DEPARTMENT OF ENVIRONMENT
CAYMAN ISLANDS GOVERNMENT

March 2023

Sharklogger Network Review

2017-2022

Project background

This citizen science programme is part of the Department of Environment's (DoE) shark research and conservation efforts. As sharks are vital to the marine environment by keeping coral reefs and reef fish communities in balance and healthy, all sharks are protected in the Cayman Islands through Marine Parks (since 1986)[1] and a nationwide Shark Sanctuary (since 2015)[2]. The Sharklogger programme was designed and established by DoE's Shark Project Officer, Dr Johanna Kohler in 2016 as part of a broader collaborative project with Marine Conservation International[3]. The Sharklogger Network involves the local diving community (resident divers/snorkelers, dive staff and dive operators) which collects dive data throughout the year to help with the monitoring of the local shark population close to shore.

Sharkloggers are residents who dive regularly and have voluntarily committed to logging every single dive and whether they saw a shark - or not - all in the name of science. This is different from reporting just shark sightings because in order for the data to have any meaning researchers must be able to calculate the "sharks per dive" which can only be done by knowing how many times divers were at a dive site and didn't see a shark. Participants were also taught how to ID, size and sex the sharks they see. Monitoring where the sharks are helps researchers to infer what might drive them to be abundant in certain areas over others and how these patterns might change over time. This data helps inform conservation management, particularly if shark abundance overlaps with high fishing activity thus making the sharks more vulnerable in certain areas and/or times of the year.

Re-launch of the programme in July 2021

In March 2020 the programme came to stop because local COVID health regulations implemented by the Cayman Islands Government 'locked down' most public activity including SCUBA diving. After these restrictions were lifted in July 2020, a small amount of participants resumed diving and logging their dives and shark sightings for the programme. However most dive operations remained closed due to the lack of tourism until the opening of Cayman to outside visitors in 2021. Minimal guidance and management was provided to the programme by the DOE during this time. The programme was officially re-launched in June 2021 after the

[1] All marine organisms including sharks are protected from take within the Marine Park Zones.
[2] When section 33 of the National Conservation Act, 2013, came into force providing complete protection for all sharks at all times in all Cayman waters.
[3] Scottish NGO and partner of DoE's shark research

opening of Cayman to tourism and the opening of most dive operators. The re-launch was announced island-wide and local residents were encouraged to participate. Under the guidance and supervision of Dr Kohler, DoE volunteer Anne Veeder accomplished the re-launch of the network after a hiatus due to COIVD and also managed the Sharklogger Network after that for 2021/2022. Former and new participants were recruited. The relaunch of the citizen science programme in June 2021 has sizably increased the data collection compared to that of 2020.

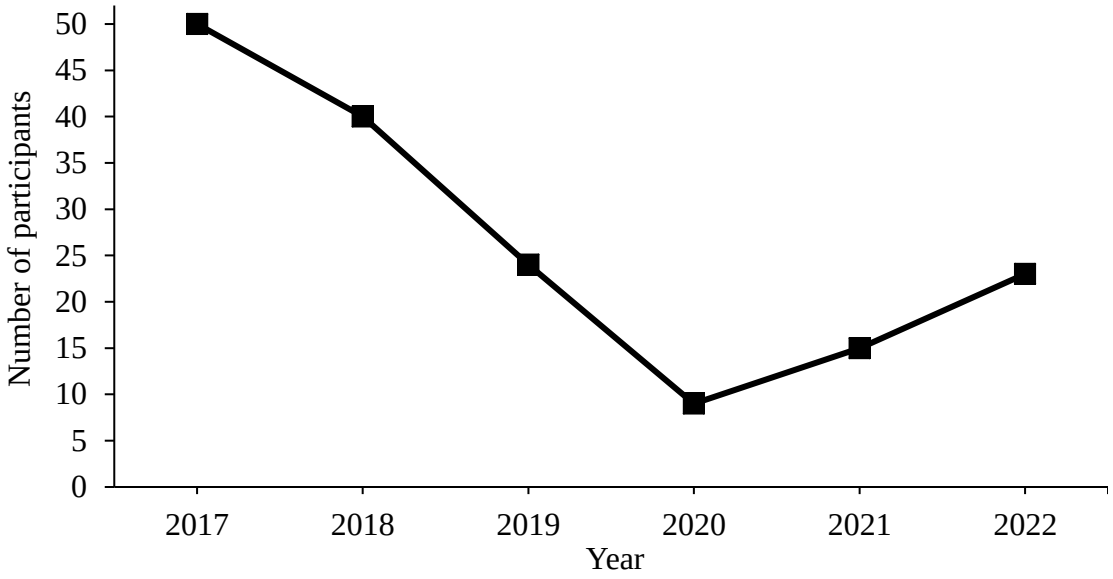

Figure 1: Number of participants in the Sharklogger Network for each year from 2017 – 2022

Temporal trend of shark sightings

The data was reported on individual 'Shark Logs' designed and provided by the project coordinator to ensure standardized data collection. Every dive with shark sightings and those without shark sightings are recorded and 'Shark sightings per Dive' - the chance of seeing a shark on a dive - is then calculated. This gives an indication of the relative abundance of sharks in a particular month, year, or area and is important information for the monitoring of our shark populations throughout the year.

A total of eight coastal shark species namely Caribbean reef, nurse, hammerhead species[4], blacktip, tiger, lemon, whale and silky sharks were recorded by participants from 2017 to 2022.

[4] Most likely great hammerheads (*Sphyrna mokarran*) or scalloped hammerheads (*Sphyrna lewini*). Most reef-associated shark species (except *Carcharhinus* spp. and *Sphyrna* spp.) are easily distinguished in Cayman and, subsequent to the training of divers, the data on species and sex of sharks were trusted. However, hammerhead sharks were collectively called 'hammerhead spp.' since identification to species level was not possible for most individuals reported by divers.

The annual mean number of sightings per dive varied for each species. Three shark species namely Caribbean reef, nurse and hammerhead species were the most common. The number of sightings of Caribbean reef shark and hammerhead species recorded on dives seemed to increase from 2017 to 2022, while those recorded for nurse sharks remained relatively stable. The same three species were also consistently encountered on dives throughout the time period 2017 – 2022. The sightings of the remaining species on dives were rather sporadic with just a few single sightings reported over the years.

The number of shark species reported by divers ranged from three to eight with the maximum number of eight species reported in 2018 followed by a considerable drop of only four species reported in 2019 until 2021 and the minimum of three species in 2022. Three species namely Caribbean reef shark, nurse shark and hammerhead species, were consistently recorded from 2017 to 2022 while the remaining five of Cayman's coastal shark species were not seen on dives in certain years. It is of note that the species seen on dives more than halved in 2022 (three species recorded) from 2017 (six species) and 2018 (eight species).

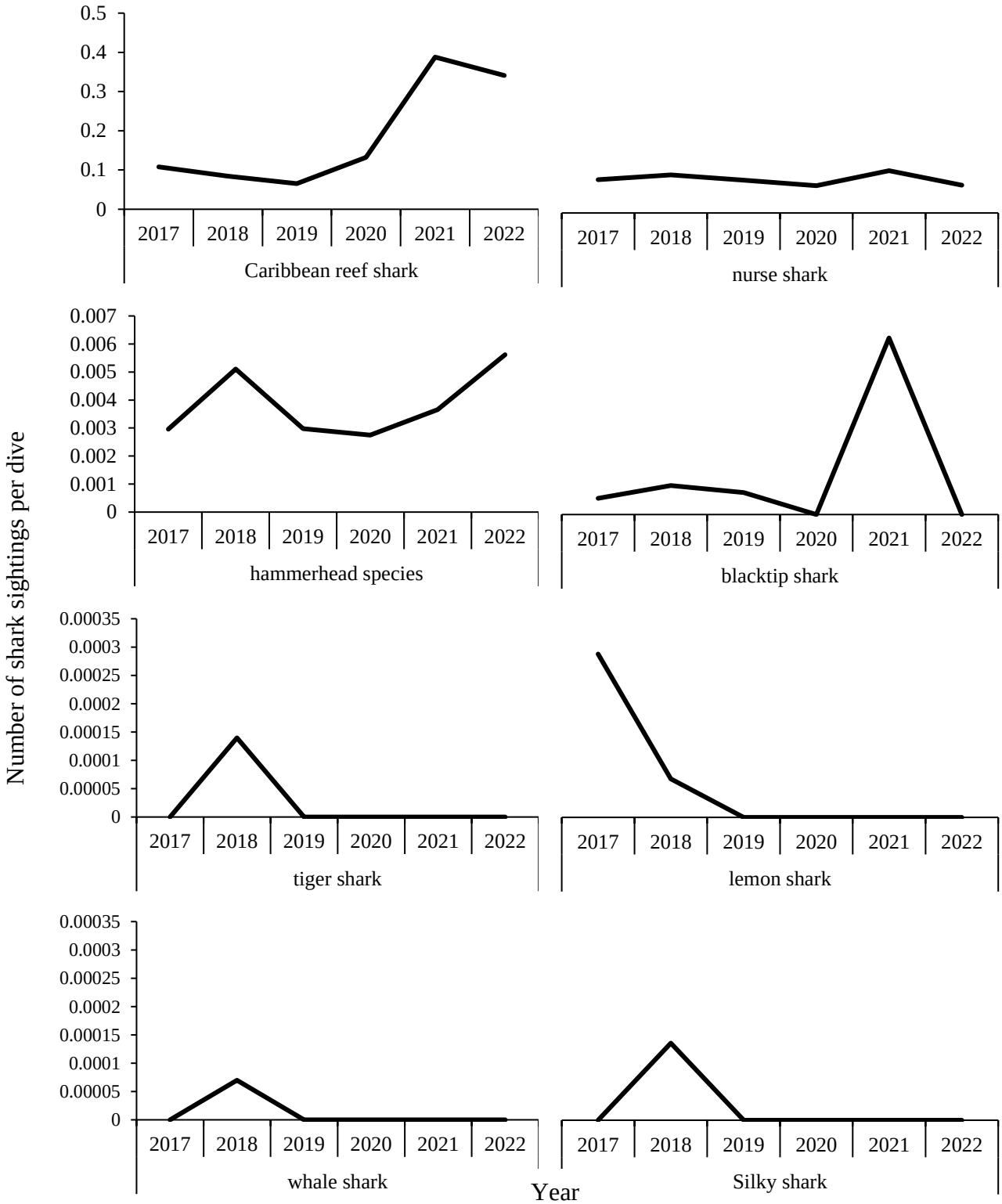

Figure 2: Relative abundance of shark sightings for each species reported by participants on dives from 2017 – 2022

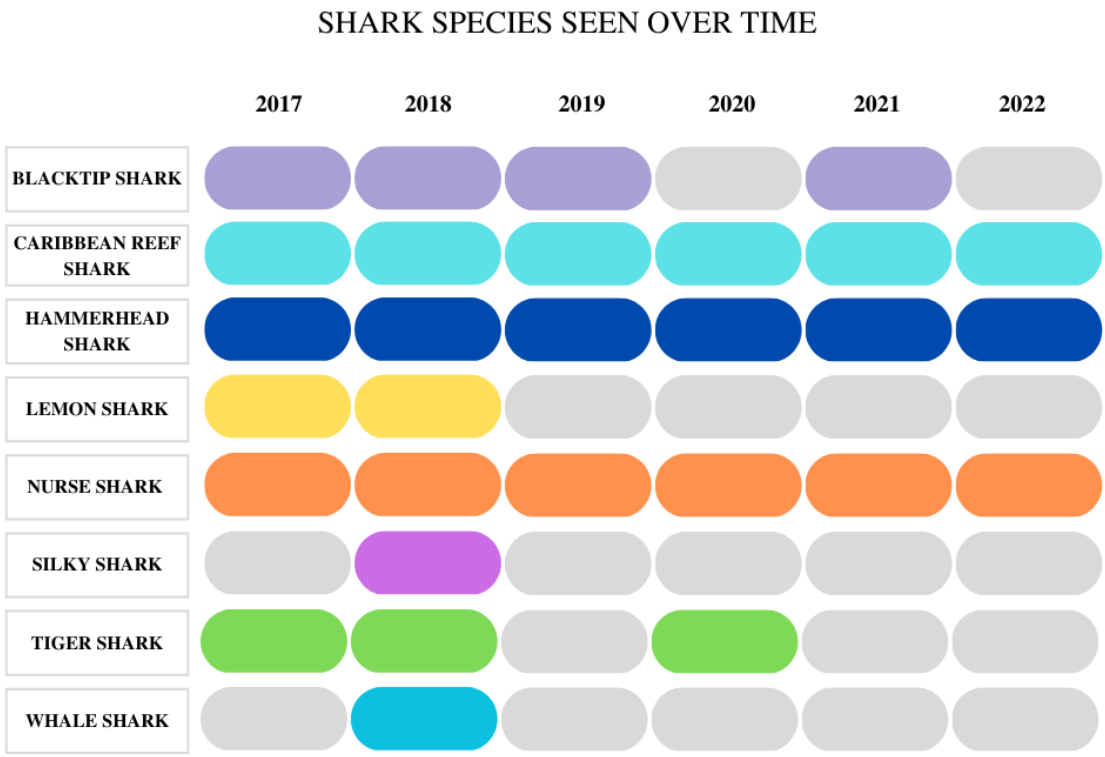

Figure 3: Shark species recorded by divers and snorkelers on their dives from 2017 – 2022. Tile with colour imply the presence and grey tiles indicates the absence of a particular species in each year

Overall the annual mean number of sightings for all species combined showed an increase over the time period (2017 to 2022). The mean number of shark sightings per dive were fairly stable from 2017 to 2020 and increased considerably in 2021 with participants reporting double the number of sharks sightings in both years 2021 and 2020 compared to the numbers of sightings previous years. However, it is unlikely that this increase reflects a real increase in population numbers. Relative abundances of shark populations have minor fluctuations that occur naturally throughout the year and over time. Sharks have long generation times due to their slow growth, late maturity, long pregnancies and relatively few young per litter. Hence for real changes in shark populations to occur it takes a long time.

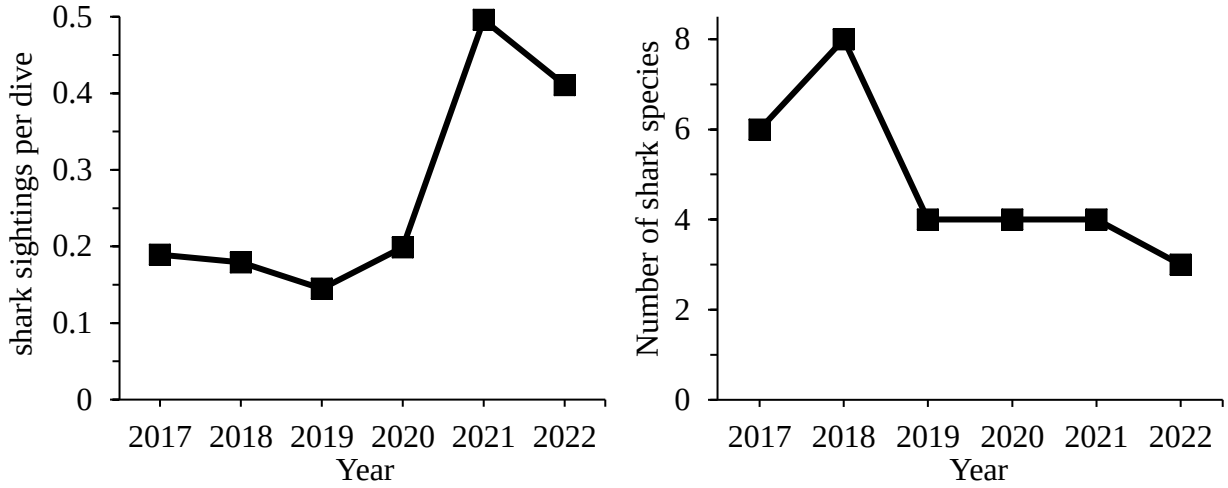

Figure 4: The mean number of shark sightings per dive and the number of shark species recorded by divers for each year from 2017 – 2022

The increase of sightings could also reflect a change in the diving behaviour of Sharkloggers as new participants entered the programme. For example, some divers might prefer dive sites with higher chances of a shark encounter because sharks are very charismatic animals and typically the 'highlight' of a dive for most divers. At the same time divers that favour shark encounters may also be more likely to participate in the Sharklogger programme. Therefore more recorded dives might be conducted in areas with more sharks compared to areas with few shark encounters, causing the overall mean number of sightings to increase. This possibility is a limitation of a non-random sampling design and a typical source of bias in most citizen science programmes involving volunteers such as this.

Alternatively, the increase in number of sightings could be also a result of a reduced level of disturbances by human activities in certain areas. Over the past decade the results of DoE's shark research show that sharks are more abundant in areas with least human disturbances (SCUBA diving, boat traffic, and fishing). In-water activities by residents were limited for most of 2020 due to the 'lock down', and tourism was lacking for most of 2020 and half of 2021, which could have resulted in sharks becoming more active in areas they previously avoided. This could have resulted in more shark activity being seen by those persons who were diving from 2020 through 2022 without the actual number of sharks increasing. For example, sharks that might use the deep water below the drop off (approx. 100ft/30m) to escape human disturbances on top of the coastal shelf might, during 2020, have re-occupied that shallower water (< 100ft/30m) or certain shallow areas that they used to avoid. This would make those individual sharks more visible to divers in 2021 and even 2022 compared to previous years.

Due to the life characteristics of sharks, it takes decades for real changes in population number to become evident. Therefore we cannot yet say if the increase seen after 2020 from the numbers of sharks reported before 2020 is a real change or merely a fluctuation in the data. Answering this will require continued monitoring of our local shark population. Such ongoing monitoring by various methods is critical for the continued protection and conservation of sharks within Cayman waters.

Acknowledgements

Thank you to all Sharkloggers for their participation in the Sharklogger Network. This project is only successful because of every participant's involvement. The Sharklogger Network relies purely on volunteers and the dedication of every one is essential to the work that we do. The data collected on dives contribute directly to DoE's shark research and have made an impact. The Department of Environment looks forward to continuing to monitor our local shark populations together with this exceptional network of passionate volunteers.

Contact Information

For more information please visit DOE's website (www.doe.ky) or email sharkloggers@gmail.com.

Divers, snorkelers, and even boaters who are on the water very regularly and are interested in becoming a citizen scientist for the Sharklogger Network can sign up by emailing sharkloggers@gmail.com.