

Economic Value of Sharks:

25 years of shark conservation in the Bahamas

Shark populations around the globe have been in rapid decline for the past decades as over-fishing and habitat loss have severely reduced their abundance. The IUCN estimates that fully one-quarter of the world's sharks and rays are currently threatened with extinction (Dulvy et al., 2014). This is a significant issue from an ecological standpoint, as sharks play a critical role in maintaining the health of coral reefs and open ocean ecosystems (Baum and Worm, 2009; Brierley, 2007; Ferretti et al., 2010; Terborgh, 2015). "Despite the worldwide decline of sharks and their important ecological and economic value, conservation and management measures have yet to have any discernible impact at reversing these trends for most at-risk species", due to a lack of basic data on shark populations and a lack of political willingness and/or resources to implement and enforce conservation measures (Shiffman and Hammerschlag, 2016).

Sharks can boost island economies based on their non-consumptive value, as a natural attraction for eco-based recreation and tourism (Haas et al., 2017). Shark diving is now a prominent feature of ecotourism activities in 29 countries, involve 376 dive operations and generate an estimated US\$314 million in economic expenditures per year. This is predicted to more than double, to US\$780 million, in the next 20 years (Haas et al., 2017; Cisneros-Montemayor et al., 2013). It appears that

shark ecotourism is more economically valuable than the fisheries which fuel the global shark fin trade: "the landed market value of shark fisheries around the globe is \$630 million per year, but has been in decline over the past 10 to 15 years" (Cisneros-Montemayor et al., 2013). Significant increases in shark tourism are especially evident in the Caribbean and Australia (Cisneros-Montemayor et al., 2013).

A new study from The Bahamas (Haas et al, 2017) highlights the importance of the shark diving industry to the Bahamian economy. The study found that the non-consumptive value of elasmobranchs (sharks and rays) for The Bahamas in sectors such as tourism, film and research totals US\$113.8 million per year (Table 1). Elasmobranch tourism generates 98.8% (or \$112.6 million) of this total revenue, with Caribbean reef shark (*Carcharhinus perezi*) dives¹ being the most popular. This was made possible by conservation measures enacted by the Bahamian government over the last 25 years, notably the ban on long-line fishing in 1993 and the establishment of the shark sanctuary in 2011 (Haas et al, 2017). These measures have helped to establish healthy and diverse shark populations around the island. The non-consumptive value of sharks is increasingly used to support further shark management and conservation legislation.

¹ Shark diving is defined by Haas et al, 2017 as "any diving where the primary motivation was to see sharks, either through provisioning (baiting, chumming or feeding) or by visiting locations where sharks are known to predictably aggregate".

Table 1: Total Economic Impact of elasmobranchs on the Bahamian Economy, broken down on a sector-by-sector basis

Activity	National expenditures	Value added effects	Total economic impact
Shark diving	\$48,820,104	\$60,536,929	\$109,357,033
Ray tourism	\$1,429,401	\$1,772,457	\$3,201,858
Film and television	\$214,068	\$265,444	\$479,512
Research	\$794,141	-	\$794,141
Total	\$51,257,714	\$62,574,830	%113,832,544



Photo by: © Jim Abernethy, taken in the Bahamas



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Haas et al. (2017) found that the Bahamian shark sanctuary serves to attract divers. Of the 50.3% divers who were aware of the shark sanctuary, 34.4% stated that it greatly influenced their decision for coming to The Bahamas (Haas et al, 2017). For the 49.7% of divers who reported not knowing about the sanctuary before their trip, the vast majority (75.0%) stated that the sanctuary was either very important (31.1%) or extremely important (44.1%) to their future decisions to come to The Bahamas.

The Dutch Caribbean has yet to acknowledge the presence of sharks in its waters as a potentially valuable tourism asset but with strong conservation measures in place and 26 shark species present, among which are some of the most iconic species such as whale sharks, tiger sharks and hammerheads, this may provide an opportunity for economic growth in the future. But over the past 5 years, significant steps have been made towards the full protection of sharks in Dutch Caribbean waters. The St. Maarten Nature Foundation successfully lobbied for a ban on fishing and killing sharks and rays in the territorial waters around St. Maarten in 2011. Since 2015 DCNA has been running a three year long "Save Our Sharks" project on all islands, funded by Dutch Postcode Lottery. The project funds work with local fishermen, scientists and aims to build popular support for shark conservation amongst local communities.

The Save our Sharks project has contributed significantly to the body of knowledge about sharks. Stereo Baited Remote Underwater Videos (sBRUV) monitoring has been run on all islands to establish baseline information on the size, diversity, species composition and abundance of shark populations throughout the Dutch Caribbean.

Acoustic tagging of Reef and Nurse Sharks around the windward islands has allowed researchers to determine for the first time the movement patterns of sharks. And an expedition to the Saba Bank in 2016 to tag Tiger Sharks has provided the first scientific data on Tiger Shark movements and migration patterns.

For the Dutch Caribbean the establishment of the Yarari Sanctuary in September 2015 to protect marine mammals and sharks was a landmark event for shark conservation. This Sanctuary protects sharks and rays in the waters around Bonaire and Saba and is only the 11th shark sanctuary of its kind in the world. With the support of the Save our Sharks project, the Dutch Ministry of Economic Affairs has developed a Shark Policy document which, when it comes into effect, will provide the Kingdom of the Netherlands wide support for the conservation of sharks and rays.

Beyond the political support and commitment to shark conservation on Dutch Caribbean islands, what is needed is a region-wide commitment to protect these highly migratory species. As part of the Save our Sharks project and in close collaboration with the Dutch Ministry of Economic Affairs and the Dutch Elasmobranch Society, in March 2017, eight species of sharks were added to the list of protected species under the international Specially Protected Areas and Wildlife (SPA) Protocol. The SPAW protocol is the only cross-border legislative instrument for nature conservation in the Wider Caribbean Region, with signatory countries agreeing to protect vulnerable animals and their unique habitats from trade, fisheries, tourism and coastal development (DCNA, 2017).

Recently the conditions of shark sanctuaries around the world have been evaluated (Ward-Paige & Worm, 2017). The results of a global diver survey in 15 countries that have a shark sanctuary were compared to 23 non-sanctuary countries. "Specific results varied by country, but there were some general trends:

1. Shark sanctuaries showed less pronounced shark population declines, fewer observations of sharks being sold on markets, and lower overall fishing threats compared to non-shark sanctuaries.
2. Bycatch, ghost gear, marine debris and habitat destruction are significant threats that are often not addressed by sanctuary regulations and need to be resolved in other ways.
3. Participants in sanctuaries were more optimistic about the survival of shark populations in local waters, but also highlighted the need for further conservation efforts.

These results suggest that shark sanctuaries, as seen through the lens of local experts (>200 dives and >3 years living in the country), may be a helpful conservation tool but likely not sufficient in isolation. There is an urgent need for higher-resolution data on shark abundance, incidental catch, and markets to direct priority conservation needs and optimize the conservation benefits of existing and future shark sanctuaries "

(Ward-Paige & Worm, 2017)

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Table 2: new SPAW Protocol listed shark and ray species

ANNEX III	Hammerhead sharks (<i>Sphyrna lewini</i> , <i>Sphyrna mokarran</i> , <i>Sphyrna zygaena</i>)
	Manta rays (<i>Manta birostris</i> , <i>Manta alfredi</i> , <i>Manta sp. cf. birostris</i>)
	Oceanic whitetip shark (<i>Carcharhinus longimanus</i>)
	Whale shark (<i>Rhincodon typus</i>)
ANNEX II	Smalltooth sawfish (<i>Pristis pectinata</i>)

ANNEX III : Species that should receive special attention and sustainable management to ensure and maintain healthy populations

ANNEX II : Species that are agreed to receive the highest level of protection in the wider Caribbean region.



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