SharkFocus

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THE MAGAZINE OF THE SHARK TRUST

ISSUE 51 November 2014

Sharks of Galapagos

Shark fisheries of India

Big fish, big value

Guitarfish

Shark immunity bites back

plus

all your Shark Trust and EEA news

Supporting the European Elasmobranch Association

CAMPAIGN CORNER

The 50th issue of Shark Focus featured a fantastic centre-spread on the launch of the Trust's ***No Limits?*** campaign at London SEA LIFE's Oceans of Stars event. The coverage highlighted the strength of support from both political and public sectors – bolstered by Shark Trust Patron and ***No Limits?*** Ambassador Steve Backshall.

Steve Backshall "Lose the sharks and our planet's oceans would be infinitely poorer places – and that's why I'm supporting the Shark Trust's ***No Limits?*** campaign".

No Limits? is focused on securing science-based catch limits for a number of shark species facing unchecked exploitation and unrestricted trade. Six months into the campaign and ***No Limits?*** continues to develop momentum. The second phase of the campaign website was launched in October, providing additional information and, perhaps more importantly, allowing mobile users improved access, especially to the petition. If you've not visited the site yet then please do – the animation at the base of the homepage is a great way to learn about the sheer scale of Atlantic shark fisheries.

No Limits? is about enabling public engagement in the Trust's advocacy for catch-limits, and events such as the Birmingham International Dive Show (25-26th Oct) gave the Trust a great opportunity to engage the public: and Birmingham did not disappoint! Show-goers lined up to support the campaign, sign the petition and pen messages on the ***No Limits?*** photo-boards – all guided by enthusiastic volunteers [thank you again!]. Engagement with the Dive Community should get an extra boost, as in September Project AWARE signed up as an official campaign supporter.

While the Trust team were at the Dive Show, aquariums across the country were hosting campaign events sponsored by the SEA LIFE Trust with additional support from the British and Irish Association of Zoos and Aquaria (BIAZA). With badges, posters, flyers and stickers on hand we're hoping the aquariums have secured several thousand additional signatures to add to the growing tally. Watch the website for news of more events in February/March 2015.

The more the Trust promotes ***No Limits?*** the clearer the message becomes, that what we're asking for is simply practical, science-based management – it's not a big ask, but there is a great deal of legislative process between the ***No Limits?*** species and a sustainable future and during that time, public support is vital.

With influential fisheries management meetings convening this autumn and the EU December Fisheries Council potentially taking decisions with ramifications for ***No Limits?*** species, we hope to have progress to report in the next edition of Shark Focus.

#NoLimitsNoFuture

www.nolimitsnofuture.org

Housekeeping

Generosity consists not the sum given, but the manner in which it is bestowed Mahatma Gandhi

We have just returned from a very successful Dive Show in Birmingham and it was lovely to see so many of our members visit the stand, and new ones join us. Thank you all! The 'Sharks of the World' book up for grabs was won by Greg Williams from Aberystwyth and I hope he has enjoyed reading it.

We depend on regular income to support the work and projects of the charity, so your ongoing generosity and regular fundraising events have never been so important to us, and everyone involved with The Shark Trust sends a very big thank you to all.

If you didn't get the chance to buy any of our wares at the show please do take a look at the web shop, as we have a small but selective range of goods all very reasonably priced which will be perfect for Christmas gifts, and whilst picking up a bargain you are helping shark conservation - see the new Shark Trust range of goodies on page 10!. Alternatively gift someone a membership or adoption, or make a donation on their behalf.

I have had several reminders this month of changes in address, so can I ask all of you on the move or relocating, to please make sure you tell me where you are. This is so I can ensure you get your ***Shark Focus*** magazine and not just to invite myself around for drinks or a holiday. If you miss out on copies we might not have back issues when you remember you didn't get one.

Renewal emails are sent out regularly from the office and it would certainly be very beneficial if you would consider setting your subscription up by standing order. This ensures continuity of subscription and always getting your Focus when it is due. You can download a form from the website and this can be done at any time. Also, can everyone please ensure you have signed a gift aid form if you are a taxpayer in the UK.

Thank you all again for your continued support and I look forward to being able to report in the Spring that the Winter season brought us more new members, re-joiners and lots of donations.

Glenys Heafield, Company Secretary/ Head of Finance & Administration

SHARK TRUST

European Elasmobranch Association

Supporting the European Elasmobranch Association

Shark Focus

Issue 51 November 2014

FEATURES

REGULARS

Scalloped Hammerheads *Sphyrna lewini*, Galapagos © Simon Pierce.

Edited by the Shark Trust

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The Shark Trust

4 Creykes Court, The Millfields, Plymouth PL1 3JB

Tel: +44 (0)1752 672008/672020

Email: enquiries@sharktrust.org

Website: www.sharktrust.org

Established in 1997, the Shark Trust works to advance the worldwide conservation of sharks through science, education, influence and action. The Trust is the UK member of the European Elasmobranch Association and currently provides the EEA's secretariat services.

Design: Fluke Art. www.flukeart.com

EDITORIAL

Back in the summer I made the rash observation that the tabloid press, in particular the red tops, were starting to adopt a more responsible and balanced approach when reporting shark news. We had proof positive to back this up and the miracle persisted through July, August and early September. Sadly in late September it was back to normal when a young Basking Shark (aka a 'White Shark'…) made headlines in most of the papers. Someone decided that a clip of YouTube footage taken by a skipper in south Cornwall was a White Shark. Rather than wait for expert confirmation, (or not) the tabloid bandwagon rolled and many jumped on it. Unfortunate!

2014 was an enigmatic shark summer. Basking Shark numbers were disappointing in many traditional hotspots, while Blue Sharks were often more abundant than in recent years and with many more males recorded than normal, smoothhound heads, fins, and other parts were found dumped in South Wales and the Isle of Wight, and as far as I know there were no makos caught this year...

The new EU Environment, Maritime Affairs and Fisheries Minister is Karmenu Vella from Malta. He takes over from Maria Damanaki who was wholly committed to the principle of sustainability, we hope the new Minister follows suit. There are many challenges in the EU, not least of which are claims (mainly from sectors of the Spanish industry) that FNA (Fins Naturally Attached) is an unworkable policy. This is despite clear evidence to the contrary and the Trust continues to monitor such developments very closely.

The Convention on Migratory Species (CMS) was in conference as I wrote this editorial. The conference in Quito, Ecuador, debated the listing of 32 species – including the Polar Bear, African Lion and 21 species of shark and ray, three of which – the Common, Bigeye and Pelagic Threshers – were proposed by the EU, but originated from the UK. Incredibly delegates agreed to list all 21 sharks and rays under the Appendices of the Convention – see p.9 for more on this historic step forward for global shark conservation.

I will be back in South Africa this winter working on my new book which is the story of Nicole the White Shark. If you are in the Cape please look me up, I am easy to find.

Happy Christmas, Happy New Year,

Go well and stay safe.

Richard Peirce
Chairman

Sharks of Galapagos

Pete Haskell
Communications Officer at the Galapagos Conservation Trust
www.galapagosconservation.org.uk

***"The Bay swarmed with animals; Fish, Shark & Turtles were popping their heads up in all parts."*[1]**

Charles Darwin made this entry into his diary on 17th September 1835 having just moored in St Stephen's Harbour on the island that is today known as San Cristobal in the Galapagos Archipelago. Having been travelling on board the HMS Beagle for almost four years by this point, his description provides an interesting insight into how notably abundant the marine life was around these isolated volcanic islands at the time of his visit.

Located in the eastern Pacific 1,000km from the coast of mainland Ecuador, the waters around the Galapagos Islands continue to host an impressive array of species, albeit in lesser quantities than during Darwin's stay. The unique convergence of cold, nutrient-rich currents with warm, tropical waters which occurs around Galapagos has resulted in tropical, temperate and cold-water marine species surviving in relatively close proximity[2]. The difference in sea surface temperatures across the archipelago can be as much as 13^{0}C, so whilst tropical fish swim around coral reefs off some islands, Galapagos Penguins *Spheniscus mendiculus* hunt cold-water sardines off others less than 100km away.

PHOTOS and GRAPHICS

Main image: Scalloped Hammerhead © Jonathan Green.
Map: Galapagos Islands. ©flukeart.com.
Image 1: Whale Shark researchers © Simon Pierce.
Image 2: Galapagos Shark © Jonathan Green.

Galapagos sharks

At least 58 species of Chondrichthyes* have been recorded in Galapagos waters, including 33 species of shark, 19 species of ray, four skates and two chimaera[3]. That's not to say that more don't exist: as recently as 2012 a brand new species of deepwater catshark *Bythaelurus giddingsi* was described from several specimens caught around Galapagos by the California Academy of Sciences[4]. Several other species that are assumed endemic are similarly known from only a handful of specimens, for example the Galapagos Gray Skate *Rajella eisenhardti*[5] and the deepwater chimaeroid commonly known as the Galapagos Ghostshark *Hydrolagus mccoskeri*[6].

As is often the problem with common names and their implied associations, one species that bares the Galapagos preface is not exclusive to the Islands. The Galapagos Shark *Carcharhinus galapagensis* is in fact widespread, occurring around islands in the Pacific, Atlantic and Indian Oceans. The name in this case derives from the first specimen to be scientifically described which was caught in Galapagos in 1905.

Of all the sharks in Galapagos however, one species sticks out as being the most sought after by visitors: the charismatic Scalloped Hammerhead *Sphyrna lewini*. The best chance for Hammerhead sightings in Galapagos is around the northern-most islands of Wolf and Darwin during the warm season (Dec-May), where schools of these iconic sharks, sometimes over 100-strong, can be seen swimming in vast circles. Galapagos is one of the few remaining places on Earth where such schools can be observed[7], although the reason behind this gregarious behaviour is still debated.

Tagging studies have revealed a high degree of connectivity between eastern Pacific populations of Scalloped Hammerheads, with evidence of individuals travelling between the protected waters of Galapagos, the Cocos Islands in Costa Rica and Malpelo Island in Columbia[7]. Discovering that hammerheads, as well as other large marine pelagics** such as other shark species and turtles, have been found to travel between these areas has led to discussions of creating a protected Eastern Tropical Pacific Marine Corridor to ensure that protection for these species extends to their full range. However, tangible legislation is still to be achieved.

Shark protection

Given the proliferation of sharks in Galapagos, it is unsurprising that the archipelago has a relatively long and tainted history of shark fishing. The industry first became a commercial enterprise in the Islands in the 1950s and it has been growing ever since. It is estimated that over 100,000 tonnes of sharks have been taken from Galapagos waters by the Ecuadorian fleet since 1950[2]. When you take into consideration the countless boats from other countries such as Costa Rica, Columbia and Japan, which are also known to fish for sharks in Galapagos, the reality of human impact on the marine ecosystem becomes devastatingly apparent.

In response to this situation, the Ecuadorian authorities have, over the past 20 years, brought in various laws and regulations which afford sharks some protection. In 1998 the 'Special Law for Galapagos' was passed, laying out a legal framework for certain aspects of island life including fisheries management. This meant that the 133,000km^2 Galapagos Marine Reserve (GMR) could be created and given national protected area status. Commercial fishing, including shark finning and longlining, was prohibited and the Special Law meant that the Galapagos National Park (GNP) authorities had a legal backing for enforcing Reserve regulations.

In 2004, further protection for sharks was granted for the GMR after the President of Ecuador signed a decree outlawing the export of any shark products. This put the nation at the forefront of global shark conservation on paper but it is questionable how effective it was in reality. Shark fins continued to be exported from the mainland by falsely labelling them as 'plastic sheeting' or by smuggling them into Peru[8]. Unfortunately, the legislation was amended by the President in July 2007 to the effect that fishermen are now allowed to extract and export fins from sharks which are 'incidentally' caught during regular fishing activities. Given that shark bycatch can account for up to 70% of the total catch[2], this loophole is now being actively exploited without any legal repercussions and a commercial export market is once again in full swing.

That said, legal action is still taken against boats that fish illegally within the GMR. Between 2001 and 2007 the GNP authorities apprehended 29 illegal shark catches, and in 2011 a vessel containing 379 shark carcasses was seized, impounded, and the 30 crew members put on trial[9]. Unfortunately, an issue within the judicial system meant that this case was eventually annulled.

Whilst certain types of fishing remain banned within the GMR, the GNP has, on several occasions over the last decade, been seen to trial prohibited fishing techniques. Whilst this sounds concerning, in a press release sent out by the GNP earlier this year, they said the reason behind this was that "it is the responsibility of the state to carry out scientific study into all methods of fishing including those not permitted. This is due to technological advances allowing for improved capture accuracy which will improve the quality of life for local fisherman"[10]. A pilot study of longline fishing conducted by the GNP in 2003/4 found that bycatch rates were between 35-78% which led to them rightly declaring that it would remain illegal within the reserve.

Uncovering Hidden Secrets

Another significant visitor to the archipelago is the enigmatic Whale Shark *Rhincodon typus*. In Galapagos, Whale Sharks are regularly sighted around Darwin and Wolf between the months of June and September. The aggregations are like nowhere else on Earth.

Jonathan Green, a British naturalist, photographer and diver, began guiding expeditions to Galapagos in the late 1980s. As time progressed he realised that Whale Sharks seemed to appear on a seasonal basis in the north of the archipelago, but it was a little while longer until he realised the importance of the sharks passing through. Unlike aggregations in many other locations around the world, which are largely made up of immature males, it became apparent to Jonathan that the majority of Whale Sharks sighted in Galapagos were large mature females. Not only this, a very high proportion of the females had swollen abdomens, suggesting that they were in an advanced stage of pregnancy. Given how little is known about Whale Shark reproductive ecology, this was an exciting discovery, and one that spurred Jonathan into founding the Galapagos Whale Shark Project (GWSP).

In 2011, the inter-institutional GWSP research team began an ambitious study to tag and track Whale Sharks that passed through the GNP. In their first year, they tagged 24 individuals which at the time represented the single largest tagging study of the species ever undertaken. Several interesting patterns began to emerge from the tracks of these sharks. Firstly, it was seen that individuals only remained within the protected waters of the GMR for several days, appearing to use the islands as some kind of way-marker on a large-scale migration. Secondly, it was observed that sharks would continue past Galapagos into the open ocean early in the season, but move back towards the continental shelf later in the year.


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In 2012, they continued to tag sharks and it now looks likely that a predictable migratory corridor exists. Why the sharks are showing this movement pattern has still to be established, but a third tagging study, conducted in August this year thanks to funding from the UK charity Galapagos Conservation Trust, hopes to provide further insight. Not only will the tracks add to the body of evidence for an inter-annual migration path, but the team have also attached a different type of tag onto several individuals which will measure their vertical movements as well as horizontal. Interestingly, one shark which was seen on this latest trip has been observed in three consecutive years and each time she has appeared to be heavily pregnant.

Whether or not the elusive breeding grounds of the world's largest fish are indeed located near the Galapagos Islands is still to be determined. It will need persistence, the use of cutting-edge technology and a significant amount of funding to establish if this is the case, but one thing for certain is that the GMR acts as an important stopover for breeding individuals. Given its history and association with ground-breaking theories in the past, it seems very apt that the Galapagos Islands still play a central role in uncovering some of the mysteries of our natural world. Who knows what other discoveries will emerge from this incredible archipelago.

* The taxonomic class containing all cartilaginous fishes: sharks, skates, rays and chimaera.
** Open-ocean species.

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Please see website for full references

Between the devil and the deep blue sea:

Shark fisheries in India

Divya Karnad
Foundation for Ecological Research, Advocacy and Learning, India.
Rutgers University, New Jersey.

India's relationship with sharks is long and complicated. Home to about 70 species of shark[1], the species composition of shark landings varies around the Indian coast, with the west coast reporting large numbers of Spadenose Sharks *Scoliodon laticaudus* and hammerhead sharks *Sphyrna* spp., while Milk Sharks *Rhizoprionodon acutus* and other requiem shark species dominate catches on the east coast .

Researchers suggest that targeted shark fisheries are relatively new in India, beginning within the last fifty years, coinciding with the opening-up of international markets and the increased demand for seafood[1,2]. This may be true of fisheries on the east coast, particularly the Coromandel Coast. On the other hand, my work with traditional fishermen from the west coast of India suggests that, while none identify themselves as exclusive shark fishermen, they do possess traditional knowledge on how to catch sharks, which has been passed down from their grandfathers and great grandfathers. Given that many of these fishermen are now in their sixties, this dates traditional shark fisheries in India back by at least a century.

1

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PHOTOS

Main image: Gharapuri Island, Mumbai Harbour, India © Owen Lin CC BY-NC-ND 2.0.

Image 1: Shark Fisheries in India. © Divya Karnad.

Image 2: The west coast reports large numbers of Spadenose Sharks *Scoliodon laticaudus* and hammerhead sharks *Sphyrna* spp., often caught in large gill-nets and by hook and line. © Divya Karnad.

Image 3: Longheaded Eagle Rays *Aetobatus flagellum* and Scaly Whiprays *Himantura imbricata* often make up part of the catch. © Divya Karnad.

A major shark fishing power

A long history of shark fishing has meant that Indian fishermen and sharks are deeply connected. Apart from having an ornamental and cultural significance, fishermen have long considered sharks as a source of protein. Originally, shark meat was eaten only by the fishing community because of its strong taste, but shark meat has recently captured the imagination of the urban elite as a sort of coastal delicacy. However, the pungent smell (due to high urea concentration) has resulted in shark meat not being very highly valued in India. An additional pressure is the recently developed export market. India is now the second highest harvester of sharks in the world[3], and many of the fins drying in Thailand and Hong Kong were found to have originated from Indian waters. In India, different parts of each individual shark or ray are processed for different markets. Bigeye Thresher Sharks *Alopias superciliosus*, for instance, are commonly landed on the east coast of India. Their meat is sold in the local market, while their fins are removed for export. Interestingly, the Bigeye Thresher's huge tail is not processed as a fin. A shark fin exporter reports that most shark fins sourced from India are dried before reaching the retail market; as the thresher's huge tail shrinks once dried, it is not valued by the shark fin industry.

The diverse markets for shark parts have meant that almost all sharks caught in India are brought to shore whole. The flesh is consumed locally while the fins are exported to Southeast Asian markets. This export is completely legal, and is in fact encouraged by the government. The primary scientific agency of the government, the Central Marine Fisheries Research Institute, has recommended that there is scope to increase the exploitation of sharks in Indian waters, while the Marine Products Export Development Agency of India lists seven species of shark and ray as products whose export it oversees – including threatened hammerhead sharks and the vulnerable Javanese Cownose Ray *Rhinoptera javanica*. Yet, it should also be noted that as a signatory to the Convention on the International Trade in Endangered Species (CITES) India is bound to control the trade in shark fins, particularly for hammerhead sharks, which were recently added to CITES Appendix II.

India's contradictory national policies on sharks pull fishermen in opposite directions. Almost all Indian laws regarding sharks focus on fishing rather than trade, and centre on issues of classification. Sharks are simultaneously classified as 'wildlife' and 'marine products' under Indian law. Consequently, any attempt to ban shark fishing results in a debate over classification – with the economic argument usually winning the day. For instance, in 2001 shark fishing was banned by the Ministry of Environment and Forests – a short-lived decision that attracted widespread protest from the fishing community, particularly those who had traditionally harvested sharks[2]. One of the key arguments was that sharks, being fish, ought to be under the supervision of the Ministry of Agriculture, which is responsible for *encouraging* fisheries in India. The ban was then reduced to cover the harvest of just ten species of shark, many of which are difficult to identify, particularly in their juvenile stage.

Confusion

This list of banned species in Indian waters does not overlap very well with the IUCN's Red List of Threatened Species. Easily identifiable sharks on the Red List – such as the Scalloped Hammerhead *Sphyrna lewini* (Red List: Endangered) – are not included in the Indian list, therefore there is no legal support to control their harvest domestically. Indeed, the confusion over policy has created a situation where both the Ministry of Environment and Forests, and the Ministry of Agriculture cannot afford to enact or implement rigorous policies. For instance, the recent 'fins attached' policy legislated through the Ministry of Environment and Forests has been celebrated internationally as a major step towards the control and reduction of shark harvest from India. Locally, the 'fins attached' policy is seen as one of the few environmental policies that has the backing of the fishing community. Given that most sharks are landed whole and most parts of the shark are used, this policy has maintained the status quo for shark fisheries in India. The policy's main contribution is in preventing foreign fishing vessels from finning sharks in Indian waters. However the success of this policy will lay in its execution, since the coast-guard, customs and other officials are still unsure about the implementation of at-sea raids on fishing vessels.

Targeting policy towards shark *fishing* rather than *trade* has even more downsides. My research suggests that the fishing gear being deployed in India is not very selective, so the only measure that fishermen use to avoid 'banned' species is a rule-of-thumb on shark body-size. According to the fishermen, their fishing is legal as long as they do not catch large sharks, and they believe there is no ban on catching and landing small sharks. Yet, efforts to try and rid them of these misconceptions are met with looks of incredulity. While fishermen are aware that some of the sharks that they catch could be juveniles of larger shark species, they ask me how they are expected to make these distinctions when they put out their nets. They feel that their contribution to shark conservation is that they avoid using shark hooks, and avoid fishing in deep waters where the big sharks are found.

Cultural significance

There is no doubt that traditional shark fishermen from India's west coast could be conservation allies, since sharks have a cultural significance to them. Just as shark capture was a rite of passage among some Pacific Island communities[4], traditional fishermen from the state of Maharashtra in India tell me that catching large sharks using a hook and one's bare hands was as much a proof of manhood as it was a demonstration of particular fishing prowess. Research in 1999[1] noted that, in Indian waters, sharks are typically caught in depths of 50-70m – a fact corroborated by the fishermen whom I interviewed. This suggested that along some parts of mainland India, where the continental shelf is wide, fishermen would have to venture out 20 – 30km before they could begin setting their hooks. In the age before engines, shark fishing was a commitment, according to an old fisherman, because it took several days and lots of preparation. This same fisherman remembers rowing out to set the shark hooks, saying:

"There would be three or four people on a small wooden boat and it would take us close to twelve hours of rowing to reach our destination. Our destination looked like a blue desert; you could not see any signs of land, or people – no ships. It was very quiet. It was so peaceful that once you went there, you wouldn't feel like coming back…"

Urgent need for more research

Declines in shark populations in Indian waters are difficult to identify. There is no reliable or consistent information on stocks, particularly because many species are so mobile. Research into both horizontal and vertical movement is difficult and, so far, the basic life-history of many species remains unknown. Fishermen do not seem to have noted population declines, mostly because sharks have shifted from being targeted species to incidentally caught species, due to recent conservation efforts and policies. Most research into sharks in Indian waters is confined to land, i.e. catch monitoring. There is an urgent need for more technologically advanced science (tagging etc.) that can provide greater detail about these animals. My future plans for shark research in India include identifying the habitats which sharks use – including the identification and protection of nursery grounds, as well as studying their behaviour and basic life-history parameters.

It is also crucial to view fishermen as allies in the conservation battle, since their dependence on sharks will ensure support for the long-term survival of these species. Shark conservation is necessarily inclusive of all those who depend on, eat or are awed by sharks.

3

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SHARK TRUST NEWS


Batten Bay Bioblitz © Shark Trust.

Batten Bay Bioblitz

In mid-September, the Shark Trust attended the annual Bioblitz – this year held at Batten Bay, Plymouth. Organised by the Marine Biological Association, the Bioblitz is a 24 hour marine and terrestrial survey of a natural space to identify and record as many species as possible, and to raise public awareness of biodiversity in the marine and coastal environment. This year, the Shark Trust stand contained a wide range of information and hands-on exhibits, while the Shark Trust provided on-the-spot expert identification of eggcases found during the survey. To date, 1026 species have been identified in this year's Batten Bay Bioblitz.

Big Night Out on the Beach, South Devon

Also in September the Shark Trust headed to the South Devon Area of Outstanding Natural Beauty (AONB) at South Milton Sands, South Devon. Covering 60 miles of coastline, estuaries and countryside between Plymouth and Torbay, the South Devon AONB is also a prime location for eggcase hunting, Basking Shark sightings and shark angling. The Trust was on hand to answer questions on all things shark, skate and ray-related in the region, as well as raising awareness of current campaigns and issues facing sharks.

National Aquarium Conference, Liverpool

In early October, Conservation Officer John Richardson attended the 2014 National Aquarium Conference (NAC) in Liverpool. NAC provides professionals in the British public aquarium sector with an opportunity to exchange ideas on animal husbandry and the latest aquarium technology. Marine education is also an incredibly important component of the conference, with John giving a presentation to the conference on the work of the Shark Trust, the *No Limits?* campaign, and how aquariums can get involved.

New skate and ray fisheries project, Northern England

In October Conservation Officer John Richardson also ventured north to Humberside, Yorkshire, Tyne and Wear, Cumbria and Lancashire to discuss a new Shark Trust project with individuals and organisations from across the commercial fishing industry. Although still in its infancy, the project is being developed in conjunction with the UK Skate and Ray Group (of which the Shark Trust is a member), and will focus on sustainability in skate and ray fisheries – for skate and ray populations, and for fishermen. Keep an eye on future issues of *Shark Focus* for more on this project.

DIVE 2014, Birmingham

In late October the Shark Trust again attended the Birmingham Dive Show, held at the NEC. As usual, the hall was packed full of stands exhibiting the latest kit and dive holidays, while talks were presented by the likes of Shark Trust patron Monty Halls and Australian White Shark cage-diving specialist Andrew Fox. The Shark Trust stand drew plenty of visitors interested in sharks and shark conservation, as well as the latest products in the Shark Shop. Shark Trust staff and a small team of volunteers also promoted the *No Limits?* campaign – visit www.nolimitsnofuture.org to find out more. Thank you to all of our volunteers who gave up their time to help out!'

WORLD SHARK NEWS

WORLDWIDE SHARK NEWS SINCE LAST FOCUS

JULY 2014

New sonar shark detection system to be trialled
Lifeguards on Bondi Beach, Australia, will trial a new shark detection system known as the *Clever Buoy* which uses seafloor sonar to gather information about individual animals in nearby waters. Sonar data is then sent to the Clever Buoy which uses each marine species' unique sonar signature to identify what species the animal is. The information is then relayed to a satellite and alerts sent to the lifeguard tower.

Scalloped Hammerheads become first sharks on U.S. Endangered Species Act
Scalloped Hammerhead Sharks have become the first species of shark to be protected by the US Endangered Species Act. Scalloped Hammerheads are among the most threatened highly migratory sharks, travelling across jurisdictional boundaries, and are prized for their fins and meat. Scalloped Hammerhead populations are found primarily outside of US waters therefore the listing will have little effect on U.S. fishermen.

AUGUST 2014

Google reinforces undersea cables after shark bites
Google will reinforce undersea fibre-optic cables (which carry internet traffic around the world) across the Pacific with Kevlar-like matting to prevent damage from shark bites. Older copper cables have not experienced the same problem; research indicates that sharks are attracted by the magnetic field generated by the high voltage carried through the cables, which resembles those created by prey.

Whale Shark numbers boomed before they crashed
New genetic research suggests Whale Shark populations experienced a dramatic increase prior to their recent decline. The research found an increase in genetic diversity, which coincides with population growth (and diminishes when populations decrease), and indicates that Whale Shark populations experienced a population boom during the Holocene Epoch (~11,700 years ago to present). However, the current population decline – due to human activity – is now producing a decline in genetic diversity.

Shark eyes designed to catch photons in twilight zone
Detailed research into the eye structure of five species of bioluminescent sharks reveals they have a higher rod density than other shark species, enabling them to capture as much light as possible and survive in the deep-sea mesopelagic zone (200-1000m), where only shorter wavelength light at the blue end of the spectrum reaches. Scientists also found evidence that bioluminescent sharks' vision has relatively good resolution.

SEPTEMBER 2014

Shark and skate conservation proposals fail at NAFO
Members of the Northwest Atlantic Fisheries Organisation (NAFO) rejected both scientific advice to reduce the quota for Starry Skate fisheries, as well as recommendations on best practice for preventing finning in the region. The EU could not accept a US proposal to reduce the catch of the Starry Skates to the level advised by scientists, while Canada did not support a US-EU proposal to strengthen the ban on shark finning – helping Japan and Korea defeat the measure.

Sharks are shrinking in the Gulf of Mexico
A new study suggests shark sizes in the Gulf of Mexico have diminished over the last century – by as much as 70% for some species. The finding is based on analysis of annual recreational fishing competitions over the years. From the 1920s to the 1980s, the weight of the winning shark catch increased; however in the 1980s the trend dramatically reversed. The trend is thought to reflect the impact of escalating commercial fishing of sharks beginning in the 1980s, in particular for their fins.

CITES restrictions on shark and manta ray trade come into force
Trade in five species of shark and all manta rays is now subject to CITES regulations. Without a permit confirming they have been caught legally and sustainably, the sale of meat or fins from Oceanic Whitetip, Porbeagle and three species of hammerhead shark will be banned as a result of their listing in CITES Appendix II. Similar restrictions apply to all manta rays. The restrictions are the most significant protection CITES has provided for sharks in the convention's 40 year history.

OCTOBER 2014

WA drops federal push on drum lines
Western Australia (WA) Premier Colin Barnett has abandoned his bid for Federal approval to re-deploy drum lines off WA beaches. The withdrawn application sought approval to set drum lines between November and April each year as a means of reducing the number of large, potentially dangerous sharks in nearshore waters. However, in a concession, the Federal Government will permit WA to deploy drum lines to catch sharks in 'emergency situations' without Federal approval.

Megalodon kept whale populations in check
New research suggests the disappearance of Megalodon – the largest shark known to science – may have triggered whales to grow to their current gigantic sizes. Scientists have found fossils of primitive baleen whales alongside Megalodon teeth, indicating the predator may have fed on the whales, which were notably smaller than their counterparts today. The extinction of Megalodon some 2.6 million years ago coincides with evidence in the fossil record of whales beginning to attain the gigantic sizes seen in species today.

Protecting Migratory Species: the Convention on the Conservation of Migratory Species (CMS)

In Quito, Ecuador, an unprecedented event occurred this November with 21 species of elasmobranch added to the Appendices of the Convention on the Conservation of Migratory Species of Wild Animals (CMS). But what is CMS and what benefits does CMS listing afford sharks, skates and rays?

CMS is: an environmental treaty which provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the 'Range States', and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range.

How are species listed? Migratory species threatened with extinction are proposed for CMS Appendix 1. Signatory States are encouraged to protect these animals, conserve or restore the habitats in which they live, remove obstacles to migration and control other factors that might endanger them. It is prohibited for any Range State to catch these species.

Migratory species with an unfavourable conservation status, or those that would significantly benefit from international co-operation, can be proposed for CMS Appendix II which encourages Range States to enter into agreements with each other to protect these species.

Time for Action! was the rallying cry of the 2014 Conference of Parties (CoP) and a positive message which resounded across social media, however as with all these conventions, work on the CMS proposals started years in advance.

In late 2012, the UK government (Defra) started considering the potential benefits of authoring a proposal for three species of thresher shark with a view to securing Europe as the proponent Party, a proposal which the Shark Trust was pleased to support. In Defra's 'Love Sea Life' blog (**lovesealife.blog.gov.uk**) Jamie Rendell from the Marine Species Conservation Team reflects on the importance of this meeting for marine species, and the effort and energy required to secure such a positive outcome. George Eustice, UK Fisheries Minister commented: "Thresher sharks are particularly vulnerable so I am delighted that this UK-championed proposal was successful."

In all, 21 species of shark and ray were proposed and accepted for listing from countries as diverse as Kenya, Egypt, Fiji and the hosts Ecuador. Detailed information on all of these species can be found on factsheets available to download from the Shark Trust website at: **www.sharktrust.org/CMS**.

For more on CMS and in particular the CMS Memorandum of Understanding for Sharks visit **www.sharktrust.org/cms** and for more information on CMS, visit: **www.cms.int**.

© Steve Jones


© Chris Kowalski.

What our colleagues in Quito said:

"We are elated by the overwhelming commitment expressed by CMS Parties for safeguarding some of the world's most imperiled shark and ray species, including the highly endangered sawfishes," said Sonja Fordham of Shark Advocates International. *"These unprecedented actions more than triple the number of shark and ray species slated for enhanced conservation initiatives."*

"Manta and devil rays are exceptionally vulnerable to overexploitation, usually having just one pup every few years," explained Ian Campbell from WWF, serving on the delegation from Fiji. *"The Appendix I listing obligates CMS Parties to ban fishing for reef manta and all devil ray species, and reflects a responsible, precautionary approach in light of their inherent susceptibility to depletion."*

"From hammerheads of the Galapagos to threshers in the Philippines, sharks are incredibly popular attractions for divers," noted Ania Budziak of Project AWARE. *"With increasing recognition of the economic benefits of associated tourism, divers' voices are playing a key role in winning protections for these iconic species."*

Amie Brautigam of the Wildlife Conservation Society concluded: *"We urge countries to channel the overwhelming concern for sharks and rays demonstrated at this historic meeting into leadership towards national protections and regional limits on fishing."*

Appendix I:

Basking Shark (*Cetorhinus maximus*)
White Shark (*Carcharodon carcharias*)
Giant Manta Ray (*Manta birostris*)
Other Mobulid Rays (Reef Manta and Devil Rays)*
Sawfishes (All family Pristidae)*


© Tim Priest.

Appendix II:

Whale Shark (*Rhindodon typus*)
Basking Shark (*Cetorhinus maximus*)
White Shark (*Carcharodon carcharias*)
Porbeagle (*Lamna nasus*)
Shortfin Mako Shark (*Isurus oxyrinchus*)
Longfin Mako Shark (*Isurus paucus*)
Spiny Dogfish (*Squalus acanthias*) - Northern hemisphere populations only
Giant Manta Ray (*Manta birostris*)
Other Mobulid Rays (Reef Manta and Devil Rays)*
Sawfishes (All family Pristidae)*
Silky Shark (*Carcharhinus falciformis*)*
Great Hammerhead (*Sphyrna mokarran*)*
Scalloped Hammerhead (*Sphyrna lewini*)*
Common Thresher (*Alopias vulpinus*)*
Bigeye Thresher (*Alopias supercilliosus*)*
Pelagic Thresher (*Alopias pelagicus*)*

*new listings


© David Ainsbury.

Supporter's page

Rory Sacree completes the 'Float4Life' challenge

Shark Trust member, Rory Sacree, successfully completed the 'Float4Life' Challenge, in aid of the Shark Trust and the RNLI International Development Programme, on Thursday, 21st August. Rory, a Senior RNLI lifeguard on Crooklets Beach in Bude, North Cornwall, had challenged himself to spend twenty-four hours floating alone, a kilometre out to sea.

Rory received a rapturous welcome upon his return to Summerleaze Beach, Bude, but what the well-wishers hadn't seen were the many trials along the way. As night fell on Wednesday evening the temperature plummeted to below 10°C. Rory was dressed in a cold water immersion suit and had many layers of warm clothes underneath, but he still needed to keep moving to maintain his body temperature. Hypothermia was a real danger during the early hours, but having survived that he thought the worst was behind him.

Sunrise was a big morale booster for Rory, but as the day went on the sea conditions deteriorated drastically. The wind swung around to the west, whipping the sea into a horrible mess. Constantly buffeted by three foot wind swell, Rory was unable to sleep throughout the whole twenty-four hours. From 3am on Thursday morning he suffered constantly from seasickness.

Radio communication problems, dehydration, and the constant mental torpor were just a few of the other challenges that Rory needed to overcome. He stayed strong both mentally and physically, although he did have some dark moments at around 3pm on Thursday afternoon. After the ever-present seasickness, no sleep, and just a mouthful of water and two bites of flapjack over the previous twenty one hours, the finish line seemed further away than ever.

"An old friend helped me through it with some words of wisdom", said Rory, speaking after the event. "'Think of the now', he said to me, 'if you're not ready to quit now, then don't, always stay in the present' – that's all I was thinking about in the difficult times out there."

Rory was brought back to shore by the lifeboat men on Bude's RNLI inshore lifeboat. He was welcomed by his support team, friends and family. It was important to keep him horizontal to avoid Post-Immersion Collapse,

Rory, after completing the Float4Life Challenge © Rory Sacree.

where his blood pressure could have dropped rapidly after his removal from the water, but he was able to enjoy a warm shower and a hot drink in Bude lifeboat station.

"A huge thank you to everybody who has supported me and donated to the 'Float4Life' challenge" said Rory. "Initially I thought it was going to be a low-key jolly at sea, but it was far more of a challenge than I realised, and the money and support generated is greater than I could ever have imagined. I couldn't have done it without my friends and fellow lifeguards who kept things running smoothly behind the scenes."

And a huge thank you to Rory from everyone here at the Shark Trust! To date Rory has raised over £4000; you can still donate to Rory's chosen charities, the RNLI International Development Programme and The Shark Trust, by visiting http://uk.virginmoneygiving.com/rorysacree.

Stuck for gift ideas this Christmas?

If you're buying for a shark fan don't forget to check out our Shark Shop - we have beautifully crafted jewellery, intricate fully-dimensional keyrings, a range of super soft snuggly cuddlies and much more…

We're very excited to announce our new Shark Trust range is now on sale! We have three ceramic mugs, each featuring an exclusive design. The ***Sharks*** and ***Skates & Rays*** mugs are beautifully illustrated by Marc Dando and feature species found in British waters. Our ***Eggcase*** mug showcases mermaid's purses found on British beaches - so you can brush up on eggcase ID skills while enjoying your favourite brew!

We also have a limited amount of short sleeved rash vests available in various sizes for both men and women. These provide UV 50+ protection and feature a Blue Shark silhouette on the front, and the Shark Trust logo and web address on the back.

All proceeds generated from the sale of our products help to further the aims of the Trust, so why not treat a special someone this Christmas and support shark conservation at the same time!

To guarantee your goods arrive in time for Christmas please remember to place your order before the last posting dates (International - Wed 3 Dec; Europe - Mon 8 Dec; UK – Fri 19 Dec).

Any orders placed after 1pm on Friday 19 December will not be despatched until after Monday 5 January 2015.

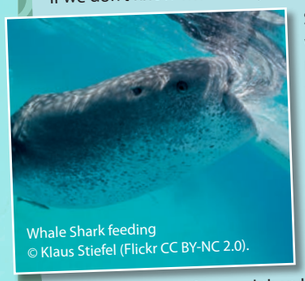
Merry Christmas from all at the Trust!

Pup's activity zone

Protecting long-haul sharks

Hi sharky peeps! It's me, The Blowfish, back again to speak to you about the secret ways of the sharks and rays. The Shark Trust is once again fighting the best fight for the toothy, finny elasmobranchs under the waves. So, what are we looking into this time round then?

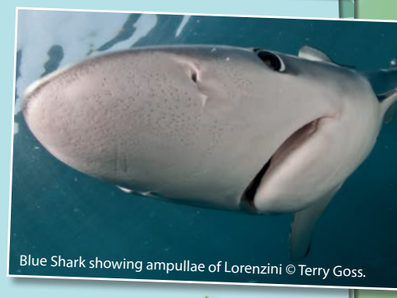
Today we are going to talk about those sharks and rays that are always on the move. Now at first it might seem a great idea for sharks to always move around, but it can make it a nightmare for us conservationists to protect them if we don't know where they are heading.



Whale Shark feeding © Klaus Stiefel (Flickr CC BY-NC 2.0).

So which sharks are highly migratory? We know that Whale Sharks swim the world's oceans looking for the perfect plankton, Blue Sharks have been shown to travel 9200km and there has been some amazing work done recently satellite tagging White Sharks and other sharks to track their movements across the globe. However, we still do not know enough about the routes taken by sharks, what factors might make them migrate or even, where they go along the way. Take the Basking Shark: we get a brief glimpse of the world's second largest fish from May till October, then poof!!! Vanished!!

The truth of the matter is we still have lots of research to conduct on these highly migratory animals. Tagging and tracking sharks is hard work, and not just due to the large cost of satellite tags – many tags need to wash up first, and then be found and uploaded on to a computer. Even simple numbered tags need to be reported to the correct organisation to be recorded. It's a sad thought that many tagged sharks might be finned at sea and the tag – and all its amazing information – lost without trace.



Blue Shark showing ampullae of Lorenzini © Terry Goss.

So how do sharks manage to navigate all over the world?

The ampullae of Lorenzini have long been considered the GPS of the shark and ray world. Being able to pick up the electromagnetic fields of living animals, it is widely believed that the ampullae also can detect the earth's magnetic field and thus guide a shark across oceans. Sharks and rays must also have a great sense of timing though, as Whale Sharks are known to visit Christmas Island at a specific time each year to feast on the eggs spawned by the population of crabs found there.

So we get to the real problem with these footloose (or should that be fin loose?) sharks. How can we protect them if we do not know where they are? Well it is hard. Really hard. You basically need to get every country to agree to protect the sharks that enter their waters AND get that same country to actually uphold the agreement. Thankfully some of the best shark boffins in the world are coming together to talk about all this at the Convention on the Conservation of Migratory Species of Wild Animals (CMS) in Ecuador this November.

So keep your eyes peeled for some new developments and hopefully some solutions for the long-haul sharks and round-trip rays.

4-9 NOV 2014
QUITO, ECUADOR
CMS COP 11
TIME FOR ACTION!

SHARK TRUST NEWS FLASH

Phenomenal! Twenty-one species of shark and ray have been added to the Convention on the Conservation of Migratory Species (CMS)!

Hammerheads	 Hammerhead © Jillian Morris.	2 species
Manta and devil rays	 Manta ray © Steve Jones	10 species
Thresher sharks	 Thresher Shark © Matt Newell.	3 species
Silky Shark	 Silky Shark © Michel Labrecque www.plongeexl.com.	1 species
Sawfishes	 Sawfish © The Deep.	5 species

Big Fish, Big Value:

examining what the Whale Sharks of the Maldives are worth

Jim Hancock
Maldives Whale Shark Research Programme

A recent scientific paper by the Maldives Whale Shark Research Programme (MWSRP) has, for the first time, put a dollar value to Whale Shark tourism in one small region of the Maldives[1]. Here, one of the authors of that paper explains how this study came about and how he hopes it will have an impact on Whale Shark conservation.

The Whale Shark *Rhincodon typus* is one of the ultimate prizes on the 'bucket list' of many marine life enthusiasts. It was, in part, ticking this box that led me to my first encounter with this enigmatic species. Still under the 'spotty spell' from my first sighting, a decade has now gone by and the MWSRP is now a fully-fledged research charity, staffed by equally passionate Whale Shark aficionados. The MWSRP team then, of all people, perfectly understand both the draw to encounter the Whale Shark in its natural environment and the enthusiasm with which many pursue this goal.


1

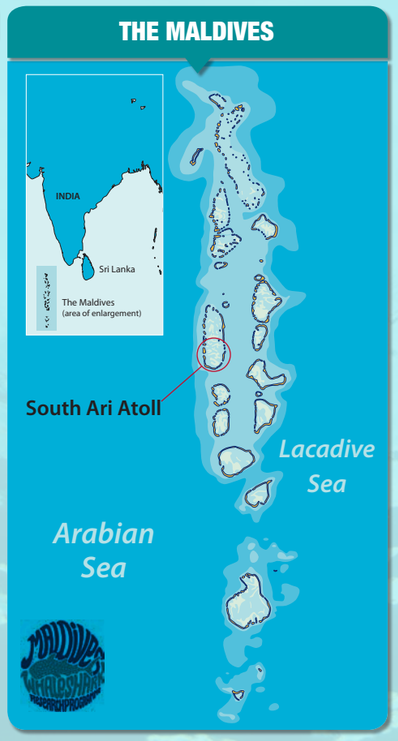
South Ari Atoll

We work in one of the best places in the world to see Whale Sharks – South Ari Atoll in the Maldives. In 2009, the Maldivian government made a 42km^2 stretch of reef and ocean along the atoll's southern edge into the largest marine protected area (MPA) in the archipelago. It was designated to "***protect and preserve a Maldivian aggregation of Whale Sharks, promote long-term conservation of the marine environment, and foster educational and scientific initiatives in the area.***" Known as the South Ari Atoll Marine Protected Area (S.A. MPA) it is truly a special location, almost unique in having an aggregation of Whale Sharks which can be seen all year round.

After a few seasons of conducting research in this region the MWSRP began to notice that an increasing number of vessels and tourists were coming to the area in the hope of glimpsing its famous residents. Being scientists, it was in our nature to want to quantify this and so in early 2011 we began to note down the other vessels we were seeing during the course of our search transects. These vessel logs (still much loathed by our research volunteers!) were used to record the time, GPS location and type of vessel we encountered, as well as the number of persons it had on board. One of the key aspects we recorded was the resort or live-aboard the vessel was associated to, something that in the early days had no particular direction but which was to become an important element in the methodology of our work.

In early 2014 the team compiled our dataset and began to assign a 'price per guest', based on the actual cost of a trip for each resort or live-aboard they were with at the time. As far as we have been able to ascertain, this is the first time that a long term valuation of a wildlife viewing excursion has been calculated exclusively from observational data. This technique also allowed us to filter those vessels not directly involved in Whale Shark viewing.

While there was an awful lot more sunburn associated with our technique, we are of course aware of its limitations. We were limited to those vessels that came close enough for us to see. Only people who were out on deck could actually be counted (we never made assumptions). We could not count while we were in the water with a shark. We weren't on the reef all year round…you get the idea, so I'll save you here from how we countered these challenges in creating the final figures (but if you are interested I will point you instead to our open access *PeerJ* paper [see reference list] for some further reading and clarifications!).



The numbers

When the numbers came out of the crunching machine we were staggered. In 2012 approximately 72,000 people came to S.A. MPA specifically to see Whale Sharks. In 2013 that climbed to just under 78,000. The value of all this traffic was even more surprising. Not including any taxes or service charges, those visiting in 2012 shelled out US$7.62 million. This climbed to US$9.36 million in 2013.

To put that into context, this one small section of Maldivian epipelagic reef accounted for nearly 3% of the global shark ecotourism in 2013. In the context of the Maldives this value is even more important as it represents nearly half that of the whole country's earnings from shark tourism. While these big numbers are worthy of a briefly raised eyebrow in most readers, why do they really matter on the ground? How can this be beneficial to the conservation of the Whale Shark at any level?

Well, when you are dealing with decision makers, money is an attention grabber. We avoided assigning a dollar value to each Whale Shark, instead calculating a substitutive value for the Whale Shark aggregation. By that we mean the income which would be lost to the economy if the Whale Sharks were to disappear from S.A. MPA. Unfortunately when the MPA was created no feasible management plan was implemented. Important aspects of a plan such as measures to protect, enforce and monitor Whale Shark and visitor safety still do not exist. Without informed and effective management, wildlife tourism can have negative effects on wildlife such as disruption to natural activity, injury or wider habitat alteration. Ultimately an unregulated MPA may end up damaging the resource the area was intended to protect.

The vast majority of people coming to see Whale Sharks in this region are keen divers or snorkellers – many probably looking to also tick off their 'bucket list' sighting as I did all those years ago. When well-briefed about 'good encounter' practices and guided by knowledgeable and disciplined guides, tourists in the water probably have very little impact on the Whale Shark's behaviour and we enjoy watching them have a memorable experience. The problem is that there is such a volume of tourists that the number of 'bad apples' who spoil it for everyone by driving their boats too fast or sometimes even touching or hitching a ride on the shark is inevitably going to increase. While this may be a short term annoyance to a shark in some locations, it potentially has much more serious impacts to the Whale Sharks in the S.A. MPA.

Impacts on natural behaviour

The MWSRP believe that the sharks in this region are feeding in the cold deep waters just offshore from the reef and coming back up to the warm shallow reef edge afterwards as part of their thermoregulation behaviour. Like most sharks, Whale Sharks are cold blooded and we think they use the shallow reef plateau as a safe haven while they get back up to temperature. When disturbed, such as by a stray hand or by a boat getting too close, their natural response is to dive off the reef edge into the deep. If they are indeed in a thermoregulation cycle then this disturbance will mean that they are either going back down with a lower body temperature than is optimal, or they need to make another energy expensive ascent to come back up and complete their delayed warming cycle. Either way, it has the potential to reduce feeding duration or opportunity. At this point we don't know the physical effects this may have, but any disruption to finely tuned natural behaviour in this way cannot be positive. More worryingly perhaps is that we have no idea at what point a Whale Shark's natural attachment to an area is compromised by its tolerance to disturbance, or how far down that path they currently are in this region. Certainly it seems to be a case of better-safe-than-sorry in ensuring they are undisturbed and uninjured though.

There is no doubt the government of the Maldives has an incredibly hard job on its hands establishing a balanced and workable plan in this region. As always there are lots of different stakeholder interests to consider and not all of them see eye to eye. In the mean-time though, there is now a great opportunity for tourism sector stakeholders to show their commitment to environmental responsibility by embracing self-regulation and ensuring that all their excursions are run to a sustainable standard. To aid this process the MWSRP has created an open access data sharing platform called the **Big Fish Network**[2] and we've even created a **free app**[3]! We are also committed to continue offering training and educational materials to those tourist resorts aspiring to stand out as stewards in this area.

The publication of this paper has proven timely. Consultations by the Maldivian government with local communities and tourism industry representatives have restarted with earnest in recent months. There definitely feels like there is some determination to create a world class and responsible Whale Shark tourism destination in South Ari Atoll – it's just clearing that final hurdle and crossing the line. We are hoping that this study and the eye-catching conclusions it reaches assist in being a catalyst for this final push.


2


3

About the MWSRP

The Maldives Whale Shark Research Programme (www.mwsrp.org) is a UK and Maldives registered charity that exists to conduct Whale Shark research and foster community-focussed conservation initiatives in the Maldives and throughout the Indian Ocean.

You can find more information about how you can get involved as a research volunteer with the MWSRP at **www.mwsrp.org/volunteer**.

Adopt

When you adopt a Whale Shark with the Shark Trust, you will be supporting the work of the Maldives Whale Shark Research Programme. Visit: **www.sharktrust.org/adopt**.

References:

1. Cagua, ***et al***. 2014. Whale Shark economics: a valuation of wildlife tourism in South Ari Atoll, Maldives. ***PeerJ*** 2:e515; DOI 10.7717/peerj.515.
2. **http://maldiveswhalesharkresearch.org/bigfishnet-work/**
3. **http://maldiveswhalesharkresearch.org/2014/06/your-guide-to-the-mwsrp-app/**

PHOTOS

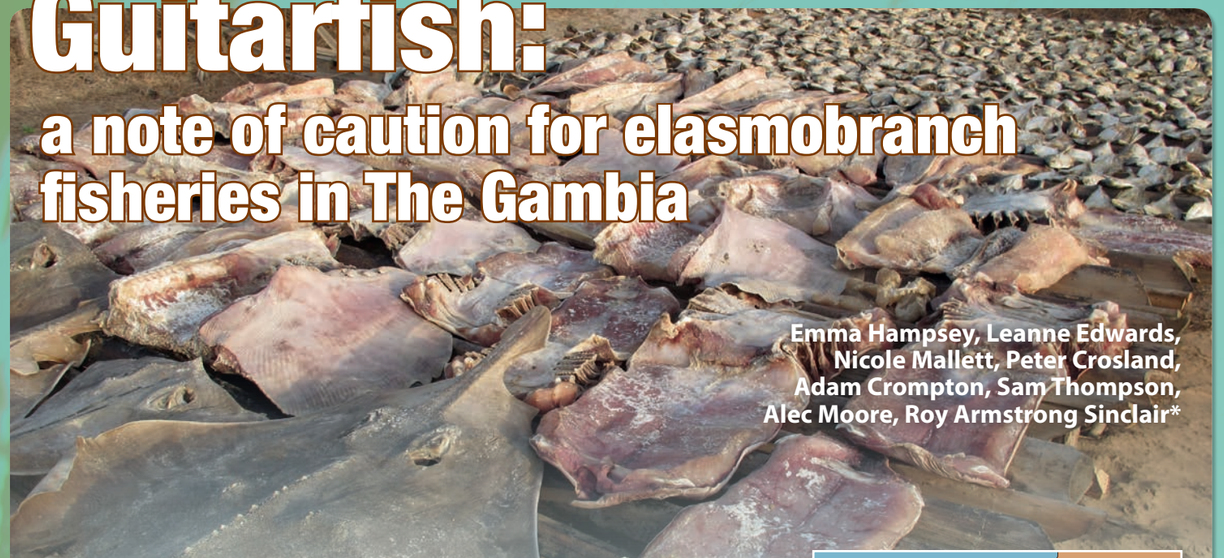
Main image: A Whale Shark cruises close to the surface in South Ari Atoll, Maldives © Jim Hancock.

Image 1: A member of the MWSRP Team records details on vessels in the S.A. MPA © Gregor Kervina.

Image: 2 Vessels spot Whale Sharks by cruising back and forth along the epipelagic reef edge © Gregor Kervina.

Image 3 Whale Sharks are thought to be coming to the shallow, sunlit surface waters to warm themselves after deep feeding dives © Gregor Kervina.

Guitarfish:
a note of caution for elasmobranch fisheries in The Gambia



Emma Hampsey, Leanne Edwards, Nicole Mallett, Peter Crosland, Adam Crompton, Sam Thompson, Alec Moore, Roy Armstrong Sinclair*

In April 2014 conservation students from the University of Cumbria undertook a field trip to The Gambia, West Africa, as part of their Applied Field Studies module. The focus of their project were the elasmobranch fisheries in coastal villages and the impact this might be having on the conservation status of some species. What they found were extensive elasmobranch fisheries with some sobering, and potentially significant, conservation impacts.**

The Gambia

The Gambia is the smallest country in mainland Africa. It sits on the extreme western coast of the continent and is bounded by the Atlantic Ocean to the west and is otherwise encapsulated by Senegal. Across West Africa the fishing industry is a large and important resource, especially so to the people of The Gambia, whose coastal waters are exceedingly rich fishing grounds which attract fishermen from nearby countries. In the majority of fishing villages, the main catch is the small, herring-like Bonga Fish *Ethmalosa fimbriata* which are smoked for local sale or export. Larger, high-value species such as Ladyfish (Elopidae) and spiny lobsters are sold to local hotels. Guitarfish (Rhinobatidae) and rays are the focus of more specialist fisheries. These are salted and placed on drying racks (main image) before being exported, primarily to Ghana

A number of fishing villages along the Atlantic coast of southern Gambia and the capital city of Banjul on the River Gambia were visited and their activities monitored (Table 1).

Table 1: Fishing villages of Gambia

Gunjur	Gunjur is one of the larger fishing villages visited, with large numbers of drying tables/ racks present. Substantial Bonga Fish smoking facility, and large numbers of rays found drying on racks.
Sanyang	A large fishing village community with a mixed fishery. Striped Panrays *Zanobatus schoenleinii* and two species of electric rays (Torpedinidae) were found discarded here, as they are considered low value and 'bad eating'.
Tanji	The largest fishing settlement in The Gambia, equipped for multiple preservation methods including freezing, drying and a large number of smoking houses.
Ghanatown	Named after the large Ghanaian fishing community. Although Ghanatown was one of the smaller fishing villages along the coast, the fishery here seemed to specialise in elasmobranchs when we were there, with mainly Blackchin Guitarfish *Glaucostegus cemiculus* being caught, with some Daisy Stingray *Dasyatis margarita*.
Kartung	Kartung was the smallest fishing village visited, on the border with Senegal to the south. Little catch data was available during our visit, as there were few boats present. Anecdotal evidence suggests that elasmobranchs are targeted during the wet season.
Brufut	This is another smaller village, with a number of traditional pirogue boats operating off the beach. Chinese shipwrights were building large wooden trawlers on the beach. Two Chinese trawlers were based out of Brufut during our visit, although we were unable to observe their catch.
Banjul	Fishing activity is closely linked to the towns fishing market. Limited activity was recorded due to weather conditions, but there is a large commercial market for local, national and international markets.

PHOTOS

Main image: Guitarfish (Rhinobatidae) salted and drying © Jenni Mouat.

Image 1: Map of the Gambia and fishing villages mentioned in article.

Image 2: Preparing a freshly caught guitarfish (Rhinobatidae) © Mic Mayhew.

Image 3: Coastal fishing boats © Billy Sinclair.

Fish market surveys

Fish market surveys are widely used as a cheap and effective way to estimate elasmobranch catch diversity, especially in developing countries where there is no funding for expensive at-sea surveys. Size measurements were taken to understand the composition of the elasmobranch fishery. Where guitarfish and rays were found, their total length and disc width were measured, respectively. As many of the Blackchin Guitarfish specimens were already dismembered and on drying racks, we overcame this problem by measuring their pre-orbital length (POL: the distance from the tip of the snout to the front of the eyes). The total length was then estimated by using photographs of an intact animal to determine what proportion of the total length the POL was. The sex was also determined by either the lack (female) or presence (male) of claspers. The developmental stage of the clasper can also be used to estimate maturity of the males; however, maturity of females cannot easily be determined without dissection and examination of the reproductive tract, so we were unable to estimate this.

Our survey provided some of the first scientific information on the elasmobranch species landed by commercial fisheries in The Gambia. Although our short study recorded too few individuals to do any meaningful analysis for many of the species we documented, it did provide vital information on elasmobranch diversity, abundance and fishing activity. It also showed that endangered species, as well as those 'data deficient' species about which very little is known, are being caught (Table 2).

The two most commonly recorded elasmobranch species recorded on the surveys were the Blackchin Guitarfish and Pearl Stingray. The Blackchin Guitarfish dominated the drying racks at Ghanatown, with reconstructed total lengths ranging from 100 – 200cm, averaging around 150cm. This average size is approximately the same as that at which both males and females were found to become mature in a study in neighbouring Senegal[1]. The fins from the guitarfish at Ghanatown are sold as part of the shark fin soup trade for approximately £8 GBP per kilogram. This species is found in the eastern Atlantic (including the Mediterranean) where a general reduction in the size of individual guitarfish and a decline in the recorded catch of these species have been observed in West Africa[2]. In Senegal, it has been reported that landings of Blackchin Guitarfish have decreased from 4,050t in 1998 to 821t in 2005[3].

The Pearl Stingray is listed as 'Data Deficient' on the IUCN Red List. This small species (max. disc width ~30cm) is reported as occurring in both marine and estuarine environments, but little is known about its biology. The study of Pearl Stingrays is made more difficult because it closely resembles smaller individuals of a larger species, the Daisy Stingray**.** Large numbers (at least 1000) of stingrays, probably all Pearl Stingrays, were found on drying tables at Gunjur. The Pearl Stingray was one of the most commonly encountered rays in the local catches, often occurring in large numbers – for example, one catch contained 118 females and just one juvenile male.

Table 2: A selection of elasmobranch species identified in daily catches in The Gambia

Species	IUCN Red List status	Notes
Blackchin Guitarfish *Glaucostegus cemiculus*	Endangered	Seen being landed at Ghanatown, where it was salted and dried.
Daisy Stingray *Dasyatis margarita*	Endangered	Seen being landed at Ghanatown.
Pearl Stingray *Dasyatis margaritella*	Data Deficient	Commonly recorded. Most abundant on drying racks at Gunjur and Ghanatown.
Striped Panray *Zanobatus schoeleinii*	Data Deficient	Commonly discarded, often found scattered across villages.
Twineye Skate *Raja miraletus*	Least Concern	Frequently recorded, but not in large numbers.
Butterfly Ray *Gymnura* spp.	Data Deficient	Recorded, but not in large numbers.
Common Guitarfish *Rhinobatos rhinobatos*	Endangered	Frequently recorded, e.g. at Sanyang.
Scalloped Hammerhead Shark *Sphyrna lewini*	Endangered	One newborn at Gunjur.
Milk Shark *Rhizoprionodon acutus*	Least Concern	A handful of pregnant females and juveniles found.

Another area of conservation concern

In The Gambia it is clear that there is a wide range of elasmobranchs that are being subjected to capture in fisheries both as bycatch and in specialist, targeted fishing. Although it isn't illegal to specifically target elasmobranchs in Gambia, it is illegal to undertake finning at sea, but anecdotal evidence from fishermen suggests that the fin trade is a lucrative and attractive opportunity. This is a concern, as some of the elasmobranch species we recorded in Gambia have already undergone severe declines in other parts of the world. For example, both the Blackchin and the Common Guitarfish have been reported as having disappeared from some parts of the Mediterranean, where they were previously abundant[3]. Furthermore, the Largetooth Sawfish *Pristis pristis* was once common in artisanal fisheries in The Gambia, but is now considered locally extinct.

Overall, the data we collected indicated The Gambia is yet another area of conservation concern for elasmobranchs. Overfishing is a major concern as specialist elasmobranch fishermen from other nations immigrate to profit from the rich waters. The lack of protective legislation and active enforcement makes The Gambia an attractive fishing opportunity for many of Africa's nations and beyond. Without stringent control and more focussed management strategies, the abundance and diversity of elasmobranchs there will be increasingly threatened.

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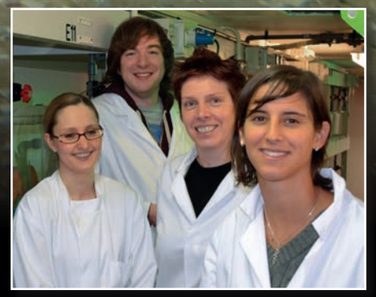
*Emma Hampsey, Leanne Edwards, Nicole Mallett, Peter Crosland, Adam Crompton and Sam Thompson are all second year undergraduate conservation students, at the University of Cumbria, where Billy Sinclair and Roy Armstrong are academic staff; Alec Moore is a member of the IUCN Shark Specialist Group who accompanied us on the field course.

** All sharks, skates and rays; the Elasmobranchii form a subclass within the taxonomic class Chondrichthyes which contains all cartilaginous fish.

Shark immunity bites back

Helen Dooley
School of Biological Sciences,
University of Aberdeen

I am currently a lecturer and research scientist at the University of Aberdeen where my group studies the immune system of cartilaginous fishes – mainly sharks and skates but also chimaera (including the Elephant Shark *Callorhinchus milii*). There are two main aspects to what we do: the first is to try to understand how sharks protect themselves from infection and the second is what this can tell us about how the immune system works. Although the first cartilaginous fishes actually appeared over 500 million years ago, their immune system is not so different to that of humans; they use the same molecules in roughly the same ways, so we can look for similarities/differences between the two systems to figure out what is really important for immune protection. This work is a bit like comparing a modern day Ferrari (the human immune system) with a Model-T Ford (the shark immune system) to figure out which parts are essential for the functioning of a car (the engine, wheels, etc.) and which are the 'added extras' that make the Ferrari faster or more efficient.



The Aqua Lab team: (left to right) Kimberley Mackenzie, Anthony Redmond, Helen Dooley and Rita Pettinello © Helen Dooley.

Improved understanding

When I first started studying sharks about 15 years ago it was generally thought that they had a poor immune system. The few studies that had been performed in the 1960s concluded that sharks usually did not respond to immunological challenge (e.g. immunisation) and if they did it was a very poor, very general response, not at all tailored to the attacking pathogen. To us this didn't make very much sense; sharks have been successfully swimming about in our seas for a very long time – with some individual species living for well over 70 years. Similarly, sharks in the wild are not riddled with disease and infection; in fact they are one of planet Earth's most successful top predators. So how could their immune system be so poor? To try to solve this puzzle we decided to repeat the immunisation studies undertaken previously, but using our improved understanding of the immune system and the more advanced analytical techniques developed in the meantime.

Now, while White Sharks are beautiful, awe-inspiring animals, they are not actually a very good experimental model. Our studies take many months, or even years to complete, during which time we have to be able to handle the animals to immunise them and take small follow-up bleeds about once a month. Quite apart from the sheer size of tank and ready supply of seals you would need to keep a couple of White Sharks happy, I shouldn't imagine they would stay that way for long if someone kept trying to prod them with a needle! For our studies we use Nurse Sharks ***Ginglymostoma cirratum*** – a tropical/sub-tropical species which grows to around four metres and is abundant in the warm waters off the southern USA, South America and the Caribbean – and the Smallspotted Catshark ***Scyliorhinus canicula*** which is native to the Northeast Atlantic and Mediterranean and grows to a maximum length of around one metre. Both species are relatively docile, so we can handle them easily without risking harm to the animal or ourselves, and both do exceptionally well in aquariums, surviving for many years and even reproducing if the environment is right.

PHOTOS

Main image: Elephant Shark – the first cartilaginous fish to have its genome fully sequenced © fir0002_flagstaffotos.

Image 1: Removing a blood sample before returning a Smallspotted Catshark to tank © Helen Dooley.

Image 2: Smallspotted Catsharks © Helen Dooley.

Image 3: The different types of immune cells present in shark blood © Helen Dooley.

Image 4: Using dye to light up antibody-producing cells present in sharks blood © Helen Dooley.

Robust immune response

The process we follow is the exact equivalent of, and no more painful than, when you go to get your holiday vaccinations: following a priming and booster shot a blood sample is taken to see if you have responded to the vaccine and are protected from catching that particular disease. Upon completion of our studies we found that, contrary to the earlier studies, our sharks actually produced a very robust, good-quality immune response following immunisation and that the type of response could be modified to ensure that it targeted the specific pathogen. Although the shark response took longer than the human response to reach its maximal level (4-6 months rather than 1-2 weeks) it was also maintained for much, much longer; in some cases we monitored the response for over two years without observing any significant drop in protection! We also proved for the first time that, much like in humans, the shark immune system can respond considerably faster to a pathogen it has encountered before – a process called 'immunological memory' and the reason why vaccination works so well in protecting us from subsequent infection. In this case maximal levels of protection were observed in sharks only four weeks after they had received a booster shot. So from our studies we could conclude that, as expected, the shark immune system is perfectly capable of protecting the animal from infection[1].

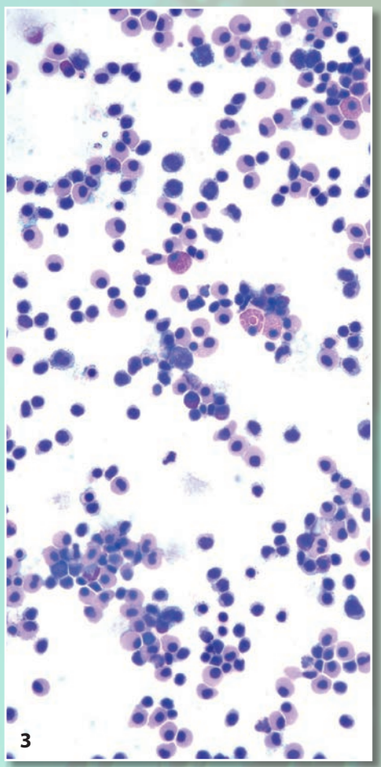
During our studies we occasionally come across molecules that are involved in immune protection in the cartilaginous fishes but are not found in any other species. The second aspect of our work involves studying these molecules to see if they have the potential to be developed into drugs that one day could help humans fight diseases such as cancer, auto-immune disease or severe bacterial infections. Once we have identified an interesting molecule we take a fresh blood sample, extract the blood cells and use these to clone the gene for that molecule. This means we can then generate a synthetic version of the molecule in the lab to complete the downstream testing. For example, we have a three year project funded by Worldwide Cancer Research to investigate the potential of a special type of antibody – one that is found only in sharks – to prevent the growth and spread of cancer cells.

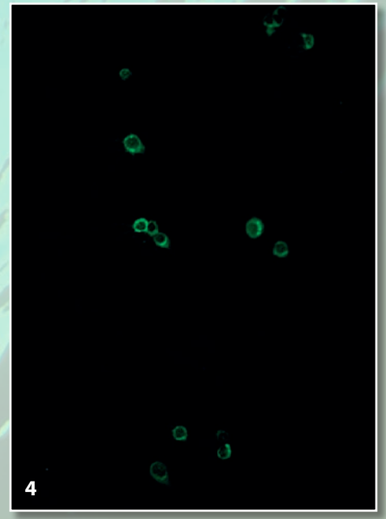
'Shark-inspired' drugs

To do this we immunise sharks with a selection of proteins that are found at high levels on the surface of cancer cells but not on normal cells. Once we see a high response to the cancer cell proteins we take our usual blood sample, isolate the antibody-producing cells and clone the genes that encode those antibodies. We are currently producing the synthetic versions of our shark antibodies so that we can begin testing them on a selection of human cancer cell lines. The process of developing a new drug is a long one, usually ten years or more, and as we are at the very first stage, even if this project is successful it would be many years before the first 'shark-inspired' drug would be prescribed to a patient. I should stress that while this project is looking for anti-cancer molecules it is not because sharks are 'immune' to cancer. Contrary to popular myth, sharks DO get cancer with reports of tumours being found in at least 20 different species[2]. Additionally, although there may be molecules present in sharks that one day might be developed into effective anti-cancer drugs, there is currently no scientifically validated trial that shows the use of shark cartilage 'supplements' can help prevent or cure human cancer.

We have had one or two surprise findings along the way too. For example, during a study of an immune molecule called MHC (the molecule that is tested before human organ transplants to see if the donor and recipient are a 'match') a colleague of mine in the US, Dr Yuko Ohta, discovered that one litter of 39 Nurse Shark pups (a surprise in itself!) had been sired by at least four different fathers[3]. While the idea of multiple paternity isn't so new in sharks, in this case the very different sizes of the pups and the fact some still had a small yolk sac suggested that they hadn't been conceived at the same time, with an interval of at least a few weeks between the biggest and smallest pups.

With each new piece of data about the shark immune system we have to try to figure out how it fits into our pre-existing knowledge or, on occasion, completely re-evaluate our ideas about immune functioning in this group. The first cartilaginous fish genome sequence (for the Elephant Shark) was published at the beginning of this year[4] and has already thrown up so many new questions regarding the immune molecules and immune system functioning in this group that it seems the people in my lab will be busy for a very long time to come!





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The 18th European Elasmobranch Association Conference: Leeuwarden November 2014

EEA 2014 conference group photo © Peter Verhoog.

The 18th European Elasmobranch Association (EEA) conference was this year hosted by the Netherlands Elasmobranch Society. Running from 7th – 9th November, the conference was held at the Van Hall Larenstein University of Applied Sciences in the city of Leeuwarden, in the northwest of the Netherlands, a little over 10 miles from the Wadden Sea coast. More than 100 delegates attended this year's conference, with some coming from as far away as South Africa, the Dutch Caribbean, the US and Israel.

In all, 39 talks were presented over the three days – including three by Shark Trust staff – in four thematic sessions, with 19 posters also displayed. Themes covered a wide range of topics: policy, stock assessment & management, distribution & tagging and husbandry & biology.

Paddy Walker – EEA president and chair of the Netherlands Elasmobranch Society – opened the conference, followed by a keynote presentation from Dr. Euan Dunn – Principal Marine Advisor for the RSPB. Dr. Dunn spoke of the RSPB's experience in the development of Marine Protected Areas in UK waters and lessons applicable to the inclusion of sharks, skates and rays. This led into a session on Elasmobranch Policy in which Shark Trust Director of Conservation Ali Hood spoke on the Trust's ***No Limits? No Future!*** campaign and provided a snapshot on current EU policy. The day's second keynote by The Pew Charitable Trusts' Angelo Villagomez covered the use of shark sanctuaries, consumer campaigns, trade restrictions and domestic measures to reduce global shark mortality. This was followed by Conservation Officer John Richardson introducing a new Shark Trust project on sustainable skate fisheries in the UK. Other presentations in the session discussed shark sanctuaries and management plans for North Sea elasmobranchs.

An icebreaker reception was held at Leeuwarden's award-wining Nature Museum Fryslân – one of the more unusual natural history museums around! This afforded a great opportunity to catch up with delegates old and new, some all-important networking, as well as an after-hours look around the museum.

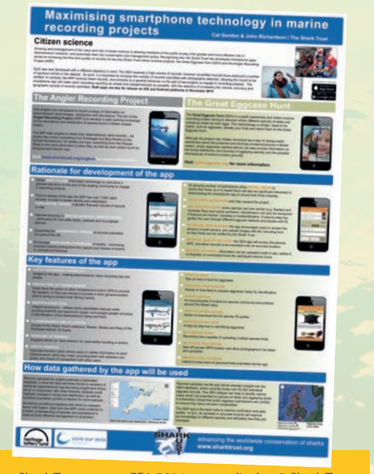

Cat Gordon presenting at the EEA conference. © Shark Trust

Saturday kicked off with a keynote presentation by Dr. Enric Cortés of the US National Oceanographic and Atmospheric Administration (NOAA), providing an overview of the status of shark stocks on the US Atlantic coast, and various methods of assessing them. This opened the session on Stock Assessment and Management, in which Shark Trust Conservation Officer, Cat Gordon, outlined how data from the Trust's Great Eggcase Hunt can contribute to an understanding of population trends for egglaying elasmobranchs. This was followed by an afternoon of talks on Elasmobranch Distribution and Tagging – which included presentations on the Canary Island Angelshark population and the movements of Starry Smoothhounds tagged in Dutch waters.

In the evening the conference dinner was hosted at the Koperen Tuin restaurant, where the annual charitable auction of sharky (and skate!) items was compered by the highly entertaining João Correira – the EEA board's Portuguese representative – and raised a fantastic €1600 for the EEA student bursary, overseen by EEA Treasurer, Glenys Heafield.

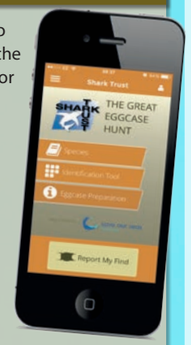
A well-attended Sunday session was opened by Dr. Correira's keynote presentation discussing how public aquaria can help in elasmobranch conservation, and laying the platform for the session on Husbandry and Elasmobranch Biology. The session included talks on captive-breeding programmes for the Undulate Ray, as well as on exploring shark personality and learning processes and the possible reintroduction of regionally extirpated sharks and skates back into Dutch North Sea waters.

Leeuwarden hosted another successful EEA conference, bringing together elasmobranch scientists, policy-makers and many more from around Europe and the world, to further elasmobranch research, management and conservation. With the Shark Trust's Ali Hood now holding the Vice President's position we are looking forward to exciting times ahead for the EEA. See you in Portugal for EEA 2015!



Promoting the new Shark Trust apps – EEA 2014 poster display © Shark Trust.

The Great Eggcase Hunt at your fingertips!



The Trust is very excited to be nearing the launch of the Great Eggcase Hunt app for Apple devices!

The Great Eggcase Hunt (GEH) database records occasional finds rather than being survey based and relies heavily upon public submissions. The app includes information about the project, tips on how to hunt and advice on how best to prepare eggcases for identification. An encyclopedia of egglaying species commonly found around the British Isles is also included, based on the Shark Trust's 'Sharks, Skates and Rays of the Northeast Atlantic' ID Guide. The app will:

Aid identification: some species can look similar (e.g. Spotted and Undulate Rays) and some eggcases may be damaged, causing confusion. A step-by-step identification tool will guide the user through the ID process.

Once identified, the find can be submitted using the recording form, with the option to include multiple species. A logbook will also help keep track of finds submitted via the app.

Increase verification: records can only be marked as 'verified' if a specimen has been seen. The app encourages users to take photos using the phone's in-built camera, and upload them in order for the species to be verified by the Shark Trust.

Improve quality of data: many records are submitted with approximate locations. The GEH app will access the phones GPS location, and allow records to be submitted using accurate co-ordinates.

If you're an iPhone/iPad user, head to the Apple store soon and search for the 'Shark Trust'. We're not neglecting Android users – the app will be available in the Google Play Store soon after the iPhone release. Watch this space!

Download on the App Store

GET IT ON Google play

Funded by: save our seas foundation

The Shark Trust welcomes new Trustees

The Shark Trust is pleased to welcome five new Trustees to the board. Between them, they have a wide range of experience and expertise.

Annabelle Lowe

Annabelle is a marine conservationist, as well as Director and Wildlife Guide for Newquay Sea Safaris and Fishing/Atlantic Diving – a recent award winner for Wildlife and Marine Attraction of the year at the Cornwall Tourism Awards. Annabelle has a particular interest in sharks since an awesome experience snorkelling with Basking Sharks many years ago. Annabelle is also a diver and keen Sea Search snorkeller, British Diver Marine Life Rescue Marine Mammal Medic, core member of Newquay Marine Group and one of five founder members of Cornwall Marine Life Boat Operators.

Tom Kennard

Tom is a businessman, entrepreneur and keen marine advocate. Tom has been a shark enthusiast since looking into UK shark catches for his dissertation and now promotes sustainability, funding and marine engagement through his various roles including as a trustee at the National Marine Aquarium, Plymouth. Tom is involved at a strategic level with a number of key organisations in the UK and overseas and is keen to ensure a sustainable future for shark species in particular.

Stephen Allen

A partner with GA solicitors, Stephen has more than 30 years of experience in court work and dispute resolution and hopes to bring these skills and perspectives to the work of the Trust. He has a broad interest in wildlife and conservation. He is a keen snorkeller and occasional diver and has been lucky enough to see Angelsharks off the Canaries.

Alan Godwin

For over 25 years Alan has run a travel company specialising in natural history, both terrestrial and marine. For a little longer than that he has been fortunate to have dived in some of the world's best scuba locations and encountered many species of sharks.

Sune Nightingale

Sune has been involved on and off with the Shark Trust for many years. In the early 00's he put together a short film for the Trust called *'The Hunting of the Shark'* which was presented to EU Commissioners as part of a petition on shark finning in EU waters. Sune also filmed and co-presented *'Shark Hunters'*, a program about the plight of sharks produced by Icon Films for the National Geographic *'Out There'* series. In addition, Sune has worked in IT since the late 90's and will be bringing this considerable experience to the Shark Trust.

Blue Shark © Charles Hood