target specifically sharks. The conservation of sharks and rays is the aim of 65% of our undertakings. However, our scope of funding has expanded. While still concentrating on the overall mission, we have sponsored a wide range of marine-focused projects from satellite tagging, radio shows, travelling exhibits and lobster research to citizen science initiatives and community workshops.

RESEARCH

Research is the cornerstone of conservation strategy. This is why it takes up most of our funding, accounting for nearly 60% of our projects. We recognise that in order to conserve anything, you must begin by understanding it. Often we want to conserve a species or ecosystem by passing legislation, establishing a protected area or creating a programme to inform people about a specific issue.

However, none of this can happen without baseline data on species and habitats. That is why 30% of our research projects focus on gathering information about population ecology, behaviour, habitat use, migratory patterns, reproductive cycles, fishing effort and by-catch. Of the 76 research projects, 47 of them have involved the tagging and tracking of marine species.

EDUCATION

Between research and conservation lies education. To put it simply, information breeds knowledge; knowledge gives rise to action; and action leads to change. This is why 25% of our projects are focused on education. We have funded three exhibits, four public awareness campaigns, 16 books, six curriculum-aligned education programmes, two radio shows, two websites and 15 DVDs, films and documentaries.

CONSERVATION

Though all our projects are conservation-minded, 19% of them have focused specifically on conservation outcomes. These have included a wide range of initiatives involving long-term reef monitoring, by-catch reduction techniques, monitoring and data collection by citizen scientists, the management of marine megafauna in the face of climate change, the protection of marine biodiversity, elasmobranch conservation strategies, combating destructive fishing methods with acoustic technology, and investigating how the media affect shark conservation policy.

CENTRES

The Foundation has established three centres that serve as permanent outposts from which its mission is carried out. The SOSF Shark Education Centre in South Africa, the SOSF Shark Research Center in the USA and the SOSF D'Arros Research Centre in the Seychelles continue to grow and evolve with the Foundation, functioning as hubs for cutting-edge research, conservation and education.

Many of us ask, what can I as one person do, but history shows us that everything good and bad starts because somebody does something or does not do something.

SYLVIA EARLE | OCEANOGRAPHER

SOSF Shark Education Centre, Kalk Bay, Western Cape, South Africa

Established in 2008 with the objective of connecting the public with the ocean in order to nurture awareness and environmentally responsible actions, the centre runs education programmes that focus on sharks and local marine ecosystems. Its small group of dedicated educators deliver experiential and place-based courses on marine science and conservation. Over the past six years, approximately 25,000 children, teachers and families have taken part in the centre's on-site and off-site learning programmes.

SOSF Shark Research Center, Fort Lauderdale, Florida, USA

In collaboration with Nova Southeastern University Oceanographic Center, the Shark Center provides a physical presence for SOSF in the USA. Under the leadership of Dr Mahmood Shivji, it is a leader in shark research and produces information and publications that feed into the conservation and management of sharks on a global scale. Funded since 2009, the centre assesses:

- The frequency, load and species distribution of mercury and persistent organic pollutants in shark fins.
- Integrative approaches to shark conservation, involving population genetics, forensics and electronic tracking.
- Great white shark genome characterisation and its application to shark conservation.

SOSF D'Arros Research Centre, Amirantes Islands, Seychelles

Under the guidance of Rainer von Brandis, this research facility aims to be 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.

The work focuses on the foraging ecology and post-nesting migrations of hawksbill turtles, the spatio-temporal movements of manta rays, the long-term monitoring of coral reefs and the rehabilitation of vegetation. Gathering baseline data is crucial in the Amirantes, where there are currently no protected areas. In

addition, the centre will be hosting the second annual D'Arros Experience for a group of 16 students. This camp aims to increase students' knowledge about the marine environment through project-based, place-based and experiential learning.

SPONSORSHIPS

Short-term grants for mission-driven events have been an important component of our funding portfolio. Since 2008 we have sponsored Cape Town's Wavescape Surf Film Festival, which reaches 10,000 people each year and aims to build communities and promote ocean conservation.

The following year we began supporting European Shark Week, a series of events that takes place across Europe over seven days to raise awareness of the plight of sharks, promote public involvement and encourage decision makers to achieve better shark conservation policies. Ripple effects from this event include the support of the Community Plan of Action for Sharks by the EU Council of Fisheries Ministers in 2009. In 2010, 423 MEPs across the EU supported a written declaration that bans shark finning.

In 2010, Sharks International in Cairns, Australia, was the first fully international elasmobranch conference in nearly 20 years. Although it was arranged as a once-off meeting, it was so successful that most of the delegates felt it should become a regular event. The Foundation has been a major sponsor from the beginning and continues to support this gathering, which encourages a more international approach to the management and conservation of sharks worldwide.

Since 2010 we have supported the American Elasmobranch Society (AES) in its efforts to bring together both experimental and applied biologists whose diverse backgrounds span fisheries management, experimental physiology and animal health. Their combined experience leads to a better understanding of the physiological effects of stressors on elasmobranchs and thus helps to determine environmental mitigation, management and conservation strategies.

In 2013, we supported the three main elasmobranch scientific conferences, mainly funding towards additional student travel grants: the American Elasmobranch Society (AES) conference in Albuquerque, New Mexico, USA, the Oceania

Chondrychthian Society (OCS) in Brisbane, Australia, and the European Elasmobranch Association (EEA) conference in Plymouth, UK.

MEDIA

From the beginning, the Foundation has recognised the media as an invaluable conservation tool. Twenty-four of our projects have focused on the media in different forms and have involved the creation of exhibits, websites, radio shows, field guides, children’s books, billboard campaigns and documentaries. This tradition of investing in conservation media projects is now carried on in a more official capacity through our newly established Conservation Media Unit.

A DECADE AT A GLANCE

2003 Beginning modestly, the Foundation supports three projects on shark science education and the population ecology of manta rays.

2004 Two more projects are added, focusing on basking sharks in Scotland and white sharks in South Africa. These two are the longest-running research projects on our roster, with a combined total of 17 years of gathering baseline data on the population and behavioural ecology of basking sharks and white sharks. The funding gives rise to ripple effects that include population estimates of basking sharks generated from photo-identification, the identification of more than 150 basking sharks and over 260 white sharks, and the appearance of both these charismatic species in five documentaries, six scientific publications and countless popular articles.

2005 With an additional seven projects, the Foundation expands its scope to educational media, highlighting sharks, manatees and ocean awareness, and to research projects that focus on whale sharks in the Seychelles, dolphin species in Mozambique and bull sharks in Fiji and the Bahamas.

2006 Adding six more projects, we invest in the making of three DVDs: one about Kemp’s ridley sea turtles in Mexico, an award-winning film about whale sharks by a teenage filmmaker and the *Dive into your Imagination* DVD and educational resource. Research expands to include the investigation of tiger

shark behaviour in South Africa, philopatry and habitat use by manta rays in Mozambique and the ecology and conservation of blue sharks in the Atlantic Ocean.

2007 Ten new projects include pioneering studies on manta rays in the Maldives, mako sharks in the Atlantic and sevengill sharks in Tasmania, and two UK-based initiatives that feature stakeholder involvement in lobster conservation and the culture of bivalves as bio-filters. Other projects, in the Gulf of California, look at the population structure of blue whales and the migratory patterns of whale sharks. There are also three education projects: an award-winning documentary on the plight of grey seals in Ireland, a DVD to raise awareness among recreational boaters, and a billboard campaign in Beijing aimed at reducing consumer demand for shark fin soup. In addition, the Foundation supports the research and photography for the book, *Wild Seas, Secret Shores of Africa* by Thomas Peschak.

2008 The Save Our Seas Shark Centre opens in Kalk Bay, South Africa. Seven new research projects swell the Foundation’s portfolio, all of which focus on sharks and rays. They study whale shark ecology in Brazil; investigate manta ray fisheries in South-East Asia; monitor sharks acoustically in the Bahamas; evaluate stress in sharks and rays using non-lethal biochemical methods; research ways to increase awareness about shark conservation in the USA and Mexico; and embark on population studies of sharks in Sudan and grey reef sharks in Palau. The education projects are the television pilot ‘Ocean’ with Carl Safina, a film about sharks in the Bahamas, a website on marine biome education and conservation outreach, the COOL Seas travelling road show and the IUCN Shark Specialist Group website.

2009 The Save Our Seas Shark Center opens in Florida and research begins on D’Arros Island. Seventeen new projects are added to the mix, with more or less equal emphasis on research, education and conservation. Four projects focus on the tracking and conservation of sea turtles in Malaysia, Kenya, and the USA. Others explore ocean acidification through volcanic CO₂ vents, study the West African manatee and investigate global manta ray migration. A conservation project conducts a workshop on minimising sea turtle by-catch in artisanal fisheries, while educational programmes include the award-winning DVD *The*

Shark Riddle, the children’s book and educational video *Once upon a Tide* and marine-based initiatives in the Seychelles.

2010 Of the 20 new projects this year, 80% focus on sharks and rays. Researchers explore the reproductive cycles of white sharks, the population status of Zambezi sharks, the effects of marine protected areas on rays, the stress of catch-and-release techniques on coastal sharks and the pollution of coral reefs in Chagos. Education initiatives include the renovation and redevelopment of the National Lobster Hatchery’s visitor centre in the UK and two marine science-themed radio shows, while on the conservation side citizen scientists are engaged in a survey of shark and ray egg cases and there is support for the Shark Spotters programme in South Africa and the ‘Stop the Soup’ campaign in Canada. Thomas Peschak’s book *Lost World: The Marine Realm of Aldabra & the Seychelles* is published with the aid of the Foundation.

2011 Another 16 projects include research into the ecology of whale sharks in the Arabian Gulf, the assessment of refuge areas in the conservation of coastal sharks, satellite tagging porbeagle sharks in the north-eastern Atlantic and the development of a non-lethal protocol to study elasmobranch reproduction. We are instrumental in putting together USA-based Shark Advocates International and the ‘Sharks for the Future’ conservation campaign in Indonesia, as well as an exploration of how the governments of three different countries respond to shark bites and how their responses drive public policy on shark conservation. Among the education projects supported are the media-based ‘Turtle Diaries’ in India and ‘Shark Days’ along the west coast of the USA, a series of shark-themed family events at museums, aquariums and libraries.

2012 As well as taking on the management of D’Arros Island and St Joseph Atoll as a natural reserve, the Foundation adds 14 projects to its portfolio. These include an investigation into the impacts of South Africa’s recreational shark fishery, the identification of critical habitat for killer whales in British Columbia, and clarification of the natural history and conservation of Greenland sharks. On the conservation front, open-source software for identifying individual marine animals is developed, as is a global action plan for sawfish, and the

potential for shark ecotourism in Portugal is investigated. Education initiatives include ‘Divers for Sharks’, a public awareness campaign in Brazil, and an educational DVD about the importance of whale sharks and manta rays in Mozambique.

RESULTS AND RIPPLE EFFECTS

While it is difficult to summarise every single outcome of our assistance over the past 10 years, it is even more challenging to identify the multitude of ripple effects that have occurred as the indirect result of funding. What follows is not an exhaustive list, but just some of the many highlights that we are proud to have supported:

- White shark ecology project, Alison Kock. Having identified False Bay, South Africa, as a critical feeding habitat for white sharks, this study has contributed to the growing body of biological knowledge that informs shark conservation through technical and popular publications and media.
- Basking shark conservation, Mauvis Gore. This work has been key to solving the mystery of basking shark migration, which in turn is vital to a conservation strategy. Following our sponsorship of the Basking Shark Conference in 2009, a community project evolved to undertake the photo and genetic identification of more than 150 sharks.
- Bull shark tagging programme, Juerg Brunnschweiler. The tagging of bull sharks in Fiji and the Bahamas was instrumental in establishing the Shark Reef Marine Reserve in Fiji, which has been a no-take zone since 2007.
- Campaign to reduce shark fin soup consumption, WildAid, Peter Knights. Two campaigns to educate the public and reduce the demand for shark fin soup – involving the co-production of a series of PSAs, a consumer report and an Olympic billboard campaign featuring NBA star Yao Ming – successfully reached hundreds of millions of people.
- Maldivian manta rays, Guy Stevens. This project has played a major role in the recreational diving and tourism industry in the Maldives. As a direct result, the Maldivian government has announced three new marine protected areas for mantas and whale sharks. In addition, Baa Atoll has been designated a

UNESCO World Biosphere Reserve; fishing for any shark species within Maldivian waters has been prohibited; and a complete ban has been imposed on the export and import of all shark products.

- IUCN Shark Specialist Group. The creation of a website for this group paved the way for a communication strategy for 128 shark experts across the globe. The website informs the public, influences decision makers and guides the development of effective conservation and management policies for the world’s sharks, rays and chimaeras.

- COOL Seas Road Show, Andy Starbuck. This travelling road show targets primary school students and teachers throughout the UK. Featuring a life-sized, realistic inflatable whale, dolphin, seal and turtle as well as shark props, COOL Seas’ interactive, awareness-raising workshops have reached more than 150,000 children in over 400 schools.

- Monitoring grey reef sharks in Micronesia, Tova Harel Bornosvki. Focusing on understanding the grey reef shark as a keystone species for reef systems and ecotourism, this project has tagged sharks and developed a non-lethal method to identify individual sharks for demographic studies. Over the years it has also garnered community support in the monitoring of reef sharks and reached all grade 5 students in Palau, Yap and Pohnpei with its ‘Sharks in School’ programme.

- *Riddle in a Bottle* and *The Shark Riddle*, Shark Days Outreach, Laura and Rob Sams. These two films received 25 awards, including Best Children’s Program at the International Wildlife Film Festival. The interactive and educational DVDs and the travelling outreach programme targeting primary school pupils have reached more than 12,000 students in the USA and thousands more in South Africa.

- *Once Upon a Tide*, Kathleen Frith. Produced in collaboration with Harvard’s Center for Health and the Global Environment, this award-winning film was adapted into a children’s book and curriculum, which together convey how our health and well-being depend on the ocean environment. The film and its materials have been translated into Japanese and Spanish and are currently being used in Loreto Marine Park’s education programmes.

- Migratory patterns of manta rays, Andrea Marshall. A project of many firsts, including the first PhD completed on manta rays and the first register of *Manta alfredi* in northern Egypt, this study created one of the largest databases of manta rays (more than 900 individuals) and discovered an additional manta ray species, *M. cf. birostris*.

- Sea turtle conservation, Marine Research Foundation, Nicolas Pilcher. As a result of this work in Malaysia, Turtle Excluder Devices (TEDs) have been introduced by the nation’s Department of Fisheries and will help provide a better understanding of the dynamics of open-water sea turtle populations. Feedback has been positive and the MRF has been asked to continue its assistance with training.

- Status and conservation of the West African manatee, Lucy Keith. Training has been provided for nine West African biologists in the tagging and tracking of this elusive species, as well as the first live capture of an individual. Thanks to the study, baseline data critical for the conservation of this manatee has been collected.

- Study of ocean acidification through CO₂ vents, Jason Hall-Spencer. The scientific publications resulting from this ongoing research have contributed to the body of knowledge about climate change that informs public policy.

- Satellite tracking of green sea turtles, Jeanette Wyneken. This study produced the first successful satellite tracks of any neonate green sea turtle, which enables us to peer into the previously unknown progression of a sea turtle from hatchling to adult. It also provided the first empirical, in situ evidence of the long-term movements and habitat use of green turtle hatchlings in the Atlantic.

- Marine education in the Seychelles, Abbie Hine. In collaboration with the Seychelles’ Ministry of Education, this project (recently named Island School Seychelles) has ushered marine science education into schools over the past few years. Now for the second year, it is bringing students to D’Arros Island for a week-long marine awareness camp.

- ‘Stop the Soup’ campaign, Vivian Kwong. Shark Truth held a contest that secured pledges from more than 38 couples across the globe to not serve shark fin soup at their wedding banquets. The contest attracted more than 1,500

viewers and 880 votes, and ultimately prevented 4,300 bowls of shark fin soup from being consumed. The successful couple won a trip to Mexico, where they swam with more than 100 whale sharks.

- Naked Scientist, Helen Scales. During the radio show’s inaugural series it established itself as a leading marine-themed podcast reaching an audience exceeding 16 million listeners worldwide. A special one-hour edition called ‘Diving into Naked Oceans’ attracted 100,000 listeners followed by 60,000 downloads.

- Shark Spotters, Sarah Titley. Designed to mitigate shark–human interactions by proactively alerting water users to the presence of large sharks, this programme operates at seven beaches on the Cape Peninsula, South Africa. It has recorded to date approximately 1,400 shark sightings, of which 60% have resulted in beach closures, correlating directly to a reduction in potential shark–human interactions. The programme provides employment for 22 spotters from previously disadvantaged areas in Cape Town.

- Shark bites and public policies, Christopher Neff. This pioneering study addressed the stigma against sharks following shark bite incidents and how this impacts public opinion, public risk perception and policy making for all sharks. It led to the American Elasmobranch Society calling upon the Associated Press and Reuters to adopt a labelling system for the multiple types of shark–human interaction, thereby resisting use of the term ‘attack’ without scientific basis and providing more accurate reporting.

- Building Shark Advocates International, Sonja Fordham. This group provides leadership in advancing sound, science-based local, national and international conservation policies through collaboration with diverse organisations and decision makers. Through finning bans, fishing limits, conservation plans and CITES listings, SAI works towards protection for sharks and rays.

Today we continue to prioritise projects with a central focus on charismatic marine megafauna and we have an exciting line-up for 2013–2014. Through our redeveloped funding strategy, comprising keystone grants, small grants and emergency funds, we are able to support a wide range of needs and initiatives in research, conservation and education.

What does protecting the ocean look like? How do we measure conservation success? These are difficult questions, and pointers to answering them and measuring success are even more elusive. Although we have had many successes over the past decade, the bar for excellence must be raised. We are focusing on better ways to track and measure the outputs and outcomes of projects.

With 10 years under our weight belt, we look forward to the next decade as an ongoing evolution and refining process. We continue to grow and learn as a Foundation, seeking out the best and brightest people with innovative projects that make a real and lasting impact for the health of our oceans and ultimately for every person on the planet.

SOSF D'ARROS RESEARCH CENTRE

RAINER VON BRANDIS

INTRODUCTION AND HISTORY

The natural environment of D'Arros Island and St Joseph Atoll is among the most pristine and spectacular in the world. Scores of sharks, manta rays, turtles, stingrays and fish inhabit the lagoon and the surrounding coral reefs while flocks of seabirds roost in trees overlooking tranquil beaches. In recognition of the islands' outstanding natural values, the private owners established the D'Arros Research Centre (DRC) in 2004 and tasked it with becoming a regional centre of excellence for marine and tropical island conservation. Initially, collaborations were established with local and international institutions and baseline ecological surveys were conducted in the various habitats. Over the ensuing years an increasing number of research projects and monitoring programmes were implemented in response to questions raised by the baseline surveys and visiting scientists. More recently the D'Arros Research Centre expanded its activities to include ecosystem restoration and environmental education. To date the D'Arros Research Centre has initiated 34 projects in collaboration with more than 25 institutions, resulting in two PhD dissertations, one MSc dissertation, nine scientific journal publications and 27 scientific reports.

The DRC's facilities consist of a dry and a wet laboratory that are separated by a series of eight flow-through seawater tanks. The dry lab contains computer and electronic equipment while the wet lab is used for sample analysis and experimentation. The flow-through tanks house corals, algae and other benthic organisms for experimental research purposes.

D'ARROS RESEARCH CENTRE STAFF

The SOSF D'Arros Research Centre is directed by Dr Rainer von Brandis and facilitated by Mr Chris Boyes.

Rainer began his career in the outer Seychelles in 2001, when he arrived at Aldabra Atoll as a volunteer. Five months later he was hired by the Seychelles Islands Foundation as the research officer for Aldabra, where he remained until the end of 2005. In 2006 he was offered an opportunity to conduct his PhD on the foraging ecology of the critically endangered hawksbill turtle at D'Arros Island

and St Joseph Atoll. Rainer spent the next five years based on D'Arros where he gained an intimate understanding of the area and its surroundings. In the process he designed and initiated new research, monitoring and restoration programmes and wrote a conservation management plan for the islands. In 2011 Rainer achieved his PhD and became the scientific director of the D'Arros Research Centre.

In 2012, the ownership of the islands changed and the Save Our Seas Foundation (SOSF) was entrusted with the conservation and the centre's management, and its name changed to the SOSF D'Arros Research Centre (SOSF-DRC).

Chris Boyes was hired in 2013 as the lab manager of the SOSF-DRC. Chris spends 10 months of the year on D'Arros, where his main functions include maintaining facilities, assisting visiting researchers, collecting long-term marine monitoring data and managing the forest rehabilitation programme. Chris studied for a BSc in forestry and has been working with nesting sea turtles in Costa Rica, South Africa and Mozambique since 2005. His Masters study was on the nesting ecology of leatherback and loggerhead sea turtles in Maputaland, South Africa. This mixture of experience in forestry and marine ecosystems means that Chris is equally at home and competent on land and underwater.

Under the new leadership of the Save Our Seas Foundation, Rainer and Chris have been given all the support and expertise they require to achieve the revived mission statement of the research centre: to preserve and showcase the ecological integrity of D'Arros Island and St Joseph Atoll through research, monitoring, restoration and education.

CURRENT PROJECTS

Projects undertaken by the SOSF-DRC fall into four categories: long-term monitoring, targeted research, ecosystem restoration and environmental education.

Long-term monitoring programmes are a vital tool in conservation because they show trends over long periods of time. The longer the timeline of data, the more powerful the results become. As humans, we tend to limit our perception of change to our own lifetimes. Consider for instance a retired fisherman who, as a child, caught at least 10 times more fish in a day than he does today. In his

eyes, fish stocks were healthy or even plentiful 'back in the day' when he was a youngster. However, his deceased grandfather probably caught 20 times more in his time – and his forefathers even more! Thus, the fisherman's perception of what constitutes healthy fish stocks is undoubtedly incorrect. This tendency to apply inappropriate baselines to assess environmental health has been termed 'the shifting baseline syndrome' and has elicited fierce debate between conservationists and resource extractors in recent times. Long-term monitoring programmes alleviate the effects of this syndrome and thus provide a key management tool for conservation.

The SOSF-DRC uses state-of-the-art equipment to monitor climate change, population numbers and ecosystem health. Low-lying sandy islands are more prone to the effects of global warming than any other environment. Although sea level rise is the most obvious threat, increasing sea temperatures also accelerate erosion and result in habitat-altering sand shifts. Corals normally buffer wave action but when mass mortality occurs during sea-warming events, water turbulence over the reef flat and against the beaches increases significantly and with devastating effects. So far, D'Arros and St Joseph have remained relatively unscathed, although increased erosion has been noticed in some places following the mass coral mortality during the 1998 sea-warming event. With its automated weather station and extensive array of temperature and sea level loggers, the SOSF-DRC monitors changes in climatic conditions and relates these to data from its erosion and coral bleaching monitoring programmes. Over time this will enable it to model the effects of climate change on the islands and, where feasible, take mitigatory action.

D'Arros and St Joseph support one of the largest nesting sea turtle populations in Seychelles. Hundreds of endangered green and hawksbill turtles migrate annually from their distant foraging grounds to nest on the islands' pristine beaches. Nesting activity has been monitored daily since 2004 and, encouragingly, numbers appear to be on the rise. The SOSF-DRC also monitors the numbers of manta rays in the area, reef-dwelling macro invertebrates, nesting birds and reef fish using a high-tech piece of equipment called a stereo-video photogrammetric system. In

short, images from two underwater video cameras are overlapped to provide a dimension of depth so that fish can be measured. Holding the camera system horizontally and pointed forward, a diver swims slowly over predetermined coral reef transects while recording continuously. Back at the lab, the video is imported into sophisticated software for identifying, counting and measuring all fish, sharks, rays and turtles encountered on the transects. These data are then extrapolated to estimate fish biomass and diversity for the whole area. Regular monitoring over the years will indicate which species are changing in numbers in response to specific environmental variables such as fishing pressure, global warming and natural species shifts.

TARGETED RESEARCH

Targeted research projects answer specific questions arising from conservation concerns. For instance, to better protect a threatened species we need to know what its ecological requirements are: What habitats does it utilise? What is its reproductive biology? What does it eat? What eats it? and so on. Answers to these questions allow us to better manage and protect specific species and their habitats.

Presently the SOSF-DRC manages five targeted research projects, all of which concern the ecology and movement behaviour of sharks, manta rays, turtles and stingrays. In collaboration with Danah Divers, the centre manages 70 acoustic receivers that extend to the furthest reaches of the Amirantes Bank. These receivers are stationed on the sea floor and constantly 'listen' for animals fitted with acoustic tags. Each acoustic tag has its own unique code and when it comes within range, the receivers record the code, date and time of the detection. By the end of 2014 more than 70 sharks, 40 turtles, 30 manta rays and 30 stingrays will be fitted with acoustic tags. The resulting data will illustrate the movement patterns of these threatened species, which will greatly assist in their management and protection. For instance, the SOSF-DRC will be able to set effective boundaries for the Marine Protected Area (MPA) and afford improved protection in zones where activity is at its highest. The data will also provide a wealth of information regarding the natural history and ecology of these species.

In collaboration with renowned turtle expert Dr Jeanne Mortimer, the SOSF-DRC has been tracking the long distance migrations of adult sea turtles. In 2013, we fitted four green turtles with satellite transmitters, one of which travelled 935 kilometres to Aldabra Atoll. In early 2014, we will deploy seven satellite transmitters on nesting hawksbill turtles to determine the origin of their foraging grounds and the migratory routes they take to reach them.

Ecosystem restoration is a vital tool in improving biodiversity on small islands that have undergone anthropogenic damage. Despite being relatively pristine compared to other tropical islands worldwide, some ecosystems at D'Arros and St Joseph have indeed been altered by man. In the marine environment, a bygone era of poaching and overfishing has significantly reduced the numbers of turtles, sharks and fish around the islands. Today however, poaching no longer occurs and commercial fishing is not permitted within the MPA. In the years ahead, long-term marine monitoring programmes will hopefully document the recovery of these species, and highlight the importance of MPAs.

Terrestrial ecosystems at D'Arros and St Joseph have suffered extensively at the hand of man. By the early 1800s native vegetation had been almost entirely replaced with coconut plantations and nearly all mangroves had been cut down for timber. Unlike in marine ecosystems, management intervention in the terrestrial environment can significantly accelerate recovery. The SOSF-DRC currently manages an ambitious forest rehabilitation project in which abandoned coconut plantations are systematically replaced with indigenous forest. To restore mangrove forests in the St Joseph lagoon, we are growing seedlings in the nursery and planting them out in suitable areas when they attain a height of about one metre.

Environmental education has always been one of the chief purposes of the Save Our Seas Foundation. In collaboration with other NGOs and the ministry of education, the SOSF-DRC has recently initiated a marine education programme for local school children. Children are awarded this opportunity on merit and come to D'Arros for a week to explore the islands and learn about

conservation by assisting resident scientists in their work, conducting coral reef transects and bird counts, planting trees in the forest and snorkelling with manta rays and turtles.



SOSF SHARK EDUCATION CENTRE

PHILIPPA EHRLICH

It is 9am in the quaint seaside fishing village of Kalk Bay at the southern end of Cape Town. The tide has been pulled far from the land, revealing a flat outcrop of smooth rock eroded by numerous shallow pools and crevices. At the edge of the water, kelp stalks twinkle with the movement of the gentle swell. The air is bright and still and the ocean is a deep blue. In a nearby parking lot, surfers stand around skittishly, frustrated at the lack of a decent wave. In the distance, a burnt-orange fishing boat is sitting low in the water as it pulls slowly into the harbour followed by scores of white seabirds.

The view is briefly obscured by a screeching, mustard-coloured train travelling towards the city centre. It rumbles past a pedestrian crossing where 19 uniformed eight-year-olds are lined up ready for a visit to the Kalk Bay Shark Centre. The centre opened in 2008 and over the past five years it has become a hub for marine education, research and dialogue.

Kalk Bay is home to a community whose lives have been determined by rising and falling ocean tides for centuries. The town's name is derived from the Dutch word for lime. Kalk Bay's first residents were 17th-century lime-burners who used kilns to extract lime from seashell deposits. In the 1840s a Filipino ship was wrecked off Cape Point. The survivors settled in Kalk Bay and it grew into a thriving fishing village. Many colourful commercial boats still dock in Kalk Bay harbour and tourists visit the town to watch fishermen offloading catches of yellowfin tuna, yellowtail and snoek.

The area is also South Africa's oldest ocean research and education hub. In 1902 the country's first marine aquarium and research station was established in nearby St James. Sadly, the marine aquarium was demolished in 1954. It seems appropriate that the Save Our Seas Shark Education Centre should fulfil this valuable role in modern day Kalk Bay. In early 2013, the centre redefined its mission 'to connect the public to the marine environment through experiential education programmes focused on sharks and local marine ecosystems, in order to nurture ocean awareness and environmentally responsible actions'.

'People need to know why we need sharks in the sea. We're surrounded by ocean users in Kalk Bay and many of them don't know much about conservation.

This centre is an awesome resource in a relevant location,' explains facilities manager Heidi Thormählen.

The green man at the pedestrian crossing lights up and the children file across the road and into the building. Like a huge, gurgling magnet, the aquarium immediately draws them in. They push each other aside to get a better look, pressing their hands and faces up against the glass. 'They're just swimming round and round,' a boy says dismissively. His friend is indignant: 'That's what fish think of the human world. Just walking round and round!'

Paul Millar, the centre's chief educator, loves seeing this kind of interaction among his learners: 'I enjoy being involved in what for many kids is the awakening of a new way of seeing the world as a beautiful and fragile home to be nurtured. For the children who already see the world this way, I enjoy sharing their excitement and fascination for marine life.'

After a 30-minute talk about rock pool ecosystems, the children trail out of the building for a few hours of hands-on rock pool discovery. They are immediately captured by the starfish and try to remember the names of the three different species they were taught. One little girl squeals, pointing at a purple anemone, 'It's like a cup with hair on top!'

I pick a flat dry spot next to the children's teacher, Maria Doyle, and we watch as child after child picks something up for Millar to identify and explain. He is careful to ensure that each little sea creature is put back exactly where it is found. 'This is my favourite outing,' says Doyle. 'We used to take them to the aquarium but it's dark and everything is contrived. Here they really get an interactive, authentic experience.'

I look back. The swarm of eight-year-olds is being led closer and closer to the kelp by Millar. One little girl is trailing at the back, thinking carefully about every footfall. Doyle follows my gaze, 'It's funny. She lives 20 minutes from the sea, but I don't think she's ever learned to walk on rocks.'

South Africa's complex history has created an unjust and largely dysfunctional social structure. It is a country where your education, well-being and even understanding of nature are determined by where you fall on a steeply graded

socio-economic scale. Walking from one end of Kalk Bay to the other, you will see SLR-wielding tourists browsing boutique galleries and chatting in coffee shops. You will also notice barefoot, ragged children banging on homemade instruments and belting out 'When the Saints go marching in' in a desperate attempt to earn some money.

With an unemployment rate of 25%, many children cannot rely on their parents for food and clothes, let alone an introduction to the natural world around them. Thousands of Cape Town's children live within walking distance of the sea but only set foot on the sand once or twice a year, usually at Christmas time. It is a reality that saddens Millar, who believes that marine education is as important for the environment as it is for the children themselves: 'More and more South African children do not have a direct connection to nature. Apart from the emotional and health benefits of living a life that is connected to the natural world, individuals who grow up engaging with nature are more likely to understand the importance of healthy natural systems and make environmentally responsible choices.'

Luckily for the children from Forres Primary, they are privileged to have good teachers and, for the most part, ocean-minded parents.

On Friday afternoons, a very different group arrives at the Shark Centre. A scruffy-looking minibus pulls up and 11 excited 12-year-olds tumble out and head for the garage, where they find a line of brand-new wetsuits. They are from the nearby Capricorn Primary and this is their second time at the centre. They are from a far less privileged part of Cape Town and grow up under leaky tin roofs, playing in dusty, potholed streets.

They are part of a new Shark Centre initiative called The Marine Explorers Club. It took a few months for Millar to identify the right school from which he could recruit an enthusiastic team of trainee snorkellers. Before the list of marine explorers could be confirmed there was a trial at St James tidal pool. Of the school's 16 strongest swimmers, only 11 were strong enough to become part of the club. 'Most people from the township are scared of sharks. They tell their children not to go into the sea because they will be eaten by sharks,' explains Zanele Mayiya, the Shark Centre's assistant educator.

Mayiya lives in Khayelitsha township and has unique insights into how many South Africans view the oceans and sharks. She started work as a housekeeper, but her interest in the marine world grew. She started reading books in the centre's library and became increasingly enthusiastic about talking to people about marine conservation: 'I noticed that most people from townships don't know much about the sea or about sharks. I like to pass information on and tell them that sharks are not aggressive.' When the course began, the young snorkellers were mostly afraid of the sea. 'I find sea animals like sharks scary, even though people who are divers claim that they're harmless,' said Alulutho Tomsana suspiciously.

By week four their confidence has grown as has their respect for and interest in marine life. 'I think sharks are cool. It's just the great white shark I'm worried about. I love snorkelling and I would love to see one of those shysharks,' smiled Shannon Draai after hearing Millar's Shark 101 talk. Steven Sankona was a little disappointed to spend a whole afternoon in the classroom and is excited to get back to the sea: 'I love it when we duck-dive with the snorkelling and I want to see a leopard shark, catshark, blue shark and ragged-tooth shark.'

Millar is extremely encouraged by reactions like this. He believes that exposing children to the sea in this way will inspire a love of the ocean and encourage environmentally responsible behaviour: 'All kids know they shouldn't litter, but by creating a bond between them and the ocean we're giving them a reason to look after nature.'

SOSF SHARK RESEARCH CENTER

MAHMOOD SHIVJI

The Save Our Seas Shark Research Center USA (SOSSRC), one of three named centres supported by the Save Our Seas Foundation (SOSF), is located in Fort Lauderdale, Florida, USA. The SOSSRC is housed in a new, architecturally award-winning building at Nova Southeastern University's Oceanographic Center and includes state-of-the-art research laboratories and field-work facilities for conducting cutting-edge, interdisciplinary studies. The association between the SOSF and Nova Southeastern University was initiated in 2008 by directive of the Founder of the SOSF, with the formal naming of the association as the Save Our Seas Shark Center in 2009 (note the slight difference in the original and current names). With each of the three SOSF Centres starting to focus on their strengths and targeting specific needs, an administrative decision was made in 2013 to highlight the remit and expertise of the SOSSRC by including the word 'research' in the centre's name.

The SOSSRC focuses primarily on conducting scientific research aimed at expanding knowledge to aid the conservation, management and understanding of sharks and rays on a worldwide basis. The SOSSRC specialises in taking integrative, multidisciplinary approaches to research, which includes combining high-tech genetics research and field work to holistically illuminate aspects of shark and ray biology that would be difficult to decipher using single-discipline approaches alone. Another hallmark of the SOSSRC is its international, and in most instances global, scope of work on sharks. A key aspect of the SOSSRC also is that it serves as an academic unit within Nova Southeastern University, and as such also functions in an educational capacity. Indeed, most of the past and current scientists at the SOSSRC have been or are graduate students performing research as part of earning their Masters and PhD degrees.

Since its inception, the SOSSRC has worked in close partnership with the Guy Harvey Research Institute, another academic unit of Nova Southeastern University and the research arm of the Guy Harvey Ocean Foundation, to accomplish larger goals. This partnership works extremely well for two reasons. First, the SOSSRC and Guy Harvey Research Institute share broadly similar objectives – scientific research to facilitate conservation, improve basic knowledge and guide

the sustainable use of our ocean's fishes. Second, by combining expertise the two entities have been able to tackle crucial research issues that are global in scope and would be challenging for each entity to address alone.

Some examples of research by the SOSSRC and its partners that have had a global impact on shark conservation include the development of novel, rapid DNA forensic methods to identify the origins of shark body parts found in trade. This ground-breaking research found immediate application in shark conservation and management practice internationally, including enabling law enforcement agencies to successfully identify and prosecute many operators conducting illegal shark fishing and trade. This work was also a key element in a high-profile, collaborative study with Dr Shelley Clarke from Imperial College (UK) that made the first quantitative determination of sharks traded by individual species, and the total number of sharks traded per year in the global fin markets. The staggering number of sharks (26 to 73 million) revealed by this study to be contributing to the fin markets brought international attention to the issue of shark overfishing. Equally importantly, this revelation has spurred policy changes by many governments to reduce this previously unrecognised and unsustainable level of destruction of our ocean's apex predators.

Research conducted by the SOSSRC has also led to the discovery of new species of large sharks and rays, including a hammerhead species that looks very similar to the scalloped hammerhead but actually has a distinct evolutionary lineage. This surprising discovery of another large hammerhead shark increases the total number of known hammerhead species from eight to nine, highlighting how much we still have to learn about shark diversity.

Very recently, the SOSSRC and colleagues from Cornell University have dived into a new frontier in genetics research, studying shark species at their fundamental biological core – their entire genetic blueprint or 'genomes'. This ongoing work has produced the first large-scale view of the genetic repertoire of one of the world's most charismatic animals, the great white shark. True to its fascinating form and biology, an in-depth look at the white shark's genes has revealed remarkable findings, including, and quite unexpectedly, more similarity



in some of its protein categories to humans than the zebrafish, the quintessential bony fish research model. These findings further underscore that even more surprises are likely in store as we dig deeper into understanding how sharks work at the level of their genes.

Current research projects at the SOSSRC fall into three broad categories involving mainly large shark species, captured in world fisheries, that in many cases are overexploited and in urgent need of improved, science-based conservation and management:

I. Projects using DNA approaches to uncover hidden populations of sharks and monitor the sources of fins in international trade

The high demand for shark fins and other products continues to drive the overfishing of shark species and populations worldwide.

Even though the DNA forensic tools pioneered by the SOSSRC and Guy Harvey Research Institute can rapidly determine the species of shark from market-derived body parts, the geographic population divisions of most sharks at a global level are so poorly known that it is nearly impossible to determine even the general geographic area that the traded shark or shark body part originated from. This means that some shark species and/or populations may unknowingly be subjected to disproportionate and unsustainable levels of fishing, risking the eradication of some shark populations before we realise it's happening.

The SOSSRC is addressing this issue head-on. Our ongoing research is showing that many shark species, despite their ability to travel thousands of kilometres, are typically made up of smaller genetic divisions (stocks) than assumed. Each of these stocks must receive targeted management, and in some cases even urgent protection by national and regional laws, to prevent their further depletion and attendant loss of important genetic diversity. The discovery of discrete shark genetic stocks is also providing an opportunity for tracking the geographic origin of shark products already in international markets distant from fishing sites. The information being provided is essential for developing

tougher national legislation and international treaties to help the recovery of sharks on a global scale.

II. Projects investigating how sharks work at the level of their DNA

As far as vertebrates go, sharks are veritable antiques. Fossils of shark teeth show that sharks, in one form or another, have been around for at least 400 million years, predating even the dinosaurs. At least 500 species of living sharks are currently known and more are undoubtedly going to be discovered. The antiquity of sharks, their species and habitat diversity, and their amazing form and function all point to sharks possessing unique genetic properties underlying their evolutionary success.

Recent evidence that shark immune systems produce novel molecules of potential human therapeutic value has highlighted the fact that, as the earliest-evolved jawed vertebrates, sharks can serve as important comparative biomedical research models for understanding the evolution and function of human biology and disease, including immune systems, neurobiology, stem cells, ageing and cancer biology.

Using sharks as research models may also lead to other direct benefits to human health. For example, the remarkable ability of elasmobranchs (sharks and rays) to heal rapidly from significant dermal wounding, although not well studied, is anecdotally well known by field researchers. How these wound healing properties are achieved by elasmobranchs is unknown, but they are likely a function of the animals' genetic makeup. As such, sharks could very well provide a useful model system for studying genes and genetic mechanisms that underlie wound healing, a topic of major interest to human health. Furthermore, exploring such linkages between shark and human biology has the potential to provide additional public awareness tools to further the cause of shark and marine conservation generally.

The SOSSRC is taking a leadership role in understanding sharks at the level of their entire genetic blueprint: their genomes. The first large-scale look at

the great white shark's genes has opened the intriguing possibility that some aspects of white shark overall biochemistry might be more similar to that of a mammal than a bony fish – a completely unexpected finding. These tantalising results further beg the question: what other distinctive genetic properties do sharks possess? The SOSSRC is moving at full speed ahead to explore the world of shark genomes by investigating the full genetic repertoire of other threatened and endangered species such as mako, tiger and hammerhead sharks, as well as rays. There will undoubtedly be novel findings in store, helping illuminate the underlying genetics of what makes sharks such unique creatures.

III. Projects using satellites to determine the where, when and why of shark travels

Most of the world's overfished sharks are large species that can, and often do, move extensively in space and time. Researching these movements is key to not only providing information on the basic biology of sharks and how they use the ocean, but also where and when sharks might be most susceptible to fishing pressure. Understanding shark movements, including their migratory patterns, is also important for predicting how they might respond to physical environmental shifts, including climate change. The recent development of increasingly sophisticated animal-tracking instruments is allowing an exceptional look into the long-distance and long-term movements of sharks in both horizontal and vertical dimensions.

The SOSSRC is working closely with the Guy Harvey Research Institute to uncover the secret lives of sharks as they wander the oceans. Our researchers are attaching different types of electronic tracking tags to large pelagic sharks and following their movements, in many cases in near real-time, via information received from the tags as they report to orbiting satellites.

Sharks of current research focus are shortfin mako, tiger and oceanic whitetip sharks, all species of conservation and management concern. The data being collected are revealing unprecedented information on the migration patterns

of these large, highly mobile species, including demonstrating that these animals have a very finely tuned sense of space and time as they swim thousands of kilometres in the ocean.

Tracking tiger sharks in the Atlantic has been our longest-running work, with several tiger shark individuals having been successfully followed for two to three years. Achieving these long-term tracks has been key to the discovery of clear seasonal movement patterns by tiger sharks. In the western North Atlantic, tiger sharks are revealing an amazing ability to be quite happy exploring shallow habitats close to land for extended periods, but also feeling equally comfortable far offshore in very deep water nearly in the middle of the Atlantic, and moving seamlessly and quickly between these very different and distant ecosystems. One tiger shark followed for three years travelled more than 44,000 kilometres in that time. The makos, tigers and oceanic whitetips are all showing distinct seasonal migrations. Additional tracking work by the SOSSRC and Guy Harvey Research Institute in 2014 will add to these fascinating revelations, allowing general migratory patterns to be described and enhancing conservation planning for these remarkable and threatened species.

The tracks of all these sharks can be followed on an educational, interactive website at: *www.nova.edu/ocean/ghri/tracking*

MANTA RAY OF HOPE

GUY STEVENS

The date 11 March 2013 may go down as pivotal in the history of marine conservation! That was the day when both species of manta ray successfully gained approval for protection under Appendix II of CITES, joining five shark species in a clean-sweep victory in Bangkok. After years of work uncovering and tracing the trade in manta ray gill plates around the world, followed by a week of hard campaigning in the Thai capital, 178 of the world's nations demonstrated that we can make a difference if we work together for the common good of our planet, its species and our future.

CITES (the Convention on International Trade in Endangered Species) offers a legislative lifeline to threatened animal and plant species. It is the only internationally binding treaty that requires its member nations to control and sustainably manage the trade in products sourced from species protected under its listings. Their initial opposition notwithstanding, the 178 member nations voted overwhelmingly in favour of the proposal to protect manta rays, securing an 80% majority – well over the two-thirds majority needed to gain protective status for these species.

Going into the conference, the stakes couldn't have been higher. Manta rays have been facing global population declines of up to 86% due to a growing market for their gill plates, the appendages that filter the rays' planktonic food from the water. Falsely claimed to be a Traditional Chinese Medicine, the gill plates are used in a tonic that supposedly removes toxins from the body and cures certain ailments. There is, however, no scientific evidence of their efficacy.

The manta rays' saving grace may have come from their value to eco-tourism. These charismatic and intelligent animals sit high on the bucket list of many scuba divers and snorkellers, who flock to manta hotspots in the hope of encountering the world's largest rays. Studies have valued manta tourism at more than US\$140-million annually, whereas the gill plate trade may total a meagre US\$5-million per year in comparison – a value that would decrease rapidly if the trade were to continue and manta populations were allowed to crash. The successful approval for listing under Appendix II now means that the trade in manta

ray gill plates must be controlled by September 2014 in order to avoid utilisation incompatible with the species' survival.

THE ROAD TO CITES

While researching the shark fin trade in 2008–09, researchers and undercover field investigators began to notice an alarming increase in the presence of gill plates from manta and mobula rays in dried seafood markets in Asia, and the increased targeting of these rays in Indonesia and Sri Lanka. In addition, a 2002 report had documented a dramatic increase in manta ray landings in the Indonesian village of Lamakera in the province of Nusa Tenggara Timur, reportedly in response to an emerging market for the rays' gill plates for use as a 'health tonic' ingredient in China. No focused research on this gill plate market had been conducted and updated data were urgently needed.

In 2009, the same researchers began preliminary investigations in China, Hong Kong, Macau, Singapore, Indonesia and Sri Lanka to determine the extent of mobulid trade and fisheries and their impacts on these species. The team confirmed that a targeted manta and mobula fishery was active in Lombok, Indonesia, with trade routes pointing to Surabaya and Singapore and final destinations in Hong Kong and China. Interviews with fishermen and buyers in Lombok and Lamakera and with dealers in Singapore indicated that manta and mobula catches had declined in recent years, especially of the large manta rays that are most highly valued in the gill plate trade.

In response to these new findings, the team, of which I was now a member, launched the Manta Ray of Hope (MROH) project in 2011 to assess the full scope of the mobulid fisheries and trade and to spearhead a cooperative global effort to save manta and mobula rays. An important aspect of this project was to assess exactly which countries were fishing these species and in what numbers. The support of the Save Our Seas Foundation (SOSF) through its funding of the Manta Trust project was essential in enabling the Trust to contribute the required data to the global report.



In the past few years the SOSF has funded key projects that monitor mobulid ray fisheries in Sri Lanka, Indonesia, India, Pakistan, Peru and the Philippines. The success at CITES in 2013 hinged not only on good-quality data collection from the fisheries, but also on the scientific evidence that demonstrated the extremely conservative life-history strategies of manta rays, which make them vulnerable to commercial exploitation. For the past six years the SOSF has also funded the Manta Trust’s founding project in the Maldives, which is home to the world’s largest population of reef manta rays *Manta alfredi*. The SOSF’s support has enabled my colleagues and me to undertake vital long-term studies on this species in the Maldives, greatly advancing our understanding of its longevity, reproductive fecundity, population demographics and overall life history.

THE FUTURE

Now that the MROH team has brought the issue of manta fisheries and the gill plate trade to the attention of the world, the interest in manta and mobula ray conservation has soared, giving this important issue a platform from which to reach new levels. In March 2014, a year after the CITES vote, Indonesia announced complete protection for manta rays within the entire 15.6-million-square-kilometre range of its territorial waters, banning any fishing or harming of these species. We will continue to put pressure on other governments in order to push for greater national protection for these species globally.

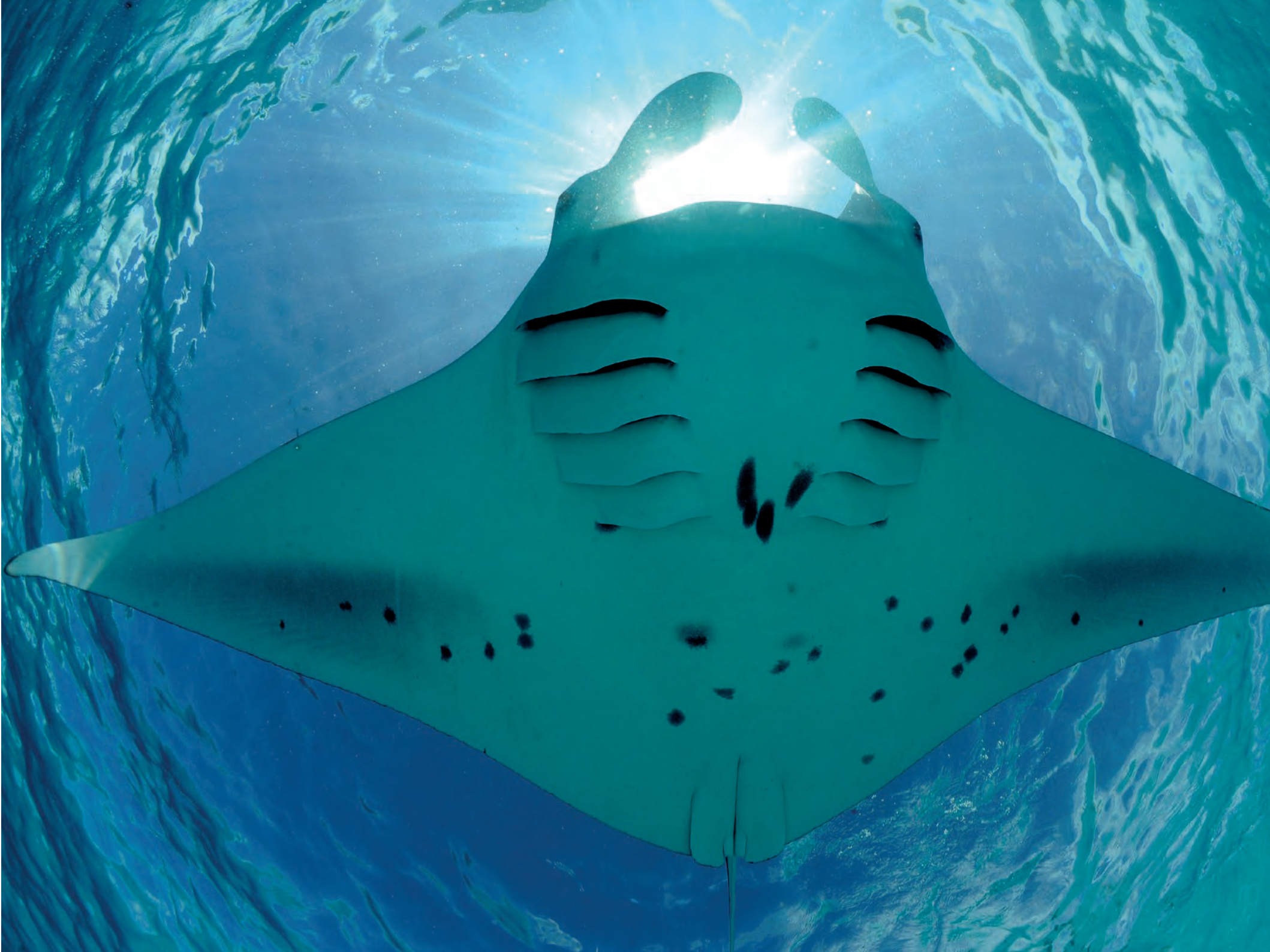
While the CITES decision has been a huge step forward for the conservation of manta rays, their mobula cousins are still being fished in greater numbers each year in order to supply gill plates for the senseless medicinal trade. Many of the mobula ray species are likely to be just as vulnerable to exploitation as the two manta species, but our poor scientific knowledge and understanding of the former impedes the conservation process.

Identifying mobula rays has proven to be very problematic due to the species’ similar external features, which lead to misidentification even in the current scientific literature. To combat this issue, the SOSF is funding the

development of a comprehensive taxonomic, morphological and genetic identification guide to all mobulid ray species worldwide that will be accessible to both scientists and non-specialists. As well as assisting researchers in the field, the guide will be extremely useful to officials monitoring the legal trade and preventing the illegal trade in these species and their body parts.

Looking ahead to the next CITES convention in Cape Town in 2016, the IUCN Shark Specialist Group, with the support of the Save Our Seas Foundation, has established the Manta and Devil Ray Network, a collaborative initiative that aims to formulate a global conservation strategy for mobulid rays and coordinate the efforts of scientists, conservation organisations and governments to execute it. The Manta Trust and our MROH partners are playing an important role in this initiative and we hope that their combined efforts will result in greater conservation achievements for these increasingly vulnerable species.

In the past year manta ray conservation has taken some great steps forward. These steps would not have been possible without the continued support of funding organisations like the SOSF, and certainly not without the dedication of a great number of passionate people who have worked tirelessly to see their goals realised. I am proud of our achievements to date and my colleagues and I will continue to work together using science, education and awareness to communicate to the public, governments and the conservation community what we are doing and the urgent need to protect mobulids. We know we still have a long way to go if these animals and their habitat are to be truly protected for future generations, but we are positive that together we can, and will, make a difference.





WHERE WE WORK 2013

The Save Our Seas Foundation (SOSF) was founded 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 2013 the Foundation proudly celebrated our 10th anniversary. In that time, SOSF sponsored 150 projects in more than 40 countries, supporting outstanding researchers, educators and conservationists who have contributed to the continued existence of more than 60 of our planet's precious marine species.

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

AFRICA

SOUTH AFRICA

- 1 SOSF Shark Education Centre.
- 2 Shark Spotters. Sarah Titley and Alison Kock.
- 3 BRUVS. Lauren De Vos and Colin Attwood.
- 4 Bull Sharks. Meaghan McCord.
- 5 Sharks. Tamzyn Zweig.
- 6 ATAP. Paul Cowley.
- 7 White Sharks. Alison Towner.

DJIBOUTI

- 8 Whale Sharks. David Rowat.

MADAGASCAR

- 9 Sharks. Frances Humber.

SEYCHELLES

- 10 SOSF D'Arros Research Centre. Rainer von Brandis.
- 11 Education. Abbie Hine.
- 12 Hawksbill Turtles. Rainer von Brandis.

- 13 Turtles. Jeanne Mortimer.
- 14 Manta Rays. Grace Phillips.
- 15 Education. David Rowat.

SIERRA LEONE

- 16 Sharks and Turtles. Steven Trent.

SUDAN

- 17 Sharks. Iqbal Elhassan.

WEST AFRICA

- 18 Manatees. Lucy Keith Diagne.
- 19 Sawfishes. Armelle Jung.

OCEANIA

AUSTRALIA

- 20 White Sharks. Charlie Huveneers.
- 21 Reef Sharks. Richard Fitzpatrick and Adam Barnett.
- 22 Whale Sharks. Lara Marcus Zamora.
- 23 Rethinking Education. Christopher Neff.
- 24 Sharks. Mark Meekan.
- 25 Sharks. Jayson Semmens.

OCEANIA

- 26 Student Travel Grants. Oceania Chondrichthyan Society (OCS) Conference.

PALAU

- 27 Grey Reef Sharks and Education. Tova Bornovski.

AMERICAS

USA

- 28 SOSF Shark Research Center. Mahmood Shivji.
- 29 Turtles. Jeanette Wyneken.
- 30 Shark Riddle. Laura Sams and Robert Sams.
- 31 Sharks and Rays. Betty Bauman.
- 32 Durophagous Stingray Symposium. Matthew Ajemian.
- 33 SMART Hooks. Eric Stroud.
- 34 Student Travel Grants. American Elasmobranch Society (AES) Conference.

BAHAMAS

- 35 Bimini Biological Field Station. Tristan Guttridge and Samuel Gruber.
- 36 Oceanic White Tips. Demian Chapman.

CANADA

- 37 Killer Whales. Janie and Hermann Wray.

GREENLAND

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CUBA

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WHO I AM

The furthest back I can remember is being on the New Jersey shore, probably when I was a toddler. I recall the great cooling sensation of the Atlantic in summer, the vastness of the ocean and the power of the undertow as I lay in the swash zone. I am a native of Long Island, New York. Summers there, as well as in New Jersey, were my first introduction to the marine environment.

Having taken up fishing early on, I was exposed to an incredible diversity of fishes: striped ones, puffy ones, flat ones made mainly of cartilage, ones with crawly fins and, of course, the really toothy ones. I was fortunate to have supportive parents who were gracious enough to walk me through natural history museums and aquariums wherever our travels took us. These visits in turn led me on fact-finding quests in identification guides and stories of the sea, where I absorbed as much as possible about the oceans.

I spent several summers fishing the north side of Robert Moses State Park on Fire Island, Long Island's largest barrier island. There I had the opportunity to witness some wonderful fishy happenings, including a stream of tropical migrants usurping the

The Foundation helped bring conservation threats to myliobatid rays to the forefront and undoubtedly contributed to the future sustainability of this poorly understood group. Few organisations strive to preserve what most consider 'pest species', yet we are lucky that the SOSF is supportive of science-based conservation decisions and lends a hand even to nature's less charismatic creatures.

late-summer shallows and fantastic blitzes of offshore sportfish cruising past the jetties, out of reach of hungry surf fishermen.

Occasionally I would also come across whole fish carcasses wedged between rocks. Generally, these were little skates, thorny pan-sized pancakes even your mother couldn't love, and sea robins, large-winged critters with spiny heads and feelers that would 'creep out' even the boldest of New York's tough guys. Fishermen would often cast them onto land in an ill-fated attempt to rid the sea of the menacing creatures that stood in the way of a good meal or a shiny trophy fish.

I've always felt the need to share compassion for our sea's wondrous animals, charismatic or not. Education and hands-on exposure to marine life can transform even the most stubborn of individuals into conservationists.

My introductory 'soak' in marine life led to an undergraduate degree in biology and Hispanic studies from Boston College and a summer internship with the Center for Shark Research at Mote Marine Laboratory in Sarasota, Florida. This is where I was first exposed to shark and ray biology and conservation.

The following fall semester I started an MSc in biology at Hofstra University, only 20 minutes from my home town on Long Island. I was lucky enough to interact with an enthusiastic elasmobranch biologist, who introduced me to many researchers at that year's American Elasmobranch Society meeting. Learning about the different types of research on these animals, and more importantly the large knowledge gaps, inspired me to undertake a PhD in marine sciences in South Alabama, where I focused on our awesome yet poorly misunderstood friends, the myliobatid rays.

WHERE I WORK

Currently I serve as an assistant research scientist at the Texas-based Harte Research Institute for Gulf of Mexico Studies where, among other things, I continue to work on elasmobranch conservation and ecology.

The warm temperate and subtropical seas of the western Atlantic host productive coastal ecosystems that often teem with lawns of hard-shelled molluscs. Few fishes are able to consume these stone-like critters, but those that can include myliobatid

MATT AJEMIAN



stingrays. Despite comprising primarily cartilage like their shark, skate and ray cousins, myliobatid rays are often considered the nutcrackers of the sea. Armed with a unique set of pavement-like tooth plates and strutted jaws, they are designed to pulverise the shells of clams, oysters, scallops and snails. This awesome ability is what initially captured my interest, which was then fortified by my unforgettable first encounter with a flotilla of cownose rays cruising the coastal flats in majestic synchrony.

I quickly learned that there was a bounty placed on some myliobatid ray species, despite their awe-inspiring evolutionary adaptations and how easy it was for the public to observe squadrons of them along the immediate shoreline. Myliobatid rays such as the cownose unfortunately share some valuable food items with humans and have been implicated in impairing the restoration of shellfish species in certain parts of their range. This linkage has led to unsubstantiated measures (coordinated culls, ray-fishing tournaments, ad campaigns to market rays as ‘green’ food) to assist shellfishermen to control the apparently increasing populations of these ‘pests’.

WHAT I DO

For the past seven years I have been doing my best to assess the impacts of myliobatid rays on shellfish and to define their critical habitats for conservation purposes. Despite the hype that makes them the scapegoats of shellfish declines, few studies show that rays do actually have a negative effect on these resources. Thus, a large part of my efforts has been telling the public what we know about this fascinating group of fishes, which has been crucial to changing the negative image of them. My goal is to ensure that rays are caught sustainably if need be and that users of the coastal environment will be able to interact with them for years to come.

In 2013, the Save Our Seas Foundation (SOSF) supported a symposium on the biology, ecology and management of myliobatid stingrays at the annual American Elasmobranch Society meeting. Having assembled the leading researchers from the USA, Mexico and Japan, the symposium enabled us to gain an international perspective on current knowledge about these animals and will result in a special issue publication with *Environmental Biology of Fishes* in 2014.

The symposium also provided these scientists with an opportunity to draft a resolution for a science-based conservation plan in response to the rapidly grown fishery for cownose rays along the USA’s Atlantic states. These actions would not have been possible without the logistical and financial assistance of the SOSF.

AES SYMPOSIUM: MYLIOBATID RAY
CONSERVATION THROUGH RESEARCH
DISSEMINATION AND OUTREACH
HARTE RESEARCH INSTITUTE
2013
ALBUQUERQUE, NEW MEXICO, USA
CONSERVATION & EDUCATION
MYLIOBATIDAE FAMILY





WHO I AM

It is on the water, or under it, that I feel most at peace. This is important because I spend a lot of time on fishing boats, mostly *bancas*. These small, wooden Filipino boats have bamboo outriggers for stability and travel between remote islands, sometimes for hours at a time. Being on a banca brings me calm, as if being a floating speck on the vast ocean draws my mind out to a broader horizon. With no landmarks to break up the distance, there's just the seascape of swells, chop and waves, and the occasional creature that pops above the waves to have a look at life topside. On a recent trip our little boat was surrounded by a pod of 30 or so dolphins. What could be better?

Of course, this feeling of calm is also because I trust the skills of the local fishers with whom I work. Having grown up on the water, they can read every nuance of waves, wind and clouds. They have a deep respect for the power of the ocean – every community of fishers has stories of those lost at sea.

It was scuba diving that turned me to marine conservation. On my very first dive, as the afternoon sun streamed through the water, I was lucky enough

to see a leopard shark, an eagle ray and a sea snake. There was no turning back; the magical world under the waves had me hooked.

Years of working in environmental education, living in Asia and diving, combined with being a lifelong campaigner for social and environmental justice, finally led me to return to school and switch to a career focused on coastal livelihoods and marine conservation. I completed a Masters in environmental studies and a graduate diploma in Asian studies from York University in Toronto, Canada, with a focus on coastal communities in the Philippines, the seaweed-farming industry and the economics of the global marine trade.

Some people are surprised that I am a social scientist and not a marine biologist. Yes, I work on marine conservation and saving species, but I also work on saving fishers and communities that are trying to live off the oceans sustainably. We need to understand the biology of the creatures, like mantas, we share this blue planet with, but without also understanding the economic and social systems that have pushed them to the edge of survival, we will not

be able to change those systems and find our way to choices that respect the oceans.

While my awe at the world we live in is inspired by non-human nature, my interest in making that world a better place lies in looking at society's relationship with nature – understanding how humans are intertwined with their ecosystems.

I've been fortunate to work on many aspects of fisheries and marine conservation, from small-scale fisheries issues in Atlantic Canada, the EU and the Philippines to aquaculture, international fisheries management and policy, food security and shark and ray conservation. I have a world-travelling shark alter ego on the Internet, Hector the Blue Shark, and have even cycled across parts of Europe in the name of shark and ray conservation.

WHERE I WORK

Now I am back in the Philippines working with fishing communities and conservation colleagues. Fascinating and challenging at the same time, the Philippines has very rich marine ecosystems and is said to lie at the heart of the world's marine biodiversity

SHANNON ARNOLD





– the Coral Triangle. Divers exploring the waters around the 7,107 islands can see everything from awesome pelagic species to the most incredible macro life. Unfortunately, working here brings the realisation that as amazing as the Philippines underwater life still is, it is a mere shadow of its former self.

The sad reality is that the Philippines’ waters are under extreme pressure and its marine populations are declining rapidly. In 2012, after denying it for years, the government finally released data showing that 10 out of 13 major fishing grounds here are overfished.

More than one million of the country’s population of 96 million rely on fishing for income and fish is still the main source of protein for most people, yet more than 40% of fishers live below the poverty line. Industrial fishers work illegally in waters reserved for small-scale fishers, leaving too few fish for them to make a living or feed their families. The small-scale fishers’ catch has dropped from 8–10 kilograms a day 15 years ago to only two kilograms a day now. Meanwhile the number of fishers climbs, so more people are chasing dwindling stocks. This is why some fishers turn to catching species they would have previously left, like rays.

WHAT I DO
Our multi-year project aims to paint a comprehensive picture of mobula ray distribution, fishing and trade in the Philippines. It is designed to build a network of researchers and collaborators that incorporates universities, volunteers, divers and fishers, and uses different methods, including citizen science, to achieve its goal.

While rays have been caught traditionally in some areas for centuries, it is the suspected increase in landings to supply the trade in dried gill plates, or gill rakers, that is causing concern. Most of this catch is illegal, unregulated and unreported. Whereas both manta ray species are officially protected in the Philippines, the five species of mobula rays are not. Studies on rays have been limited to just a few areas and the information we have for mobula rays in particular is inadequate. But we do know that all species have declined drastically in recent decades.

Building a knowledge base about the distribution, exploitation and trade of mobula rays at international, regional, country and local levels is key to making progress in monitoring, managing and protecting the species. With this as its goal, the pro-

ject is currently focusing on building relationships and networks, and hopefully planting the seeds for long-term collaboration.

This project would not be possible without the support of the Save Our Seas Foundation, which has recognised the dire situation of manta and mobula rays and the need to increase our knowledge of them as quickly as possible. The Philippines has one of the highest diversities of shark and ray species and yet little research has been conducted here. This project is trying to change that – an effort to fill in the Philippines sector on the mobula map and contribute to the important global work to save these majestic species before it is too late.

STATE OF MOBULID RAYS IN THE PHILIPPINES THE MANTA TRUST 2013 QUEZON CITY, OLD BALARA, PHILIPPINES RESEARCH & CONSERVATION MOBULIDAE FAMILY [GENERA MANTA AND MOBULA]	
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WHO I AM

Callao is the principal harbour of Peru, a country with the good fortune to have its coast washed by the productive Humboldt Current, which supports the anchovy fishery, one of the most important of its kind in the world. It was in Callao that I was born, and where my first childhood memory is of being on a boat with my parents and sister one Sunday in summer. The waters were calm that sunny morning as a sea breeze played around us. In those days it was the custom to eat fresh fish every day and I learned about the different species at a very young age.

As an adult, I can say that the sea is in my blood. In the early days of my career my grandfather, who had been a fisherman, would tell me stories of how he used to sail around certain islands – the same islands where I began working as a biologist.

I have been involved in research and marine conservation for 16 years, having started at Peru's Institute of the Sea (Instituto del Mar del Perú; IMARPE) where I studied seabird ecology. I now coordinate the Coastal Marine Programme of the Peruvian Association for the Conservation of Nature (Asociación Peruana para la Conservación; APECO), an NGO that has been contributing to the conservation of biodiversity in our country for 31 years. We have

Information about the conservation status of sharks and rays in Peru is very scarce. As an associated researcher of APECO (Peruvian Association for the Conservation of Nature), I applied to several funders in order to raise money for basic data collection. We are very grateful to the SOSF for giving us the first funding that has allowed us to generate information that will form the foundation of a mobulid conservation strategy. The SOSF support has allowed us to monitor the mobulid ray fishery at major landing sites in Peru. We have a group of observers collecting data at the main ports in Tumbes. We have also spoken to fishermen and colleagues who have given us important insights into the fishery. I consider this project the first step in understanding the conservation status of mobulid rays in Peru and I hope to continue contributing to the protection of these beautiful animals.

studied several species of threatened marine birds, mammals and turtles in Peru and are the only NGO in the country that takes part in scientific expeditions to Antarctica. This is our first study of manta rays, and with it we hope to make a contribution to their protection.

WHERE I WORK

Our project is based along the coast of Tumbes in the far north of Peru, which is completely different to the shores of the centre and south of the country. There the marine environment is influenced by the cold waters of the Humboldt Current, whereas the ocean off Tumbes is warm. Together with white sandy beaches and friendly local inhabitants, it attracts many tourists who come from all around Peru and elsewhere in South America to enjoy summer bathing and the local cuisine.

WHAT I DO

For some time now, one of APECO's projects has been involved in reporting incidental catch in long-line fisheries, with the help of people who check the catches on the fishing boats. The fisheries' targets are mahi-mahi gamefish and sharks. In view of this experience, a few years ago we were asked to take part in the

Action Plan for the Conservation and Management of sharks, rays and chimaeras, a plan that is now awaiting approval from the Peruvian government.

The existing information about fishing for manta rays was gathered by the government, but its main focus was on other species that are more important commercially. What prompted us to undertake the study was the need to know how many rays are caught and their size and sex; which species are taken; and where they are caught and with what gear. Keeping such a record of manta ray fishing in our country is the first step in understanding the extent of the utilisation of species that, due to their biological characteristics, is unlikely to be sustainable.

Interviews with local fishermen reveal that they fish for rays (both manta and mobula) by default, partly because they don't catch enough of their target species. They feel under pressure to go after rays even though these species bring in a smaller income as the prices for them are very cheap.

It is our aim to find an alternative to fishing for rays, but we can only do so by consulting with all the relevant stakeholders. We hope that this will be the next step, after we have completed our research. Above all, we keep on working for a sea full of life.

LILIANA AYALA



**FIRST ASSESSMENT OF MANTA AND MOBULA
RAYS FISHERY IN PERU
PERUVIAN ASSOCIATION FOR THE
CONSERVATION OF NATURE
2013**

TUMBES DEPARTMENT, PERU

RESEARCH & CONSERVATION

MOBULA & MANTA RAYS





RICHARD FITZPATRICK ADAM BARNETT

WHO WE ARE

Richard is an Emmy Award-winning underwater cameraman and marine biologist who has shot more than 50 films for clients such as the BBC, National Geographic Channel and Discovery Channel. Renowned for capturing complex behavioural sequences, many of which have never been seen before, he has filmed around the world, from the crystal-clear coral gardens of Australia's Great Barrier Reef to the murky waters of the Amazon.

Having grown up with the Great Barrier Reef on his doorstep, Richard was the ultimate fish nerd. He spent his childhood snorkelling on the reef and keeping tropical fish (including his prized epaulette sharks) in home aquariums, so moving into marine biology was just a natural progression.

Adam got into marine biology in a more roundabout way. Originally a chef for 13 years, he wanted to turn his favourite pastimes, scuba diving and observing animals, into a job. Since changing from cooking animals to studying them, Adam has worked as an educator aboard an ecotourism vessel and as crew on more than 20 natural history documentaries. He has also completed a PhD on sevengill

shark ecology, which was funded by the Save Our Seas Foundation. He currently holds a research position at Deakin University in Melbourne, Australia, and is the director of the new initiative Oceans IQ, a free educational website.

WHERE WE WORK

One of our many projects at the moment is studying the reef sharks (grey and whitetip) at Osprey Reef in the Coral Sea off the north-eastern coast of Australia. Osprey Reef is an isolated sea mount rising vertically from 2,400 metres to less than one metre below sea level. It lies approximately 220 kilometres due east of Cape Melville on the Queensland coast and some 125 kilometres from the edge of the Great Barrier Reef. The diving out there – on the edge of reef walls that drop straight down 1,500 metres in crystal-clear water – is amazing, among the best in Australia!

Sharks are abundant in the area, with grey reef, whitetip reef and silvertip sharks the staple species, while the prized hammerheads (both scalloped and great) are spotted regularly.



WHAT WE DO

Shark ecotourism is a growing multi-million-dollar industry worldwide and many dive companies market trips specifically to feed sharks. Although the practice is controversial, information about how provisioning sharks, or tourism in general, affects their health and natural behaviour is still limited. Research therefore needs to be done so that the positive effects of shark ecotourism (for example, benefits to the local economy and creating public awareness that becomes an aid to conservation) can be weighed against its potential to adversely affect a target species by altering the animals' natural behaviour.

Our previous work at Osprey Reef shows that tourism does alter the daily activity patterns of whitetip reef sharks and has the potential to affect their metabolic rates, net energy gain and overall health. However, nothing has been reported on the effect tourism may have on sharks' energy budgets. The findings of our 2011 paper 'Variation in depth of whitetip reef sharks: do shark feeds change their behaviour?' (*Coral Reefs* 30: 569–577) and the increasing popularity of shark provisioning suggest that this topic needs to be addressed in much greater



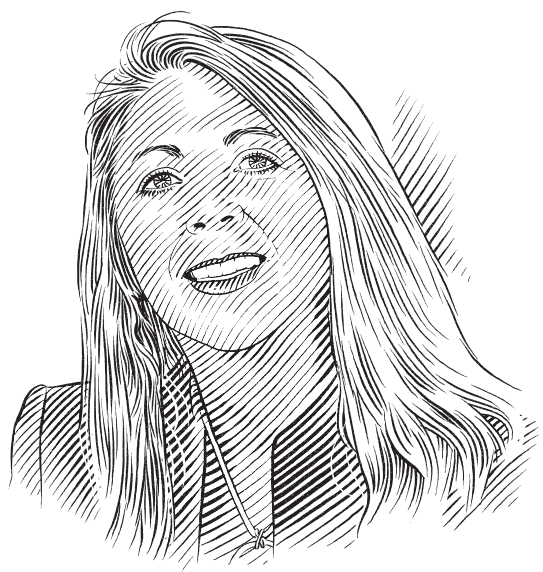
ACTIVITY PATTERNS OF REEF SHARKS: DOES TOURISM AFFECT THEIR HEALTH?	
OCEANSIQ	
2013	
OSPREY REEF, CORAL SEA, NORTH QUEENSLAND, AUSTRALIA	
RESEARCH, CONSERVATION & EDUCATION	
WHITETIP REEF SHARK [<i>TRIAENODON OBESUS</i>] & GREY REEF SHARK [<i>CARCHARHINUS AMBLYRHYNCHOS</i>]	



detail. In view of the life history of sharks and the escalating rate and magnitude of human activity in the world's oceans, research into human–shark interactions has never been more important.

Our research involves attaching electronic tags to whitetip and grey reef sharks to determine their activity levels, routine metabolic rates and energy budgets and then comparing these on days when shark feeds are conducted and when they are not. From the results, tour operators and conservation management bodies will be able to draw up guidelines for best practice in shark ecotourism so that there is minimal effect on the animals' behaviour and health.

BETTY BAUMAN



WHO I AM

I learned to love fish as a child at my home in Pennsylvania in the USA, where we had a fish pond. We realised from early on that if we released our fish, they would be more likely to thrive and reproduce. My business ventures brought me to Florida, working as the marketing manager for large boat companies, and it was here that I learned about saltwater fishing.

I launched my marine industry marketing firm MetroMedia Marketing, which specialises in the fishing sector, and subsequently partnered with the Florida Fish and Wildlife Conservation Commission to produce a series of ‘Ladies, Let’s Go Fishing!’ seminars around the state. Aiming to show women who take up angling how to put conservation skills into practice and why it’s important to do so, the seminars have produced 8,000 graduates. As a result of them, I have been presented with the Sportsman of the Year Award in our nation’s capital and been recognised in *USA Today*, the television show *Inside Edition* and countless other national media, bringing further recognition to the sport.

WHERE I WORK

I work with many organisations that promote conservation in fishing. As a saltwater angler, I am the first to see what is happening in the seas and how we can preserve sea life for the future. Anglers are the first to react when the marine environment is threatened and, through their excise tackle taxes that go into the Sport Fish Restoration Program, their contributions are primarily responsible for the majority of the fish conservation efforts in the USA.

WHAT I DO

Sometimes anglers looking for fish for dinner accidentally hook sharks, rays and other species they don’t intend to keep. My project is to educate them as to why and how they can release these unwanted fish to give them a good chance of surviving. Having practised such release techniques on fish myself, I know the average angler can do it too!

Through my contacts in the fishing industry I have seen the latest equipment designed to facilitate the release of fish and I know how easy it is to use. My objective is to share this knowledge with as many anglers as possible. With my promotional background and contacts, I am in a perfect position to accomplish this. For more than 30 years my company has been building alliances with the marine and fishing industries and marketing projects for them, and we can provide the infrastructure and contacts needed to build global alliances. We also have relationships with the most influential media in the USA and contacts in others around the world, and have a good rapport with all the conservation agencies in the southern states.

My next goal is to spread the word in other countries, such as the Bahamas where subsistence fishers are less aware of how their actions today affect the fisheries of the future. I was crushed to see reefs there that had been bleached to harvest lobster and thus been killed for ever – beautiful coral turned white and dead. Information about how destructive this kind of fishing is has to be passed on through education, as people see how plentiful fish are and don’t realise that they are a finite resource.

Overall, my aim is to spread awareness about how individuals can contribute to the preservation of our marine fisheries, and in terms that the average person can understand. One person’s observance of conservation is like a drop of water in a bucket; multiple people can fill the bucket and the marine resource – our fishery – is the winner!

The SOSF has made it possible to establish a ‘go-to’ website for how and why to release sharks, rays and other fish that were hooked unintentionally. We are excited to research, create and promote this website and affiliated media channels to help the SOSF achieve its goals to protect our ocean’s resources. It is awesome to be associated with such a world-class organisation that really cares about the ocean’s future!

SHARK, RAY AND FISH

RELEASE AWARENESS CAMPAIGN

METROMEDIA MARKETING

2012-2013

FLORIDA, USA

CONSERVATION & EDUCATION

SHARKS & RAYS





WHO I AM

Living things are cool. As an academic with a PhD in medical physiology who spends most of his time teaching anatomy and physiology to future health professionals, I am constantly reminded of this fact. Living things in water are even cooler. As a researcher with an MSc in marine biology and a long career spent exploring how aquatic organisms function in the marine environment, I am constantly amazed and excited by every new discovery, however mundane it may seem to be.

Over the course of my career I have been trying to combine the two fields by focusing on the application of physiology in the service of fisheries. In other words, if we are going to both exploit and protect marine resources, we have to better understand the basic biology of the organisms and their role in the ecosystem.

I would love to say that I have always felt a calling to do this, but sadly not. As a child of diplomats I grew up in exotic locations around the world, which facilitated exposure to a wide array of cultures. The experiences of my youth left me interested in a variety of topics; science, and specifically marine biology, was just one of them.

We know very little about Greenland sharks as they live in the deep, dim and frigid waters of the Arctic Ocean. With the aid of the SOSF, we are beginning to shed light on sharks that live in the dark.

The one common thread that I did not identify until much later in life was my fundamental love of water. There has always been an unmistakable primordial connection; if there was a creek, lake or ocean in the vicinity, I was in it. Swimming, fishing, canoeing, sailing – I loved them all. The fact that maybe I could make a living by studying living things in the water seemed like a very attractive way to spend my life. An opportunity to research lemon sharks in Florida launched my postgraduate career and subsequently led to various studies involving animals, which have included tunas, marlin, sandbar sharks, bar-headed geese, Gippsland giant earthworms, leatherback sea turtles, Arctic cod, haemoglobin-less icefish – and now Greenland sharks.

WHERE I WORK

As most of our field work is done in summer, ours is a cold, light world. We spend a great deal of time on research vessels off the eastern and western coasts of Greenland, setting long-lines to catch, measure, fit with tags and release Greenland sharks. While technology has made our job a lot easier, there is nothing like bouncing about in a small rubber boat,

hands numb from the cold water, feeling dwarfed by icebergs as they float by, and with an extremely angry, large and powerful shark 20 centimetres from your face to remind you that this is their world and you are nothing more than an unwelcome intruder.

Over the past few years we have worked with scientists from a variety of nations and disciplines to study the biology of Greenland sharks. With the help of agencies like the Save Our Seas Foundation (SOSF) we are committed to learning more about these fascinating creatures to make sure they will continue to roam the deep, dark, frigid waters of the Arctic and be a part of your great-great-grandchildren's world.

WHAT I DO

The Greenland shark *Somniosus microcephalus*, or as I call it the 'old and cold' of the shark world, is one of the few shark species that inhabit polar waters. Amazingly, it reaches a length of more than seven metres and a body mass of over 1,000 kilograms. Unfortunately, this elusive creature's growth characteristics are not known. Although Greenland sharks achieve a massive adult body size, they are thought to be extremely slow growing (one centimetre

PETER BUSHNELL





per year reported for medium-sized sharks) and exceptionally long-lived (more than 150 years old). Females are believed to reach sexual maturity at about 4.5 metres long and thus could be up to 100 years old before giving birth to a litter of only between seven and 10 pups. The sharks we study today were most likely born about the same time as your great-great-grandparents.

Thanks to generous support from the SOSF, we have been using modern tracking technology and state-of-the-art ageing techniques to better understand the Greenland shark's natural history, distribution and age. Since 2011 we have been deploying pop-up satellite archival tags on sharks in a variety of locations in the pristine waters off eastern and western Greenland and collecting tissue samples for radio-carbon age analysis. Our studies so far indicate that while some individuals travel long distances, others tend to remain in one place. Analysis of their stomach contents has revealed that their diet includes squid, crabs, fish and seals. Theirs is a cold, dark world, as they generally experience water temperatures ranging from -1 to 6 °C. These almost sightless giants tend to follow the bottom, rarely coming to the surface. Occasionally, when the topography permits, they dive to depths of more than 1,600 metres.

The size and age structure of the Greenland population(s) are not yet known, but shark species with slow growth rates and low reproductive potential are highly vulnerable to overfishing. While commercial fishing for this species ceased in the 1960s, significant numbers continue to be taken as by-catch in some local fisheries and we are therefore very concerned about its future.

OLD AND COLD:
CONSERVATION OF GREENLAND SHARKS
INDIANA UNIVERSITY SOUTH BEND
2010, 2011, 2013
QEQERTARSUAQ (GODHAVN)
DISKO ISLAND, GREENLAND
 RESEARCH & CONSERVATION
 GREENLAND SHARK [*SOMNIOSUS MICROCEPHALUS*]



DEMIAN CHAPMAN



WHO I AM

I am a native New Zealander, born in a country known for the progressive conservation of its wildlife, forests, coasts and oceans. Many summer days were spent on the beach, playing in the surf with my cousins. I am not sure how much of my interest in sharks is encoded in my DNA or how much arose from early experiences, but either way my family had a lot to do with it. We were always told to watch for sharks while we were in the water and those warnings seeded my fascination. Both my grandfathers shared my interest and we would spend hours talking about sharks. For their part my parents hunted down dusty, out-of-print shark books for my Christmas presents.

At university I studied zoology and ecology, subjects that hooked me. On the advice of a New Zealand-based shark researcher and friend, after my degree I set off to The Bahamas to work with a world-famous shark researcher and learn the trade from him. Having met my wife and research partner there, I decided that the USA would be my base. A friend had inspired me to study shark DNA, but I was also alarmed that sharks were disappearing as a result of overfishing to supply the Asian fin trade.

As I obtained a PhD and started a faculty position at Stony Brook University in New York, I resolved that my research should be used to improve shark conservation.

WHERE I WORK

My research and outreach efforts take me all over the world and into diverse settings. Sometimes I find myself in Hong Kong's dried seafood district, surrounded by bleached shark fins. A few weeks later I could be in a room somewhere in the Middle East, Latin America or Oceania teaching border control personnel how to identify dried shark fins. At other times I am in my office in New York, staring at DNA sequences on my laptop as I try to decipher the information hidden within the As, Ts, Cs and Gs on the screen. But I am probably happiest when I am on the water, savouring a slight scent of salt and bait on the breeze, waiting for sharks to find me – and hoping that I have selected a site where sharks are still to be found.

To research oceanic whitetips I have returned to The Bahamas, a nation comprising hundreds of low-lying islands that sit on top of a shallow bank and are bathed by the warm, clear waters of the sub-tropical Atlantic. With an economy intimately tied to

ocean-based tourism, the people of The Bahamas pioneered diving with sharks as a maritime parallel of the African safari. They never established a large shark fishery and over the past two decades they have taken unprecedented steps to protect their sharks. It is perhaps these efforts that now allow my friends and me to conduct our studies of the iconic oceanic whitetip.

WHAT I DO

The oceanic whitetip is a shark among sharks. Built like a barrel and growing to more than three metres long, it is a true apex predator. As its name suggests, it has been forged by evolution to live in the open ocean, gliding through the empty blue on long, white-tipped pectoral fins. The vastness of the open ocean and the patchy distribution of prey make finding food a challenge, and early ocean explorers like Jacques Cousteau quickly learned how this endless search affected the oceanic whitetip's disposition. Described as 'the most dangerous of all sharks' by Cousteau himself, the oceanic whitetip is bold and inquisitive and readily approaches divers. I have personally been in the water with many large shark species, including tigers, bulls and great hammerheads. None



have approached me closer or with greater assurance than the oceanic whitetip.

Reports about oceanic whitetips written before the age of industrial fishing almost always commented on how abundant they were in offshore waters all over the world. As humans began setting baited hooks by the mile to capture tuna, roving oceanic whitetips became a common accidental catch, one that provided an unexpected bonus as the demand in Asia for shark fins to make soup grew. Oceanic whitetip populations began a downward spiral and the sharks, once common, suddenly became difficult to find. Worse still, they had never been researched in detail, which left us without the key information – such as their migration and reproductive patterns – necessary to develop an effective plan to protect them.

In the past few years a team of scientists from universities, research institutions and private companies have come together in The Bahamas to learn about the oceanic whitetip. Having cobbled together a pilot expedition to Cat Island in the central Bahamas, we found that the species was still common in the deep water surrounding this island. This high-density ‘pocket’ of oceanic whitetips may still exist as a side

effect of local policies designed to protect shallow-water sharks that were the subject of shark dive operations. With funding from the Save Our Seas Foundation (SOSF) and others, our team started in earnest to collect as much information about these sharks as we could.

As in most shark field research, most of our time is spent waiting. Once a shark arrives, however, we catch it, bring it alongside our vessel and fit it with a PSAT tracker. This small device measures light, temperature and depth for several months before self-detaching from the shark, floating to the surface and transmitting its data to orbiting satellites. From this data we are able to reconstruct where the sharks go throughout the year and what temperatures and depths they prefer. We also give them a physical examination to find out if the females are pregnant. By tracking pregnant females we hope to learn where the sharks of Cat Island give birth.

Although we have much still to learn, even our earliest results have helped shape international policies aiming to better protect these sharks. In 2013 the species was listed under an international treaty that restricts trade in wildlife products, which will

hopefully choke off the trade in oceanic whitetip fins. Among my proudest moments as a scientist was when delegates from The Bahamas spoke out in favour of this trade restriction, citing our research results as the reason for their support. As more nations follow the lead of The Bahamas, I am becoming more and more hopeful that the oceanic whitetip will one day reclaim its position as the premier blue-water apex predator.

TRACKING CRITICALLY ENDANGERED	
OCEANIC WHITETIP SHARKS FOR EFFECTIVE	
TRANSBOUNDARY CONSERVATION	
INSTITUTE FOR OCEAN CONSERVATION SCIENCE	
2013	
CAT ISLAND, THE BAHAMAS	
RESEARCH & CONSERVATION	
OCEANIC WHITETIP SHARK	
[CARCHARHINUS LONGIMANUS]	





WHO I AM

As a youngster I always knew that I wanted to study fish and become an ichthyologist. My love for fish stemmed from my passion for fishing and trying to understand more about the mysterious underwater lives of these biologically diverse creatures. Not knowing what fish were doing when I couldn't catch them led me to take a particular interest in studying their behaviour and movement ecology.

As an undergraduate I never missed an opportunity to participate in research field trips and help postgraduate students with their projects. I always looked for vacation jobs that would keep me close to nature and, of course, the creatures that fascinate me.

As a postgraduate student myself, at Rhodes University in the Eastern Cape, South Africa, I made sure that my research projects involved lots of field work. During my MSc student days I joined the crews of research vessels on offshore cruises whenever I could. While searching for fish samples I also travelled widely around the South African coastline, often sleeping in my beach buggy. For my PhD I tackled a challenging project that found me sampling, counting and measuring fish for at least three days a week for three years.

My philosophy has always been to 'follow my heart' and today I consider myself to be an extremely fortunate person who has turned a passion for fishing and love for fish into a career.

WHERE I WORK

In 2000 I joined the South African Institute for Aquatic Biodiversity (SAIAB), based in Grahamstown in the Eastern Cape, where I now hold the post of principal scientist. During my career I have been involved in the publication of more than 100 scientific papers and presented my research findings at conferences around the globe. Student training also forms an important part of my vocation and over the years I have been involved with the supervision of no fewer than 25 postgraduate students. I find nothing more rewarding than training and nurturing the next generation of fish biologists, not only through transferring skills and participating in field work, but also by sharing my passion for research and striving for new knowledge.

Much of my research is done in collaboration with other local and international scientists. Our studies deal primarily with the movement behaviour

of fish, their patterns of habitat use and the ecology of fishery resources, with the aim of providing information for the management of these resources.

My research activities have taken me around the world and during my travels I have seen amazing things, met fascinating people and found myself catching and tagging fish at remote tropical atolls in the Indian Ocean and fishing for Atlantic salmon in northern Norway. I am also privileged to have worked in most of South Africa's Marine Protected Areas. I am living my childhood dream!

WHAT I DO

The Acoustic Tracking Array Platform (ATAP) is a collaborative research programme that provides a service to the greater marine science community in order to monitor the movements and migrations of inshore marine animals. The platform comprises a network of moored data-logging acoustic receivers around the South African coastline, from Hout Bay in the south-western Cape to the Mozambique border. Much of the acoustic telemetry hardware was provided by the Canadian-based global Ocean Tracking Network project and capital equipment

PAUL COWLEY





grants from the National Research Foundation.

The data uploaded from the receiver network are stored on a national database and distributed on request by the scientists concerned (the data owners). Currently much of the research focuses on large predatory sharks and important coastal fishery species. There are several dedicated research projects that benefit significantly from ATAP. For example, the OCEARCH South African Shark Project has surgically equipped a number of sharks, including 39 white sharks, with acoustic transmitters that have a battery life of 10 years. Additionally, multi-institutional collaborative projects on bull sharks

and estuarine fishery species will benefit from this marine science platform.

It is envisaged that this project will witness substantial growth in biotelemetry research locally. It should also foster broader national and international collaboration to ensure a sustained future for the study of migration biology and the behavioural ecology of marine animals in coastal waters around Africa.

Funding from the Save Our Seas Foundation enables SAIAB to prepare, service and maintain ATAP's national network of receivers and thus extend the geographic coverage of the animals tagged by various research teams. The impact of this will be to

improve our understanding of key issues, notably the spatial ecology of several iconic conservation species; the environmental and biological factors that trigger the movements and migrations of marine animals; South Africa and Mozambique's shared fishery stocks, and the movements of whale sharks and manta rays (both tourism species) between the two neighbours; shark-human interactions and ways to improve bather safety; and the effects of climate change, such as a rise in sea temperature.



**THE ACOUSTIC TRACKING ARRAY
PLATFORM (ATAP): A NATIONWIDE MARINE
SCIENCE PLATFORM**
**SOUTH AFRICAN INSTITUTE FOR
AQUATIC BIODIVERSITY**
2013
**SOUTHERN AFRICA COASTLINE, EASTERN
ATLANTIC, SOUTH WESTERN INDIAN OCEAN**

RESEARCH, CONSERVATION & EDUCATION
MARINE MEGAFaUNA





WHO WE ARE

Between us, Simona and I have studied and worked in, at and under the Mediterranean Sea for decades. Together we've snorkelled with pregnant sandbar sharks, tracked basking sharks at sea and in fish markets where they are sometimes illegally sold, trained coastguards to recognise protected species, and persuaded old fishermen to share their knowledge and anglers to release sharks alive. We've scanned the sea from aircraft looking for sharks and mobula rays and dived at night in sweeping currents to meet deep-water sixgills. We've also worked to reduce plastic litter in the sea. And all the time we've striven to raise the public's awareness about sharks and the sea in general.

Simona is the 'proper' PhD scientist. Now a member of the IUCN Shark Specialist Group, she began her career tagging blue sharks, moved on to the Italian Marine Research Institute and is now a scientific supervisor for European Union-funded conservation projects.

I am a marine photojournalist who has been diving in, studying and writing about the sea for 25 years. For national and international media, including the *Financial Times*, *National Geographic* and the

Discovery Channel, I've covered everything from the Mafia-run bluefin tuna trade to deep-sea drilling, and am now writing scientific papers for peer-reviewed journals.

WHERE WE WORK

Being Italian, we focus on the Mediterranean, one of the world's biodiversity hotspots and home to fin whales, great white sharks, sea turtles and countless other species. It is a fantastic sea, with deep, colourful coral reefs that rival those of the tropics, but it is also one of the most overfished areas on the planet. And if you're a shark, the Mediterranean is the most dangerous sea in the world. For 86% of the species, the risk of extinction is either high or very high, or there is simply not enough information to tell us how they are faring – though usually it is badly.

I soon realised that some of my readers – divers, recreational sailors, fishermen – were far more often at sea than marine scientists could ever be, and that their observations were, in fact, the only information available for some rare species. Although the term wasn't even coined then, 15 years ago Simona and I began running 'citizen science' projects that involve

the public in collecting observations and data. Mermaid's Purse, funded by the Save Our Seas Foundation, is one of them.

WHAT WE DO

One of the lesser-known sharks in the Mediterranean is the nursehound, a large catshark that grows to a length of up to 1.6 metres. It lives in small, isolated groups on reefs where it usually hides during the day and feeds on crabs, molluscs, fish and other catsharks at night. It's not doing very well. Although currently classified as Near Threatened on the IUCN Red List of Endangered Species, it may soon qualify for Vulnerable status. The fact that it's a long-lived and slow-reproducing species makes overfishing the culprit for its decline, which is especially obvious in certain areas. Off Tuscany, for example, the population has decreased by an astonishing 99% in just 30 years.

Like so many other species, this is a shark we know very little about. We don't know where it occurs, what its lifespan is, where it breeds and whether these areas are under threat – even how many nursehounds there are. This is where the public comes in.

ELEONORA DE SABATA SIMONA CLÒ



MERMAID'S PURSE

MEDSHARKS

2012-2013

ITALY, MEDITERRANEAN SEA

RESEARCH & EDUCATION

NURSEHOUND SHARK [SCYLIORHINUS STELLARIS]

Divers occasionally see these sharks or their large white eggcases, called mermaid’s purses, which the females attach firmly to red sea fans or sponges by means of long curling tendrils, usually at a depth greater than 30 metres. The eggs are then abandoned, safe in their sealed pouch, for seven to nine months, until they develop into tiny sharks.

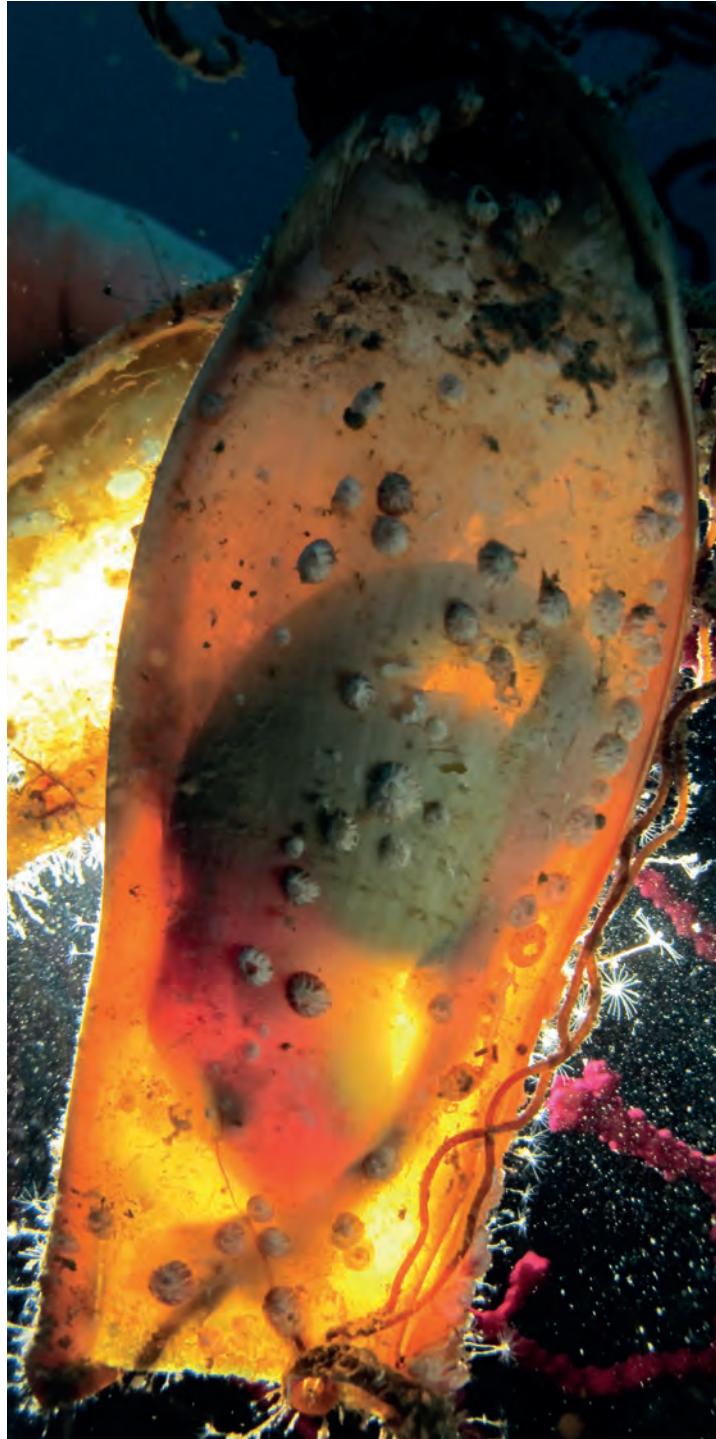
When the Mermaid’s Purse project was launched in 2012, we began collecting divers’ observations and from them produced a map of nursehound breeding areas, which until then we had known nothing about. Divers reported seeing an average of two or three eggcases in these locations, perhaps a handful in a few rare sites. But on one particular reef in the Gulf of Naples, they said ‘countless’ eggcases could be found year round. Imagine our shock when we dived there a few months ago and found *hundreds* – some just laid and still shiny while others were empty. Tiny embryos were wriggling about in many of the eggcases, whereas in others the baby sharks were on the point of bursting out.

We are now monitoring this reef, which luckily is already situated in a protected area. We dive there every month, checking the embryos’ progress in tagged eggcases to record their growth rate and see

what preys on them. Collecting information at such a depth is tricky. Our survey area is between 33 and 38 metres down and long decompression times build up when you’re working at levels like these. For this reason, we use either oxygen-rich gas or even re-breathers when we can, as they enable us to stay down for longer, and safely, at such depths.

Although we have yet to see a live adult shark with our own eyes, divers report occasionally seeing one in a crevice. As the nursehound is a ‘spotty’ shark, we may be able to identify individuals if each one has a unique spot pattern and we could thus determine whether those seen are occasional visitors or resident here year round. They may even stay for a number of years; an aquarium in Italy has had some for at least 15 years, which suggests the species is fairly long-lived.

Divers are very helpful, constantly providing photos of the nursehounds and their eggcases. If you would like to contribute too, please join us at the next BioBlitz, which will be held on 14 June 2014, when dozens of divers will join us for a weekend of fun dives and shark talks – and, being in Naples, great food!





WHO I AM

For a girl born inland and raised on red African soil, it's a bit of a journey down to the sea. However, every day sees me fall a little more in love with our planet's wildest spaces – so it was almost inevitable that I would end up at that last great blue wilderness: the ocean. My research career to this point has been nothing if not eclectic – a good indication of my love of learning and my addiction to the outdoors!

When I moved to the coast for university, my first stumbling attempts at surfing and free diving unearthed a curious passion for the ocean, which had originated during childhood beach holidays and been carefully nurtured from a stash of surfing magazines hidden under my bed in my teenage attempt to 'learn the coastal lingo'. At some point during my undergraduate years, when I was fuelled by the passion of the researchers I encountered, the ocean captured my imagination.

So, after stints traipsing up the Cape Peninsula's mountains to study insects, wading through rivers for freshwater research, scaling termite mounds while studying in the Kruger National Park and learning not to run from charging baboons for my Honours degree, I was drawn back to the sea. Tackling my

MSc in conservation biology opened my eyes to the need for sound scientific research to inform conservation decisions. By its end, I was determined to explore the variety of possible solutions to the conservation challenges our oceans face. And as far as office spaces go, the ocean is a pretty inspiring place to work in.

WHERE I WORK

The history of False Bay is long and colourful. The bay, near Cape Town on South Africa's south-western coast, is home to a myriad of ocean lovers, from surfers and divers to fishermen and the SA Navy. Many people who call it home have been intricately bound to its waters for centuries. Inevitably, our relationship with the ocean has consequences for the biodiversity in this region; indeed, commercial fishing has been recorded here from as early as the 1600s. As the urban population surrounding South Africa's largest true bay continues to grow exponentially in the 21st century, so too does the host of threats to its biodiversity, from coastal development and pollution to overfishing and human-wildlife conflict. However, it's precisely at this intersection between False Bay's rich marine biodiversity and the humans who rely on

BAITED REMOTE UNDERWATER VIDEO ASSESSMENT
OF ALL FALSE BAY SHARKS AND FISHES
UNIVERSITY OF CAPE TOWN
2012-2013
FALSE BAY, WESTERN CAPE, SOUTH AFRICA
RESEARCH, CONSERVATION & EDUCATION
SHARKS, RAYS & SKATES



the ecosystem services it provides that conservation-related research becomes interesting – and vital.

False Bay is not only my study site, but my home and playground. So, every now and then, I take a more lyrical view of this beautiful bay and remind myself exactly why I work here. Take a deep breath, dive in and discover False Bay.

WHAT I DO

With an inshore fishery that has been exploited for more than 200 years, many fish species in South African waters are in serious decline. If we're to address this situation, we need to properly understand the conservation status of these species. However, our coastline is tasked with socio-economic challenges that ultimately mean very few species are adequately monitored, because of the costs and logistics of doing so. South Africa's marine protected area (MPA) network relies on fish surveys to understand to what extent protected areas are effective in achieving the goals of biodiversity conservation. Developing a method of surveying fish species that not only is kind to conservation agencies' pockets but also takes into account the varied and challenging ocean conditions

LAUREN DE VOS





our coastline presents, is integral to ensuring that monitoring is sustainable.

After I had completed my MSc, my project supervisors (Associate Professor Colin Attwood of the University of Cape Town and Dr Albrecht Götz of the South African Environmental Observation Network) and I realised that the Baited Remote Underwater Video (BRUV) research I'd covered could be further developed in a project closer to home. We had a hunch that it might allow us to address some of the challenges of long-term monitoring. Developed in Australia, BRUV surveys attract fish into the field of view of a remotely controlled camera and record the diversity, abundance and behaviour of species. They offer a low environmental impact way of understanding changes in fish numbers and diversity over time.

For South Africa, the practicality of BRUVs extends beyond pure scientific interest to meeting the very real need for affordable, efficient monitoring of our coastal fish populations. Our False Bay BRUV project introduced easy-to-replicate steel rigs with GoPro cameras attached to them that are buoyed off at the surface and left to film independently on the sea floor. Because it reduces the manpower required for field work (as well as the cost and complexity of equipment) and maximises the amount of data collected, the methodology can be replicated by conservationists along the coastline and utilised in standardised monitoring.

As the first underwater camera survey of False Bay's fishes, including its rays, skates and sharks, the BRUV project is gathering information about the region's species that can be archived and used in long-term ecosystem comparisons. Concern about how our methodology translates for those tasked with its application elsewhere along the coast led us to design a series of skills-sharing workshops to take our research results directly to the managers and rangers of South Africa's MPAs. We have also discovered that our data can speak to a non-scientific audience in a different, exciting way and so we put a lot of effort into 'bringing our oceans ashore', sharing information through talks, blogs and short films.



NICK DULVY

A GLOBAL MANTA AND DEVIL RAY
CONSERVATION STRATEGY
IUCN SHARK SPECIALIST GROUP
2013
WORLDWILDE
CONSERVATION
MOBULIDAE FAMILY [GENERA MANTA AND MOBULA]



WHO I AM

I have often wondered what is hidden beneath the silvery veneer of the water's surface. That film is so thin, yet what lies underneath is profoundly different from the air and land above that are so familiar to us.

I first marvelled at what lay beneath the surfaces of the myriad rivers and lakes of Ireland. An old fishing rod opened the door to a new world of red-eyed roach, surface-feeding shoals of rudd and shoals of bream. Little was I to know that this would lead to a Bachelor's degree in zoology and physiology (fish studies) rather than biotechnology, and a chance to marvel at what lay beneath the coastal seas and oceans of the world.

The second turning point in my life began with learning to scuba dive at university. My first dive was under thin ice on a frigid day at Dost Hill Quarry in central England. After years of imagining what fish did underwater, I could now observe their lives at first hand.

Diving led me to an expedition to mysterious Mafia Island in Tanzania, the playground of the poet Milton and the writer Hemingway. I discovered that you did not need complex electronic equipment and the application of a sophisticated series of colourless

reagents to reveal the secrets of life. The laboratory skills of cell biology and physiology were so hard-won that, having learnt them, academics were reluctant to leave them behind. The questions they asked were always constrained by the methods they knew.

I learned two important lessons in Tanzania. Ecology is low tech. You don't need a lab full of equipment and a catalogue of chemicals. You need only two things: a measuring thing and some way of identifying the creatures you measure. The measuring thing was often a fish board of a square-metre quadrat made out of the straightest mangrove wood. I became very familiar with Jassunt's *Guide to the Seaweeds of Tanzania*, the FAO fisheries catalogue. It does help, however, if you have a yacht and a dive compressor.

I also learned at first hand how the ecology of a place is inseparable from the people who live there. Flicking through the pages of that FAO fisheries catalogue with any villager would open the door to their lore and knowledge of the behaviour and ecology of the fishes they caught and observed.

I noted too that conservation and management would be meaningless without recognising the many ways in which villagers relied upon the sea for food and shelter. The low, dry desert islands of Mafia had great stands of mangrove but little with which to build a dwelling. The villagers resorted to filling fishing boats with massive corals that they would leave to die and dry on the shore. Weeks later they would burn the corals on mangrove pyres 20 feet in diameter and the height of a person. These kilns would burn for days, slowly yielding a brilliant white limestone that would be used to bind corals into a mangrove lattice wall and to skim coral floors. The villagers knew that they were converting fish homes into human houses, but what could they do?

In the two decades since leaving Tanzania, it is hard to believe that I could once teach marine biology in Swahili. But the lessons I learned in ecology and the importance of involving the human inhabitants of coastal ecosystems in conservation management have never left me.

WHERE I WORK

Now far from tropical seas, I revel in the wilds of the rugged, conifer-rimmed and salmon-soaked Pacific Northwest. My field work now involves e-mail and Skype, which enable me to travel daily to faraway places, many times over, and hear stories of the wonders of sharks and rays. We plot our next moves in the chess game of marine conservation. Through the Shark Specialist Group I learned how bringing people together is a powerful way to gather and share scientific knowledge. I learned too that people rather than scientific papers conserve species and manage fisheries.

Every day I wonder what lies beneath the sparkling, glittering surface of our seas. I still seek to find out what swims below that surface and what has changed.

WHAT I DO

We have recently published a summary of two decades of work by the IUCN Shark Specialist Group. This work involved 300 experts from 66 countries, brought together in 17 workshops all over the world. It is one of the first systematic studies of the conservation status of a lineage of exploited fishes – not just any fishes, but the sharks, rays and chimaeras of the chondrichthyans. These are one of the two major lineages of fishes. They were among the first back-boned animals and they embody the blueprints for the jaws, brains, placentas and immune systems that characterise much of vertebrate life. We estimate that one-quarter of chondrichthyans are threatened with a high risk of extinction.

The study warns that what lies beneath has been greatly diminished. It shows that if we keep going as we are, then there is a real risk that sharks and rays will be as krakens and sea monsters to our grandchildren.

Declines can be, and have been, arrested – sharks and rays can be saved. We know what to do, and this is laid out in the paper and the reports of the Shark Specialist Group at great length. All we have to do is to choose to save them!

IGBAL ELHASSAN

POPULATION GENETICS OF SOME SHARKS
FROM THE RED SEA
UNIVERSITY OF BAHRI
2013
THE RED SEA (SUDAN, YEMEN,
ERITREA AND SOMALIA)
RESERACH & CONSERVATION
SHARKS



WHO I AM

I grew up in Port Sudan, where the Red Sea shimmers with crystal water and beautiful coral reefs. I will never forget the moment when, as a child, I stared through the glass bottom of a boat and saw countless colourful fishes and healthy reefs. I think it was that beauty that subconsciously inspired me to study fisheries when I joined the University of Juba, the first university in Sudan to offer a course on fisheries in the country.

The curriculum focused mainly on freshwater fishes, so little was taught about cartilaginous fishes and my knowledge of sharks, skates and rays was very limited. I thought of sharks as fierce animals that could evoke no emotional response in me.

After graduating, I joined the staff of the Fisheries Department at the University of Juba and began studying towards a Masters degree. I wrote a proposal for a thesis on the population dynamics of *Plectropomas maculates* and *Lutjanus bohar*, both of which are commercial coral fish in Sudan. My supervisor asked me to show the proposal to a professor at the University of Khartoum.

The late Professor Abu Geder pioneered the study of fisheries in Sudan, and I will never forget

his response. ‘This is a good proposal, but why not research sharks in the Red Sea?’ he asked. ‘We think they are being overfished, but no studies have been done on sharks in Sudanese waters and those of neighbouring countries.’

When I heard his suggestion I was concerned. How could I approach and research an animal with such a bad reputation? After some thought, I accepted the challenge and started to review the literature about all aspects of sharks. I read countless papers, watched documentaries and even went on field trips to the Sudanese coast. The more I learned, the more my fear was transformed into great sympathy for these fascinating creatures. If they disappear from our seas, our marine world will lose its balance and its beauty.

WHERE I WORK

I completed my Masters degree, the first study on sharks in Sudanese waters, in 2002. It outlined biological aspects of the animals as well as socio-economic factors that drive shark fisheries in Sudan.

Before the 1990s, Sudanese fishermen did not target sharks and only a few of them were experienced shark fishermen. By the middle of that decade, however, commercial fishing for sharks began to get under way and fishermen from some neighbouring countries were hired. This fishing for sharks was motivated by the high price for their fins around the world. Because the Sudanese do not eat shark meat, the fins were sliced off and the shark bodies were thrown back into the water or dumped on local islands in the Red Sea, contaminating these environments.

Tourists come to the Sudanese Red Sea to enjoy the beauty of its coral reefs and to dive with grey reef sharks and scalloped hammerheads, which

at certain times form massive schools off the coast of Sudan. In the early 2000s, however, tourism agencies in Port Sudan reported that shark numbers, particularly of grey reef sharks and hammerheads, were declining.

WHAT I DO

Since 2011 I have been working on my PhD on the population genetics of some shark species in the Red Sea and I will complete it this year. For weeks at a time I collect samples at landing sites in many countries of the region in order to determine the genetic diversity of these species and to assess their population structure. With the information I collect I hope to contribute to the conservation and management of these shark species in the Red Sea.

At the start of the project I was faced with hopelessly scarce funding and facilities. I received some finance from the Mohammed Bin Zayed Species Conservation Fund, which allowed me to collect and process genetic samples from the Sudanese coast, but I needed to get to other parts of the Red Sea region as well. In 2012, I had the good fortune to meet Sarah Fowler during the Arabian sharks workshop in Dubai. I am grateful to her for inviting me to apply for funding from the Save Our Seas Foundation. Support from the SOSF has allowed me to carry out field trips to collect samples from multiple landing sites, including three trips to Yemen. I have also been given the opportunity to travel to the SOSF Shark Research Centre in the USA, where I will analyse my samples and receive training.

My project could never have continued without the support and assistance of the Save Our Seas Foundation.

It is an incredible opportunity to collect data on manta and mobula rays all around the world, helping to compile the first global and comprehensive identification guide book. This is a vital step in driving the conservation movement for these rays and would not be possible without the support of the Save Our Seas Foundation.



WHO I AM

I was clinging to a rock 15 metres below the ocean’s surface and the current’s surge seemed determined to wrench me from my precarious hold. Visibility was less than five metres, but through the gloomy waters a massive bird-like fish glided gracefully into view, passing just inches above my head, with its ‘wings’ on either side of my body. This first encounter with a manta ray was an experience I will never forget!

Sri Lanka is a small island nation in the Indian Ocean and I grew up right in the middle of it, miles away from the ocean. My passion for the underwater realm only got going when I started snorkelling at the age of 10 and then later when I got the opportunity to learn scuba diving. It was then, during an advanced open-water dive in the Maldives, that I first encountered manta rays. After briefly contemplating dropping out of university to become a scuba instructor, I realised (and was convinced by my parents) that I could have a much greater impact on the marine environment if I had an academic background. So I switched from my undergraduate degree in biomedical science to a Masters in marine resources management.

After my studies I briefly pursued research on the whales off the eastern coast of Sri Lanka. On a return trip to the Maldives, however, I rediscovered the manta rays and reignited my desire to learn more about them. After hearing of the large-scale fisheries around the world for manta rays and their smaller cousins, the mobula rays, I decided to get involved in the research and conservation of all mobulid species. It is not just the fact that they are highly threatened, but also that these iconic creatures help draw attention to the destructive fishing techniques employed around the world that endanger many other marine species.

WHERE I WORK

My project is not confined to one geographical region but, due to the global distribution of manta and mobula rays, is spread all around the world and is undertaken with the assistance of several international collaborators. Primary study locations include Sri Lanka, India, the Maldives, Chagos, Malaysia, Pakistan, West Africa, Gaza, Mexico and the Caribbean. This global coverage enables us to collect data on all nine mobula and two manta species.

I spend a lot of time at early morning fish markets, and one thing that always strikes me is that although cultures vary greatly from one country to the next, the similarities between fish markets in tropical regions can be astounding. The noise, chaos and bustle, and the unique smell, are not something you easily forget! Additionally, the friendships I make are special; without the support of the fishermen and traders I meet, most of my work would not be possible.

Fortunately it is not always about dead fish. I get opportunities to swim with mantas and mobulas in stunning locations like the Maldives and Malaysian Borneo because I need images of living rays too. These are the moments that make it all worthwhile, as I realise that projects such as mine will help these graceful species to continue swimming in the world’s oceans.

WHAT I DO

The ocean, the final frontier. We know so little about it, yet depend so heavily upon it. This reliance has led to over-ambitious exploitation of the ocean, with no thought given to the consequences that future generations will inherit.

DANIEL FERNANDO






Indiscriminate fishing techniques such as gill nets endanger manta and mobula ray populations around the world. An even greater threat is the target fisheries for rays in several countries, which find a market in the global trade in dried mobulid gill plates – also known as gill rakers, the cartilaginous structures that enable rays to filter plankton from the water column. Since rays grow extremely slowly (mantas can live longer than 50 years), mature late and have a low reproduction rate, commercial targeted fisheries will inevitably result in a decline in their global population.

Very little biological or ecological information about rays is currently available because the 11 species look alike and are not easily identified. This makes protecting them very difficult, as any declaration of their threatened status needs to be backed up by in-depth and solid scientific evidence.

My project aims to develop the first global and comprehensive identification guide and genetic kit for all 11 mobulid species and make it accessible to scientists, field researchers, conservation policy makers and, of course, ray enthusiasts. To create the guide, I have been cataloguing all data currently available,

identifying gaps in the information and then heading out to fish markets in a bid to fill the gaps. Since data and genetic samples are required from all parts of the world, I am also collaborating with other organisations and individuals who are already collecting information from living populations and from fisheries.

All the data will be compiled into a guide book. The samples will be used to develop a genetic identification kit for tissue and gills – a crucial component in the monitoring and control of the international trade in mobulid ray parts. Ultimately the guide and the genetic kit will enable a larger number of people to identify each ray to species level and thus increase the data collected for each species. This in turn will lead to improved conservation measures for rays, a key aim of the Save Our Seas Foundation.

GLOBAL MOBULA RAY TAXONOMICAL, MORPHOLOGICAL AND GENETIC IDENTIFICATION GUIDE	
THE MANTA TRUST	
2013	
WORLDWIDE	
CONSERVATION, RESEARCH & EDUCATION	
MOBULIDAE FAMILY (GENERA MANTA AND MOBULA)	

After nearly two decades with a steady job, I found myself essentially on my own, except for a few extraordinary angels, starting a brand new project for shark and ray conservation. The Save Our Seas Foundation stepped up as a ‘keystone contributor’ to the initiative. That funding was vital to getting Shark Advocates International off the ground and remains critical to our continued growth. For the early vote of confidence and the financial as well as moral support, I am eternally grateful.



WHO I AM

I am an advocate. Not a scientist, a lawyer or a lobbyist – just a proud advocate for some of the oceans’ most vulnerable species. I take what scientists say about much-needed limits on shark and ray fishing and try to get it reflected in policy.

Advocacy in an often hostile environment was not a likely path for me. I was painfully shy as a child and my parents imagined I would live a quiet life, perhaps as a kindergarten teacher. It was thanks to those parents that I came to love nature from an early age and by high school I was a fully fledged marine mammal hugger and, like many others, I had a dream to ‘save the whales’. While at the University of Maryland, I was fortunate enough to take a class by the shark lady herself, Dr Eugenie Clark. It’s hard to believe now, but during that class I stayed focused on my dolphin project and had much less interest in sharks.

After university, I did what most young people are told to do: find an organisation you like and take whatever job you can, just to get your foot in the door. That organisation was the Center for Marine Conservation (CMC) in Washington, DC. The job was in a new fisheries programme led by a

brilliant and delightful man called Harry Upton.

In 1991, the year I joined CMC, Harry made the visionary decision to get involved in the first ‘Sharks Down Under’ international conference in Sydney and brought back both important information and a keen interest in addressing the plight of the under-appreciated species. At the time, shark fishing was expanding in the south-eastern USA and finning (slicing off the fin and discarding the body at sea) was legal.

I knew from school that sharks and dolphins had similar reproductive strategies: slow growth and few young. Yet dolphins and all other marine mammals were strictly protected in the USA, regardless of population status. Although sharks were similarly vulnerable to overexploitation, shark fishing was a veritable free-for-all back then. It seemed clear that sharks were in much greater need of an advocate than dolphins were and I made what I think was a wise decision to ‘stick it out’ in the world of fish.

My first duties at CMC included pestering National Marine Fisheries Service (NMFS) officials about finalising a long-languishing draft Atlantic shark fishery management plan, which included a ban on finning. I was also tasked with assisting in the

development of the newly established IUCN Shark Specialist Group (SSG), whose founding members, Sarah Fowler, Sonny Gruber and George Burgess, evolved into enduring colleagues.

The first US shark fishery management plan was finalised in 1993, about the time that a US fishery for spiny dogfish sharks was starting to develop further north. There was plenty of work to be done to tighten the shark plan and try to apply its hard lessons (about how easily sharks are overfished) to dogfish and then to skates, as well as all the closely related species that were being increasingly fished around the world. The opportunities to help sharks and rays continued to expand, as did my role in the SSG; I now serve as deputy chair. In 2010 I founded my own shark and ray initiative, Shark Advocates International, as a project of The Ocean Foundation.

WHERE I WORK

I work in Washington, DC, about a mile from where I was born. Despite what many people might think, I don’t spend much time on Capitol Hill. Most US fishing rules are developed by regional councils and commissions or NMFS, which is headquartered

SONJA FORDHAM





MAUVIS GORE



WHO I AM

I come from Jamaica, where the Caribbean has been overfished and sharks are feared. Being surrounded by sea and the amazing life in it was hugely inspiring for me. I love being in the ocean, the feeling of being carried along, the colours, the wind and waves, and the interactions of the marine animals. As a family we spent a lot of time in or by the sea and my father had a strong influence on my curiosity about what I saw, how it worked and how it fitted into the ecosystem – a curiosity that led me to study zoology and then marine biology.

I have always felt that it is important to respect animals in their environment. So often, people think they can chuck whatever they like into the sea and take from it any amount of resources. This led me to study sharks, which was a challenge as I had a healthy fear of them. So for my first dive I chose a species I was most afraid of: the tiger shark. Those first sharks I dived with were magnificent and now I would rather be in the water with sharks of any species than with most dolphins.

I love field work: snorkelling and diving, being around boats, putting together the gear I need to answer my questions. I also enjoy analysing data and seeing how my work fits into a wider context, as well as interacting with people about the sea and sharks,

especially if they say they are scared of them. Then I try to show them how important sharks are to the environment and to their own lives. Sharks are so beautifully designed and graceful, and each species behaves differently: nurse sharks are amazingly agile and can almost tie themselves into knots; tiger sharks seem to be resigned when handled whereas silkies are more edgy and feisty.

WHERE I WORK

My 'office' when I'm in the field may be an air-conditioned cubicle or wherever my bed or hammock happens to be. I am currently based in South Queensferry, Edinburgh, and have the best office I can think of, overlooking the Firth of Forth. In Scotland, where I work with Rupert Ormond on basking sharks, there is a very long coastline to cover – longer in the small area of Argyll and Bute than around France!

In Pakistan my office is a tent or a floor shared with the team. Boats may or may not float and their engines may or may not work. Local villagers are friendly but very poor, government agents skulking and assertive. The navy has been very helpful and hospitable for the Balochistan surveys, where the desert, mountains and mud volcanoes are in stark contrast to the convoluted coast of the Indus delta in Sindh.

Pakistani food is delicious, although Ramadan can be hard, especially if you're doing field work in summer and there is no water to drink.

Working on Cayman, with its tropical fruits and vegetables, culture and music, and laid-back, friendly attitude, is like coming home.

WHAT I DO

When Rupert was director of the Millport Marine Biological Station, he and I lived on a small island in the Clyde Sea, near Glasgow. We became aware of a basking shark in the local waters and from the skipper of one of the research vessels, a former basking shark hunter, we learned all that was then known about these huge animals. Basking sharks are endearing and intriguing, posing no threat to anything except zooplankton, yet we knew so little about them: where did they go in winter, how did they use their habitat, how did they behave individually? We discovered that individuals could be identified, like white sharks and dolphins, and this helps us to see them as personalities.

From the beginning I got the public involved and used the basking shark as an introduction to other shark species in discussions and talks. We set up a public sighting scheme for basking sharks and made

contact with each person who reported a sighting to tell them about shark conservation and ignite their interest in wider issues. On Scotland’s west coast, basking shark watching has now surpassed whale watching as a tourist attraction. Even fishermen get involved and report their encounters with basking sharks.

The Save Our Seas Foundation (SOSF) was instrumental in getting the project off the ground and sustained our work with funds, educational material and moral support. The family atmosphere the SOSF engendered meant that good dialogue developed between us, SOSF scientists and the media, which helped enormously to promote good science, communication and conservation.

My work broadened to include marine mammals and other shark species. I led a project in Pakistan to survey the species there and inform the people and government about the wonderful resources they had. I trained a local team to continue the work, including persuading fishermen to focus on species that can bring them profit rather than on marine mammals and sharks.

An invitation from the Cayman Islands led to a similar project. Being isolated and situated at the edge of one of the deepest marine trenches in the

world, the islands are uniquely placed in the Caribbean. Working with the government, we conducted the first surveys of their marine mammals and sharks. Once we had begun to collect and analyse our data, we reached out to the public and engaged in dialogue. SOSF’s support here was particularly valuable, helping us to form discussion groups and organise a public event to air our findings.

Sharks are not popular in the Caymans: fishermen fear them and see them as competition for the fish that make up their livelihood, and tales of ferocious sharks attacking people abound. Shark meat is eaten in some communities and it appears on restaurant menus. But our discussions led to a public consultation on protective measures for sharks, resulting in new legislation going before the appropriate government department for consideration. One of our successes was the first ‘shark beer’, with conservation messages to read while you drink and five cents from each can bought going to shark conservation.

The methods I use to gather information on sharks depend on the questions I’m asking, but they include boat-, snorkel- and dive-based surveys, baited remote underwater visual systems, photo ID and acoustic and satellite tags. By analysing the results

**CAYMAN ISLANDS SHARK PROJECT:
ACHIEVING PROTECTIVE LEGISLATION
MARINE CONSERVATION INTERNATIONAL
2010-2013**

CAYMAN ISLANDS, CARIBBEAN SEA

CONSERVATION & EDUCATION

SHARKS



I can determine species, sex and age groups and how many sharks there are, and then calculate the population size. Comparing results over time enables me to see if there has been a change and what this may be attributed to.





WHO I AM

For most people, sharks don't fit the cute and cuddly image that has been cultivated for iconic mega-fauna. They just aren't members of the clique of lions, tigers, elephants and the like that inspire a warm and fuzzy feeling in wildlife lovers. Growing up in North Africa as an only child with an unbridled curiosity, I learned two things: that I didn't quite fit in (although that never stopped me from talking to anyone and everyone) and that my sense of not fitting in stoked my love for animals that no-one else cares much for, like snakes, bats – and sharks.

After a peripatetic upbringing, it took a few more years for me to return full circle to my childhood fascination for sharks. A series of dives at Ras Mohammed on Egypt's Sinai Peninsula in 1990 propelled me towards the course I follow today. Of course life's pursuits, like a good movie, are rarely linear in their unfolding and another seven years would pass before I was well and truly working with sharks.

My curiosity about sharks came flooding back in 1998 when I bumped into a whale shark at Gladden Spit in Belize while working on a project that focused on artisanal fisheries and fish-spawning aggregations.

So little was known about whale sharks at the time that I set out to discover as much as I could and by means of early satellite-tagging technology I followed their movements when they left Gladden Spit.

And that led me to Cuba. In 2000 I had the good fortune to meet the country's pre-eminent ichthyologist Dr Rodolfo Claro, who recommended that I focus on Jardines de la Reina, a remote archipelago off Cuba's southern coast. He also introduced me to Dr Fabián Pina Amargós from the Centro de Investigaciones de Ecosistemas Costeros who, like me, was a graduate student at the time. It took until 2004 to find the funding to start working in Jardines in partnership with Fabián.

WHERE I WORK

My first visit to Jardines de la Reina Marine Protected Area (MPA) left me in complete awe and all subsequent visits have had the same effect. The corals and fish assemblages are some of the healthiest I have seen in the Caribbean and have been used by several colleagues to demonstrate what a Caribbean baseline should look like.

Aside from the whale sharks that seasonally frequent this wild and beautiful collection of sandy mangrove islands underpinning Cuba's southern coast, several other shark species find a haven at this coral site. Large Caribbean reef sharks, silky sharks and nurse sharks, as well as the occasional blacktip or great hammerhead, vie for your attention during dives in reef channels and lagoons or along the fore-reef cliffs and slopes. This abundance of apex predators in one area begged a key question: is the Jardines de la Reina MPA providing effective protection for them?

Although shark fisheries have existed in Cuba for decades, the trajectory of shark populations was unknown and the information about coastal elasmobranch populations and their critical habitats was limited. The ultimate goal for our SOSF-funded project has been to establish robust baseline data for elasmobranchs in the Jardines de la Reina MPA and neighbouring areas that will enable us to assess the MPA's role in maintaining shark abundance. Jardines will serve as the initial site for surveys of sharks and rays along Cuba's southern coast, and we intend to expand our monitoring efforts to other MPAs over time.

RACHEL GRAHAM



WHAT I DO

Based at the Avalon Dive Center in the central part of the Jardines, five hours from mainland Cuba, we conduct our field research from the 10-metre *Itajara*, a refitted fishing boat. Sampling days are long, often lasting from 6 am to 7 pm, or later if night sets are included, and they involve travelling to monitoring sites along the edge of the fore-reef or to the north of the archipelago.

Using a sampling design developed with noted biostatistician Dr Samantha Strindberg, we employ standardised monitoring techniques (hanging long-lines and underwater visual transects, and soon also baited remote underwater video) to determine the abundance and distribution of sharks and rays throughout the archipelago and MPA. Areas outside the MPA have also been sampled for comparison, and demographic details and the diversity of catches are noted too. The baseline survey is revealing patterns of species distribution according to habitat and environmental preferences. Recaptures of tagged sharks outside Jardines are also showing that fishing pressure is high outside the MPA.

Our standardised baseline and survey efforts will enable us to compare this site with others in the Caribbean where, with a range of local partners, we are monitoring elasmobranch populations. By publicising our results through state-sanctioned channels and by getting involved in shark management meetings, we are raising awareness for sharks in Cuba. We are also contributing to the country's National Plan of Action for Sharks and trying to prioritise elasmobranchs in plans for the management of southern Cuba's MPAs.

The remit of the Save Our Seas Foundation (SOSF) dovetails with our own in that we share a mission to foster the protection of sharks and rays by means of novel and timely initiatives. Support from the SOSF has given us the means to establish the baseline for these species in the Jardines de la Reina region. It has also enabled us to demonstrate that the public-private partnership between the Cuban government and the Avalon Dive Center helps to ensure that apex predators are protected effectively in the Jardines de la Reina MPA.





SAMUEL DOC GRUBER

WHO I AM

As a child in the late 1940s, I was what we in Miami called a ‘water baby’. I used to go down to the docks and look at every fish that was brought in. While the other kids were playing baseball, I was out there looking for sharks and fishes and walking the beaches for miles, collecting seashells. At age 12 I taught myself to scuba dive, and when I was a teenager we used to sail out to the reefs on an 80-foot schooner and spend the weekend on a reef, feasting on the fish we had speared.

My interest in the marine world became exponentially more entrenched when I was 20. Back in the ’50s I paid seven dollars for a ticket on the *Blue Goose*, a World War II-era schooner that crisscrossed the waters off Miami Beach. I took along my mask, snorkel and spear gun for some fishing in the reefs around Fowey Rocks. One day I was taking aim at a grouper under a rock when I met with the most terrifying sight. I saw this submarine. In fact, it was a huge hammerhead shark, looking about 150 metres long though it was probably more like four. It was only five metres away and there was blood in the water from the fish I had just speared. I thought I was dead, but the hammerhead swam calmly past me. In hindsight I doubt that the shark thought anything about the encounter, but the experience changed my career instantly from pre-med to marine biology.

WHERE I WORK

You will find me on the tiny island of South Bimini in The Bahamas. I founded the Bimini Biological Field Station, which many people know as the ‘Shark Lab’, in 1990.

In 1492 Christopher Columbus referred to the seas surrounding the Bahamas as ‘baja mar’, meaning ‘low water’ or ‘low sea’. The islands thus became known as The Bahamas, or ‘The Islands of the Shallow Sea’.

Known as the gateway to The Bahamas, the small islands of Bimini are located less than 80 kilometres from Florida, USA. The warm, clear waters washing their shores flow from the Gulf Stream up onto the Great Bahama Bank. Since the early 1920s, Bimini has become known as a destination for adventurers, travellers and smugglers from all parts of the world. When Pulitzer Prize-winning author Ernest Hemingway found his way here in 1935, he was so enthralled with Bimini that he used it as inspiration for his last book, *Islands in the Stream*.

It’s not just the bright blue seas or chalk-white beaches that make Bimini a great place for field research. The archipelago supports a diversity of marine habitats varying from mangrove forests to coral reefs that slope to the deep pelagic zone of the Florida Current to the west. These habitats are a perfect home to the sea creatures that have captivated me



for the past 50 years. Dive in the waters surrounding Bimini and you could meet a number of ray and shark species, including tiger, Caribbean reef, lemon, blacktip, bull, blacknose, nurse, big-eye sixgill, silky and night sharks, smalltooth sawfish, eagle, sting and manta rays – and my old friend, the great hammerhead shark.

WHAT I DO

I first got into shark research through fear and wonder, but the more I studied sharks, the more I realised how amazing these creatures are. Most of my studies have focused on the lemon shark. I spent the first 15 years of my career researching vision in this species and discovered that it has one of the most sophisticated visual systems in the sea. This shark’s eye possesses unique structures and capabilities.

It has a large and pretty amazing brain too. During my doctoral studies in the 1960s I learned to ‘speak’ to sharks. I trained them to answer very simple questions by winking to say ‘yes’. I discovered that a lemon shark can learn a simple conditioned response 80 times faster than a cat or rabbit can when given the exact same task, and it can remember such tasks for more than a year. Incredibly, individual lemon sharks had different personalities and IQs; some were left-handed (or -finned) whereas others were



right-handed. It turned out that there are all kinds of advanced features about sharks that one would never have expected. And today we are actually studying the personalities and cognitive capabilities of our little lemon sharks.

Sharks aren't gods and they're not devils. I regard them as true lords of time. They've survived multiple extinction episodes when most marine animals have disappeared. They've had the strength and adaptations to come back time and time again, and they've been around probably longer than most animals with backbones – nearly half a billion years! But now humans, the super-predator, threaten to undo the half-billion-year reign of sharks. And the sad fact is that we're killing them off to make soup out of their fins!

I always tell my students that we need sharks more than they need us. Fishers say sharks compete with us by eating the same species that we do. In reality, sharks keep the commercial fish stocks healthy and under control.

Following your dream is not always easy, especially when much of it plays out under water. I often wish I could fit my research station with a new solar-operated, hurricane-proof facility and not have

to worry about where my next grant is coming from – indeed, where the groceries to feed all 18 of my staff are coming from. But the truth is that I have never wanted to do anything other than what I do. I love teaching up-and-coming students who want to use sharks as models for their research.

ELASMOBRANCH RESEARCH, EDUCATION AND CONSERVATION IN BIMINI, BAHAMAS
BIMINI BIOLOGICAL FIELD STATION FOUNDATION
2013
BIMINI, BAHAMAS
RESEARCH, CONSERVATION & EDUCATION
SHARKS



In Bimini and Florida we are lucky to have a transient population of great hammerheads. With the generous support of the Save Our Seas Foundation, this project seeks to contribute important information to improving the management and conservation status of these magnificent animals.



WHO I AM

I have always had an extraordinary passion for sharks. I have been utterly mesmerised by them for as long as I can remember. That probably sounds extreme, but sharks have always been part of my life and being in the water with them is where I feel most inspired.

I was first introduced to animals and marine life by my granddad. He and I would explore the textures and creatures of our garden and he would tell me about the birds, bees, trees and leaves. He had a voice like David Attenborough's and I was utterly captivated by his every word. Granddad bought me my first fishing rod and together we would head out to catch supper, though if I caught a fish I had to prepare it for Nanna to cook. So at the age of seven I caught, killed and gutted my first fish – a somewhat daunting experience for a youngster, but an important first lesson in acknowledging life and the earth's precious resources.

Granddad lit my imagination further when he described an experience during World War II. His aircraft crashed into the sea off Malaysia and as he and another survivor swam to shore they watched a shark 'with a dorsal fin as big as a block of flats' circle them confidently and with curiosity. He told this tale with

such animation that it inspired me to seek similar experiences for myself.

Fast forward 10 years to when I finished school and applied to the University of Leeds for a BSc in zoology. The admissions officer and I discussed the gap year I had organised in Africa, and I believe my yearning to do something exciting with my life persuaded him to offer me a place.

So in January 2001, at the age of 18, I departed for six months of coral reef surveys in Madagascar and terrestrial biodiversity transects in Tanzania. I had some unbelievable encounters with wildlife: I held a giraffe weevil, got stung by scorpions, climbed Mount Kilimanjaro, had a worm growing in my foot, swam in the middle of a school of barracuda and, most amusing for everyone else, had *siafu* (army ants) swarm over my legs and genitals after I had stepped on a trail of them.

Inspired by my year abroad, I returned home brimming with excitement to begin my first year at university. By the start of year two I had secured an undergraduate dissertation project with leading behavioural ecologist Professor Jens Krause. Together we investigated how attacking predators (pike cichlid)

single out individuals of a differing colour or size within a group to overcome the confusion effect (of multiple targets making it difficult to pinpoint one). This was my first exposure to experimental design, and to this day I love the challenge of exploring an exciting phenomenon with novel experimentation – like my study on social learning in sharks.

After university I travelled to New Zealand and then Tonga, where I completed my scuba Dive-master. Soon afterwards I made the best decision of my life – to be a volunteer at the Bimini Biological Field Station, also known as Shark Lab, in the Bahamas. I arrived at Bimini in January 2005 with the ambition to conduct my PhD research with the lemon shark as a model. Under the academic guidance of Professors Jens Krause and David Sims, I set out to investigate the species' social organisation and behaviour. My field supervisor was Professor Samuel Gruber, who has had a huge impact on improving our understanding of sharks and their conservation management.

In 2010 I completed my PhD and flew out to Australia to collaborate with Dr Culum Brown at Macquarie University on investigating cognition in Port Jackson sharks. At the end of 2011 I heard that

TRISTAN GUTTRIDGE





Professor Gruber was looking for a new director to continue his legacy at the Shark Lab and in January 2012 I returned to Bimini to take up that post.

WHERE I WORK

In addition to founding the American Elasmobranch Society and the IUCN Shark Specialist Group, Professor Gruber created a unique research facility at Bimini that provides experiential opportunities for young scientists to further their careers and knowledge of marine life. To this day, Bimini Shark Lab is an industry leader with informative outreach, effective conservation, creative research and high-impact publications that I am proud to be a part of.

Since returning here, I have loved the opportunities and experiences afforded me, such as leading shark biology courses for universities worldwide; designing research projects like the one on the great hammerhead; coordinating the PIT tagging programme held every June; and travelling far and wide to represent the Shark Lab.

WHAT I DO

The great hammerhead is one of those sharks that, as a silent hunter, exudes charisma, mystique and power. Its distinctive, oddly shaped head and exquisite sensory capabilities make it one of the earth’s most

remarkable creatures. Yet despite its prominence among the ocean’s greatest predators, we know very little about its biology and behaviour. Even more worrying is that we suspect substantial population declines have occurred throughout its range as a result of fishing. What’s more, hammerheads are the second-most abundant species group in the international trade in fins, and great hammerheads in particular are sought for their large fins.

In March 2013 great hammerheads were added to CITES Appendix II (which allows strictly regulated trade) and were categorised as Endangered on the IUCN Red List. Locally, the declaration of a shark sanctuary in the Bahamas in 2011 prohibits commercial shark fishing, and there is a similar ban in Florida state waters. However, great hammerheads are still at risk in US federal waters and even a measure such as prohibiting the keeping of a shark after capture would not be effective as this species has the highest at-vessel mortality rate (about 90%).

So how can we reduce great hammerhead captures around the world? It is crucial that we understand more about the species’ movements, habitat use and behaviour. Do they use migratory corridors? Are there spatial hotspots? Are the populations in the USA and the Bahamas connected? This is what I am trying to do.

ELASMOBRANCH RESEARCH, EDUCATION AND CONSERVATION IN BIMINI, BAHAMAS
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SHARKS





WHO I AM

As a professor of marine biology, I have always been fascinated by ocean life – and there is still so much to discover. Growing up by the sea meant that I spent much of my childhood in rock pools or out on boats. Some years later, a highlight of my career, and of my life, was diving in a two-man submarine in the Arctic. At depths of perpetual darkness we found a giant coral reef teeming with large fish and a riot of colourful animals – nobody even knew that coral reefs could occur in the Arctic! Also, I have seen how marine science can make a difference. When we presented evidence of how fishing damages deep-sea coral reefs, governments listened and now many such areas around Europe are protected.

When I was little, raw sewage was dumped into the sea and toxic anti-fouling paints were widely used. There have already been many improvements on a number of fronts since then: UK waters are cleaner for bathing, less radioactive waste is being dumped into the sea and Atlantic whales are slowly edging back from the brink of extinction. Mistakes have been made, but luckily some marine habitats are as wonderful as ever. Off Plymouth, where I'm based, we have spectacularly colourful coral gardens and jewel

SOSF has made a massive difference to this project by providing funding to get scientists under the water. For our research we need to travel to remote volcanoes around the world. This would be impossible without the support of the SOSF, because most agencies don't provide funding for this kind of work. Being able to produce evidence of what the sea looks like around carbon dioxide vents is a powerful communication tool, more compelling than computer model simulations. I really do appreciate SOSF's help with this aspect of my research.

anemone-encrusted reefs that appear unchanged over the 50 years that divers have studied them.

WHERE I WORK

I've moved around a lot in my career, but am now very pleased to be back in my home town of Plymouth in the UK, a hotspot of marine science expertise where I get to do the work I love. There aren't many jobs that allow you to marvel at the phosphorescent trails of fish swimming past at night or to survey underwater volcanoes. I feel very privileged to be able to regularly explore life in the seas around us, but I'm also aware of an obligation to tell people about the wonder of life in our oceans, the new discoveries that are being made, and how we can best avoid damaging what we have.

As the world's population continues to grow, we need to improve the management of how we use our seas so that we enhance their bounty and benefits to our society. Striking sensible balances – between marine renewable energy developments and sustainable fisheries, for example – is key. Much of my time is spent teaching a new generation of scientists at universities; the rest is divided between field work, publishing

research findings and providing advice to forums such as the United Nations (UN) and the International Council for the Exploration of the Sea.

WHAT I DO

In 2006 I began to hear about ocean acidification and a shiver went up my spine as I read about the speed with which ocean chemistry is changing worldwide. Back in 2002 an Italian geologist had recorded underwater gas seeps off Naples during a deep-sea expedition. If the gas were carbon dioxide, I thought, such seeps would enable us to look into the future and see which organisms will survive and what coastal habitats will look like as carbon dioxide levels rise.

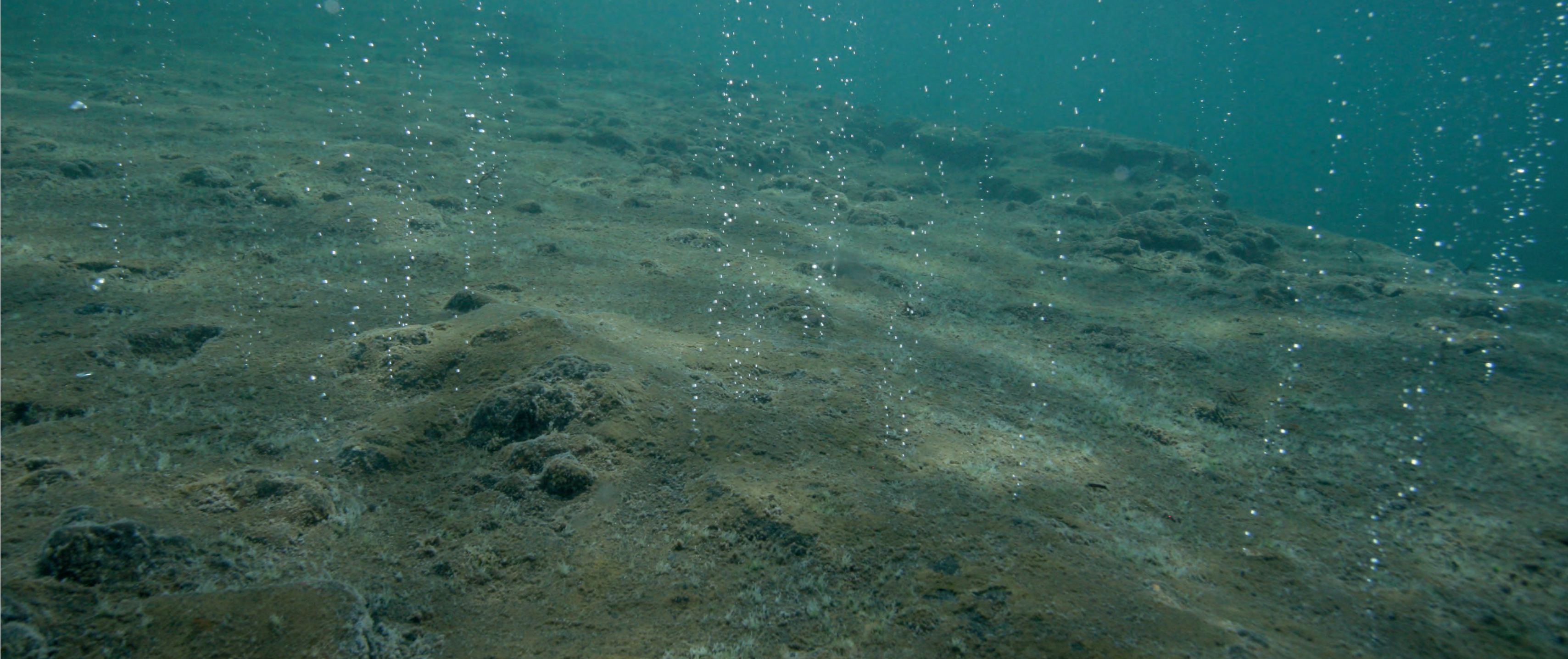
We surveyed the Naples seeps in 2007 and discovered that the gas was indeed carbon dioxide and it caused dramatic shifts in coastal marine ecosystems, including rocky reefs, sea-grass beds and sediments. Our work was published in the scientific journal *Nature* the following year. Since then I have been organising expeditions to underwater volcanic vent systems around the world to gather evidence about the ecosystem effects of ocean acidification at carbon dioxide seeps.

JASON HALL-SPENCER



We monitor the seawater chemistry at these sites and survey the distributions of organisms to find out which ones can tolerate increasing levels of carbon dioxide. We also conduct experiments to work out the mechanisms by which ocean acidification affects marine life. This evidence is now being widely used to inform scientists, policy-makers and the public about what we need to do to protect iconic ecosystems, like coral reefs, from the ravages of acidification. Conserving the ecosystems by removing other stressors on them seems our best bet, while at the same time trying, as a society, to reduce carbon dioxide emissions.

As I write this I'm on my way to the UN's ocean acidification coordination centre in Monaco to update an assembly of international delegates about our latest findings and to discuss how this new knowledge can inform policy. By helping to provide evidence about what rising carbon dioxide levels do to the oceans and communicating it to the public, industry and political decision-makers, the SOSF is bridging a key gap.





TOVA HAREL BORN OVSKI



WHO I AM

Having spent my early years travelling around the world, learning different languages and diving in different oceans, I have developed an immeasurable appreciation of the marine environment and its delicate ecosystems. Two decades ago, my husband Navot and I sailed with our two toddlers from Florida to Palau, an island of the Micronesian group in the western Pacific Ocean. We made our home on the island in 1993 and had two more children.

I soon acquired a deep love for the culture, flora and fauna of this island nation. The realisation that sharks are badly treated locally and internationally, and that little is known about many of the species, led me to establish the Micronesia Shark Foundation (MSF) in 2002. I am the president of MSF and the owner and general manager of the Fish 'N Fins dive centre and the *Ocean Hunter* live-aboard scuba fleet.

WHERE I WORK

Among the projects I am involved with is one that takes education about sharks into schools. I developed a programme that appeals to island children and for the past five years have travelled with a dedicated team to all the elementary schools in Palau. With the programme as a model, the team has also visited the is-

The Save Our Seas Foundation has been the main sponsor of our shark research and education and has made it possible for MSF to extend its scope and expand its database.

lands of Yap and Pohnpei in the Micronesian region. 'Finny the Funny Shark', the lead actor in the programme, has become a popular mascot at local schools.

I got together with talented local youth and created two children's books that deal with protecting sharks. With the help of the Save Our Seas Foundation (SOSF), we hand out the books to all fifth-graders in Palau and on the neighbouring islands.

WHAT I DO

Through MSF I initiated the first shark study in Palau, which collected, distributed and analysed data that could be used to protect sharks in the region. Micronesia's first shark count was part of this, whereby tour operators and volunteers recorded the sharks they saw and noted other information, such as the species, gender and markings of the individual and the depth and water temperature of its location. Working with government organisations, we used the results to assist with shark protection. Collecting DNA samples, documenting illegal shark finning in Palau and developing shark count procedures also led to the compilation of a significant amount of data, which was recognised as valid citizen science and formed the basis of a scientific paper.

In partnership with the Australian Institute of Marine Science (AIMS) under the leadership of Dr Mark Meekan (also a member of the SOSF scientific team), MSF has been conducting various shark studies in Palau. Over the past couple of years these have included: an analysis of habitat use by grey reef sharks; fitting five sharks with depth-sensor tags to better understand the depth distribution of sharks; identifying individual sharks for population demography studies by means of a new non-invasive technique; and reef surveys in Koror State Southern Lagoon and of Eastern and Northern reefs, and a comparison of the results with those from the survey of South West Islands reefs in June 2012.

We have also published a study entitled 'Socio-economic value of reef sharks as a non-consumptive resource in Palau, Micronesia', and launched a documentary about the problem of illegal fishing in remote parts of Palau and the resulting decline in reef sharks. Our ongoing community monitoring programme continues to thrive, with close to 4,000 shark count sheets having been returned by ecotourism operators over four years. And we continue to work closely with the Palau government on shark protection issues.

Looking ahead, MSF aims to maintain its efforts to protect sharks in Palau and Micronesia. Without government and community support, the region's healthy shark population could vanish very quickly.

MIGRATION, POPULATION STATUS AND MONITORING OF GREY REEF SHARKS IN PALAU & SHARK EDUCATION IN MICRONESIA

MICRONESIAN SHARK FOUNDATION

2008-2013

REPUBLIC OF PALAU

MICRONESIA, PACIFIC OCEAN

RESEARCH, CONSERVATION & EDUCATION

GREY REEF SHARK [CARCHARHINUS AMBLYRHYNCHOS]



ABBIE HINE



WHO I AM

Having grown up by the British seaside and spent hours messing about in the water and on boats and beaches, I suppose it was inevitable that the marine environment would continue to be a permanent feature in my life. Yet I'm not sure I could ever have imagined that it would give me the career, experiences and opportunities in some outstanding parts of the world that it has.

A childhood spent mostly outdoors ingrained into me the need to respect and care for nature and the environment. Even from a young age, I never questioned that I wanted to work in conservation, but it wasn't until my gap year, when I headed to the tropics and learned to dive, that my focus really began to develop.

With one degree to my name and the experience of a few years of working on marine research expeditions, I realised that how and what people are taught about the seas around them can influence their behaviour and their desire to protect them. My Masters degree in coastal tropical management developed this insight further, and my research paper looked into how marine education can be used as a form of management to reduce damage to coral reefs. I subsequently worked for three years as a resident marine biologist at luxury resorts in the Maldives.



**MARINE EDUCATION: A TOOL TO CONSERVE
THE SEYCHELLES MARINE ENVIRONMENT**
WISEOCEANS
2009-2013
SEYCHELLES
EDUCATION
CORAL REEF ECOSYSTEMS



In 2007, while working in the Maldives, I was in the right place at the right time to come into contact with the Save Our Seas Foundation (SOSF). I was working on a coral propagation assignment and the SOSF asked me to take this experience over to the Kingdom of Saudi Arabia, where I set up a small reef restoration project and conducted some marine education classes for the Foundation. The education element of this undertaking expanded and moved to the Seychelles where, for the past three years, I have been coordinating a large marine awareness project.

WHERE I WORK

The Seychelles is a country of outstanding natural beauty with very diverse coastal and oceanic habitats. As a nation, however, it relies heavily on its marine resources, focusing on tourism and fisheries as its main economic activities. Due to poor public awareness of their importance and a lack of sustainable development, these marine resources face serious depletion – and the conservation consequences of that would be extremely severe.

In order to counter the depletion it is important to change opinions and behaviour – and the best way to do that is to educate people. Enthusiastic and

passionate teaching combined with visual aids, in-water experiences and a more penetrating look into the intricacies of the marine environment can lead to improvements in environmental stewardship and a renewal of the feeling of ownership.

WHAT I DO

The ocean awareness project is both lively and productive, taking marine education into schools throughout the Seychelles and also into the nation's tourist resorts. To date, the project has passed an awareness of the marine environment on to thousands of local schoolchildren aged between three and 18, as well as to hundreds of teachers and tourists and the wider Seychelles community.

Education is a brilliant way to increase our enjoyment of the oceans and the life within them. More importantly, it is key to helping to preserve the marine environment. Education can stir a sense of wonder for the beauty of oceans and a compassion for their vulnerability.

ALI HOOD & CAT GORDON



WHO WE ARE

With a BSc (Hons) in marine environmental science and an MSc in applied marine science, Ali has worked for marine science and conservation charities for more than 17 years. Her intrigue for the sea started at a young age; as a child in Cyprus she could often be found sitting on the seabed (with a lap full of rocks to weigh her down), feeding an insatiable curiosity for life underwater.

Ali later wound up in North Queensland, Australia, where as a teenager she worked in environmental tourism by crewing on a traditional boat that took the public as well as researchers from the Australian Institute of Marine Science and James Cook University out onto the reef and into mangrove systems and sea-grass beds. Catching sea snakes and surveying dugong populations convinced her that a career in the marine environment was unavoidable.

In 2002 Ali began working for the Shark Trust, a conservation charity based in Plymouth, UK, and is now its director of conservation. She works with the conservation team to secure effective science-based conservation and fisheries management, contributing to a more sustainable future for sharks. As a natural forager herself, she realised that eggcase

hunting might appeal to the wider public and launched the Great Eggcase Hunt in 2003. It is now one of the most popular wildlife-recording activities in the UK.

A conservation officer at the Shark Trust, Cat delivers the Basking Shark Photo-ID and Great Eggcase Hunt projects, and in the latter case is leading the development of a Smartphone App. Her keen interest in nature and the environment surfaced at an early age, but it was only when she learned to scuba dive at the age of 14 that she fell in love with the ocean and its inhabitants. When it came to deciding on a career, she opted to study for a BSc (Hons) in marine biology and coastal ecology followed by an MSc in conservation biology, with a view to working in marine conservation. It was while she was at the University of Plymouth that she began to volunteer at the Shark Trust.

Cat's subsequent work in various areas of conservation – as a marine research officer on a remote island in Fiji, a dive master in Thailand and the warden of a Ramsar nature reserve in Spain – gave her a more rounded understanding of how different ecosystems interact. She joined the Shark Trust full-time in 2010 and, as well as organising outreach and



educational events, is responsible for developing the Great Eggcase Hunt project and engaging new audiences.

WHERE WE WORK

Shark conservation is often seen as the exclusive realm of those who scuba dive in clear, tropical waters. The Great Eggcase Hunt, however, provides a tangible link to the diverse world of elasmobranchs in the North-East Atlantic, making shark conservation accessible to a broader range of people – and they don't even have to get wet! Eggcases are washed up all year, so hunting for them is a fine excuse for a beach walk in winter and adds an extra dimension to a summer holiday.

Although based in Plymouth, with the majority of information submitted from UK beaches over the years, eggcase hunting can take place all over the world. Records have been submitted from South Africa, Australia, the USA, The Netherlands and Malta to name just a few countries, and sister projects have been set up by organisations in France, Ireland and Croatia. With the collaboration of the Wildlife Conservation Society, the Great Eggcase Hunt has even been launched in the USA. The reaction there

has been phenomenal, with park rangers and members of the public equally excited about it.

Eggcases are sought not only on beaches but also in museum collections, where the Shark Trust improves its understanding of shark taxonomy in the region while updating specimen collections with newfound knowledge.

WHAT WE DO
The Great Eggcase Hunt was established to get a better understanding of the relative abundance and broad distribution of skate and egg-laying shark species around the UK and at the same time raise awareness of the diversity of sharks, skates and rays in British waters. As catch composition changed over the years and population numbers for the larger elasmobranch species declined, the Shark Trust realised that relatively little was known about their life history and that insights into the egg-laying phase at least would be valuable.

Many elasmobranch species are oviparous, laying their eggs in tough, leathery cases (known as ‘mermaid’s purses’) that are deposited on the sea floor or attached to seaweed. Once the miniature skate or

shark has emerged several months later, the empty eggcases often become dislodged and are washed ashore. The mermaid’s purses of approximately 10 skate and two shark species are commonly found on UK beaches, and we can identify which species they belong to by their size, shape and differing features.

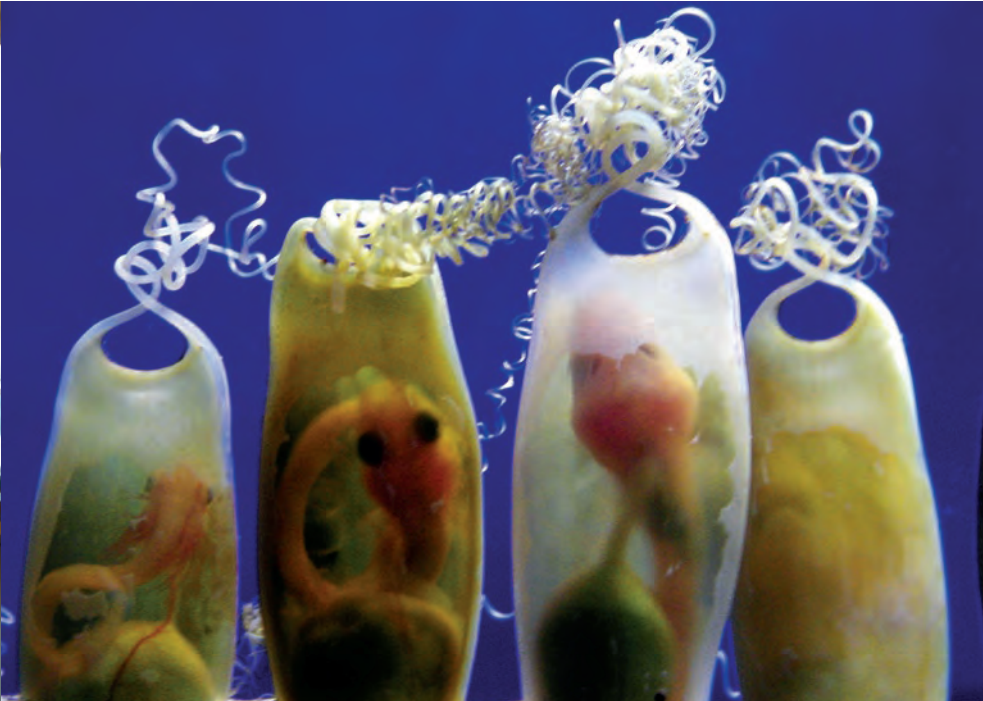
Spent eggcases provide an easily accessible source of information about the location of egg-laying elasmobranch populations and their potential nursery grounds. The identification of these critical areas will enable the Shark Trust and other marine organisations to propose management measures that will help to reverse the decline of these charismatic animals and allow us to support sustainable fisheries.

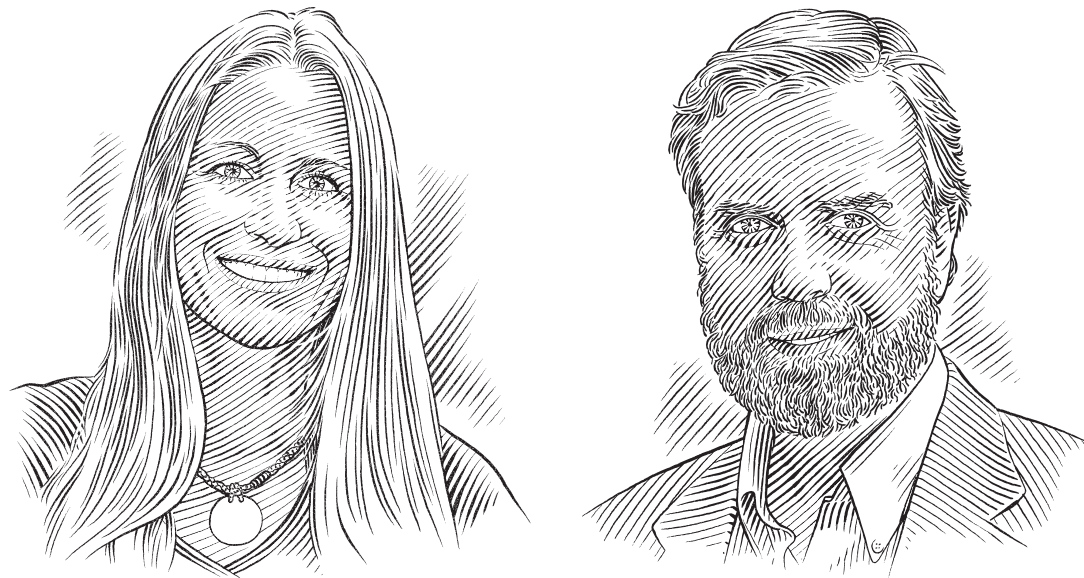
As a ‘citizen science’ recording project, the Great Eggcase Hunt provides an important platform to engage the public and raise awareness of the presence of elasmobranchs in British waters and the important role they play in the marine environment. The project has grown dramatically since its inception and the database now holds about 40,000 records. As awareness about it has increased and technological advances have been made, more people are getting involved and submitting records with accompanying photographs

and specific locations. This enables us to verify significantly more records, thus improving the accuracy and quality of the database.

From the start, the Great Eggcase Hunt gained its own momentum, but the support of the Save Our Seas Foundation (SOSF) enabled the Shark Trust to maximise the project’s potential for public engagement and citizen science. SOSF funding has dramatically improved the resources available to the project. The creation of a dedicated Smartphone App will improve the overall quality of the database by encouraging users to submit their records with a photograph for verification.

THE GREAT EGGCASE HUNT
THE SHARK TRUST
2010, 2012-2013
UK – NORTH ATLANTIC
RESEARCH, CONSERVATION & EDUCATION
SHARKS, SKATES & RAYS





WHO WE ARE

‘There was something about the whale’s eye that drew me in, connected with me and inspired me,’ says Kim Bassos-Hull. ‘I was on a high school outing to watch whales off Provincetown, Massachusetts, when I had a up-close encounter with a spy-hopping right whale. Then and there I decided to study the fascinating creatures of the sea that we only glimpse before they slip back into their watery world.’

‘This decision led me to the University of California at Santa Cruz (UCSC) in 1986, where I obtained my BSc and MSc degrees. Through research opportunities at UCSC I was introduced to Hawaiian spinner dolphins, northern elephant seals and a bounty of marine wildlife in nearby Monterey Bay. I was also able to interact with two lab-bound bottlenose dolphins, Echo and Misha, and eventually return them to Florida and reintroduce them to the wild. At the same time I became a research biologist at Mote Marine Laboratory in Sarasota, Florida, and met my husband, Captain Peter Hull.’

‘The year 2009 was pivotal for me: I started a kayak and paddleboard tour company and, with my husband, a research project on spotted eagle rays.’

Targeted by fisheries in some countries, the spotted eagle ray is a species we know very little about. We are lucky to see these graceful, beautiful fish in our coastal waters as they glide over sand shoals and sea-grass flats, sometimes leaping high into the air.

‘The amazing times I’ve spent on and in the water remind me how much my spirit thrives on my connection to the ocean. Imagine a calm day after a large thunderstorm has passed, not another soul on the water, and then “whoosh”, a dolphin and her calf surface next to your paddleboard. Or paddling over a sea-grass flat and watching a bonnethead shark searching for its next meal. These are experiences I share with paddling guests, Mote interns, research colleagues and anyone who wants to take a moment to listen and feel the spirit of the sea.’

‘Growing up in the Jacques Cousteau era, I believed that marine biology was the future for someone interested in science,’ explains Bob Hueter. ‘My fascination with Cousteau’s explorations led me to take up diving at a young age. Spending summers on the south-east Florida coast, I snorkelled the local reefs and would watch and listen to the

undersea life for hours – the myriad colours and forms, the sounds of barnacles closing and fish crunching on the reef. It was magical, and so perfect because all the living organisms were so well adapted to their environment. On those dives, my innate affinity for science came together with an acquired passion for understanding how life in the sea works. That was almost 50 years ago, and I have been a marine biologist ever since’.

BSc and MSc degrees at the University of Miami (UM) in biology and marine biology and a PhD in zoology at the University of Florida prepared me well for a life of scientific study. As an undergraduate intern at a lab on UM’s marine campus I studied vision in sharks. That got me hooked and I have been researching sharks and their cartilaginous relatives ever since. Early lab work on the physiology of sharks was matched by field studies of their behaviour and ecology. In the late 1970s and early 1980s I tagged sharks from New England to Bermuda and the Bahamas. Thousands of sharks, long days working fishing gear, sailing before hurricanes – it was all so alive and inspiring.





It is both important and exciting to reach across the Gulf of Mexico and establish relationships with international colleagues and students to make new discoveries about the poorly understood but beautiful spotted eagle ray. Save Our Seas Foundation (SOSF) support has enabled us to interact with Mexican and Cuban researchers as well as involve students in hands-on training and outreach opportunities. The SOSF has an amazing website, social media presence and support network that allow us to bring our conservation stories to public attention. KIM BASSOS-HULL



‘When I came to Mote Marine Laboratory in 1988, I found a place as alive as the sea itself. It was like a research ship on land, everyone with a passion to explore new waters. In 1991 the designation of Mote as the US Center for Shark Research enabled us to achieve new heights in our studies on sharks, skates and rays, including their relationship with human society. All this has led me to assist Kim and her team in their study of the spotted eagle ray. We must save this species for future generations because we must save the ocean itself. I believe the best way to do that is with good science and a caring spirit.’

WHERE WE WORK

Our conservation project on the spotted eagle ray *Aetobatus narinari* is providing much-needed information about its life history, abundance, behaviour, population structure and critical habitat in the Gulf of Mexico and western Caribbean Sea, as well as about the impacts of fisheries on the species. In some parts of the world, including Mexico and Cuba, these rays are targeted by fisheries or taken as by-catch.

We at Mote are working with academic institutions in Mexico (ECOSUR) and Cuba (University of Havana), bringing students from both nations to our field site in Florida and collaborating in all three countries to study and protect this ray. Our public outreach and education programme engages students on several levels, using exhibits on spotted eagle ray conservation, video productions, teacher training and media interviews.

WHAT WE DO

The spotted eagle ray’s extremely low fecundity (one to four pups per litter) and vulnerability to fisheries have led to an IUCN listing as Near Threatened with a decreasing population trend. We are filling the gaps in research data needed to protect the species and build international bridges for its conservation.

Our work involves aerial, on-water and fisheries surveys, tag-and-release in the wild, international exchanges and training, and public outreach and education. We are discovering, among other

things: fluctuations in the spotted eagle ray’s seasonal and annual abundance; growth rates and size at maturity; reproductive biology, including mating and pupping; genetic stock structure; and fisheries characteristics and landings. Our project addresses urgent concerns about the ray’s biology and status in the Gulf of Mexico and the Caribbean Sea and serves as a model for collaborative study and protection of this and related species worldwide.

CONSERVATION RESEARCH ON THE SPOTTED EAGLE RAY
MOTE MARINE LABORATORY, INC.
2013
GULF OF MEXICO AND CARIBBEAN SEA, USA, MEXICO AND CUBA
RESEARCH, CONSERVATION & EDUCATION
SPOTTED EAGLE RAY [<i>AETOBATUS NARINARI</i>]



FRAN HUMBER



SOSF funding has enabled Blue Ventures to do the first ever trial with communities to collect shark fishery data using smartphones. We have been able to demonstrate that the benefits of new technology can be harnessed in the most remote communities to improve our understanding of local fisheries. We believe that this technology could be used by a wide range of organisations and disciplines to increase information flow in and out of remote areas.

WHO I AM

Most people working in marine conservation say that they have always had a passion for the sea and its inhabitants since as far back as they can remember. My background is no different, and learning to scuba dive and seeing marine creatures up close confirmed that this environment would define the rest of my life.

After studying biology and marine biology at university in the UK, I volunteered and worked for marine conservation groups in the Philippines and Indonesia. There I savoured the opportunity to learn the Latin names of corals and was proud that I could demonstrate the difference between a corallimorph and a zooanthid. Just as I was looking for the next opportunity, a random e-mail landing in my university inbox meant that in 2005 I started working for Blue Ventures Conservation in London, when we were still a small team juggling multiple roles and working out of the back room of a friend's house.

Blue Ventures' work has always focused on Madagascar and in 2007 I visited the south-west of the country to study the artisanal shark and turtle fisheries for four months. We'd highlighted these two fisheries as ones we wanted to learn more about.

We knew both are important – the turtle fishery is significant culturally and the shark financially – but both are almost invisible if you're not in the right place at the right time.

It was during this first time in Madagascar working alongside the community of Vezo fishers that I had my 'moment': conservation isn't really about animals, even if it's a passion for them that leads us to study what we've studied. To be a successful conservationist today you have to have a passion for people too, not only because almost every environment is now inhabited by humans or is under their influence, but because to truly care about the state of an environment or a species you have to also truly care about the people who live in that environment or who may rely on that species for food or income.

WHERE I WORK

With this in mind, we developed with the Vezo community a method to monitor the shark and turtle fisheries in Madagascar. Community members would act as the eyes and ears of the project across a number of villages to record data on animals landed in their locations and were given digital cameras for taking

photos. This was the first community-based assessment of the status of these two fisheries in Madagascar and is now the longest-running project of its kind.

The communities that we work with are at the heart of Blue Ventures' operations, which have now developed into an integrated Population, Health and Environment (PHE) programme, nurturing approaches for locally led marine conservation initiatives.

Although my time is now spent mostly in the UK, I relish my visits back to south-western Madagascar to work with our team of dedicated scientists, researchers, community liaisons and community data collectors. The Vezo people are extremely welcoming and before you know it you are sitting in a local sailing boat (pirogue) for eight hours, listening to the chatter and laughter of the sailors as you bob from one remote village to the next. At dawn the next morning, before you set out on a data-collecting trip, you are greeted by smoke swirling around the homestead, the sound of coffee being pounded and the smell of charcoal fires.

It's now 10 years since I first started working in this field and I can barely remember those Latin names of corals. Instead I have realised that I have

something much better: I can now name the people we work with in Madagascar and the community members who have benefited from Blue Ventures’ PHE programmes. Thomas, the ex-shark fisherman who taught me everything I know about the shark fishery; Noavy, the wife of a village president, who for six years has been collecting shark data with us; Richard, the leading community sea-cucumber aquaculture farmer; Balbine, the supervisor of community-based distributors providing access to family planning; Joelson, a student supported through our education programme; Marcel, Eloi, Silvere, Roger, Clement, Elina, Zizienne, Hery, Tovotena... The list goes on and on.

WHAT I DO

Our current work with the Save Our Seas Foundation focuses on Madagascar’s shark fishery and aims to capitalise on the growing use of mobile phones in the region to gather real-time data. This not only increases our knowledge of this shark fishery and how it’s changing over time, but will also provide information back to communities and then to other researchers through the development of an online platform where shark landings can be viewed.

Talking to elders reveals that shark populations in particular are likely to have suffered major declines in Madagascar. Where once large sharks could be caught in the near-shore lagoon, nets now have to be set in the deeper offshore waters of the Mozambique Channel. Although the fishery is legal, there is no management in place and it is our hope that the data we collect can help to provide evidence for the need to manage shark fisheries in Madagascar.

This is a daunting task considering the lack of enforcement capacity and the high prices that shark fins fetch compared to other marine resources. Yet, viewed as part of Blue Ventures’ broader scope, we believe that locally managed marine areas should be promoted and that they can help to compensate for the lack of top-down management. Moreover, within robust communities that have an inherent understanding of the need to ensure livelihoods for their children, they can be extremely effective.



EMILY HUMBLE



Support from the SOSF has enabled me to carry out vital steps of the Manta Ray Genetics Project helping to push it further towards success. It has also given me a platform to engage with the public and emphasise the importance of genetic work in conservation.

WHO I AM

We are living in an age of ‘big data’, when an information revolution is aiding the transition from conservation genetics (the study of the composition and functioning of a single or handful of genes) to conservation genomics (the study of the entire genetic make-up of an organism to enable a broader understanding of its influence on the species). We can now address new questions that we could never approach before, and also go back and revisit old questions in greater detail. I am a young scientist who wants to ensure that this shift is widely and robustly applied to the marine environment.

While studying biology at the University of Sussex between 2008 and 2011, I got hooked on conservation genetics: applying molecular methods to resolve problems in conservation and to help restore biodiversity. Under the watchful eye of Professor Trevor Beebee I carried out my first lab-based research project: the population genetics of endangered natterjack toads.

Outside the lab I worked in Ecuador, a country that boasts the highest concentration of species in the world and is home to the largest population of oceanic manta rays. I didn’t have to travel far to get a glimpse of the damage being done along its coast.

In the sleepy fishing village of Puerto Lopez, destruction arrives each morning when thresher sharks are dragged through the shallows and packed into trucks that bounce them along dusty roads to their fate. Dead mobula rays splayed out on the dirty wet sand reek of unsustainability. Juvenile hammerheads are lined up one by one between great billfishes being hacked into pieces. Desensitised to the scene and covered in blood and scales, men and women work quickly to gut the day’s catch. Exposure to such brutality leaves me confused and frustrated and I wonder what the next day will bring.

As fisheries decimate populations of vulnerable rays and sharks, conservationists are pushing desperately to give these elasmobranchs proper protection at both species and habitat levels. Sometimes there is success: in the summer of 2011 I was lucky enough to become familiar with the largest (and most protected!) population of reef manta rays in the world.

A quiet, empty lagoon lies in the middle of a marine protected area in the Maldives. We sit in our boat, waiting. The wind changes and, as if on cue, the rays arrive. We dive into the chaos of mantas as they twist and turn, scooping up every inch of copepod in the water column. Their agitation is obvious, and

trying to document each individual becomes overwhelmingly difficult. But occasionally one engages with you, follows you, checks you out – and leaves a lasting impression.

On the way back to shore we jump overboard again to follow reefs encrusted with anemones, coral and sponges and teeming with schools of feeding fish. We reach sandbanks and swim with bottlenose dolphins mothering their calves. When the sun sets I hope that tomorrow won’t disappoint. Unfortunately, this tropical paradise is one of only a few.

WHERE I WORK

Elasmobranchs form the most diverse group of vertebrates in the ocean, yet have been least studied at the molecular level. Realising the increasing need to apply novel molecular methods to these vulnerable species, I went on to complete an MRes in biodiversity informatics and genomics at Imperial College London. Here I utilised the latest technologies and computer power to begin filling the gaps in elasmobranch gene sequence data.

None of this is possible without tissue samples and so my year began with long days on a small fishing boat in the dim light of the icy North Sea,

waiting for porbeagle sharks. Back in London, I spent several weeks in a lab squeezing out as much genetic material from tissue samples as possible before sequencing and comparing the transcriptomes (a vital and important part of the genetic code) of several shark species, including makos and porbeagles. This enabled a better understanding of what made these sharks belong to their particular species.

In 2013 I received a grant from the Save Our Seas Foundation, which allowed me to start the Manta Ray Genetics Project. Still based in London, I work closely with friends and colleagues around the globe who are involved in a vast number of manta ray field projects.

WHAT I DO

The demand for the gill rakers of manta and mobula rays has been increasing at a faster rate than our understanding of the animals’ evolutionary history and population dynamics. Although protective measures are beginning to come into play, manta and mobula rays are often difficult to identify in markets. If protection for these species is to be properly enforced, we must develop a way to monitor effectively the fisheries that supply these markets.

It is these concepts that frame the Manta Ray Genetics Project’s endeavours. In the first instance, and perhaps most importantly, the project’s field workers around the world are collecting tissue samples that will enable us to take a genome approach – an approach that will help us to understand the divergence of manta ray species, identify priority populations for conservation, and monitor and protect them by means of species ID and traceability.

Genetic techniques have the power to address conservation priorities that are difficult to tackle in any other way, and species protection will increasingly come to rely on such methods. I believe genetic work will promote the more effective management of manta rays and their close relatives, and should thus be supported and utilised by conservationists and marine scientists alike.



MANTA RAY GENETICS PROJECT

THE MANTA TRUST

2013

WORLDWIDE

RESEARCH

OCEANIC MANTA RAY (MANTA BIROSTRIS)

& REEF MANTA RAY (M. ALFREDI)



CHARLIE HUveneers



Thanks to the Save Our Seas Foundation, I will be able to travel around Australia to sample as many old white shark jaws as possible. The funds provided will also enable me to use novel genetic analyses to extract ancient DNA, which is notoriously difficult because of the high likelihood of cross-contamination and degradation.

WHO I AM

Although I am originally from Belgium, which has only a 60-kilometre coastline, I have always been attracted to the ocean. My homeland's marine fauna and flora may not be renowned for bright colours or amazing diversity, but they were enough to spark an interest in the underwater world that has become a lifelong fascination.

My specific interest in sharks started when I was 11 years old. Our teacher asked us to do a presentation on an animal, and while most of the children did theirs on cats or dogs, my mother suggested that I do mine on sharks. She bought me a book about them, which ended up being the catalyst for my passion for these magnificent creatures. The scientific editor of this book was Dr John D. Stevens, with whom I tagged sharks off north-western Australia 18 years later. Little did I know as an 11-year-old kid that I would one day work with one of the editors of the book I was reading.

Seventeen years after this presentation, I achieved one of my biggest goals by taking up a position as a shark ecologist at the South Australian Research and Development Institute (SARDI) and Flinders University in South Australia, where I formed the Southern Shark Ecology Group (SSEG). Not only

had I successfully secured a highly sought-after position, but the journey to it had taken me to some amazing locations and experiences.

After high school in Belgium, I participated in an exchange programme with the Rotary Club that allowed me to experience Australia for the first time. Thanks to having learnt English during my exchange year, I was able to enrol at an English university and completed my undergraduate degree with honours at the University of Southampton. While studying and in the following years I volunteered for various shark-related projects that gave me an introduction to research. They included studies on basking sharks in England; pelagic sharks in the Gulf of Mexico; lemon sharks in the Bahamas; white sharks in South Africa; requiem sharks and leopard sharks in Queensland; and grey nurse sharks in New South Wales (NSW).

In 2002 these experiences and my degree helped me to get an international scholarship for a PhD at Macquarie University, Sydney, on the biology and ecology of wobbegong sharks in relation to the commercial fishery in NSW. Next, with SARDI, I investigated the diet and trophic role of pelagic species and used satellite technology to follow their movements and migrations.

By 2007 I was running the Australian Acoustic Tagging and Monitoring System, which involved deploying acoustic receivers around Australia and creating a national network of acoustic telemetry users. Two years later I was offered the joint positions of shark ecologist and lecturer at SARDI and Flinders University.

I have received seven scientific awards and am an active member of the IUCN's Species Survival Commission's Shark Specialist Group, for which I have co-authored more than 60 Red List assessments. I've written or co-authored numerous other publications, including peer-reviewed papers, reports and scientific presentations. The SSEG group has undertaken a wide range of studies, many of which involve white sharks and genetic analyses. Some of the key projects have been assessing the effects of berleying (also known as chumming) on white shark movements; monitoring threatened, endangered and protected shark species and species of conservation concern within the Adelaide metropolitan region; assessing the efficiency of the Shark Shield and its risk to white sharks; and determining the critical habitats and movement dynamics of the bronze whaler off southern Australia.



WHERE I WORK

Over the past few years Australia has gained the dubious distinction of having the largest number of fatal shark attacks in the world. The fear of sharks and in particular of the great white shark, the species that has been responsible for most fatal attacks, has resulted in a much public angst and a political backlash that has seen the promotion of control measures such as culls, beach netting and the hunting of individual sharks deemed to be responsible for attacks. Much of this debate has been fuelled by the uncertain status of white shark populations since their protection in the late 1990s. Proponents of culls suggest that numbers are increasing, but there is little scientific evidence to confirm or refute this idea. This offers an opportunity for emotive and unsubstantiated views to be promoted in the media and to influence political decisions on the future of this species in Australian waters.

WHAT I DO

Our project addresses directly the question of fluctuations in the size of the Australian population of great white sharks. We will examine evidence for changes in the effective population size based on genetic comparisons of historical and contemporary

samples. Jaws of great white sharks have been collected as trophies by fishermen for many years. We will use these historical collections (we have identified more than 100 jaws in both private and public holdings) to estimate the effective population size before white sharks were protected.

Contemporary samples collected as part of our tagging studies will enable us to assess changes in the population size. Our aim is to provide robust estimates of population trends in great white sharks so that the debate about the status of this species and the options that are being considered to manage it are based on scientific evidence rather than only on emotion.

HOW MANY WHITE SHARKS? TEMPORAL VARIATION OF THE AUSTRALIAN WHITE SHARK POPULATION
FLINDERS UNIVERSITY
2013
AUSTRALIA
RESEARCH
GREAT WHITE SHARK [CARCHARADON CARCHARIUS]





This is a project that is very close to our hearts and required urgent action. By providing our initial funding, the Save Our Seas Foundation played a fundamental role in the establishment of the Sawfish Alert Network.

As a French marine biologist based at the oceanographic research centre in Brest, north-western France, I first focused on sharks 15 years ago, when I embarked on a project on basking shark ecology and movement patterns. I am now involved in the organisation Des Requins et des Hommes (DRDH; Sharks and Humans), which aims to bring shark conservation and human activity closer together in some of the areas that are most critical for elasmobranchs.

My interest in sawfishes developed during a year-long sailing trip in western Africa, which presented me with a unique opportunity to learn about the subregion. Sawfishes are critically endangered and had been presumed extinct in West African waters for 15 years. However, meetings with local fishermen convinced me that these rays still occur occasionally and that there is an urgent need for conservation action.

With this in mind, I teamed up with Mika Diop and George Burgess, both experts in shark research, to form AFRICASAW. We have three main objectives: to locate key areas for sawfish populations; to create, train and manage the Sawfish Alert Network, which will ensure that all sightings,

catches and trade of sawfishes are recorded; and to communicate with local people in order to minimise their interactions with these rays and thus reduce mortalities. Determined to reverse the dramatic decline in western African sawfishes, we first presented this ambitious objective to the IUCN meeting about sawfishes held in London in 2012.

WHERE I WORK

The first AFRICASAW field expedition was conducted in December 2013 in Sierra Leone and Guinea-Bissau, where we partnered with scientists from the two countries' fisheries ministries and travelled along the coast and up river estuaries. The tour gave us the opportunity to speak to 850 fishermen directly and make them aware of the need to protect sawfishes, and word spread further to about another 6,000 indirectly.

In Guinea-Bissau our team comprised Inluta Incom from the National Shark Focal Point and Ceuna Quade from the Centro de Investigação Pesqueira Aplicada (CIPA). We visited 38 strategic villages to speak to local people about the predicament that sawfishes find themselves in and to collect data about

sawfish catches. Our intention was to enlist the villagers' help in monitoring the presence of sawfishes by means of the alert network.

Aissa Regalla, who heads species conservation at the Instituto da Biodiversidade e das Areas Protegidas, and technicians from the national Marine Protected Area (MPA) accompanied our team into the field to share their invaluable knowledge about local biodiversity and habitats as well as indigenous traditions and languages.

In Sierra Leone, AFRICASAW team Lahay Sisey from the National Shark Focal Point and Mohamed Kamara and Charles Baley from the Ministry of Fisheries and Marine Resources accompanied Justine Dossa and me on a 700-kilometre trip for the same purpose. Departing from Freetown, we travelled by 4x4, speedboat and motorbike around the country's jagged coastline.

WHAT I DO

During each meeting we learned about the village chiefs', harbour masters' and fishermen's extensive traditional knowledge of their natural heritage. In most places, the local authorities reacted quickly

ARMELLE JUNG





to our arrival and our team was led to the centre of the village to sit down and talk. We would offer traditional gifts like tobacco, local rum or a small tip. When these had been accepted, our local partners explained the reason for our visit and we were welcomed. Then the interview would begin.

Once we started to talk, the number of people around us often grew to an impressive crowd. Most of these were fishermen, who were aware of the sawfishes' plight and were as concerned as we are. Although sawfishes are not deliberately targeted, they are often caught as by-catch in gill nets, a fishing method not practised by traditional fishermen.

Most of the villages accepted our invitation to become part of the Sawfish Alert Network and were given a laminated information poster that explained what they should do if they found a sawfish in their net. Printed on the poster was the mobile phone number of the AFRICASAW representative who will be in charge of coordinating the network. Some 'sawfish

friend' T-shirts promoting the network were also offered to the village authorities.

In addition, we recorded numerous personal accounts of interactions with sawfishes, especially in relation to these rays' biological behaviour and their traditional uses and the symbolism surrounding them. This research provides evidence of the actual presence of the common sawfish *Pristis pristis* and smalltooth sawfish *P. pectinata* in both countries.

Most of the villagers we spoke to mentioned the significant decrease in sawfish catches over the past 15 to 30 years, identifying the major cause as the increase in destructive fishing methods: demersal trawlers in Sierra Leone and bottom-set nets in Guinea-Bissau. Nevertheless, some sawfishes have been caught every year since 2010 (14 in Guinea-Bissau and eight in Sierra Leone), and in some specific areas they have included juveniles and mature adults.

As the next step in our research, our team is keen to experiment in a scientific fishery in these key

areas. Sawfishes still exist in western Africa; local people show interest in fighting to protect them and we will do our best to act hand in hand with them!

AFRICASAW: EVALUATING THE STATUS OF WESTERN AFRICAN PRISTIDAE
DES REQUINS ET DES HOMMES
2013
MAURITANIA, SENEGAL, CAPE VERDE, GAMBIA, GUINEA-BISSAU, GUINEA AND SIERRA LEONE
CONSERVATION & EDUCATION
SAWFISHES (FAMILY PRISTIDAE)



LUCY KEITH DIAGNE



WHO I AM

I've loved being by and in the ocean for as long as I can remember. I spent every summer of my childhood on beaches and riding waves in the north-eastern United States, and in my career I've been lucky enough to work at some of the most beautiful and remote beaches in the world. I've worked with penguins in Antarctica, Hawaiian monk seals on the atolls of the north-western Hawaiian islands, seals and dolphins in Maine, and manatees in Central America and some of the most spectacular places in western Africa. Although I am especially fascinated by marine mammals, I enjoy learning about all marine life and have worked with seabirds, sea turtles, fish and moray eels. I received my BSc in biology from St Lawrence University, my Masters in marine biology at the Boston University Marine Program in Woods Hole, Massachusetts, and I'm currently completing my PhD at the College of Veterinary Medicine at the University of Florida. Although I've spent the past 25 years primarily studying marine mammal behaviour, I decided to learn some new techniques for my PhD research: genetics as a tool to determine manatee population boundaries and sizes in Africa; and stable isotope analysis to determine what manatees eat. My husband is an African turtle researcher and we

The support of the Save Our Seas Foundation since 2009 has been vital for training local biologists who are now working towards the conservation of the African manatee in 17 countries. The SOSF has also funded important African manatee survey, health and genetics research that is determining for the first time where different populations of this rare species occur across the African continent. I'm extremely grateful to the SOSF for its enthusiasm for and support of this project!

often work together in the field, so we make a pretty good team! We're based in Senegal, West Africa, and Gainesville, Florida, USA.

WHERE I WORK

African manatees are found in 21 countries on the western side of Africa, so they live in a wide range of habitats: lagoons and flooded forest within equatorial rainforests, shallow sandy rivers at the edge of the Sahara Desert, and around coastal islands in the Atlantic Ocean – and in many others in between. My long-term study sites allow me to compare how manatees survive in the Central African rainforest of Gabon versus coastal mangrove and desert riverine habitats in Senegal. I'm fascinated by the way they live in these very different places and the challenges they face in each one.

A large part of my time is spent in small boats, cruising waterways looking for signs of these elusive mammals, mostly swirls of dark water as they swim away or nibbled leaves on plants overhanging rivers. Occasionally I'm lucky enough to have a curious individual swim up to the boat to check me out, or I'll visit a freshwater spring where manatees regularly come to drink. But for the most part it's like

chasing a ghost. African manatees are extremely shy, their watery habitat is muddy, and they live in places that are hard to get to. The challenge of finding them may seem daunting, but for me it has fed a desire to unlock the secrets of this 'forgotten sirenian' that we know so little about.

WHAT I DO

This project began when I embarked on a study of African manatees in Gabon in 2006. I did manatee surveys throughout the country and started training national park biologists and conducting educational programmes for schools. Over the next few years I extended the surveys to the lower Congo River in Angola, the Senegal River, the Niger River in Mali and the Bijagos Archipelago in Guinea-Bissau. I jumped at the chance to go to places where African manatees had never before been studied in depth.

In 2008 and 2009 a colleague and I taught manatee research and management workshops in Ghana for African biologists from 12 countries. During the workshops I realised there was a great need to share information and to train African researchers throughout the species' range. So I initiated a collaborative network for manatee field



work and conservation which now has members in 18 African countries. Identifying collaborators from all 21 countries in which the African manatee occurs and continuing to build a network for research at grass-roots level are among my project objectives.

This project also provides basic field research equipment and assists with the development of study plans tailored to specific countries or regions. I conduct workshops all over western Africa and have now trained some 72 African biologists in manatee field techniques and conservation planning. They in turn have trained more than 100 others in their home countries, so it's exciting to see my former trainees teaching others and starting their own manatee projects.

Of course, for me the quest for a better understanding of this species is very important, so my project also focuses on collecting biological samples for the analysis of health, genetics and diet, as well as to determine age. We take every opportunity to learn more; for example, the project funded the captive rearing of an orphan African manatee that stranded alone on a beach in Gabon at one month old. After three years of rehabilitation, this manatee was the first of its species to be successfully raised in captivity and released back to the wild. In the process we learned about manatee growth rates and normal baseline health parameters, and used the experience with this calf to teach the importance of preserving the species, which is unfortunately still heavily hunted almost everywhere it occurs. The project also works to increase educational outreach campaigns in a number of countries to educate people about the benefits of protecting and preserving African manatees.

The Save Our Seas Foundation has been a very important partner to us. Its mission to support research, conservation and education projects that focus on charismatic threatened wildlife species and their habitats closely mirrors the goals of the African manatee project. We both recognise that it will take a long-term effort that includes all of these components to protect vulnerable species like the manatee for future generations.

**AFRICAN MANATEE RESEARCH
AND CONSERVATION**
SEA TO SHORE ALLIANCE
2009-2013
GABON & SENEGAL

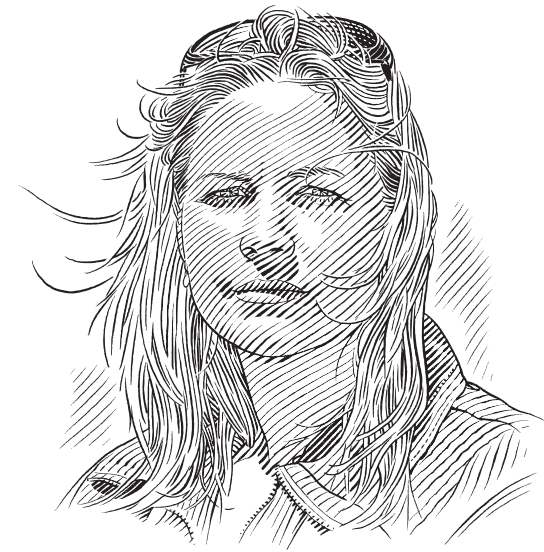
CONSERVATION

AFRICAN MANATEE [*RICHECHUS SENEGALENSIS*]





ALISON KOCK MONWABISI SIKWEYIYA SARAH TITLEY



WHO WE ARE

‘Growing up in Cape Town, South Africa, I’ve always enjoyed being close to the sea, but having a connection to one of its most feared and revered inhabitants – well, I never saw that coming,’ says Shark Spotters’ research manager, Alison Kock. ‘Fifteen years ago I was studying marine biology at the University of Cape Town and at the weekends I managed a car wash. One busy morning I saw something in the boot of a customer’s car that stunned me: photographs of a fully airborne great white shark just off Seal Island in False Bay. I couldn’t believe it.

‘Now a marine scientist, I’m determined to help secure the future of sharks through scientific research and community-based conservation strategies. My PhD, currently under review, is on the behavioural ecology of white sharks in False Bay. It’s critical for the conservation of sharks that everyone gets to know what researchers learn about them, which is why I try to make my work as accessible as possible. Sharks bring enormous personal, cultural, environmental and economic value to local regions, and this drives my passion to understand and conserve these magnificent predators.

‘My colleague Monwabisi, or Monwa, Sikweyiya is our field manager. He was born and raised

Since the Save Our Seas Foundation (SOSF) came on board as primary funders in 2009, its annual grants have made a significant contribution to the growth and development of the Shark Spotters programme. Its funding has enabled daily spotting operations to continue 365 days a year and allowed for the expansion of the programme to additional beaches. Aside from the monetary contributions, the support of the SOSF team with regard to public education about sharks and shark safety in Cape Town has been invaluable. Without doubt, SOSF’s financial and organisational support has contributed directly to the local success and international recognition of Shark Spotters, and for that we are extremely grateful.

in Khayelitsha, one of the biggest townships in Cape Town, and developed a love for the beach from an early age. He joined the local surf lifesaving club at the age of 15 and as well as being a lifeguard at his local beach he took part in the Learn 2 Swim programme, teaching young kids from the townships to swim so that there would be fewer drownings over the festive period.

‘In 2004 Monwa caught the attention of Greg Bertish, a founding member of Shark Spotters. He and Patrick ‘Rasta’ Davids were appointed the first spotters in Cape Town, pioneering the programme and contributing greatly to its success. Now Monwa is responsible for overseeing our on-the-ground operations and for training new spotters. His bravery and quick thinking in response to a shark bite incident on Clovelly beach in 2011 led to an award from the mayor of Cape Town. By administering first aid directly, Monwa contributed to saving the victim’s life.

‘Sarah Titley, our project manager, grew up in landlocked Nepal, so although she has always been seriously passionate about wildlife and conservation, her interest in marine life did not develop until much later. After school she spent some time in Zambia as a conservation research assistant before completing a degree in zoology at Southampton University.

‘For her honours thesis Sarah came to Cape Town to study the Chacma baboons. Having fallen in love with the area, she returned as soon as her studies were completed and took up a position with a local environmental organisation managing a range of projects. She even popped back to the UK to implement the Wimbledon tennis tournament’s first recycling system. Now she is responsible for the overall running of the Shark Spotters programme, dealing with all aspects from budgets to human resources. She enjoys the daily challenges of managing such a dynamic and innovative project, as well as her new-found passion for sharks and marine life.

‘And then there are the spotters themselves. The programme employs 26, all sourced from previously disadvantaged areas within 10 kilometres of the beaches where they work. No particular qualifications are necessary, but sharp eyesight and a passion for the ocean are essential. The spotters go through extensive training when they join the programme, but are learning all the time – the ocean is different every day and you never know what you are going to see! Most of them have been with the programme for at least two years, and more than half for five years or longer. Their knowledge of sharks on our coastline is second



to none and their dedication makes them a fantastic team to work with, inspiring confidence for using their beaches.’

WHERE WE WORK

A spate of shark bite incidents in 2004 and an increase in shark sightings close to popular beaches around the Cape Peninsula prompted a local businessman to set up an ad hoc warning system at Muizenberg. He asked individuals working as lifeguards and car guards to keep watch from the mountain overlooking the beach and raise the alarm if they saw any sharks in the area. At the same time a similar informal system, involving trek-net fishermen, operated in Fish Hoek. Soon local businesses got on board and the flag system and shark siren were installed.

After 18 months the pioneering programme had proved to be hugely successful and attracted local and international attention for its novel approach to finding a solution to potential conflict between humans and sharks. In 2006 the City of Cape Town helped to formalise it so that expansion to additional beaches could begin. Three years later the Save Our Seas Foundation began co-funding the programme, enabling it to develop further and incorporate ground-breaking white shark research. Shark Spotters is now the primary shark safety programme used in Cape Town.

WHAT WE DO

Shark Spotters improves beach safety through both shark warnings and emergency assistance in the event of a shark incident. Its primary goal is to reduce the risk of shark bites by actively removing people from the water when a shark is in the area and educating the public about shark activity. It also raises public awareness about shark-related issues, provides employment opportunities and skills development for the spotters and, importantly, contributes to research on white shark ecology and behaviour. In turn, increased scientific knowledge about the species plays a part in the conservation and management of this apex predator.

We believe that if we can reduce the already small risk of a shark bite, then we can make a meaningful contribution to white shark conservation. At the same time, we can also contribute to the community’s well-being and set a precedent in how people and sharks can co-exist.

Shark spotters are positioned at strategic points on Cape Peninsula mountainsides, primarily along the False Bay coastline. Each one is equipped with polarised sunglasses and binoculars and is in radio contact with another spotter on the beach below. If a shark is seen, the beach spotter sounds a siren and raises a flag showing a black shark on a white background. Water users are requested to leave the sea



when they hear the siren and return only when the all-clear signal is given.

Other flags used are: shark outline on a green background – visibility good, no sharks seen; shark outline on a black background – visibility poor, no sharks seen; and white shark on a red background – high alert, a shark has been seen in the past two hours or there is an increased risk of one being in the area. No flag means that no spotter is on duty.

The programme operates at eight beaches in Cape Town: seven in False Bay and one on the Atlantic coastline. Five of the beaches (Muizenberg, St James/Kalk Bay, Fish Hoek, Noordhoek and Kogel Bay) are protected year-round, mostly from 8 am to 6 pm. The other three beaches (Clovelly, Glencairn and Monwabisi) are watched at weekends and on public holidays and during school holidays in summer.

A lot of time and effort is invested in the skills development and empowerment of the spotters. Fishermen and experienced spotters show new recruits how to detect sharks and what to do when they see one, and first-aid training is provided so that shark bite victims can be given immediate medical care. Workshops on sharks and associated issues are held annually and customer service seminars help spotters to communicate effectively with the public. The spotters are also given the opportunity to gain field



experience by joining white shark research trips.

The research element of the programme focuses on the inshore presence and behaviour of white sharks to inform public safety policy and management strategies. Its key objectives are to determine where and when sharks are active in Cape waters, and whether their movements and behaviour are affected by changes in the environment or the availability of prey; to identify population trends; and to test shark safety technology and developments.

Shark Spotters also collates data on shark attacks, responding to all local incidents to collect factual and objective information. This forms the basis of communication with the public to present a dispassionate case for sharks in shark-human conflict issues.

**SHARK SPOTTERS: FINDING THE BALANCE
BETWEEN RECREATIONAL WATER USER SAFETY
AND WHITE SHARK CONSERVATION**

SHARK SPOTTERS

2010-2013

CAPE TOWN, SOUTH AFRICA

RESEARCH & CONSERVATION

GREAT WHITE SHARK (*CARCHARODON CARCHARIAS*)



SARAH LEWIS



WHO I AM

As a child I recall being asked, ‘What do you want to be when you grow up?’ Although manta ray scientist was not yet on my list (it would have been had I known that such a job existed), I knew that any career I followed would have to involve nature. I was passionate about the natural world; it both fascinated me and stirred a deep curiosity within me.

Growing up in a UK woodland area, I spent countless hours exploring, turning over every rock to discover what may be lurking beneath it, or wading through ponds in search of newts and frogs. I wasn’t aware of it at the time, but looking back now I realise there has always been a biologist within me.

In the pursuit of my passion I learned a heart-breaking reality: many species and habitats are under immediate and severe threat around the world, and countless animals are suffering unnecessarily cruel treatment at the hands of human beings. My innocent mind couldn’t comprehend why other people didn’t share my connection with nature, a deep love and respect coupled with an intense desire to conserve it. Rather than closing my eyes to this painful reality, I was compelled to try to understand why this was happening and to do all I could to address it. I don’t

With the increase in demand for manta gill rakers used in Chinese medicine, Indonesia’s mantas have never been under such intense pressure from the threat of fishing. The life history and ecology of mantas means that they have a limited capacity to recover from overfishing, and population declines have already been observed in certain areas of Indonesia, highlighting the severity of this fishery. This along with the threat of habitat disturbances indicates that Indonesia’s mantas may become or may already be severely threatened.

believe I ‘became’ a conservation biologist, I believe it has always been with me – my calling.

There is something mysterious about the ocean that has always fascinated me, constantly pulling me in and guiding my career choices. After graduating from Manchester Metropolitan University with a first class honours degree in ecology and conservation, I landed a position with the Maldivian Manta Ray Project funded by the Save Our Seas Foundation (SOSF). My life as a manta ray scientist had begun!

I found working with manta rays to be incredibly rewarding. For me, interacting with a manta is an experience beyond all others. These peaceful and gentle giants are extraordinarily intelligent, curious and trusting of humans (at times to a fault), and it was hard to comprehend that they are classified as fish. The inexplicable ‘knowing’ behind manta ray eyes caught my attention and I have been captivated from the first moment I experienced a manta observing me.

WHERE I WORK

I left the Maldives with a wealth of knowledge and experience and in 2010 I settled in Indonesia. Although the region has a large number of manta

hotspots, very little information about Indonesian manta populations existed and there were no long-term research projects on the species in the country.

Despite being one of the world’s top manta tourism destinations, Indonesia is also one of the largest manta fishing nations, fuelled primarily by a recent and growing demand in China for manta gill rakers, which are used as a pseudo-medicinal health tonic. I established the Indonesian Manta Project in response to this urgent need for further research into and protection for Indonesia’s manta rays, and to raise awareness of their plight.

The people I meet and work with in the Indonesian communities constantly inspire me. Their hospitality is overwhelming – at the infamous Tanjung Luar shark and manta market I never expected to be invited into the home of a fisherman for coffee and cake! Many of these communities are very poor and fishing is the only livelihood they know. Yet as they witness their fish stocks becoming severely depleted, they are increasingly open to alternative, more sustainable employment opportunities.

Indonesians have so many natural treasures to take pride in. For us, as outsiders looking in, there is




an opening to empower the nation’s coastal communities to celebrate and protect their natural environment while at the same time earning a livelihood in a sustainable way.

WHAT I DO
The objective of the Indonesian Manta Project is to create a nationwide knowledge base of manta ray distribution, population ecology and threats. This will provide data critical to encouraging and assisting with the successful implementation of conservation measures for the species.
Among the research techniques we employ are photographic ID, acoustic and satellite tagging and genetic analysis. We also conduct interviews in the fishing communities and fishery and market surveys. The combination of these methods enables us to piece together key population data and ultimately fill in the gaps in our knowledge to create a complete picture.

In conjunction with our research we are promoting awareness about the ecological and economic importance of protecting manta rays. To this end, we work with local communities to identify and develop sustainable tourism opportunities based on ‘their’ local manta populations.

The alignment of the SOSF mission and vision with my research goals, coupled with the inspirational people associated with the Foundation, compelled me to apply for a grant. Although I graduated only recently and have never set up or managed a research project before, the SOSF took a chance on me, providing the critical financial support I needed to establish the Indonesian Manta Project. For this I am so grateful and now, just three years into the project, we have made significant progress in better understanding Indonesia’s manta ray populations, helping to conserve them, and inspiring communities to protect them. None of this could have been achieved without SOSF’s initial and continued support.

INDONESIAN MANTA PROJECT
THE MANTA TRUST
2011-2013
INDONESIA
RESEARCH, CONSERVATION & EDUCATION
REEF MANTA RAY (MANTA ALFREDI)
& OCEANIC MANTA RAY (M. BIROSTRIS)





WHO WE ARE

Brought together by the same powerful attraction to the ocean, we combine two different worlds, two different ways of interacting with wildlife and exploring the wildest corners of the planet. Alex, born and raised in Britain, has spent most of his life discovering the world by living in places such as India, Russia, Egypt, Mozambique and Belize. Juliana hails from the heart of Colombia, where her childhood explorations barely scratched the surface of this mega-diverse country.

Alex found the magic of the ocean in Fiji at the age of 18, immersed in coral reef colours and forms. Juliana fell in love with the people of the ocean first, sharing weeks with fishermen when she was busy on her undergraduate and Masters projects in the Colombian Caribbean. For her work in marine conservation, she was awarded prizes that allowed her to travel to China, USA and Belize and learn about conservation in different contexts. Simultaneously, Alex worked with whale sharks in Mozambique and undertook his PhD research on stingray ecology on Glover's Reef Atoll, Belize. We met on that remote atoll and since then have united our strengths to work for protecting the ocean.

We want to be the voice of the many coastal communities that need a healthy ocean to survive and to remind wider audiences to take good care of the blue heart of our planet. Two years ago we founded a non-profit marine conservation and development organisation, which we called Talking Oceans. Registered in Colombia, it works with coastal communities in the Eastern Tropical Pacific (ETP) to develop sustainable fisheries.

We believe in the power of communication and the effect it has on social and environmental issues, from local communities along the Colombian coast to international audiences via social media networks. In Talking Oceans we develop scientific research to high standards and place special emphasis on communicating our results and experiences.

WHERE WE WORK

The sun rises lazily behind a thick layer of fog over Costa Rica's Gulf of Nicoya. Peering over our balcony bedroom and startled by the brightness of the sun reflecting on water, we get the feeling that we have woken up in the middle of a large lake. We swim in the shallow, almost mirror-like water, its salty

Support and funding from the SOSF has legitimised our work as a local marine conservation organisation based in Latin America and enabled us to initiate crucial research to provide new findings from the eastern tropical Pacific.

taste reminding us that we are in an estuary a few kilometres from the ocean.

Costa Rica has two main gulfs, Nicoya and Dulce, where many large rivers wash into the powerful waters of the Pacific Ocean. The mixture of fresh and sea water creates a magical ecosystem not only for animals, which find plenty of food in the brackish water and security in the shallows, but for plants too. Mangroves, the source of life for people and animals, have conquered this most challenging of ecosystems and have thrived. They provide fish, sharks, rays and marine mammals with protection to grow and reproduce. For people they have food, from fish to fruits and honey, and wood for cooking and for making boats.

In the Americas, mangroves reach the extreme of their development and richness in the ETP. At Térraba Sierpe in Costa Rica and Sanquianga in Colombia, the forest canopies can reach up to 40 metres high, and the intricate channel systems and crocodiles, monkeys and birds are reminiscent of the flooded Amazon forest. Drink coffee with the fishermen and listen to their stories of lobsters, bull sharks, hammerheads and rays, and you'll soon realise how rich the mangrove channels are. Yet historically

JULIANA LÓPEZ-ANGARITA ALEX TILLEY



mangrove swamps have been mistreated; considered unproductive, for centuries they were cleared to make way for aquaculture, coastal development and agriculture.

The ETP is a large region that encompasses the Pacific coasts and oceanic islands of Costa Rica, Colombia, Panamá and Ecuador. It is one of the most productive parts of the world, supporting high biodiversity and endemism while acting as an important migratory corridor for marine megafauna. Its countries are closely connected ecologically, with the health of the marine ecosystem in one depending strongly on the health of its neighbours’ marine ecosystems. This ecological interdependence notwithstanding, the ETP is highly diverse culturally, being home to indigenous tribes and the descendants of Africans and Europeans. The rich mixture of cultures comes to life in the food, music, smells and people’s smiles, making every day here a pleasure.

WHAT WE DO
Without somewhere to feed, grow and reproduce, no animal can survive. So it makes sense that the greatest threat to global biodiversity is loss of habitat. At certain stages in their lives, many marine species rely on areas close to shore. Young sharks and

rays, for example, feed safely in coastal habitats until they are large enough to venture into deeper areas.

Although the ETP is a biodiversity hotspot, we know very little about which shark and ray species occur here or which areas are important as habitats for them. Until we understand thoroughly the species that use these areas, and at what stage of their lives, our ability to protect them by means of appropriate conservation management is very limited. This is especially important for potentially vulnerable species. Luckily, through working with communities that have spent their lives here, we can glean important information about the distribution and abundance of marine species, and how they may have changed over time.

The coastal habitats are a crucial resource for local communities, which have traditionally used them like a supermarket, extracting fish, crabs, timber and honey for their own use or to generate income. The challenge for conservation and sustainable fisheries is to garner the support of these communities and through them find a solution that can be used around the world to mitigate the effects of climate change.

Our field work relies on being able to build a relationship of trust with fishermen and community members so that they talk freely with us about their

lives, their fears and their visions for their future and that of their ecosystem. This is the most challenging aspect of our work – and the most rewarding, for we meet the people who know the mangroves, reefs and ocean best and who understand the human impacts on their environment and the need to protect it.

As Colombian scientists, we recognise both the importance of the ETP to the productivity of fisheries and the battle for sustainable use and meaningful conservation that lies ahead. We’re committed to getting to know the ecosystem better and thus making an important contribution to local livelihoods and sustainable fisheries, and the Save Our Seas Foundation is a crucial supporter of this work.

ASSESSMENT OF ELASMOBRANCH CRITICAL HABITAT IN THE TROPICAL EASTERN PACIFIC
FUNDACION TALKING OCEANS
2013
ECUADOR, COLOMBIA & COSTA RICA
RESEARCH & CONSERVATION
SPHYRNIID & MOBULA SPP.



LARA MARCUS



The Save Our Seas Foundation (SOSF) is funding our field and laboratory work, both of which are pivotal for the success of the research. We appreciate – and share – SOSF’s commitment to the conservation of our oceans, and particularly the whale shark, and thank it for promoting our project and thus garnering followers to the whale shark cause. But SOSF funding is crucial not only to our work: it has helped me as the project leader to develop my career as a marine biologist.



WHO I AM

I have been interested in the ocean for as long as I can remember. Growing up in Barcelona next to the beautiful Mediterranean Sea triggered my passion for unknown blue waters, and from childhood I dedicated my academic and personal life to becoming a marine biologist.

Although Spain has long coastlines, there was nowhere for me to fulfil my desire to learn more about the sea and its inhabitants, especially the large ones. So while an undergraduate studying biology, I took part in several marine expeditions and was lucky enough to dive in some of the best places in the world, including the Seychelles and Madagascar.

Not only was I instantly captivated by the life, colours and sheer majesty of those tropical waters, but in the Seychelles I had my first encounter with an enigmatic giant – the whale shark. This incredible creature has been in my mind ever since and now I can finally make it the object of all my energy. And while I saw an abundance of life on those expeditions, I also became aware of the challenge to conserve the big blue and the need to learn more about it.

I didn’t hesitate to pack up my things and move to Australia, which I considered to be the best place to kick-start my career. It’s not easy to leave

all that you know behind and move to the other side of the world, but I was following my calling and it was worth it. My MSc in marine biology took me to Antarctica, but that’s another story. Next came my PhD, and because I feel that at this level it’s important to study something you’re really passionate about, I went back to that day in the Seychelles – and made the whale shark my life.

WHERE I WORK

Whale sharks are filter feeders that spend most of their time in the open ocean with no human contact. However, at some very special locations in the world’s temperate and tropical seas, including Mozambique, the Seychelles and Mexico, they come very close to shore for several months. This gives scientists their only opportunity to approach these magnificent animals and get some information about them. One such whale shark aggregation occurs at the Ningaloo Reef in Western Australia from March to July.

Although relatively unknown, the Ningaloo Reef is one of the most beautiful marine wonders in Australia. It lies two days’ drive from Perth, passing through ‘the red desert’, an arid and dusty place that

is inhabited by kangaroos and thorny devil lizards. On land there may seem to be little life, but the ocean is flourishing! Compared to the Great Barrier Reef off Australia’s east coast, the Ningaloo Reef is close to shore, which makes it easy to swim with manta rays, turtles, reef fish, dolphins and the star of the show – the whale shark. (Swimming with bull and tiger sharks is only for the brave.) The seasonal occurrence of whale sharks has led to the development of an extensive and well-regulated ecotourism industry, which is a major support for the local community – and for us scientists!

We still don’t know why whale sharks are attracted to this particular place, but we hope to help unravel the mystery...

WHAT I DO

Although the whale shark is the largest fish on the planet, it is also one of the least-studied shark species. There is evidence that the world population is declining, and the species’ classification of Vulnerable on the IUCN Red List makes it essential that management and conservation programmes be put in place. But in order to protect whale sharks we need to learn more about them: where they go, what they eat and



how many of them remain. This project will help to clarify the feeding ecology of whale sharks by using very interesting biochemical techniques.

The transient population on the Ningaloo Reef comprises young males between five and eight metres long. We think they come to feed on blooms of zooplankton, but our information is restricted to observations made during the day, when the sharks come to the surface. What happens the rest of the time?

With this project we are trying to determine where whale sharks feed and what they eat – and, believe it or not, a small piece of whale shark can tell us! The rationale behind this is ‘you are what you eat’, as traces of food components are left in our tissue. By analysing a fragment of whale shark tissue, we can determine the animal’s diet – but first we need to collect whale shark biopsies. This is what I enjoy most about my research.

To get the biopsies, a group of shark experts, plankton biologists and students head to the Ningaloo Reef every year. Once a whale shark has been located from a small aircraft, a bunch of snorkellers, each with an assigned role, jump into the water. We take photographs of the shark for identification, we tag it and we take a biopsy with a modified hand spear.

An interaction with a whale shark is an overwhelming experience that you can never forget. You might have swum with them hundreds of times, but each encounter is unique and special. Young whale sharks are curious and follow your bubbles, whereas older and bigger ones sometimes don’t even notice you are there. There’s no other experience like it!





WHO I AM

For someone who grew up in landlocked central Canada, a career studying sharks in South Africa seems nothing if not far-fetched. But let a girl dream and anything is possible. We lived in the middle of the bush where we had no electricity until I was about 13. My parents and our community always encouraged a close relationship with nature and much of my youth was spent romping through forests, exploring ponds and rivers, fishing, canoeing and skiing. I believe it was these close encounters with nature combined with my passion for literature – reading about adventures in far-flung and magical places – that made me aspire to becoming a marine biologist.

From an early age my one and only goal was to study sharks, whatever type or size. I was too young to comprehend how many species of sharks, skates and rays existed; all I knew was that I needed to see the ocean, to dive beneath its surface and to meet its creatures. But it was only when I turned 16 that I first had an opportunity to dip my toes into the cold waters of the North Atlantic. The ocean was everything I had dreamt it to be: powerful, boundless, unforgiving, yet gentle and soothing. At that moment I knew I was hooked.

Although I had recognised my purpose early in life, I took several detours along the way. Never a very good student, in primary school I underachieved and was told by a science teacher that my science and maths were too poor for me to pursue a career in biology. In high school I yielded to my arty self, taking courses in music, drama, dance and English literature and doing only enough maths and science to graduate. Political science was my choice of career at university, which is probably why I became a dropout at the age of 20.

After taking a serious look at my life, I decided to complete my high school science courses and follow my dream of studying sharks. So this land-bound girl moved to Nova Scotia and began an undergraduate degree in marine biology at Dalhousie University in Halifax. The first year was tough, but after attending the first class in marine ecology in year two, I knew I was doing the right thing. And luckily I met Dr Steven Campana, the chief scientist at the Canadian Shark Research Laboratory, whom I harassed (and volunteered for) until he gave me an honours project researching the diet of blue sharks in Nova Scotia.

My second lifelong passion has always been Africa. I had read so many stories about the continent and fallen in love with its wildlife and wildness from afar. It's also globally recognised for its incredible shark diversity, so it made sense to combine my two passions and study sharks in Africa. As luck would have it, I found an MSc project working on the stock assessment and fishery management of soupfin sharks in South Africa. A year after completing my undergraduate degree I boarded the plane that would change my life. The night I hit African soil I breathed in the air and felt like I was home. A decade later I'm still living on the South African coast.

I am lucky enough to have started my own marine research and education centre, and to work where I have made sharks part of my everyday life and with an incredible team of passionate people who share my love of the ocean. In many ways, I believe that marine biologists (and shark scientists in particular) are unique in that we all knew at a young age that we wanted to study sharks. It is a dream we strive to achieve no matter what hurdles we face. And each day I look out of my office window, go into the lab and see the sharks or teach kids about the ocean, I know just

MEAGHEN McCORD



how fortunate I am to have the career I have today. I am also lucky enough to be working on projects involving no fewer than 25 species of sharks, skates and rays, including some of the world’s largest bull (or Zambezi) sharks in an unusual habitat: the Breede River estuary.

WHERE I WORK
Before bull sharks were discovered in the Breede River on the south coast of South Africa, the species was believed to be a creature of tropical and subtropical waters and not of temperate water environments. Our project has described a new maximum size for the species – four metres total length – and has documented for the first time that bull sharks undertake seasonal migrations of more than 2,000 kilometres. Our findings from the project’s preliminary data have led to the Breede River being designated the first species-specific protected habitat for any shark, and the only protected area for bull sharks, in coastal South Africa.

WHAT I DO
We are using multiple scientific techniques to better understand the relationship between bull

sharks and their primary prey, spotted grunter and dusky kob, and how and why fish move the way they do based on parameters such as the state of the tide, salinity and temperature. To study fish movements we use a combination of internal acoustic tags (with a 10-year battery life for the sharks and a 100-day battery life for the bony fish), conventional ‘spaghetti’ tags for the non-lethal monitoring of movement and growth through angler recaptures, and an array of 18 acoustic receivers to passively check movement from the mouth of the Breede River to 21 kilometres upstream.

To monitor environmental parameters, nine of the 18 receivers are fitted with temperature-pressure loggers (pressure serves as a proxy for the state of the tide), while freshwater flow, atmospheric pressure and salinity data are provided by the Council for Scientific Research, the South African Weather Service and the Lower Breede River Conservancy. The movement of bull sharks between habitats, their seasonal whereabouts and their transboundary migration patterns are monitored using pop-up archival satellite tags and smart positioning tags.

In addition to following the movements of bull sharks, our team is attempting to discover the

relationships between tagged individuals using genetic sampling techniques. Our hypothesis is that related sharks use the Breede estuary and that females return here to live and breed. We also aim to measure predator–prey interactions in the estuary by means of stable isotopes.

SPATIO-TEMPORAL DYNAMICS OF FISH, FISHERIES & ENVIRONMENT IN SOUTH AFRICA'S BREEDE RIVER
SOUTH AFRICAN SHARK CONSERVANCY
2010-2013
BREEDE RIVER, WESTERN CAPE, SOUTH AFRICA
RESEARCH, CONSERVATION & EDUCATION
BULL SHARK [<i>CARCHARINUS LEUCAS</i>] AND BREEDE RIVER ECOSYSTEM [<i>TELEOSTEI SPECIES</i>]





WHO I AM

Ever since I was a little girl I knew I wanted to be a scientist – but I didn’t know what kind. What I did know was that I loved animals, especially ‘cold’ animals – reptiles, amphibians and insects – and that I loved the outdoors. I grew up in the big city of Chicago in the USA, but from the age of six to twenty I spent all my summers at my family’s fishing lodge in the lakes region of north-western Ontario in Canada. There I worked as a waitress, a fishing guide and a house painter and in my free time I explored the wildlife of the marshes, lakes and forests. But it was the warmer realms of our planet that particularly attracted me, and in the end I decided to attend postgraduate school in Florida because it was located relatively close to the American tropics.

I had grown up fascinated by accounts of the adventures of naturalists who travelled to the tropical regions of the world and explored wildlife and people there – Raymond Ditmars, Osa and Martin Johnson, George Schaller, Archie Carr, Gerald Durrell, Jane Goodall and Louis Leakey were just a few of my favourites. So in 1973 I decided to join their ranks before starting my postgraduate studies. I bought an air ticket and spent three months travelling on my

own and exploring the diverse ecosystems of Costa Rica in Central America, from the hot and humid lowland rainforests of the Osa Peninsula to the chilly heights of Cerro de la Muerte.

At that time Costa Rica still had 80% of its original forest cover, its ecosystems were intact and it harboured an abundance and diversity of frogs (whose populations are now much reduced). During my third month in the country I worked as a full member of Dr Archie Carr’s sea turtle tagging team at Tortuguero on the Caribbean coast. Later I learned that I’d made history as the first female to do so. In those days North Americans rarely visited Central America; in the summer of 1973 I was one of only about 15 visitors to Tortuguero. Nowadays some 50,000 tourists go there each year to watch nesting sea turtles.

Dr Carr, who was regarded as the ‘father of sea turtle biology’ and was professor emeritus at the University of Florida where I would soon begin my postgraduate studies, was on site during my first visit to Tortuguero and we developed an excellent rapport. I felt privileged just to make his acquaintance, so it didn’t occur to me at the time that he would later serve as the chair of the supervisory committees for

both my MSc and my PhD degrees. After all, he’d made it clear that he was not taking any new graduate students, having launched his last PhD student in 1969. Nevertheless, I was his student and research collaborator from 1973 until his death in 1987.

Under Dr Carr’s supervision I studied the feeding ecology of green turtles on the Caribbean coast of Nicaragua for my MSc and the nesting ecology of the same species at Ascension Island in the South Atlantic for my PhD. And it was he who provided the recommendation I needed to secure my first full-time job after earning my PhD in 1981: a three-year contract in the Republic of Seychelles in the Indian Ocean to do a study of the status and management of the sea turtle populations of this vast island nation.

WHERE I WORK

Although I have worked with sea turtles in some 20 countries on six continents and visited more countries in other capacities since that time, the Republic of Seychelles has remained for me the most interesting of all my postings. This is because of its sea turtle populations with their fascinating nesting and foraging ecology, its wonderful people and its

I am grateful for the support provided by the Save Our Seas Foundation for one of our most exciting sea turtle conservation and research projects, the D’Arros/St Joseph Community Sea Turtle Monitoring Project.

JEANNE A. MORTIMER





government's support for biodiversity conservation. I find the Seychelles so interesting, in fact, that I have acquired dual US and Seychellois citizenship and made the country my home for most of the past two decades.

The Seychelles comprises some 130 islands spread over an area of about 144,000 square kilometres and divided roughly into three groups: the granitic and mountainous Inner Islands where almost all the human population lives; the sandy cay Outer Islands (including the Amirantes), most of which are located between 200 and 400 kilometres from the main island of Mahé; and the remote upraised limestone islands in the south, which lie between 700 and 1,100 kilometres from Mahé.

WHAT I DO

As well as studying sea turtles and giant tortoises, my work here entails promoting the conservation of the turtles and their habitats. One such effort is the D'Arros/St Joseph Community Sea Turtle Monitoring Project in the Amirantes Islands. Funded by the Save Our Seas Foundation and the first initiative of its kind that is both long-term and intensive, the monitoring project is located on D'Arros Island and St Joseph Atoll, which are regarded as two of the most biodiverse and least exploited of the islands in the Amirantes group. The project has been under way consistently since 2004 and is remarkable in that virtually all the data are collected by members of the local Seychellois community outside their regular working hours. Although none of these guys are trained scientists, they do a meticulous job of gathering and recording information. A bonus is that the poaching of sea turtles has virtually ceased since monitoring began, most likely because the community feels a sense of ownership for the conservation project.



**D'ARROS ISLAND AND ST JOSEPH ATOLL
COMMUNITY SEA TURTLE MONITORING PROJECT
SOSF D'ARROS RESEARCH CENTRE
2013
D'ARROS ISLAND & ST JOSEPH ATOLL,
LES AMIRANTES, SEYCHELLES
RESEARCH, CONSERVATION & EDUCATION
TURTLES**





WHO I AM

I was born in the south of England back in the 1970s and probably saw the ocean within the first few days of my life since my grandparents' house overlooked a shipbuilding yard in Southampton. For my summer holidays I went to North Wales, where I fished for mackerel and swam in the Irish Sea. This triggered an interest in the environment that led me to a life of working from the highest parts of the Himalayas to the turbulent Arabian Sea, from chasing pheasants to counting turtles.

WHERE I WORK

Being employed by one of the largest conservation organisations in the world is a dream come true: I get to see the planet's most interesting places and am paid for it! One of the challenges I was given two years ago was to start a marine programme for WWF-Pakistan – a daunting task as the coastline of Pakistan, albeit spectacular, presents a multitude of difficulties. I started with a grant of US\$5,000 that has now blossomed into regional funding to the tune of more than US\$500,000. The Save Our Seas Foundation's (SOSF) mobulid ray project is one of several exciting undertakings that are helping us to build up

our knowledge of what is going on along the coastline.

My dream is to see a marine protected area set up and supported by local communities, which is the only way to make such an area work. I also dream of swimming with an Arabian humpback whale! Each day I learn something new about working with wildlife – the natural world constantly surprises me and reminds me why our work is so important and how much we don't know.

I also believe strongly that it's the smaller projects that bring the most value to conservation rather than the huge multi-million-dollar ones that get dragged down in paperwork. Size does matter, but in this case smaller is better.

WHAT I DO

Very little is known about Pakistan's coastline, and what is known is based on old records. Both the Arabian Sea and the Indian Ocean wash the shore, which results in a high diversity of life forms, ranging from microscopic phytoplankton to massive Arabian humpback whales. My project looks in particular at the manta rays that are found along the coast and the gill nets in which they become ensnared.

The gill net is appropriately called 'the wall of death' as nearly everything that hits it dies. Fish, dolphins, sharks – you name it, they suffer and ultimately drown. The only marine animals that survive are marine turtles, which fortunately are returned to the sea. We know that a large number of fishing vessels deploy gill nets, but we can't immediately stop the use of them because thousands of fishermen depend on them for their livelihoods. But we also know that if we don't take action against them soon, we are going to lose more and more marine biodiversity. One day there will be no more dolphins or whales swimming in Pakistan's waters.

Our project is giving us the baseline information we need to make a strong case against the continued use of gill nets. It also enables us to put together a strategy and action plan to save manta rays, the gentle giants of the seas.

Once we have an idea of how many marine animals are being caught, as well as where and when, we can go to the scientists and government and explain why it is so important to change the status quo. We have to put a stop to fishing with gill nets and provide the fishermen with an alternative so that they can still feed their families.

RAB NAWAZ





We also hope to raise awareness about manta rays. Not many people know that they are found along Pakistan's coastline, but the more these amazing creatures are talked about in the news and on social media, the easier it will be to persuade top decision-makers to enforce the necessary changes to laws and commit funds to the protection of marine resources.

It will be a long journey to save these animals and we are just at the beginning of it. But it is crucial to have insight into the challenges that marine life is facing before we start our campaign for long-term conservation.

**DEVELOPING CONSERVATION STRATEGY
FOR MOBULIDS IN PAKISTAN THROUGH BY-
CATCH ASSESSMENT**

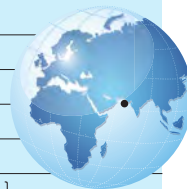
WWF PAKISTAN

2013

NORTHERN ARABIAN SEA, PAKISTAN

CONSERVATION

MOBULIDAE FAMILY (GENERA *MANTA* AND *MOBULA*)





WHO I AM

As an American political scientist specialising in public attitudes and policy responses to shark bites, I am pleased and honoured to have been a Save Our Seas Foundation advisor in 2013. You could say that I began my research at the age of eight, watching the movie *Jaws*. I was in awe of sharks and began reading all the available books about them, which included the classic oceanography writings of Ron and Valerie Taylor.

For me, shark bite policy responses have a vital role to play in the conservation of sharks because these predators can only be protected successfully if we address the fact that the general public has very different feelings about sharks swimming in the middle of the ocean and sharks swimming along local beaches. This is one of the reasons why there is a disconnect between public alarm at shark finning and public policies that allow for shark culling off beaches. Indeed, the beach is the starting point for nearly all human–shark perceptions and policies. As a result, perceptions about local shark populations can impact broader conversations about national and international shark conservation.

WHERE I WORK

In 2010 I embarked upon the first PhD on the ‘politics of shark attacks’, in the Department of Government and International Relations at the University of Sydney, Australia. I have presented my research at scientific conferences, including the International Congress for Conservation Biology and the International Marine Conservation Congress, and have published in leading journals, among them *Marine Policy* and *Coastal Management*.

Some people found the topic far-fetched at the time, but over the past four years there has been a marked increase in the politicisation of shark bites around the world, notably in Western Australia. Government responses to shark bite incidents give meaning to them as ‘attacks’ and blame the sharks, stereotyping them so that all shark conservation is hindered. Yet there is also an increasing appreciation for how education, communication and public engagement can build upon the great work that is being done in shark conservation science. As a result, I work with a team of scientists from around the world to build bridges between social science studies and natural science research.

The Save Our Seas Foundation (SOSF) shares this desire to build bridges and in 2013, in the capacity of a social scientist, I reviewed educational grant proposals for the Foundation to identify how social science, public engagement and communication can translate into real conservation impacts.

In short, this interdisciplinary setting provides a strong foundation for continuing with innovative research and projects that are dedicated to understanding how people around the world perceive sharks. From this will follow how better policy making, particularly in the wake of shark bite incidents, can be educational as well as beneficial to both public safety and shark conservation.

WHAT I DO

In 2013 Dr Robert Hueter, of the Mote Marine Laboratory in Florida, and I decided to address the historical discourse on shark attacks and offer an alternative scientific approach. In an article entitled ‘Science, policy, and the public discourse of shark attack: a proposal for reclassifying human–shark interactions’ and published in the *Journal of*

Environmental Studies and Sciences, we critiqued the history of the phrase ‘shark attack’ and proposed four new classifications for scientists and the media: sighting, encounter, bite and fatal shark bite.

For our research to be successful, however, it needed to reach a wider audience. We approached the SOSF and asked the Foundation to help fund the ‘open access’ release of the article. Having gone public in this way, it was downloaded 1,000 times in the first two days and remains the most downloaded article in the journal’s history. In July the Elasmobranch Society approved a resolution to adopt the Neff and Hueter (2013) typology as the recommended categorisation for shark bites, and even sent a letter to the editors of the Associated Press Stylebook to that effect. The impact of the article can now be seen in the reporting of shark encounters around the world.

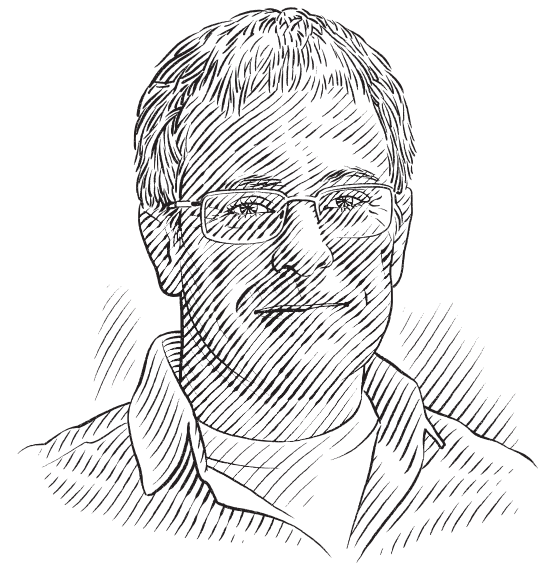
For me, SOSF funding has conferred greater access to the world’s best scientists and the capacity to challenge old ideas and establish a better-recognised international research profile. The Foundation has been willing to support innovative research that otherwise would not have taken place. With its support, the international discourse on shark bites is changing and breakthroughs in research on human perceptions of sharks are being made. These can have a lasting impact on shark conservation.

SCIENCE, POLICY AND THE PUBLIC DISCOURSE OF SHARK ATTACK: A PROPOSAL FOR RECLASSIFYING HUMAN–SHARK INTERACTIONS
CHRISTOPHER NEFF CONSULTING
2013
WORLDWIDE
RESEARCH, EDUCATION & CONSERVATION
SHARKS



CHRIS NEFF





WHO I AM

I've had a lifelong interest in sharks, but as a genetics scientist I covered a broad range of creatures – until an earnest young student known to have a passion for shark conservation listened to me lecturing about the population genetics of snails. Why, he challenged, was there no similar work on sharks? I replied that population genetic analyses of sharks would be easy; getting the required samples would be almost impossible. The student – his name was Michael Scholl – said I could leave that problem to him. If I could look after the genetics, he'd take care of the samples. That was the start of my professional interest in shark conservation, some 14 years ago.

WHERE I WORK

What's to stop a great white shark from swimming wherever it likes? The answer is simple – not much! Long before Europeans 'discovered' Australia, some white sharks from Down Under had become permanent residents in the Mediterranean. As big fish in a relatively small pond, this population offers unparalleled opportunities to study aspects of white shark biology that are unlikely to be glimpsed in ocean vastness. But our genetic analyses here have

SOSF funding has not only allowed further investigation of Mediterranean white shark populations but has permitted us to employ new molecular approaches that have ramifications for other projects, promising advances in the way we think about shark conservation and bringing additional funding for our work. The mission statement of the SOSF to encourage public outreach has been particularly beneficial. By becoming increasingly involved in promoting public awareness of our work in shark conservation I have benefited from an evolving network of contacts, some of whom have helped us in our endeavours.

raised an alarm, showing that the Mediterranean's great whites could be the most vulnerable shark population in the world.

Thanks to Save Our Seas Foundation (SOSF) funding, we are able to ask where, when and how this story started, what makes Mediterranean white sharks so vulnerable, and what can the genetic analysis of long-dead museum specimens tell us about their future?

Our story starts 450,000 years ago in an ocean far, far away from the Mediterranean, where the warming climate of a wickedly turbulent interglacial was playing havoc with normally stable oceanic currents. One current in particular was affected, the Agulhas. Having transported warm equatorial water southwards along the east African coast, at the southern tip of the continent this powerful current locks horns with the strong, cold Benguela Current from Antarctica. The resulting clash makes the seas around the south coast of Africa among the roughest – and most productive – in the world.

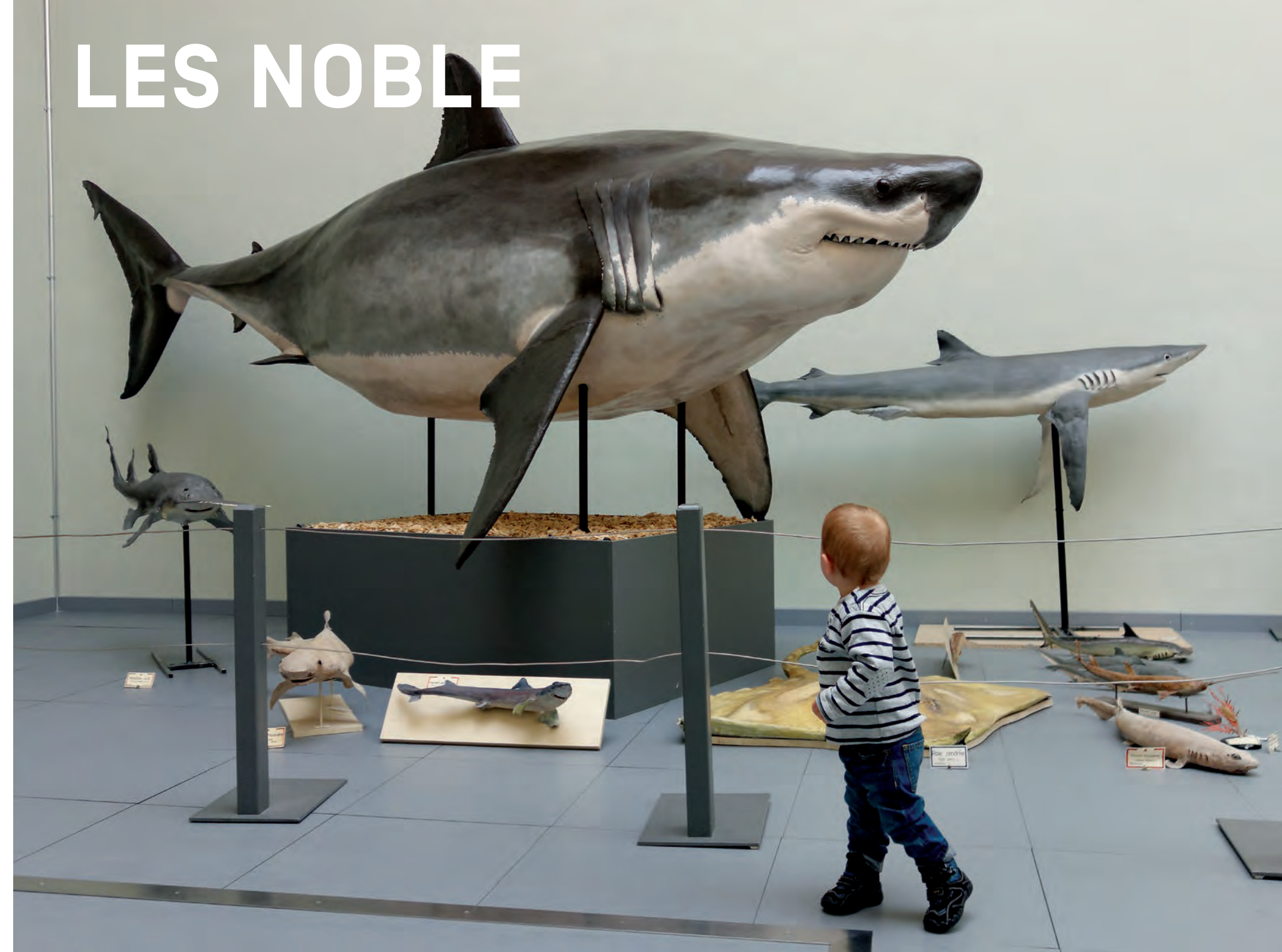
When the Agulhas is strong it occasionally pushes the Benguela aside and a great ring of warm water drifts into the Atlantic Ocean. As this

warm eddy collapses, the flora and fauna it carries are precipitated into the cooler waters, where most expire – but some may survive. The Agulhas Current is stronger during interglacials and the larger and more frequent eddies it produces then penetrate further into the Atlantic.

Two additional factors are crucial to this story. Recent research indicates that Indian Ocean white sharks off South Africa may regularly migrate to Australia, with their Australian counterparts making the reverse journey. Secondly, we have shown that female sharks return to their nursery areas to pup, which has the effect of associating female-transmitted genetic markers (mitochondria) with a pupping location.

Our genetic analyses suggest that the Mediterranean's white sharks are more similar to those of the South Pacific than to any northern hemisphere population. They may have originated from a migrating Pacific individual that followed an Agulhas ring, making a navigational blunder of epic proportions. If, after the eddy collapsed, the shark continued north while trying to turn east, it may have wandered far beyond its normal range, even to latitudes where white sharks seldom venture.

LES NOBLE





**MEDITERRANEAN GREAT WHITE SHARKS:
A CAUSE FOR CONCERN? AN ENDANGERED
ANOMALOUS POPULATION
UNIVERSITY OF ABERDEEN
2011-2013**

MEDITERRANEAN SEA

RESEARCH

GREAT WHITE SHARK [*CARCHARADON CARCHARIUS*]



The warm, salty and deep eastern Mediterranean basin is likely to have provided many cues for a lost Pacific shark. It would have been well stocked with marine mammals, swordfish and tuna, all potential prey, and during later glaciations it would have remained warmer and more ice-free than its western counterpart. If a female white shark gave birth in this Pacific proxy, the pups and their descendants would be inexorably tied to the Mediterranean.

WHAT I DO

Since my professional interest in sharks began, my group has focused on exploring how population genetics can be used to help conserve them. By integrating genetic tools with other approaches to better understand how sharks use the oceans, we are able to explore, and hopefully suggest ways to diminish, human impacts on them and their environment.

Our genetic analyses suggest that Mediterranean white sharks could be more vulnerable than ever suspected. But they are rarely glimpsed, so would they be missed if they disappeared? Probably, because as top predators they play a pivotal role in

stabilising ecosystems, preventing loss of biodiversity and species imbalance, and maintaining commercial fisheries.

The stock in the eastern Mediterranean is dangerously homogenous, an indication that it was founded from one or a few individuals. It seems unlikely that white sharks would have entered the Mediterranean from the east more recently than 450,000 years ago, as a route via Suez would have taken them through hypersaline lakes and temperatures at, and possibly beyond, their tolerances. Also, white sharks are not recorded from the highly trafficked northern Red Sea.

That the Mediterranean became the world for these Pacific descendants, with perhaps few or no more white sharks joining them, has been borne out by our work. Further contemporary samples, together with historical material from Mediterranean museums, suggest that white sharks from this area have maintained a dangerously limited genetic repertoire over the past 150 years, and in that time have even lost some of the little variation they once had.

This is worrying, as genetic diversity is the engine of evolution, allowing organisms to evolve to

survive disease, climate change, pollution and other natural and anthropogenic disturbances. In effect, Mediterranean white sharks face evolutionary bankruptcy – and at a time when their sea is one of the busiest, most exploited and most polluted in the world.

For this reason the SOSF is funding us to use historical and contemporary material to determine this population's current genetic diversity and quantify its historical decline. This will give us a better understanding of what lies in store for other white shark populations; what happens to white sharks in the Mediterranean tomorrow might well happen to populations elsewhere the day after.

RUPERT ORMOND CAT GORDON

BY CAT GORDON



WHO I AM

My keen interest in nature and the environment developed when I was young, although living in central England, well away from the coast, meant that my curiosity about the underwater world took longer to emerge. It was learning to scuba-dive at the age of 14 that led me to fall in love with the ocean and appreciate its inhabitants. Faced with choosing a career, I jumped at the opportunity to study for a BSc in marine biology and coastal ecology and then an MSc in conservation biology with a view to working in the marine conservation sector. I had a strong desire to live by the sea and so chose to study at the University of Plymouth. Intrigued by sharks and their flattened cousins, I subsequently began volunteering at the Shark Trust.

By working in various areas of conservation after I graduated, I acquired a fuller understanding of how different ecosystems interact. As a marine research officer on a remote, hard-to-reach island in Fiji, with no running water or electricity, the challenge for me and my colleagues was to teach marine identification skills and research techniques to volunteers. I then qualified as a PADI dive master in Thailand and enjoyed taking clients out to experience the local dive sites and what they had to offer.

Still keen to test other areas of conservation, I next went to southern Spain, where I was the warden of a Ramsar nature reserve and, among other duties, became involved in environmental education. Ultimately, though, my passion for the marine world led me back to the Shark Trust in Plymouth. Now, as a conservation officer for the Trust, I am responsible primarily for the Basking Shark Photo-ID Project and the Great Eggcase Hunt (see ‘Ali Hood & Cat Gordon, the Great Eggcase Hunt’).

WHERE I WORK

As the project officer for the Basking Shark Photo-ID Project, I have developed an online safe repository for fin images submitted from research organisations around the UK that use photographs to identify individual basking sharks. Working together, these groups are trying to estimate the size of the basking shark population and to map each shark’s migration route.

A ‘community’ database has been constructed to store safely photo-identification images from organisations such as the Shark Trust, Wave Action, Marine Conservation International, the Irish Basking Shark Study Group and Manx Basking Shark Watch.

These groups document basking shark encounters at hotspots around the British Isles, including the west coast of Scotland, the Hebrides, the Isle of Man, Malin Head at the northernmost tip of Ireland, and Devon, Cornwall and the Scilly Isles in south-west England. In time, the project will expand to incorporate data submitted by the French shark conservation group APECS and MedSharks in the Mediterranean. Good-quality photographs will enable re-sighted sharks to be recognised and matched on the database.

WHAT I DO

Historically, basking sharks were heavily fished for their liver oil, meat, fins and cartilage. As the subject of a number of international agreements and domestic and European prohibitions, these magnificent marine giants now face significantly lower fishing pressure, although they are occasionally caught as by-catch. Yet the species still qualifies as globally Vulnerable on the IUCN Red List and is regarded as Endangered in the north-eastern Atlantic as well as the North Pacific Ocean, thanks to it being very slow to mature and having a low reproductive output.

THE BASKING SHARK COMMUNITY DATABASE

THE SHARK TRUST

2010-2013

NORTH ATLANTIC, UK

RESEARCH, CONSERVATION & EDUCATION

BASKING SHARK (CETORHINUS MAXIMUS)

There is still a great deal to be learned about the life history of the basking shark, in part because it is so difficult to conduct field research on an animal that spends most of its time beneath the water and out of sight. In spring and summer, when the sharks feed on plankton at the sea’s surface, you may be lucky enough to catch sight of a caudal fin, a dorsal fin or a snout emerging from the waves. Such encounters give researchers – and members of the public – opportunities to photograph sharks, many of which display significant and recognisable markings (whether natural or acquired) on their fins. The resulting images can aid photo-identification, a powerful, non-invasive field technique that is now commonly used in the study of animals in their natural environment and helps researchers to understand their subject’s life history and movements. This is especially important for a vulnerable and highly migratory species like the basking shark as, among other things, it can enable us to estimate population size.

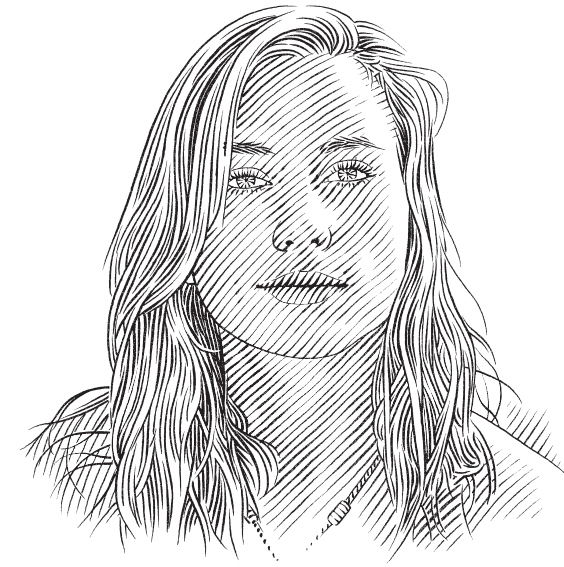
The Basking Shark Photo-ID Project forms part of a wider basking shark research programme. It focuses on the development, population, maintenance and expansion of a central community database, which also functions as a safe repository for storing

photo-identification data and images. The database allows users to browse uploaded images and search the catalogue using a number of different fields (such as distinguishing features, location or photographer) in order to find an individual shark. While members of the public get only a limited view of the database, partner organisations can register with login details to access the full range of information.

By supporting the development of this collaborative database, SOSF funding has enabled the project to store fin images safely and make them easily accessible to researchers. Although challenging to fund, data storage and archiving are vital to our long-term understanding of the movements and populations of vulnerable species like the basking shark.



GRACE PHILLIPS



WHO I AM

Mysterious depths, warm turquoise shallows, powerful storms and weird and beautiful creatures – what’s not to love about the ocean? It has always fascinated me and I knew inherently that I would grow up to be a marine biologist long before I even understood what the term ‘marine biologist’ really means. It’s just something I’ve always known I would do and be, and I couldn’t tell you exactly when, or why, it ‘clicked’. I can, however, tell you the moment when I knew I would become a manta researcher.

‘Manta 20 metres off the port side!’ September 2009 in the beautiful Maldives. After finishing my degree and finally being allowed out into the big exciting world of real-life marine biology, I landed myself an amazing position as a volunteer research assistant with the Maldivian Manta Ray Project.

I had never before encountered manta rays, but they immediately made an impact on me. The way they move so gracefully through the water, with such ease and such an aura of wisdom, is breathtaking. You can see that they are intelligent creatures by the way they eye you up as they cruise past, perhaps making a turn to pass again and suss you out a little more. And that’s what sold them to me: their intelligence

and their curiosity, and also their air of regality and dismissal. Beside a manta ray, we humans are mere clumsy beings in the water – and those mantas sure know it! As soon as they’ve had enough of us oafs, they just need to beat their pectoral fins once or twice and they’re gone, far too fast for us to even dream of keeping up with them.

WHERE I WORK

From these first encounters, I knew I had to pursue the route of manta ray research. With continuous persistence and determination and all-important networking, I finally got the big break I was hoping for and was appointed a project leader for the Manta Trust and researcher with the Save Our Seas Foundation–D’Arros Research Centre (SOSF–DRC) Manta Ray Project, in the beautiful Seychelles. The SOSF–DRC is nestled behind a beautiful white sandy beach and just several fin kicks away from a reef full of life: reef sharks, turtles, inquisitive fish, dolphins and the all-important manta rays. The range of marine habitat surrounding D’Arros Island and its neighbouring atoll is astounding, and it’s really something to be able to work in such a marine biologist’s paradise.

WHAT I DO

My manta project comprises two parts: the long-term monitoring component and the tagging component, both of which are equally important. The monitoring component consists of surveying the waters around the island for manta rays, recording all sightings as well as the prevailing atmospheric and oceanic conditions, and collecting photographic ID shots of the manta rays. Through this we aim to build up an understanding of the demographics of the population: how many mantas are in it, what are the age and sex ratios, and are there any signs of mating activity?

For the acoustic tagging component we attach to a manta ray an acoustic transmitter that sends out ‘pings’ at pre-determined intervals to receivers attached to the seabed. This will enable us to follow the movements of the population and discover where manta rays move within their habitat and why and when they move from one habitat to another.

What makes this population of manta rays special is that, unlike many other populations globally, they have not been targeted by fisheries to feed the Asian demand for manta ray gill rakers. They also face little danger of being caught as incidental



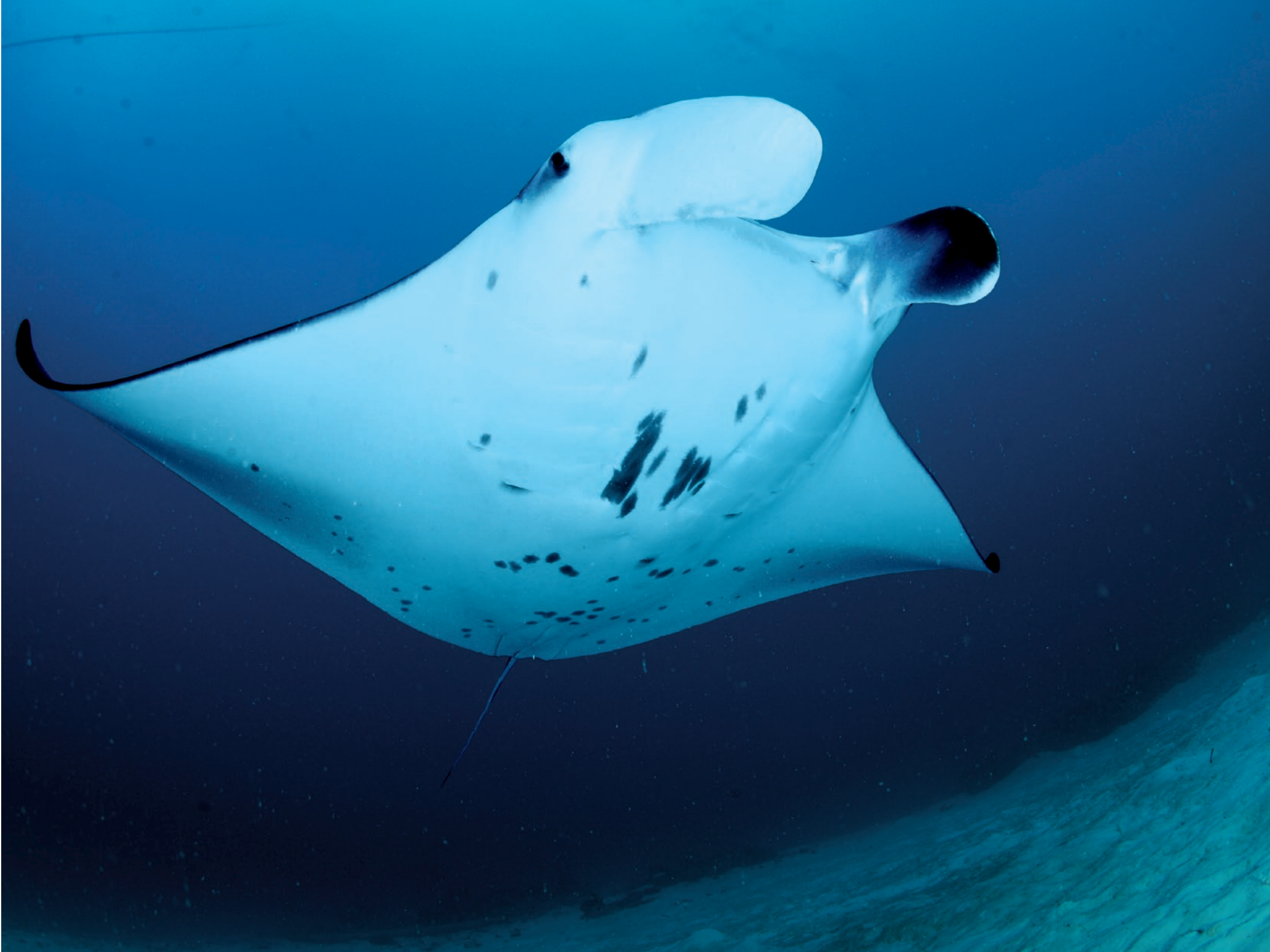
**SPATIO-TEMPORAL MOVEMENTS OF MANTA RAYS
IN THE AMIRANTES**
D'ARROS RESEARCH CENTRE
2013
**D'ARROS ISLAND & ST JOSEPH ATOLL,
LES AMIRANTES, SEYCHELLES**
RESEARCH
MANTA RAY (*MANTA ALFREDI*)



by-catch by local fishermen. As a result, we have a healthy, natural population that allows us to build up baseline data and look into the movements, habitat connectivity and sociality of manta rays unaffected by external influences.

What's more, the research centre has installed 70 acoustic receivers around D'Arros Island and further afield too, covering the entire Amirantes Bank on which the island is situated. Seventy acoustic receivers is an enormous array to have and they will return some fantastic and extremely interesting data on manta ray movements.

This will be hugely important for the continuing drive to protect the species on a global scale. By knowing where manta rays go and why they move, we can identify critical habitats and more effectively designate protective areas for them. In fact, one aim of the project is to work towards securing local legislation that will officially protect reef manta rays regionally and thus ensure that they don't fall victim to the expanding targeted fishery for the species.



NICK PILCHER

(THE TURTLE GUY)



WHO I AM

I'm a sea turtle guy through and through. I grew up snorkelling all on my own as a kid, and as the years went by and the kilos piled on I got hooked on sea turtles – it was hard not to, really. One thing led to another and I found myself in charge of a turtle project in Saudi Arabia back in 1989. I came over to Malaysia in '93, and from there the whole Indo-Pacific opened up to me. I have roamed the seas and oceans ever since, doing my turtle thing.

As someone said recently, 'Nick saves sea turtles for a living.' My PhD is on turtles. My third daughter's first word was 'turtle'. At home we have sea turtle figurines and turtle memorabilia all over the place. It's hard to think that some 25 years and 55 countries later I am still doing the same thing, but the truth is I love what I do. I tell people I'm a professional beach bum and that I get to play with turtles for a living. Now how cool is that?

WHERE I WORK

In Malaysia, where I am based, the sea turtle story is simply incredible. Turtles feature on every tourist bus and every tourism advert. You can't watch the 'Malaysia Truly Asia' tourism campaign on television and not see turtles. They're on postage stamps

I guess in many ways the SOSF is more like a partner than a donor - they seek my input on decisions they need to make, and I am able to expand the work I do because of their support. While sharks continue to be a main focus for the SOSF, it is heartening to see the commitment to sea turtles continuing to grow, and I hope that through my experience around the globe I can repay the Foundation for the support it has given us over the years.

and in comic strips. There are monuments to turtles and local folk songs about them. One of the country's marine parks supports the most robust nesting population in all of South-east Asia.

Until just recently, though, all conservation efforts focused on nesting beaches. And be assured, the beach is an important – even critical – conservation bottleneck. It's where the adults come to lay their eggs, and from which the tiny hatchlings run down to the sea.

But alongside all this concern about the beaches, sea turtles are still being lost to the long-term harvest of eggs and as by-catch in the ever-growing trawl fisheries. Several Malaysian populations have been depleted to such an extent that they are considered locally extinct. It's a sad state of affairs.

Much of the problem lies in two key areas. Firstly, the continued lack of knowledge of the biology and ecology of the turtles in many parts of the country – there is no shortage of data, but it is not the right data for use in management decisions. And secondly, a business-as-usual approach to population management – working on beaches alone has not served turtles well to date because sea turtles (as their name suggests) spend 98% of their time at sea.

WHAT I DO

Our project is changing all that. In case you didn't know, shrimp trawl fisheries can have a devastating impact on sea turtles if their nets are not equipped with some sort of escape device. Turtles and shrimps just happen to share the same habitats underwater, and the wide mouths of shrimp trawl nets can accidentally gobble up unsuspecting turtles in seconds – along with the intended catch. Dinner tables around the world crave for shrimps, while conservation agencies and people like me see the need to ensure the survival of sea turtles. So how do we solve this major conflict?

The answer is by working with Malaysia's Department of Fisheries to introduce Turtle Excluder Devices (TEDs). This little device is a rigid grid through which the catch passes while large objects – such as our turtles – are literally barred from entry and shot out through a flap. Saved, just like that!

One of the greatest aspects of working with the SOSF is its flexibility. In our case, the Malaysian Department of Fisheries was keen to get on board with the TED project but one last hurdle needed to be cleared: get the director-general to witness for himself how TEDs work. The SOSF made that happen and, what's more, did a quick turnaround so that



we wouldn't lose momentum. Today we have a fully fledged national TED programme and I am certain that it hinged on that one single intervention. We even have our own Malaysian-designed TED now.

The other thing we are working on is to fill some of those knowledge gaps relating to turtle biology and ecology, so that managers are better equipped to make good conservation decisions. For this we head out to a remote island called Mantanani, off the coast of Borneo. There we catch turtles by hand in a wild kind of marine rodeo. All cowboys and turtles! Then we use a small surgical procedure to check if the turtles are male or female, take a skin sample for genetic analysis, tag them and send them on their way.

This work is paying dividends in the form of turtle futures. We started it in 2006 and showed that (unfortunately) there was a 93:7 female to male bias. Via genetics, we could link individuals to specific hatcheries and thus identify the female-biased ones. After we had made our findings public and lobbied with the relevant management agencies, the hatcheries changed practices and started shading the nests, resulting in an environment better suited to producing male hatchlings. This year the proportion of males is already back up to 25%.

These long-term studies also tell us about turtle growth rates and population structure, and whether or not there are major failings in the conservation process from egg to adult. The scientific findings of today even allow us to predict if there will be problems in the future. It's turtle clairvoyance, and it's awesome!

I hope you enjoy reading about our work as much as we enjoy doing it.

**SEA TURTLE CONSERVATION
IMPERATIVES IN MALAYSIA
MARINE RESEARCH FOUNDATION
2009-2013**

SABAH, MALAYSIA

RESEARCH, CONSERVATION & EDUCATION

GREEN SEA TURTLE [*Chelonia mydas*]





The SOSF project funding has enabled us to undertake the most detailed documenting of a whale shark aggregation to date, which we will hopefully be able to continue with private-sector and NGO support in the coming years.

WHO I AM
Hello, I am the chairman of the Marine Conservation Society Seychelles and a member of the IUCN Shark Specialist Group. I moved to the Seychelles with my wife Glynis in 1985 and found whale sharks in our very first year of diving here. As one of the founders of the Marine Conservation Society Seychelles, I have broad interests as far as the wildlife of the region’s seas is concerned. Nevertheless, whale sharks are my first love and I got my PhD researching the occurrence and habits of these magnificent animals around the Seychelles. In the process, I made many contacts with fellow researchers working on this species around the world and was also able to assist in setting up whale shark monitoring activities in several areas. One such monitoring station is in the small country of Djibouti on the Horn of Africa.

WHERE I WORK
My first visit to Djibouti in 2006 revealed a sharp contrast to Seychelles: instead of lush green mountains, the local landscape comprised dusty, rocky mountains and lava flows descending steeply into the waters of the Gulf of Tadjoura. The area was dry for sure, but it was far from barren and presented

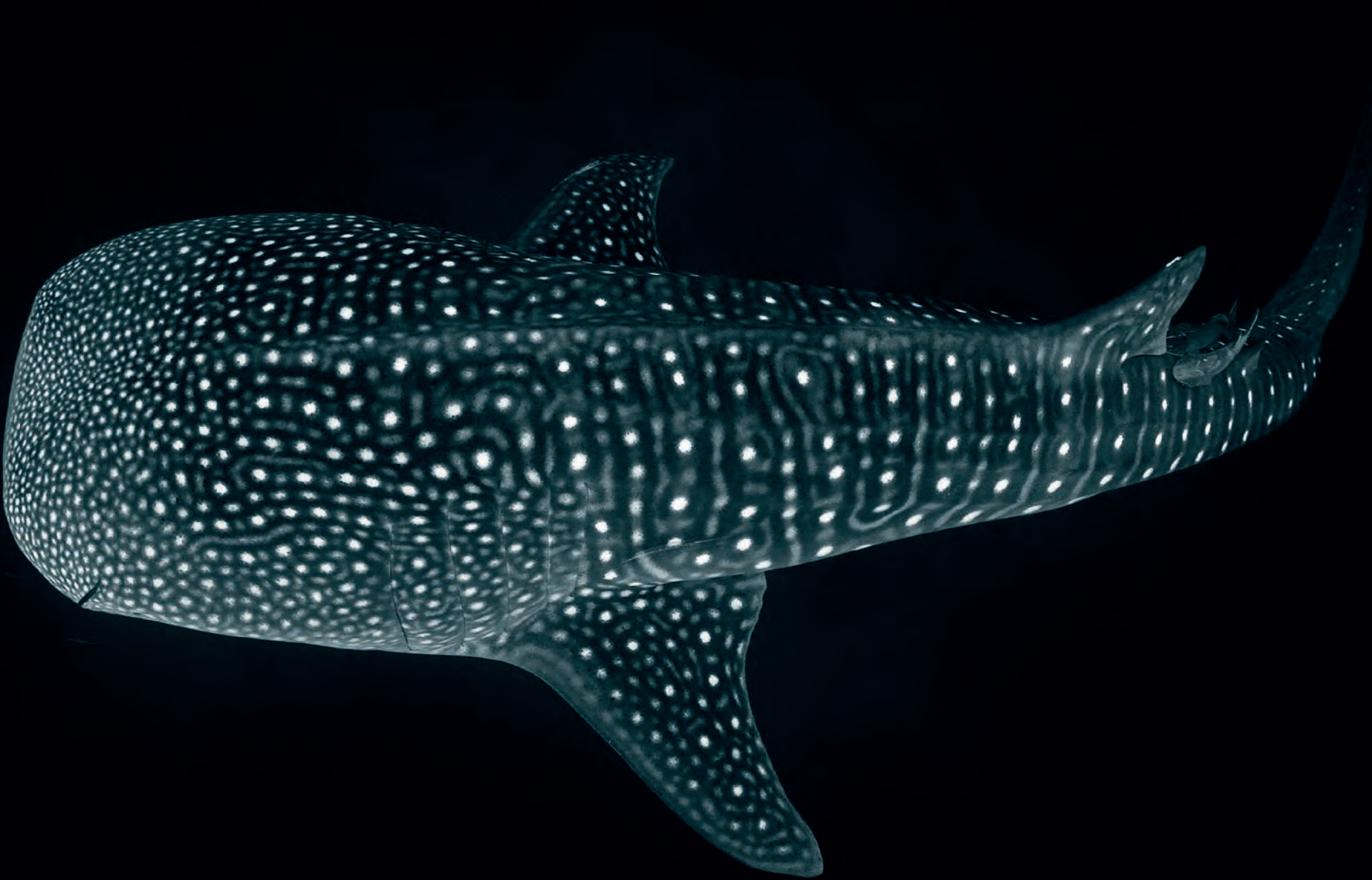
an as-yet-undocumented aggregation of whale sharks. This too was a contrast: although there were lots of whale sharks, they were all very small and thus completely different to the aggregations found in the Seychelles, at Ningaloo in Western Australia and at other coastal areas.

WHAT I DO
The Save Our Seas Foundation (SOSF) sent a film crew to Djibouti to see for themselves whether what we had found was as unusual as we suggested. Shortly afterwards it agreed to fund our project documenting this aggregation of very young whale sharks. There are so many questions... If there are no larger juvenile or adult sharks in this group, where are they? As these sharks grow up, are they moving off to join other whale shark aggregations elsewhere, such as in the Seychelles, the Red Sea or other Indian Ocean areas? The project is already beginning to get results, as sharks fitted with satellite tags have indeed shown movements into these areas. Moreover, the impressive photo ID library of more than 400 individual sharks will provide a long-term resource to compare with other whale shark destinations.

MONITORING JUVENILE WHALE SHARKS IN THE GULF OF TADJOURA, DJIBOUTI
MARINE CONSERVATION SOCIETY SEYCHELLES
2010-2013
GULF OF TADJOURA, REPUBLIC OF DJIBOUTI
RESEARCH & CONSERVATION
WHALE SHARK [RHINCODON TYPUS]



DAVID ROWAT





WHO I AM

When my wife Glynis and I moved to the Seychelles and through our diving activities we started to see ways in which we could help conserve local marine life. We began implementing several marine conservation and awareness projects, and one of the first of these was teaching children from the National Youth Service camp how to snorkel in the marine national park where the camp was situated. For many of the youngsters this was the first time they had ever been in the sea, let alone snorkelled or seen live fish!

WHERE I WORK

As one of the founders of the Marine Conservation Society Seychelles, and based on a long association with the Save Our Seas Foundation (SOSF), I put forward the idea of an integrated marine education programme. This would provide facilities for local youths and adults and give them information about the marine life in the Seychelles, ways in which they could protect it, and potential careers in the sphere of the marine environment.

With its white-sand beaches and clear waters teeming with marine life, the Seychelles is indeed a ‘paradise island’ destination, but it still faces many of

the same challenges that mainland areas face, including the effects of climate change. In fact on islands, with their extensive shorelines and limited land mass, these effects are exaggerated.

WHAT I DO

The Integrated Education Project provides secondary school pupils with a ‘summer camp’ environment in which they are introduced to the marine life of Seychelles and some of the research activities being carried out by local organisations. We provide training at a vocational level in specific areas, notably in shark identification and research and in the monitoring of marine mammals. The latter is especially important with respect to the development of offshore petroleum exploration around the islands.

The project has direct links with other SOSF programmes; this past summer, for example, the camps enabled the SOSF centre on D’Arros to showcase its research work to the youngsters. The current marine mammal training courses will similarly help provide local environment and NGO staff with better skills for monitoring these species, all of which are protected around Seychelles waters. Additionally, the

project is sowing the seeds for continued marine education and awareness throughout the community here in the Seychelles and thus supporting the overall goals of the SOSF.

INTEGRATED MARINE SCIENCE
EDUCATION PROGRAMME IN THE SEYCHELLES
MARINE CONSERVATION SOCIETY SEYCHELLES
2012-2013
SEYCHELLES
EDUCATION
CORAL REEF ECOSYSTEM



LAURA SAMS & ROBERT SAMS



We thank the Save Our Seas Foundation for giving us incredible support, from funding to world-class footage to increased credibility that has given us the tools we needed to achieve our creative vision. Our films are stronger, our ocean outreach education is more widespread, and ultimately we are inspiring thousands and thousands of people to love the ocean ... because of our partnership with the SOSF.

WHO WE ARE

Welcome to the Sisbro Studios profile! Sisbro Studios was founded in 2001 by the sister/brother creative team of Laura Sams and Robert Sams. We create science-based films, books, music, educational media and curricula that help people discover the natural world (and laugh along the way).

Laura has a Master degree in natural resources education with Bachelor degrees in zoology and parks/recreation. Robert has two Bachelor degrees, one in zoology and one in communications. This means he can talk to animals. Whether they understand him is another question.

We grew up in a family connected to nature. As part of a military family we moved frequently, but summer always took us back to the same place – our grandparents' cottage on a wooded lake in northern Michigan, USA. Somewhere between the swimming, fishing, sailing, hiking and watching deer on the evening drives along country roads, we fell in love with wild places and wild things. That led us to a passion for protecting wild things.

WHERE WE WORK

What is the biggest shark in the ocean and what do its teeth look like? This is a riddle we pose in

our film *The Shark Riddle*, co-funded by the Save Our Seas Foundation. We travel the United States with a shark-themed show based on the film – and when we reveal the answer to the riddle, crowds often murmur an audible 'Wow!'

So what is the answer? Keep reading our profile to find out. (Are we shamelessly teasing you to read our profile? Yes. We know reading a profile is an investment in your time, so we will try to make it worth your while by including warm, fuzzy words like 'excitement' and 'love' and 'shark-infested dreams'.)

From our base in Portland, Oregon, we visit thousands of people each year at schools, museums and aquariums around the United States to perform live programmes that inspire people to care about their world. Since working in the conservation sphere, we have become increasingly sensitive to the effects that 'doom-and-gloom' stories have on young people – and adults too.

While visiting a school, Laura asked a nine-year-old boy what he liked about the ocean. He said, 'The dolphins are being killed and the corals are dying. We need to save them.' She paused and said, 'That is what is wrong with the ocean. Now what do you like?' He looked at her with a furrowed brow,

then suddenly his face lit up with a smile. 'I think octopuses are really cool because they can fit their bodies into a tiny soda bottle.' Yes! That is the excitement we want to generate and use to help create the next generation of environmental stewards.

We believe that we do a great injustice to the next generation when we make them think about all the things that are 'wrong' with the world before they get to experience what is 'right'. The conservation world is full of doom-and-gloom messages, which can quickly get overwhelming for anyone. Young people especially can grow up disengaged emotionally because the problems seem too great to tackle. It is important to first help people fall in love with the ocean before we ask them to save it. People need to find that positive emotional connection with the ocean that will lay the foundation for the rest of their lives. Our goal is to help them find it through beautiful, clever, funny and family-friendly stories.

WHAT WE DO

The Save Our Seas Foundation (SOSF) has helped us reach this goal by co-funding our movies *The Riddle in a Bottle* and *The Shark Riddle*, and an educational outreach tour called Shark Days that



includes a custom-made, life-sized, seven-metre-long inflatable basking shark. Our Shark Days events are simply a way to celebrate sharks – their importance, their diversity, their beauty – in a non-preachy way. Each event is an interactive programme, which engages families in shark-themed games and music from the movie.

What if sea lions could sing a tribute to their nemesis the great white shark? Robert sings ‘The Great White Shark Song’, which thanks the predators for being part of the ocean’s food chain. How do you convince most people that sharks are not the monsters of our nightmares? Laura sings ‘The Shark Lullaby’, a hilarious tribute to sharks: ‘I would love you even if your eyes stuck out from your head, like a hammer-head ... sweet, shark-infested dreams.’

Sharks are a sexy topic – people are fascinated by them. But beyond knowing a list of the top five most dangerous sharks, most people have no idea that there are sharks that glow in the dark, that walk on their fins, that are so small they could fit in your hand! Plus, there are more than 500 species of sharks, and counting...

So what is the biggest shark, and what do its teeth look like? The whale shark can grow to 15 metres long, but its teeth are very, very tiny (as you see

in *The Shark Riddle*, about the size of a grain of rice). The biggest fish in the ocean is a filter-feeder that has some of the smallest teeth! That wonderful fact is a surprise to most people, and it encapsulates why the ocean is awesome – it is full of wonderful surprises.

**SHARK DAYS OUTREACH EVENTS BASED
ON *THE SHARK RIDDLE***

SISBRO STUDIOS

2011, 2013

USA

CONSERVATION & EDUCATION

SHARKS



JAYSON SEMMENS

ASSESSING THE EFFECTIVENESS OF
REFUGE AREAS FOR THE CONSERVATION OF
COASTAL SHARK SPECIES
UNIVERSITY OF TASMANIA

2011-2013

TASMANIA, AUSTRALIA

RESEARCH & CONSERVATION

SHARKS



This project is all about the sustainable management and conservation of school sharks and understanding how shark nursery areas function and how they should be protected. The high importance of its results to date makes the SOSF's contribution invaluable not only for this project, but also for vulnerable shark populations worldwide.

WHO I AM

I think I first knew I wanted to be a marine biologist when, as a small boy, I would badger my parents to let me walk around rock pools at the local beach for hours on end. It is funny, but I have been a professional marine biologist for more than 20 years and have been all over the world for my work – yet I still love to spend hours exploring rock pools whenever I get the chance.

My research, though, has taken me well beyond rock pools and I now spend most of my time using electronic tags to understand the movement, behaviour and physiology of sharks and rays, often with the aim of developing better management strategies for these vulnerable animals.

WHERE I WORK

Tasmania, Australia, is a unique place for many reasons, but for me the most important is that recognised shark nursery grounds – where sharks give birth to their pups – have been protected around the island since the 1960s. Shark fishing is prohibited inside these refuge areas in an attempt to rebuild local and national shark populations.

This is a great achievement and perhaps a model for other places around the world. Yet despite the importance accorded to shark refuges, relatively little is known about how shark nursery grounds function and what kind of role they play in supporting juvenile sharks.

WHAT I DO

That's where this project comes in. Many of the earlier studies that were used to identify shark refuge areas in Tasmania were based purely on the presence or absence of fishing. It has since been argued, however, that this alone is not sufficient justification to classify an area as a shark nursery. We need to have a better understanding of how sharks utilise the nursery areas in order to assess both the benefits of the areas and to what extent current management strategies are adequate if we are to protect sharks from potential changes to the environment.

Impacts such as environmental disturbance and habitat degradation caused by urbanisation and human activity have already been identified as key threats to sharks in these refuge areas. Our project's aim is twofold – to determine which habitats are critical to sharks' survival and when the sharks use them – and we see it as essential to identifying how best to rebuild shark populations.

Now here's the really exciting part. Our work to date indicates that the shark refuges around Tasmania are making a difference! Since summer 2011–12 we have conducted surveys that show catch rates of the severely overfished school shark, a species that gives birth to its pups in these refuge areas, are at a level 10 times that of the 1990s, when surveys were last conducted. This suggests that the school shark stock is recovering.



As I write this we are gearing up for the summer/autumn 2014 survey, when we will find out if we can record a third year of significantly increased school shark catches compared to the 1990s' level. Although three years of data would better support the theory of a recovery in the previously overfished school shark population, we would really love to make this a long-term study beyond three years.

These data sets are incredibly important globally as there is relatively little scientific evidence to date of overfished shark populations recovering. There is also very little evidence that the protection of nursery areas can aid this recovery. This study may serve as an excellent example of what can be done when a recovery plan is put in place and nursery areas are protected.

Importantly, the Save Our Seas Foundation (SOSF) has been a key financial supporter of this project over the past three years. Together with the Institute for Marine and Antarctic Studies at the University of Tasmania and the Winifred Violet Scott Charitable Trust, it has enabled us to undertake this crucial work.

MAHMOOD S. SHIVJI



The vision and generosity of the Founder of the Save Our Seas Foundation is allowing the SOSSRC to make key discoveries in shark science and to enhance education. The Founder's commitment to the welfare of our oceans is making a huge difference, especially in shark conservation.

WHO I AM

My life-long fascination with wildlife stems from growing up in Kenya, where I was routinely exposed to charismatic African animals and undersea environments as a child and a teenager. Having spent my formative years in this equatorial environment, I experienced college life in the very different climate setting of British Columbia, Canada, where I earned my first degree in biology at Simon Fraser University. My interest in marine science specifically was boosted when I started diving in the rather cold but awesomely species-diverse waters around Vancouver. This interest was formalised when, as an undergraduate student, I got the opportunity to assist university professors with their research on octopus population ecology and kelp-bed ecology.

Our research was based entirely on underwater experiments and scuba-diving observations near rocky shores or vast beds of giant perennial kelp in pristine, little-inhabited parts of the west coast of Vancouver Island, British Columbia. I vividly recall one particular winter morning when we surfaced from a long dive to unusually mirror-still sea conditions and gigantic descending snowflakes. Our four-metre inflatable boat and the shoreline conifer forest already had a solid dusting of snow; it was a breathtakingly

beautiful and peaceful scene. Instead of our usual rush to get back to warm showers and hot drinks at the dock, my dive buddies and I just floated in silence on the flat ocean surface for about 20 minutes (thank you dry-suits!), taking in the stunning exquisiteness of the scene. That was a day of incredible beauty underwater – and at the surface! Another amazing day at the marine science ‘office’.

Often asked how I became interested in shark research, I can only say that it’s just one of those unanticipated life-encounter things. One of my most memorable underwater experiences was a recreational shipwreck dive off Vancouver Island. As soon as we started the dive we found ourselves in the middle of hundreds of dogfish sharks as we slowly descended onto the wreck. They would approach to within a few centimetres, sometimes unavoidably bumping into us and then veering off, quite startled. We were descending through a virtual cloud of small sharks so dense that we were getting in their way! Despite having dived regularly in these waters for over three years, I had never seen more than one or two dogfish sharks at a time. It was a surreal but thrilling experience. As soon we landed on the wreck I looked up and the sharks were suddenly gone!

That experience jump-started my interest in all things sharks and has led to nearly two decades of shark research that continues to fascinate.

WHERE I WORK

Now based in Florida, USA, I’m a professor of marine science and the director of the Save Our Seas Shark Research Center (SOSSRC) and the Guy Harvey Research Institute (GHRI) at Nova Southeastern University’s Oceanographic Center.

WHAT I DO

My job is to plan and oversee the SOSSRC’s work, which focuses on scientific research to aid the conservation, management and understanding of sharks and rays, with emphasis on species and populations that are overfished, threatened or endangered.

The SOSSRC specialises in integrating multi-disciplinary approaches to research, which includes combining high-tech genetics research with field work to obtain a holistic view of shark and ray biology and the impacts of fisheries. Much of this work is conducted in partnership with the GHRI, so that the joint resources and expertise of the two organisations enable us to tackle crucial research issues that are global in

scope and would be challenging for each entity to address by itself.

Our team’s work consistently receives worldwide attention. The research to develop rapid DNA forensic methods for identifying 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 display at the Smithsonian Museum’s Sant Ocean Hall in Washington, D.C. Other research discoveries have been widely reported in national and international media, including in the *Washington Post*, *New York Times*, *The Economist* and *National Geographic*, and on the BBC and National Public Radio.

Surprisingly, recent in-depth investigation of the genetic core of white sharks has revealed more similarities between white sharks and humans than between white sharks and typical (bony) fishes in some biochemical aspects – highlighting the many mysteries about sharks that are still to be explored.

In addition to conducting DNA research, our team is making novel discoveries about the hidden, long-term travels of large sharks like tigers, shortfin makos and oceanic whitetips. The daily movements of these sharks can be followed on an interactive website developed specially for raising public appreciation of the amazing capabilities and international ‘citizenship’ of these ocean wanderers.

**INTEGRATIVE APPROACHES TO SHARK
CONSERVATION: POPULATION GENETICS,
FORENSICS AND ELECTRONIC TRACKING
SOS SHARK RESEARCH CENTER**

2008-2009, 2011-2013

FLORIDA, USA

RESEARCH & CONSERVATION

SHARKS



The Save Our Seas Foundation funded my work in the Maldives for six years. The Foundation's support and guidance throughout this time were key to my successes and I look forward to assisting other manta and mobula scientists and conservationists through my role on the Save Our Seas Foundation's Scientific Advisory Panel.



WHO I AM

I have been fascinated by the natural world all my life and growing up on a farm in south-western UK provided me with a seemingly limitless supply of weird and wonderful creatures to discover. I always knew that I wanted to make studying animals my career, but it was only when I was given a tropical fish tank at the age of 11 that my passion for the underwater world began. From that moment on I would say 'I want to study fish!' when asked what I planned to do when I grew up. True to my word, I progressed through school and college with this in mind and in 2002 graduated from the University of Plymouth with a degree in marine biology and coastal ecology.

University opened my mind to the rest of the world and I was hungry to explore as much of it as I could. Having visited and dived in the Caribbean, Africa and Asia, I realised that I wanted to work in one of these tropical destinations, and when a job for a marine biologist in the Maldives came up in 2003 I knew it was for me.

WHERE I WORK

A marine biologist's paradise, the Maldives has the world's largest-known population of reef manta rays *Manta alfredi*. It was here that I had my first

underwater encounter with any manta ray, and I was enthralled by these amazingly graceful and inquisitive creatures. Since then I've been driven by a desire to learn as much as possible about them.

In 2005 I founded the Maldivian Manta Ray Project (MMRP), which is now one of the longest-running manta ray research and conservation initiatives in the world. Highly regarded within the scientific community as a non-profit and independent organisation, it is also the founding project of the Manta Trust. The MMRP was formed with a view to collecting robust and long-term data records on manta rays throughout the Maldivian archipelago to further their conservation. The information gathered relates not only to the mantas encountered, but also to environmental and climatic factors, human interactions and tourism, all of which influence the manta ray population.

WHAT I DO

Since beginning our research we have identified more than 3,000 individual manta rays from over 25,000 photo-ID sightings. We can do this because each individual has its own unique pattern of black spots on its predominantly white belly. And since the

patterns do not change during the course of a manta's life, they enable us to track individuals as they are sighted over a period of decades.

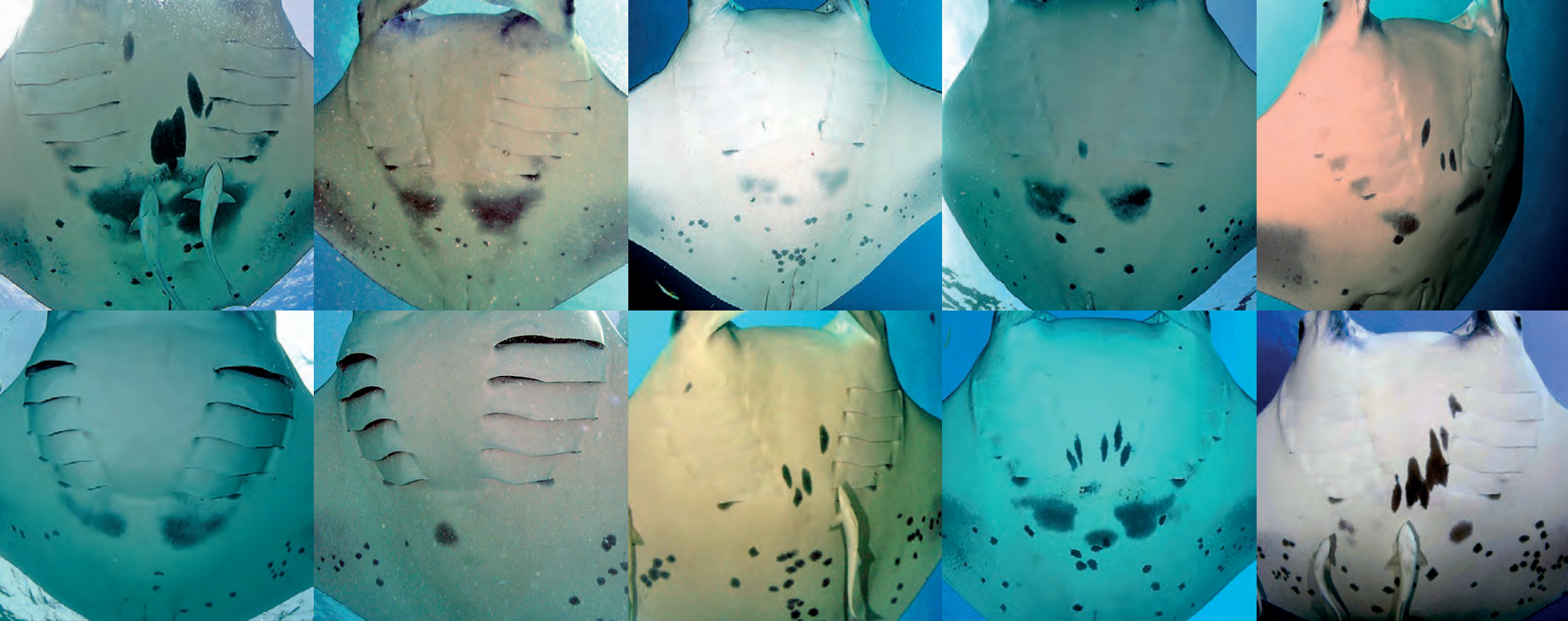
Every sighting – whether of a new manta or of one already known to us – is an important piece of a huge jigsaw puzzle, enabling us to better understand the size of a population and its composition, migratory routes and reproductive output, as well as areas of critical habitat. All this information is crucial to developing effective management and conservation strategies for these increasingly vulnerable animals.

Because we have been collecting data over a long period, the population of manta rays in Maldivian waters is one of the most intensively studied manta populations globally. Our long-term research allows us to record and identify key trends and patterns within this population over time.

Manta rays are an incredibly important resource for the Maldives, attracting tens of thousands of people to the country each year to dive and snorkel with them and generating millions of US dollars for the economy annually. Being able to improve our understanding of manta rays and pinpoint the reasons for any observed trends in – or threats to – the Maldivian population is crucial for the ongoing

GUY STEVENS





management and protection of these animals, and not just in the Maldives but globally too.

My conservation efforts in the Maldives have led to the creation of several marine protected areas (MPAs) at key manta aggregation sites, notably at Hanifaru Bay, and we expect that the reef manta ray will soon be listed as a protected species under Maldivian law. In 2011 the entire Baa Atoll, which contains the world’s largest population of manta rays, was designated a UNESCO World Biosphere Reserve, an achievement that the MMRP made a great contribution to. My work has been featured in *National Geographic Magazine* and in more than a dozen television documentaries.

Manta ray science is still in its infancy. So many questions are unanswered, making it impossible to write with absolute certainty about all aspects of these animals’ lives. I hope I will never tire of seeking answers and that by sharing knowledge I can promote imaginative thought in others so that the science and conservation of manta rays will be driven forward.

I’m often asked why I study manta rays. Why would a British marine biologist move halfway around the world to devote the past decade of his life to unravelling the lives of manta rays on the coral reefs of the Maldives? It seems a simple question, but it’s one I still find difficult to answer.

Manta rays are beautiful creatures with a grace and an inquisitive nature that are captivating. They engage my natural curiosity as no other marine creature does, driving my desire to protect them and learn as much about them as possible. Yet these words don’t fully convey my passion or the empathy and connection I feel for manta rays. So the best answer lies not in words but in an introduction between those who ask why and the mantas themselves. For me, manta rays are the embodiment of nature’s majesty, the vehicle that draws people through the looking-glass and opens eyes and minds. They captivate people and connect them to our oceans, symbolising what is at stake if we choose not to respect and protect our natural heritage.

CONSERVATION MANAGEMENT OF MALDIVIAN MANTA RAYS AND THEIR HABITAT	
THE MANTA TRUST	
2007-2013	
BAA ATOLL, MALDIVES	
RESEARCH & CONSERVATION	
OCEANIC MANTA RAY [<i>MANTA BIROSTRIS</i>]	
& REEF MANTA RAY [<i>M. ALFREDI</i>]	





WHO I AM

Working as an organic chemist in a field dominated by marine biologists and fishery scientists has been an interesting journey for the past 12 years! My interest in sharks began as a simple suggestion during the ‘summer of the shark’ in 2001. Bad weather kept my wife and me in our stateroom during a cruise and the satellite TV news was airing an unending blitz of shark attack stories. ‘Why don’t you work on a shark repellent?’ asked my wife. This was the spark that led me to years of chemical research, field work alongside renowned scientists, travelling the world and some unexpected discoveries.

WHERE I WORK

Aside from the disastrous effect on shark populations, shark by-catch in commercial long-line fishing results in damage to gear, a reduced catch of marketable fish, risk of injury to fishermen and time wasted in removing dead or dying sharks. The obvious need is to repel sharks while not scaring away the tuna and other valuable fish.

After some initial success with chemical signals as shark repellents in the Bahamas in 2003,

I formed SharkDefense, a corporation with a mission to produce shark repellents for commercial fisheries. As work on a marketable product progressed, my team learned that semiochemicals from decaying shark carcasses yielded a repellent response in all the carcharhiniform sharks studied. The beauty of this was that the chemical would scare the sharks away but not the fish – and since it derived from decaying shark tissue, we had a natural chemical signal at our disposal. Our first shark by-catch reduction tool was born!

WHAT I DO

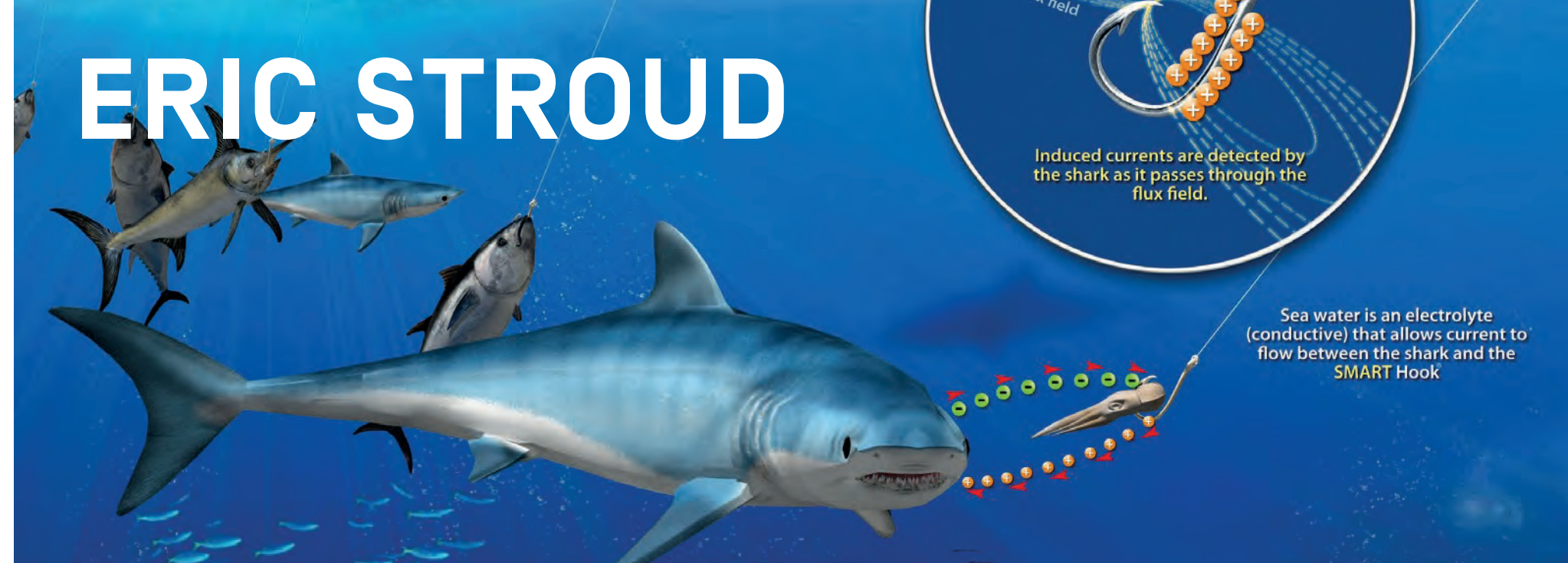
When working with shark repellents, you tend to try out some far-fetched ideas in pursuit of the best possible result. In 2004 and 2006 respectively, we discovered that permanent magnets and certain metals were, like semiochemicals, capable of repelling captive sharks at close distances. They interfere with a shark’s sensitive electro-receptive nose, a feature that bony fish like tuna lack.

Permanent magnetic fields induce electrical currents when a conductor is passed through them. In our research world, the shark is the conductive

body passing near a strong magnetic field. An electrical current is induced and is detected by the animal’s sensitive nose. This current is unnatural, many times greater than that generated by the shark’s prey – it’s like someone directing a bright light into your eyes, overloading your visual sense so that you flinch.

When sharks rely more on their noses than on their eyes to get around, such as at night or in poor visibility, the effect of the strong electrical current is striking – they turn away violently within 60 centimetres of the permanent magnet and, unless food is present, many avoid a second encounter. But in our research we have learned that sharks favour their eyes over their noses some of the time, making magnets not always effective. So perhaps we could find another repellent...

Enter the metals. In May 2006, purely by accident, my team found that certain reactive metals, called lanthanoids, produced a response similar to that of magnets. After much thought and testing, we found that these metals function like batteries in sea water, producing an electromotive force – measured at almost 1.5 volts – between themselves and shark skin. We conjectured that again the shark’s electro-



receptive nose was detecting this unnaturally high voltage and found it repellent.

Testing the metals near captive cobia showed that they had no effect at all on bony fish – exactly what we wanted! But there was a catch. Metals corrode in sea water, some more quickly than others. After a year of testing different metals and alloys we found one that would last for at least two days if submerged continuously, and even longer if it was hauled back aboard and stored for future use.

If the magnets were partially effective and the metals were partially effective, perhaps combining the two would produce a better shark repellent. After a few more years of testing we had our second and third by-catch reduction tools.

The snag now was to produce a means of application that requires no batteries, does not pollute and is cheap. Commercial fishermen use a lot of hooks, sometimes thousands per fishing trip. SharkDefense proposed that a hook might be the vehicle for its shark repellent ideas and a prototype SMART Hook™ (Selective Magnetic And Repellent Treated) was designed.

Magnetic and coated with a metal that acts like a battery when it comes into contact with sea water, the SMART Hook™ requires no power source and costs only US\$0.35 more than an ordinary fishing hook. Moreover, fishermen use it in the same way as a normal hook and no special handling or training is required. When preliminary trials in the Bahamas and Florida Keys showed promise, we approached the Save Our Seas Foundation (SOSF) with a proposal to test the SMART Hook™ on a real long-line vessel in a pelagic swordfish fishery.

SharkDefense has prepared all the SMART Hooks™ needed for trials in 2014 and is deploying them at sea. We hope to achieve a reduction in shark by-catch of at least 30% with the use of SMART Hooks™ rather than regular circular hooks, and if successful we will, with the assistance of SOSF, advocate widespread use of the new hooks. We envision a future in which thousands of them will be standard gear in commercial long-line fisheries and shark by-catch will be minimised worldwide.

SMART CIRCLE HOOKS FOR SHARK BY-CATCH REDUCTION

SHARK DEFENSE TECHNOLOGIES

2013

KEY WEST, FLORIDA AND THE SOUTH ATLANTIC BIGHT (SAB)

RESEARCH & CONSERVATION

SHARKS, RAYS & SKATES





WHO I AM

I grew up in Lancashire, England, where the weather is mostly wet and it's a long drive to the coast. Most kids of my age in the 1980s were playing with Action Man or Barbie, but nothing fascinated me more than sharks. My proudest childhood possessions were my shark videos, the typewriter on which I created shark fact sheets, and my ceiling-high collection of shark books. I was an official shark nerd and proud of it, spending hours engrossed in the adventures of Jacques-Yves Cousteau and Australian shark experts Ron and Valerie Taylor.

I'm pretty sure that my passion for marine life comes from my late father; we parted ways when I was five years old. Being a journalist and an angler, my dad wrote a novel about salmon and their epic migrations, which I read at the age of 11. I immediately realised that my fascination for ocean life was no coincidence; in fact, it still keeps the two of us connected somehow. I vividly remember the first time I watched real (non-Spielberg) underwater footage of a white shark; this had to be the most magnificent creature on the planet. From that moment I knew that, no matter what, I had to work in the ocean and study sharks.

At the age of 20 I graduated from the University of Wales with an honours degree in marine biology and went to work on a Greek island and then in the Red Sea as a scuba-diving instructor. I was subsequently offered the position of marine biologist for the Dyer Island Conservation Trust in Gansbaai, South Africa. I have been incredibly fortunate on my path so far, and have been able to write my MSc thesis on white sharks in Gansbaai through the University of Cape Town and Marine Dynamics Shark Tours.

There are still many questions about white sharks in this area that I'm endeavouring to find answers to, and I believe that being based here in the field year-round presents the perfect platform to achieve this. The role of a young scientist involves constantly learning, adapting and asking more questions. I look forward to the challenge as I embark on the adventure of a PhD project on white sharks here. I reckon Dad's proud too.

WHERE I WORK

Gansbaai is simply special. For white shark sightings, nowhere else compares to this truly privileged

area – not to mention the fact sharks may be encountered year-round. I liken the site to a pit stop, with the shark as a Formula One racing car travelling the entire South African coastline on its annual journey.

Providing the perfect refuelling station for a white shark of either sex or any age, Gansbaai is protected only on its western side, by Danger Point, and is known for its variable, wind-driven sea conditions, which play a role in the bay's high levels of marine productivity. Inshore is a 4.5-kilometre stretch of pristine sandy beach and parallel to this runs a large expanse of shallow reef. A multitude of fish prey species aggregate here, ideal food for juvenile and sub-adult white sharks.

One of my favourite times of year is November, when I can take a boat into the very shallow water close to the beach and observe sharks basking in the surf – I have counted more than 20 in one morning. They seem to be resting in the warmer oxygenated water, perhaps to aid digestion.

Four kilometres due south lies Dyer Island, a nature reserve where various seabird species breed. Geyser Rock, home to a resident population of Cape

ALISON TOWNER





fur seals, lies next to Dyer Island and separating the two is a shallow channel known as Shark Alley. In winter, between May and September, white sharks patrol the alley’s crystal-clear waters right alongside the seal colony. I have acoustically tracked large males that swim back and forth and opportunistically grab a seal from the colony’s edge.

We have observed white sharks feeding on seals, reef fish, skates, rays, smaller sharks and dolphins around Gansbaai. The area is an incredibly rich biodiversity hotspot and fully deserves the title ‘white shark capital of the world’.

WHAT I DO

Ultimately my project aims to understand whether the white sharks’ long-term movements are driven by cage-diving activities, by environmental conditions or by prey in the Gansbaai region. The results from my Masters identified that environmental conditions are an influence on the sex and numbers of sharks in the bay. Shark cage diving operations (SCDOs), however, probably impact Gansbaai more than any other area in the world. As tourist numbers

to South Africa have increased, so too has the popularity of white shark cage diving. The arguments for and against the industry are highly emotive and this research topic needs a balanced and critical approach.

White shark movements can be monitored in detail, by manually following the shark for short periods using active acoustic tracking, as well as over longer distances and periods. At present we do not fully understand shark behaviour towards SCDOs, nor how SCDOs affect the length of time white sharks stay in Gansbaai.

Through the active tracking dataset I have been collecting since 2010 I hope to provide a baseline insight into how individual sharks of different sizes and sex respond to SCDOs. Active tracking – physically following a white shark around the bay in a boat with a hydrophone – is logistically challenging, however, and at the mercy of variable weather conditions. We therefore use it in combination with passive monitoring in the form of long-term acoustic tags that enable us to track individual white sharks over a number of years, provided they pass listening stations (moored receivers that can detect the tag’s radio

signal). Satellite tagging will also give us insight into where sharks go on their long migrations when they leave Gansbaai. Once we have a better understanding of how SCDOs affect white sharks in the long term, we will be in a position to discuss the future of the industry if expansion continues.

The Save Our Seas Foundation provided the first set of listening stations for the Gansbaai area, as part of a national network array. The combination of tagging methods will provide information suitable to start testing hypotheses for this study.

PASSIVE ACOUSTIC MONITORING OF WHITE SHARKS IN GANSBAAI, SOUTH AFRICA
DYER ISLAND CONSERVATION TRUST
2013
DYER ISLAND, SHARK BAY, GANSBAAI
WESTERN CAPE, SOUTH AFRICA
CONSERVATION, RESEARCH & EDUCATION
GREAT WHITE SHARK [CARCHARODON CARCHARIAS]





WHO I AM

My full-time professional engagement in conservation began more than 25 years ago, when I worked for a pioneering organisation that actively investigated and exposed wildlife and other environmental crimes. This organisation, the Environmental Investigation Agency (EIA), is still a leader in its field, with its ground-breaking investigative methods, hard-hitting approach and astounding value for money.

Having witnessed the threats to our natural world and seen that much more was needed to protect it, I was inspired to co-found two organisations. One, WildAid, was designed specifically to kill off the demand for endangered species, thereby getting to the root cause of the illegal trade in wildlife. The other, the Environmental Justice Foundation (EJF), aims to address both environmental abuses and the human rights violations that so often go with them, understanding that in the 21st century the protection of our natural heritage and of human rights must go hand in hand.

Over this past two and a half decades I have witnessed much needless and wanton destruction, but I have also seen how we can change our world, protect wildlife and natural habitats and defend the

rights of the poorest and most vulnerable people. I am inspired by those I have had the privilege to work with and learn from. Most of all I am inspired by the wonders of nature, the marvels of which we still fail to fully comprehend and, as a global community, so tragically undervalue. Nature is my god, and my fellow conservationists and activists are my companions in honouring it.

WHERE I WORK

EJF's biodiversity project is based in coastal Liberia, centred in the West Point area of Monrovia and in Robertsport, a fishing town near the border with Sierra Leone. West Point is one of the most deprived parts of Monrovia, with a regional reputation for crime and poverty. It is also the country's largest fishing community, hosting hundreds of canoes and thousands of fishermen.

Robertsport sits alongside Lake Piso, a lagoon that has recently been designated a natural reserve by the government. In both communities, families depend on protein from the sea for food security and on fishing as the primary source of employment.

Over recent decades, however, two trends have impacted the artisanal sector. Illegal trawlers from overseas have fished in the areas reserved for local fishermen, reducing the latter's catch and often destroying their nets, while all too often using destructive fishing gear and paying no attention to sustainable practices or the biological limits of the fisheries resource. This has led coastal communities to seek alternative forms of protein – including turtles.

Turtles have been caught and killed both at sea and when they come ashore to nest, a practice that fishermen tell EJF was previously taboo.

Species impacted by this include the hawksbill turtle *Eretmochelys imbricata* (classified as Critically Endangered on the IUCN Red List), the green turtle *Chelonia mydas* (Endangered) and the leatherback *Dermochelys coriacea* and olive ridley *Lepidochelys olivacea* turtles (both Vulnerable).

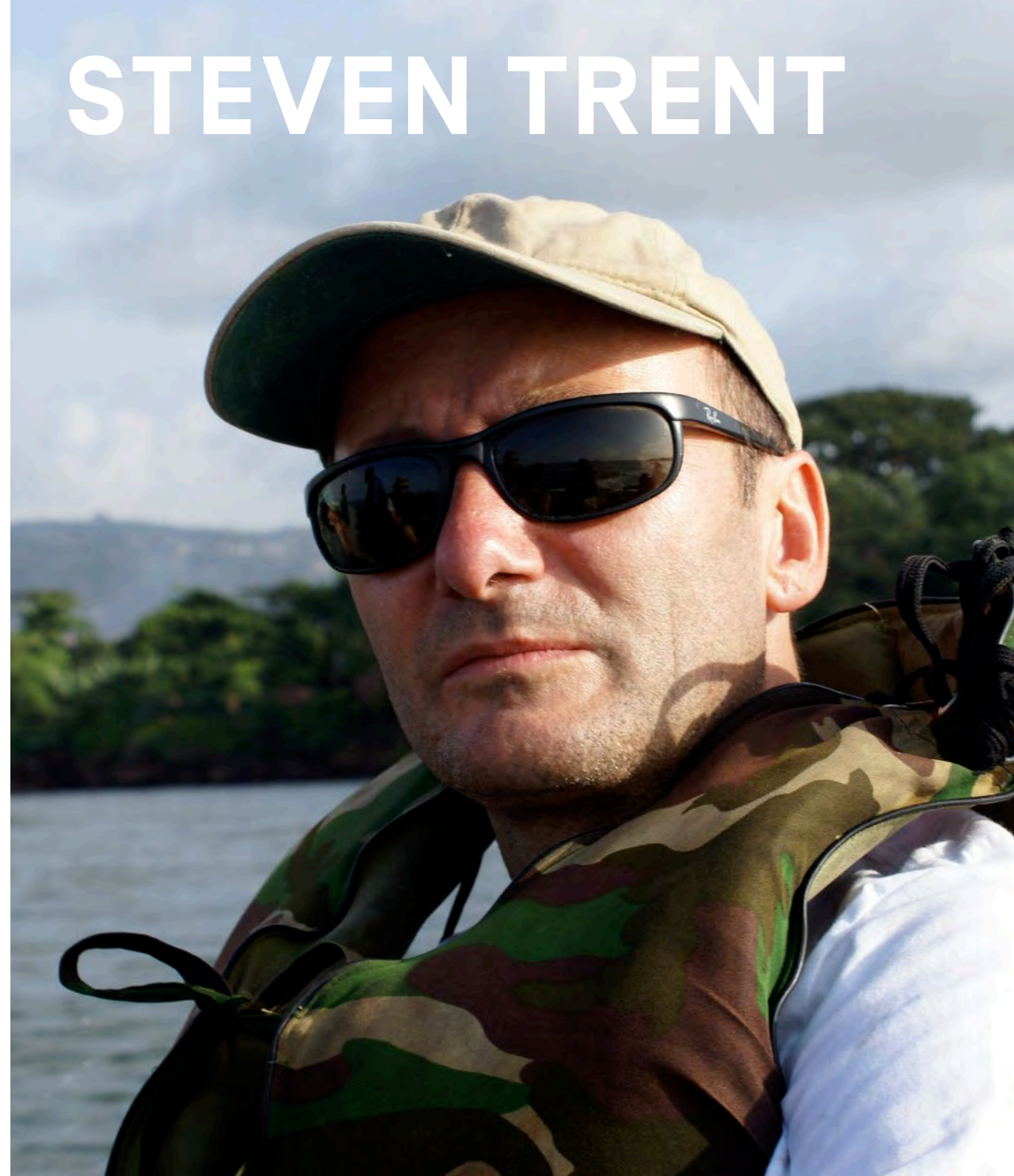
Alongside this, a demand for shark fins in East Asia has created a lucrative market across West Africa. In the dry season, when sharks are most plentiful, some fishermen now target them specifically, drying the fins and selling them to traders and smoking the flesh for local consumption. EJF has observed the landing of 12 different species of sharks and rays, including two Endangered hammerheads: the great hammerhead *Sphyrna mokarran* and the scalloped hammerhead *S. lewini*.

WHAT I DO

EJF has worked in Liberia since the start of 2012 to reduce illegal industrial fishing and the pressures it places on local communities. More recently, the Save Our Seas Foundation provided US\$ 10,000 funding to help us document and address these worrying trends.

Biodiversity officers have been hired for West Point (Alphonso) and Robertsport (Godwin). Both former fishermen, Alphonso and Godwin have good relationships across their communities. They have been trained by a marine biologist from the UK to identify species, collect and analyse data and return sea turtles safely to the sea. Each morning they watch as catches are landed. Whenever they find sharks, rays and anything else of interest, they measure and photograph them. There are no laws in Liberia banning shark and ray catches, so the two biodiversity officers normally

STEVEN TRENT



have free rein to undertake this part of their work. Going forward, EJF will be using the evidence being gathered on the catches of threatened and endangered shark species to advocate legal protection for them.

Killing turtles and dolphins, on the other hand, is prohibited by Liberian law and punished with stiff fines, so fishermen bringing turtles ashore try to avoid detection. However, Alphonso and Godwin have repeatedly engaged with local fishermen and their leaders and they are increasingly tipped off when a turtle, or more rarely a dolphin, is landed. If it comes ashore dead, the authorities are notified immediately. If a turtle is still alive, EJF staff prioritise returning it safely to the sea.

In recent months, Alphonso assisted with the return of a hawksbill caught by fishermen and Godwin ensured that a nesting leatherback that had been captured was released. Having identified the threats faced by sea turtles and built up the support of community leaders, in 2014 EJF is looking to expand the reach of its turtle conservation work within and beyond Liberia.

SAVING SHARKS AND TURTLES

ENVIRONMENTAL JUSTICE FOUNDATION

2013

LIBERIA & SIERRA LEONE

CONSERVATION & EDUCATION

SHARKS & TURTLES





WHO I AM

After completing a degree in nature conservation in Pretoria, South Africa, I spent the first part of my career in the African bushveld, where I studied the movements of white rhinos, conducted anti-poaching patrols and guided on safaris. Several years later I took a temporary job as a botanical guide at Rocktail Bay on the northern coast of South Africa. During my first encounter with a nesting turtle on the beach, I was so inspired by these vulnerable creatures that I sensed a major fork in my career path. Soon I became hopelessly addicted to the ocean and spent all my spare time getting to know it.

After hastily completing my honours degree, I returned to Rocktail as a turtle researcher and stayed there for nearly two years. My persistent hunger for adventure eventually won me a four-month voluntary position at Aldabra, a remote, untouched coral atoll teeming with turtles and other marine life. I loved it so much out there that I ended up staying for five years, working as the chief scientific officer.

In 2006 I was offered an opportunity to conduct my PhD on the foraging ecology of the Critically Endangered hawksbill turtle at D'Arros Island and St Joseph Atoll in the Amirantes, a group

of islands and atolls in the Seychelles. I spent the next five years following turtles around underwater and gaining an intimate understanding of the area and its surroundings. In 2011 I completed my PhD and took up the position of scientific director of the D'Arros Research Centre.

WHERE I WORK

The natural environment of D'Arros Island and St Joseph Atoll is among the most pristine and spectacular in the world. Scores of sharks, manta rays, turtles, stingrays and fish inhabit the lagoon and the surrounding coral reefs, while flocks of seabirds roost in trees overlooking tranquil beaches. The D'Arros Research Centre, where we are based, is situated on the beach crest of D'Arros Island and overlooks the ocean. We often spot turtles, mantas, sharks and dolphins from our office! Just this morning, while we were preparing some research equipment, a hawksbill turtle emerged from the sea and nested right in front of the centre. As we watched it, a train of several manta rays passed by just 50 metres out to sea.

Despite being the largest of the 17 islands that comprise the D'Arros and St Joseph chain, D'Arros

is small enough that you can walk along its uninterrupted sandy beach and complete a circuit of the entire island in just two hours. About 30 people live here to maintain the infrastructure and conduct research, but all the remaining islands are uninhabited.

Daily activities from the centre are diverse and include regular scuba diving to monitor the coral reefs and download remote sensors, travelling on the boat to collect ID photos of manta rays and walking the beaches to tag turtles. We usually have several researchers, students and volunteers working on various projects and thus we enjoy a productive and pleasant atmosphere on the island.

WHAT I DO

Hawksbills are gentle, charismatic creatures whose global population has been decimated by more than 80% over the past century due to the demand for their shells (tortoiseshell actually comes from hawksbills).

These Critically Endangered turtles spend most of their long adult lives at a particular foraging ground, where they maintain small home ranges and feed mostly on sponges. Every few years, however,

RAINER VON BRANDIS



females undertake epic oceanic migrations to nest on the same beaches that they themselves emerged from as hatchlings. D'Arros and St Joseph are among the few places where the nesting population appears to be increasing because the private owners have protected them since 1975. Indeed, ours is currently one of the biggest hawksbill rookeries in the Western Indian Ocean. In order to fully understand and protect these turtles, we are eager to determine the location of their foraging grounds and the routes they take to reach them.

Other studies suggest that the turtles could live as far away as the African mainland (1,500 kilometres) or perhaps much closer, even on the Amirantes bank where D'Arros and St Joseph are situated. We also know that adult hawksbills usually occupy progressively deeper foraging grounds as they mature, which is why we only see juveniles foraging on the reefs around our islands. Apart from this, we know nothing about where these turtles spend most of their life! Once we know where they go and what threats they face at their foraging grounds, we hope to take steps to ensure that they are adequately protected in the future. From a biological point of view, we also wish to know what hawksbills are capable of in terms

of migratory distance and speed, and what the foraging grounds look like in terms of depth, proximity to land and the composition of the sea bottom.

The nesting season at D'Arros and St Joseph peaks in December, at which time several turtles can be encountered on the beach laying their eggs. Interestingly, Seychelles is the only place in the world where hawksbills nest during the day. Towards the end of the nesting season, we will be attaching a satellite transmitter to the carapace of seven turtles after they have finished laying their eggs. The transmitters will provide the exact location of the turtles on a daily basis. This will be so exciting – the first thing I will be doing every morning is logging onto the tracking website and seeing where the turtles are!





WHO I AM

I grew up on the west coast of Canada and started free diving and spearfishing at a very young age. Pretty much everything that I loved involved the sea: surfing, free diving, spearfishing, sailing. My father taught me to free dive, and he also taught me to respect the sea. ‘If you’re going to spend time in the sea,’ he said, ‘it’s your responsibility to protect it.’

For more than 40 years I have been moved, impassioned and motivated by my love for the sea. Although I always tried to have a positive impact on the environment, as the years passed I started to notice big changes in the different ecosystems I was diving in. I felt I needed to do more to look after them – but what could I do?

In 2005 I chanced upon competitive free diving, taking part in a small competition and ending up qualifying for the world championships. Having achieved a top-10 finish in three out of four disciplines, I decided that I would apply myself and see what I could really do. By the end of 2006 I had gained a top-2 ranking in several disciplines and was the top-ranked male at the world championships. Now, I thought, sponsorship money will flow – how wrong I was!

As I continued to excel at competitive diving I realised that I might be able to leverage my free-diver status to make a difference. In 2008 the Malpelo Foundation in Colombia invited me to put my breath-hold diving skills to use by tagging sharks. It needed the information it could glean from tags to better protect the highly migratory scalloped hammerhead shark.

From there I started to look at how I could offer even more help. Since many research expeditions were being cancelled due to lack of funds – in some cases there was not even enough money to buy tags – my wife and I decided to look for funding. We finally found a foundation in Geneva, Switzerland, that was willing to provide finances on a small scale on condition that we set up a non-profit organisation. That is how the Watermen Project was created.

I have kept a high profile on the competitive free-diving scene because breaking records draws media attention and can thus be a useful tool. I found that I was able to leverage my title as holder of the world record for free-diving to shed light on the plight of sharks. This was particularly relevant when I was in Australia in December 2013, having been asked to promote the IMAX 3D film *Great White Shark*. Two

fatal shark bites coincided with my trip and, needless to say, I had to answer many questions from journalists. Being a world-record holder opens doors, and I take the opportunity to educate the public and dispel common misconceptions about the unfortunately vilified predators that are sharks.

WHERE I WORK

I am lucky to work in many different parts of the world’s oceans: Guadalupe Island and the Revillagigedo Archipelago in Mexico, French Polynesia, South Africa, the Bahamas and Mozambique, as well as Colombia’s Malpelo Island, are just a few of the locations. ‘Work’ is a term used loosely, though, as at the moment we are volunteers and are not paid to do the tagging, organising or a myriad of other tasks.

WHAT I DO

Since 2008 the Watermen Project has been supporting research around the globe by buying tags, receivers and other gear and by putting tags on sharks for researchers. The work I do involves many different things: looking for funding, reviewing research proposals, seeking the right fit for our tagging methods,

WILLIAM WINRAM



photographing and filming sharks, organising expedition boats and, of course, placing tags on sharks.

Every shark species presents its unique set of challenges. Some, like the scalloped hammerhead, are extremely shy and pose little risk to our safety, whereas others, such as the great white, can take a bite out of you if you are not careful.

The project we have been working on at Guadalupe Island since 2009 involves placing acoustic tags on great whites. Shark biologist Dr Mauricio Hoyos was unable to tag them from a boat because they would not approach close enough for a clean shot. We started from scratch to develop a protocol to film and tag the sharks safely on a single breath of air. This kind of tagging requires 100% attention at all times, as the great whites will sense any lack of focus or lapse in concentration and will come in for a closer look from an angle you are not expecting. Although challenging, work such as this is always rewarding.

In the 2012-13 season we were hoping to tag more sharks than we had in previous years and it was wonderful that the Save Our Seas Foundation was willing to offer financial help to purchase more tags. The tagging of great white sharks at Guadalupe will continue in 2014 as our research advances, and I look forward to a continued partnership with the Save Our Seas Foundation.

CONSERVATION OF SHARKS IN

THE MEXICAN PACIFIC


THE WATERMAN PROJECT

2013

WORLDWIDE

RESEARCH & CONSERVATION

SHARKS





ELIZABETH WOOD



SOSF support is important to us because the project is not just about catching people involved in destructive fishing – it's about stopping the damage that is being done not only to the reefs and fish stocks and biodiversity, but also to people's livelihoods.

WHO I AM

Family seaside holidays, swimming, rock pooling and snorkelling, then learning to dive while still at school; add an insatiable interest in wildlife and that was my pathway to becoming a marine biologist. Early days were spent exploring British waters and getting acquainted with our native marine life, but then in the mid-1970s came the chance to get a taste of tropical seas.

WHERE I WORK

We were in the Malaysian state of Sabah in North Borneo for a three-year placement well before diving and dive tourism started up there. Nothing quite prepared me for my first encounter with coral reefs. It's the fish that – almost literally – hit you first. Their variety and colour and the way they carry on with their lives right in front of your eyes are totally captivating. Information on the reefs was sparse and two of my first research projects were to carry out a preliminary survey of as many of Sabah's reefs that we could get to and to write a book about corals.

This early work led to a long-lasting collaboration with Sabah Parks and the launching of the Semporna Islands Project in the late 1980s. Our mission was to work on a conservation management

plan for one of the most important – and threatened – areas in Sabah. To cut a long story short, one of the major outcomes of this work was the establishment of Tun Sakaran Marine Park in 2004 – the largest in Sabah and the only one to include local communities living within the boundary. This, of course, was the beginning of the conservation challenge rather than the end of it.

WHAT I DO

One abiding memory early on in our time in Sabah was the episode of the fish bombers and the aborted dive. As we bobbed about in our small boat making preparations to dive, a small fishing boat approached and instructed us to move away pronto because they were about to throw fish bombs into the water. Well, they warned us at least – the fish and the reef were not so lucky.

Fish bombers don't have the nerve to operate out in the open these days – after all, the practice is illegal, punishable by fines or jail. But it has been going on for more than 40 years, causing chronic damage to the reefs. Many of the local fishermen condemn it, understanding that bombing is one of the most destructive forms of fishing known. It inflicts severe damage not only on the reefs, but on their own local economy

and livelihoods as well. Yet others still use this method because it is quick, relatively simple and yields a large 'catch' in a short time.

We and others use 'soft' techniques to increase public awareness about the disastrous impacts of fish bombing, but there is still a hard core of fishermen who continue the practice. Although the authorities do their best to stop them, apprehending fish bombers is difficult because of the large areas that need to be patrolled, the shortage of manpower, and the challenge of being in the right place at the right time and having the evidence to bring a prosecution to court.

This is where our new SOSF project comes in. Our aim is to develop and install a unique underwater listening device that will log the sound of the bomb in real time and plot its position. Sound travels very long distances underwater and even fish bombs exploding many kilometres away make a frighteningly loud noise. On many occasions, one of our dive team has surfaced to report the sound of a loud explosion underwater, only for the boatman to say 'Bomb, what bomb? I haven't heard a thing.' So our aim is to develop and install a unique underwater 'listening' device that will log the sound of the bomb in real time and plot



its position. The signal and coordinates will be routed to park rangers via mobile phone, enabling them to immediately send a patrol boat in hot pursuit.

Our local project coordinator Jamie Ng, along with the park manager, recently visited the technical team at the University of St Andrews in Scotland for training and to take charge of the hydrophones, laptop, software and other relevant gear required for the detection system. At the moment we are in the start-up phase, which entails calibrating the software to recognise the distinctive signal generated by an exploding bomb. This is a vital first step as the sea is a surprisingly noisy place and we don't want to find that a passing boat or a snapping shrimp on top of one of the hydrophones causes a false alarm.

**COMBATING DESTRUCTIVE FISHING IN
SABAH USING AN INNOVATIVE ACOUSTIC SYSTEM**
MARINE CONSERVATION SOCIETY
2013
SEMPORNA AREA, SABAH, MALAYSIA
CONSERVATION
CORAL REEF ECOSYSTEM





WHO I AM

It was at the age of nine that I first heard a recording of a family of orcas; instantly I was both captivated and extremely curious. This was my first emotional response to sound, and the inspiration it gave me led to a life-long commitment to understanding the behaviour of whales. After I graduated, my dream was to build a research station in an area where whales thrive and the presence and impact of people are minimal. I was fortunate enough to meet Hermann Meuter, who shares the same passion.

WHERE I WORK

In 2001, with the permission of the First Nation Village of Hartley Bay, we built on Gil Island the first and only marine facility (Cetacea Lab) along the remote north coast of British Columbia in Canada. We are the only two people who live on this island; the closest town for supplies is four hours away by boat. It's a precious area, and we hope to have it designated as critical habitat for whales.

WHAT I DO

Hermann and I established a network of hydrophone stations in the surrounding waters that, minute by minute, transmit the underwater world

of whales back to the lab. This unique structure has enabled us to collect an acoustic library of individual orca and humpback call types. When not in the lab recording whales' calls, we are on the water collecting photographs of each individual orca, humpback and fin whale so that we can better understand the species' social bonds.

In 2008 we installed a hydrophone station in Caamano Sound, not knowing at the time that we were about to discover an acoustic window into an unexplored marine corridor that was a gateway to orca activity. Resident orcas live in permanent family groups in which the oldest female is the matriarch. Because they live so close to one another, each family group has developed its own unique dialect. With our network of hydrophones set up throughout the research area we are able to identify and track the movement of orca families just by listening! By the end of the first season of listening to hundreds of hours of orca communication we knew that Caamano Sound must be designated as critical habitat for the species. Our next goal was to combine all acoustic information with visual sightings.

Wolves, bears and a variety of sea mammals are the only inhabitants of the remote island where the

hydrophone station is located. Here, along the rugged coastline of the Great Bear Rainforest, the weather can change from flat calm to storm-force winds and six-metre waves within hours. This place is wild and not always accessible by boat. We had to find a way to track the movements of whales but at the same time remain safe. So in 2009, with extremely limited funding, we built a very basic shelter at Ulric Point on this uninhabited island.

Most of that season I went weeks without seeing another person, slept in a tent, powered the radio – my lifeline to Cetacea Lab – with a small solar panel, and kept my food in barrels suspended from trees to protect it from wolves and bears. My favourite companions were two eagles that were nesting close by, a curious family of mink and my precious scope to search for orcas. The mornings were cold and often extremely wet (hence the name rainforest), but this was soon forgotten when a family of orcas would pass close to shore, the sound of their blows echoing through the forest. On the rare occasions that they recognised this lone person on the shore and slowly approached, making direct eye contact with me, time would stand still. All that mattered was that moment, and I was reminded why this intelligent and gentle

JANIE WRAY & HERMAN MEUTER

BY JANIE WRAY





IDENTIFYING CRITICAL HABITAT FOR
ORCAS IN NORTHERN BRITISH COLUMBIA
NORTH COAST CETACEAN SOCIETY
2012-2013
CAAMANO SOUND, BRITISH
COLUMBIA, CANADA
RESEARCH & CONSERVATION
ORCA [ORCINUS ORCA]

creature had stolen my heart so many years ago.

I always had either a camera in my hand to take pictures for identifying individuals or the scope to observe the orcas’ travel patterns, whether they were feeding and all groupings between families. The first season was a huge success and the high number of orca sightings made every moment of hard work worth it.

We also had to find a way to collect fish scale samples to determine the orcas’ exact prey source when they were foraging. A major step towards this goal was achieved in 2010, when the Gitga’at First Nations decided to join the efforts of Cetacea Lab and teamed up with us to conduct boat surveys whenever orcas were sighted from Ulric Point. This collaboration has become a key component in successfully gathering the necessary data to protect orca habitat.

The living conditions at the remote camp remained extremely basic and the equipment used for collecting the data was partially owned by third parties. It was also imperative that we could bring in a number of interns to participate; safety was a concern and the hours were long for just one person. All of that changed for the 2012 season when the Save Our Seas Foundation decided to fund this important research project. Everything from better camera equipment to viewing scopes and alternative energy sources has enabled us to continue on our path to understanding orca movements and the sacred bond these animals have with each other and their habitat.

We hope that with continued funding we will have sufficient data in the next few years to convince the Canadian federal government to declare Caamano Sound critical habitat for resident orcas.





WHO I AM

Every scientist has a defining moment in their life that led them to their career. For me that moment came when I was about four years old. I was fascinated by dinosaurs. The wonderful plastic models with the Latin names embossed on their bellies kept my attention for many days and nights. After a few months, I announced to my mother that I wanted a pet dinosaur. Sadly, that was not to be. I learned the term ‘extinct’, that some things were gone forever, and that there were things so old that even my grandparents had never seen them.

I also learned that turtles lived at the time of dinosaurs, so they became my ‘substitute dinosaur’ pets. I grew up with turtles in the house. Much of my reading about turtles described species, their natural history and their care. As I outgrew the children’s sections of the library, my pet turtles thrived. I still have a few of them decades later.

My familiarity with turtles led me to biology. Throughout my university education I gained experience in a number of scientific areas and with many organisms, including fish, crabs, frogs, flies, primates, pigeons, snakes and sharks. But turtles held my focus; they are ancient, fascinating and among the most imperilled species.

Each day that I am asked ‘Where are the turtles?’ I know the answer I give today –and the answers I will give in the years to come – will be because of the Save Our Seas Foundation. Knowing where animals are in the ocean is so fundamental to their conservation, yet that information was a mystery for these small members of offshore marine ecosystems. The Save Our Seas Foundation unlocked that mystery and the ways to solve it.

I had never kept sea turtles as pets, but I was fascinated by them. They are turtles that defy norms: they have flippers, migrate long distances and cannot withdraw into their shells. They start life very small and grow very large. We know strikingly little about their lives at sea.

WHERE I WORK

Our studies start on a beach with many sea turtle nests that are marked by signs, posts and cages. Many people are aware that the beaches of Boca Raton in Florida, USA, are favoured by nesting sea turtles. Our lab, the Florida Atlantic University Marine Lab, is located in a city park and one of its foremost missions is to explain our ongoing research to the layman.

The lab has a viewing area that is popular with visitors, who come in expecting to see marine turtles and a few scientists. On a typical day they get a view of several hundred sea turtles, rays, some odd fish and marine plants. Most of the lab is filled with sea turtles. It is common for people to return much later, bringing along friends to see the lab. But science has marched on and what is there to see has changed.

Turtles have come to the lab, grown a bit, served in their study and been released.

WHAT I DO

In a typical season, we study the three sea turtle species that most commonly nest on our local beaches: loggerhead, leatherback and green. The turtles get clean, safe water, good food delivered daily and a lift offshore at the end of their time in the lab. We get data for our several studies and the ability to aid conservation through science.

We bring the turtles into the lab to better understand how to track their travels when they are at sea. Our studies have to reflect natural behaviour and should not harm the turtles. How to attach tags that allow for normal behaviour and will fall off when the turtles outgrow them is important. Being able to test these tags and tagging methods in the lab before releasing the turtles increases what we can learn from the animals once they are at sea.

But why track little turtles? Understanding where imperilled animals go is key to conservation. We see where they travel to and then look at other contemporary information to identify whether they

JEANETTE WYNEKEN



are in a ‘safe’ neighbourhood or a ‘bad’ one. We can’t prevent animals from travelling to high-risk areas, but we can identify hotspots or key time periods that need conservation and management attention.

To date we’ve successfully developed ways to track loggerheads, green turtles and now leatherbacks. So where do the turtles go? All our releases are into the strong current of the southern Gulf Stream in the Western North Atlantic off Florida. Not surprisingly, the turtles behave normally when released, often diving first, then surfacing and taking off into the waves.

The loggerheads and green turtles are initially transported northward by the fast-moving current, but then they diverge. Loggerheads tend to use oceanic features, such as eddies that concentrate food, as they turn eastward across the Atlantic. Green turtles seem to be more flexible in how and when they exit the Gulf Stream to look for food-rich habitats. Unlike loggerheads, they are not constrained by the western border of the current and their routes diverge from those of the loggerheads within their first two months in the water. We continue our analyses of the thermal environments that green turtles choose as well as the productivity of the waters they seek out.

Our leatherback tracks are just starting as this has been the most challenging species to tag. Initial impressions are that these turtles spend far less time at the surface than the others do. We look forward to the results of this first season of following neonate leatherbacks, especially as no-one has yet managed to track them successfully.

Ours is the only lab in the world that routinely raises leatherbacks for study. This species is exceptionally difficult because of its unusual diet (jellyfish and their relatives), behaviour (leatherbacks swim almost constantly and don’t recognise barriers such as tank walls) and fragile health (they can be susceptible to microbes that are common in coastal waters and their skin is easily damaged). We have addressed many of these problems over the past 20 years, but leatherbacks are still a challenge.

**TRACKING NEONATE SEA TURTLES:
DISCOVERING THEIR OFFSHORE HOMES**

2009-2013

FLORIDA ATLANTIC UNIVERSITY

FLORIDA, USA

RESEARCH & CONSERVATION

GREEN SEA TURTLE (*Chelonia mydas*)



TAMZYN ZWEIG



WHO I AM

Having grown up in the ‘deep south’ of the Cape Peninsula in South Africa’s Western Cape, I think I was always destined to become an advocate for the conservation of the creatures I share my surroundings with. My playgrounds were unspoiled beaches, dunes and coastal fynbos forests. I learned to swim before I could walk and quickly developed a fascination for the otherworlds below the waves. I recall winter days when I snorkelled in the cold water of False Bay for an hour at a time and came out of the water shivering and blue. Then I’d spend hours in the library learning about the mysterious creatures I had seen. The sea was – and still is – my sanctuary, my church, my life’s love.

After an unfulfilling career in pre-school teaching and restaurant management, I joined the Cape Peninsula University of Technology’s Fisheries Resource Management National Diploma programme at the ripe old age of 32. Returning to academia and working nights and weekends was a challenge I accepted enthusiastically. It’s easy to study what you love!

WHERE I WORK

In 2010 I joined the South African Shark Conservancy (SASC), a small non-profit organisation

Without the Save Our Seas Foundation’s input in the SASC RecFishSA project, we would never have been able to get it off the ground. The SOSF has contributed to understanding the survival of elasmobranchs caught and released by recreational fishermen in South Africa and assisted in informing hundreds of anglers about the simple actions they can take to reduce the negative impacts of their sport.

based in Hermanus, Western Cape, as an unpaid volunteer. Four years later I am still happily working there. I don’t need to tell myself that I am living my dream; I’m reminded every day when I arrive at work, when I come into contact with the shark, skate and ray species I have the privilege of researching, when I see the awe and amazement on the faces of the children who enter our facility.

WHAT I DO

Recreational fishing is extremely popular in South Africa: of about 2.5 million sport and recreational anglers, roughly 850,000 participate in rock and surf fishing. Within this sector, an undetermined number of fishermen catch and release elasmobranchs (sharks, skates and rays). Some do so simply for their own enjoyment; others compete in angling tournaments.

In recreational fishing for elasmobranchs, the bag limit for caught-and-retained sharks is 10 per day (of any size). For catch-and-release fishing, however, there is no bag limit and anglers may take (and return to the water) as many ray-finned fish or elasmobranchs as they wish every day of the year – there is no closed season.

In 2007 it was estimated that the recreational fishing industry contributed about R18.8-billion per year to the South African economy, which is possibly as much as 80% more than the contribution made by commercial fishing. Both commercial and recreational inshore fisheries target (or take as by-catch) the identical species complex.

However, as the populations of species that were traditionally valuable to commercial fisheries have dwindled due to overfishing and unselective fishing practices (such as trawling and long-lining), commercial operations have begun to target less valuable species. Unfortunately, sharks, skates and rays constitute a large majority of these.

What does this mean for shark conservation? Consider the following: Is a caught-and-released shark worth more to the South African economy than a shark caught, killed and sold on the commercial market? How much does recreational catch-and-release shark fishing contribute to the South African economy? Is its contribution greater than that of commercial shark fishing? How many caught-and-released sharks live to be caught and released another day?

With these questions in mind, the SASC began its RecFishSA project.



SOUTH AFRICA'S RECREATIONAL SHARK FISHERY: UNDERSTANDING IMPACTS AND IMPORTANCE (RECFISHSA)
THE SOUTH AFRICAN SHARK CONSERVANCY 2012-2013
SOUTH AFRICA
RESEARCH, CONSERVATION & EDUCATION
SHARKS



We didn't stumble onto these questions of our own accord. In 2010 the South African Shore Angling Association (SASAA), the governing body for competitive recreational rock and surf angling, expressed to SASC its concerns about a perceived decline in the number of sharks caught, a reduction in the sharks' size and changes in species composition (the species now being caught were different to those that used to be caught).

In December 2010 SASC began tagging the sharks, skates and rays caught and released at SASAA angling tournaments. It proved to be a valuable opportunity to collect information such as how long the elasmobranch fought on the line, how long it spent out of the water and where the hook went in, which helps us to determine what stresses the individual endures in the catch-and-release process. Biological data (its species, sex and maturity) are recorded too and a genetic sample is taken in the form of a small fin clip. A simple spaghetti tag is then fitted, and the information gained if the same individual is caught again adds to our knowledge of the species.

Although much research has been carried out

on commercially important species as well as on by-catch from long-line and trawl fisheries, very little is known about the impact of catch-and-release fishing on sharks, skates and rays. What we do know is that the post-release survival rate differs from one species to another, as each reacts differently to the trauma of being caught.

During one of the first competitions we attended, we asked about 150 anglers to complete a survey on what they knew about sharks and how they felt about fishing for them. A large part of the RecFishSA project is to educate anglers so that they can make informed decisions when they are fishing and give their quarry the best chances of survival. From the survey's results we developed the Responsible Angling Clinic (RAC), which is available to all SASAA anglers in the Western Cape.

Many of the fishermen at angling events are well informed and care about sharks, skates and rays, and we have noticed a definite improvement in angling and handling techniques. Invariably, the least invasive methods are used to target, land and release the catch. Observing positive change over such a short period

makes the RecFishSA project so worthwhile and rewarding.

To date, the team has tagged more than 20 elasmobranch species along the South African coast. Most are listed as Data Deficient, Near Threatened or Vulnerable by the IUCN, which makes it all the more imperative to learn as much as possible about the threats to these ecologically important predators. Spending time close to them is one of the most exciting parts of our research; each field trip is an adventure.

SCHOLL MICHAEL |
CHIEF EXECUTIVE OFFICER

Michael is the chief executive officer of the Save Our Seas Foundation, which allows him 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.



PESCHAK THOMAS |
DIRECTOR OF CONSERVATION

As well as being director of conservation for the Save Our Seas Foundation (SOSF), Thomas is an assignment photographer for *National Geographic Magazine*. Also a senior fellow of the International League of Conservation Photographers, he is regarded as one of the 40 most influential nature photographers in the world. He leads a near-continuous nomadic existence, spending most of the year in the field on assignments around the globe.

Originally trained as a marine biologist, Thomas retired from science field work in 2004, choosing to become an environmental photojournalist when he realised that photographs could make a greater conservation impact than statistics do. As SOSF's director of conservation, he strives to merge photojournalism, documentary filmmaking and cutting-edge science to create powerful media projects that tackle some of the most critical marine conservation issues of our time.

Thomas has written and photographed five books: *Currents of Contrast*, *Great White Shark*, *Wild Seas Secret Shores* and *Lost World*. His latest publication, *Sharks and People*, was released in 2013 and chronicles the relationship between humans and sharks around the world. He is a multiple winner in the BBC Wildlife Photographer of the Year Awards and in 2011 and 2013 he received World Press Photo Awards for his work.



FOWLER SARAH |
PRINCIPAL SCIENTIST

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.



BRUYNDONCKX NADIA |
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.



STEVENS GUY |
SPECIAL MOBULIDAE ADVISOR

Guy has always been fascinated by the natural world, especially life under the sea. He progressed through school and university with this in mind, graduating from the University of Plymouth in 2002 with a degree in marine biology and coastal ecology. After university he moved to the Maldives to work as a marine biologist and in 2005 he founded the Maldivian Manta Ray Project (MMRP) to help protect the country's manta population through active research and education. Guy's conservation efforts in the Maldives have led to the creation of several Marine Protected Areas (MPAs) at key manta aggregation sites. For six years his MMRP work in the region was funded and supported by the Save Our Seas Foundation (SOSF). In 2011 Guy went on to found the Manta Trust. The mission of this UK-registered charity is to advance the worldwide conservation of mobulid rays and their habitat through robust science and research and by raising awareness about them and providing education, influence and action. With a vision of a world in which manta and mobula rays thrive within a globally healthy marine ecosystem, the trust now has projects in 16 different countries.

The SOSF also supports various other mobulid ray research and conservation projects globally. As a leading expert on the science and conservation of mobulid rays, Guy has a role within the Foundation to advise it on such projects so that an effective conservation strategy for these increasingly vulnerable species is realised.

Guy is also working towards the completion of his PhD on his manta research at the University of York in the UK.



KUBICKI STEFAN |
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.



BONORA ALESSANDRO |
CREATIVE DIRECTOR

Alessandro is the creative director of the Conservation Media Unit, a newly established division of the Save Our Seas Foundation that focuses on the celebration and publication of funded project teams’ work so that it has maximum conservation benefit.

After studying journalism and media studies at Rhodes University in South Africa, Alessandro worked briefly as a hard news reporter before opting for a career on the visual side of the creative world. A four-year spell in Rome, during which he worked as a designer for an advertising agency, was followed by his return to Cape Town, where he was the art director of an award-winning conservation magazine. He then spent more than four years working on innovative digital publishing solutions that focused on novel ways to use multimedia in magazine story-telling, and subsequently joined the Save Our Seas team in 2013.

Alessandro has a broad knowledge of all areas of publishing, whether print or digital, and is particularly passionate about the power of story-telling to both inform and inspire change. He considers himself very fortunate to be able to combine this with his love for wildlife and the great outdoors on a daily basis.



EHRLICH PHILIPPA |
MULTIMEDIA JOURNALIST

Pippa first fell in love with conservation media after reading the story of the Knysna elephant; she was mesmerised by the animal and the characters and mysteries that surrounded it. After graduating with a Bachelor of Journalism, she spent a year in Thailand and the USA, where she came to appreciate fully the rarity of healthy ecosystems. On her return to South Africa she was inspired by the rich underwater worlds of False Bay and southern Mozambique.

After two years as an investigative journalist for the television programme *Carte Blanche*, Pippa decided that the only stories she really wanted to engage with were those that explored nature and our relationships with it. This was unfortunate because next she found herself in the world of corporate campaigns and commercial media production. Luckily nature won out and she was appointed conservation journalist for the Save Our Seas Foundation (SOSF).

Now, armed with a deep connection to the ocean and a ‘colourful CV’, Pippa aims to find the balance between traditional journalistic storytelling and a more popular, creative and emotive approach. She is increasingly amazed by the SOSF scientists she speaks to and is excited to help them share their stories.



VON BRANDIS RAINER |
SCIENTIFIC DIRECTOR

After completing a degree in nature conservation in Pretoria, South Africa, Rainer spent the first part of his career in the African bushveld, where he studied white rhino movements, conducted anti-poaching patrols and guided safaris. Several years later he took a temporary job as a botanical guide at Rocktail Bay on the northern coast of South Africa. During his first encounter with a nesting turtle on the beach, he was so inspired by these vulnerable creatures that he sensed a major fork in his career path. He soon became hopelessly addicted to the ocean and spent all his spare time getting to know it. After hastily completing his honours degree, he returned to Rocktail as a turtle researcher and stayed there for nearly two years.

Rainer’s persistent hunger for adventure eventually led him to a four-month voluntary position at Aldabra, a remote, untouched coral atoll teeming with turtles and other marine life. He loved it so much out there that he ended up staying for five years, employed as the chief scientific officer. In 2006 he was offered an opportunity to conduct his PhD on the foraging ecology of the critically endangered hawksbill turtle at D’Arros Island and St Joseph Atoll in the Amirantes group of the Seychelles. He spent the next five years following turtles around underwater and gaining an intimate understanding of the area and its surroundings. Having completed his PhD in 2011, he took up the position of scientific director of the D’Arros Research Centre.



BOYES CHRISTOPHER ALAN |
LAB MANAGER

For Chris Boyes, being the lab manager at the research centre on D’Arros Island in the Seychelles means that he is the full-time person on the ground who maintains a world-class facility for research and education. At the same time, he manages the long-term studies and rehabilitation projects on and around the island and neighbouring St Joseph’s Atoll.

Since gaining a BSc in forestry (nature conservation) from the University of Stellenbosch in 2004, Chris has worked on many diverse research projects, from nesting sea turtles in Costa Rica and Maputaland, South Africa, to wetland birds in Botswana’s Okavango Delta. He specialises in working with nesting sea turtles and is currently completing his MSc thesis on leatherback sea turtles in Maputaland with the University of Stellenbosch.



SHIVJI MAHMOOD |
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 masters 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 solve 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, D.C. and his team’s research discoveries have been widely reported in the national and international media.



DODGE RICHARD |
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.



SOSF STAFF

THORMÄHLEN HEIDI |
FACILITIES MANAGER

Having previously worked for the founder of the Save Our Seas Foundation in the Seychelles, Heidi joined the Save Our Seas Shark Centre team in January 2012 as facilities manager. Soon afterwards, in late May 2012, she welcomed a bouncing baby girl called Maya, who keeps her constantly on her toes.

Heidi has more than 16 years of experience in the hospitality and property management industries, as well as a Swiss post-graduate degree in hospitality/property management, which she gained in 2007. She obtained two additional diplomas, in travel & tourism management and business economics, in the 1990s. It was her background in property management and admin that brought her to the Save Our Seas Shark Centre.



MILLAR PAUL JAMES |
EDUCATION COORDINATOR

As an educator and conservationist whose own fascination with the marine world began with surfing and diving around Cape Town, Paul believes that initiating or growing people's experience, knowledge and appreciation of our oceans has a vital role to play in protecting our natural world. In between chasing swells up and down the coast of South Africa and enjoying the icy waves of local surf spots, he squeezed in some terrestrial time at the University of Cape Town, studying environmental and geographical science and education.

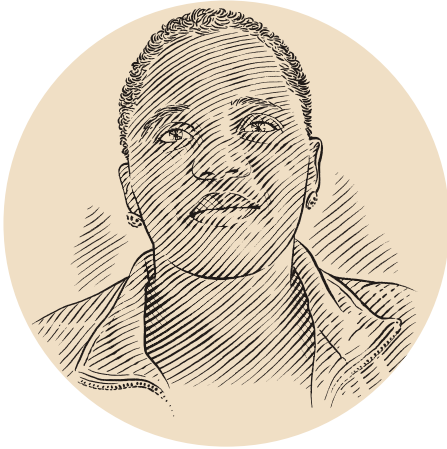
Paul draws on his significant experience in schools and environmental education when running the SOSF Shark Centre's programmes. His classes welcome the range of strong opinions inevitably encountered when educating people about sharks.



MAYIYA NTOMBIZANELE |
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 the 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 STAFF

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European Elasmobranch Association
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Northeast Pacific Shark Symposium 2014
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