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Introduction:
Since 2010, the Saba Bank falls under the jurisdiction of The Netherlands. Spanning an area of 2000km2, the Saba Bank houses the largest coral reef in the Caribbean Netherlands with a great diversity of species. The past 5 years the Dutch Ministry of Economic Affairs has funded research on the biodiversity, health and ecological functioning of the bank. On 8 December 2016 The Saba Bank Symposium was organised with 11 speakers and a panel discussion on the knowledge gaps and future perspectives of the bank. With this letter we provide an overview of results and future directions for policy and research.

Key message:
We need to improve the resilience of the Saba Bank to cope with the effects of climate change and fisheries.

What have we learnt from the past 5 years:
Reef status: Compared to the 1990s, coral cover on Saba Bank is currently much lower. In 2011, 2013 and 2015 quantitative surveys were carried out on the Saba Bank on 10 locations. At each site 3 transects of 50 m were photographed (150m^2). In 2011, living coral cover was only 8%, which is much lower than the coverages of 40-60% reported in 1996. The proximate causes for this dramatic decline remain uncertain but we suggest that bleaching and climate change are largely responsible for the lower cover of living corals on the bank. Climate change leads to warmer sea water and this causes periods when the sea water temperature is too high for corals leading to so called bleaching events, which often cause high coral mortality. In particular, the 2005 Caribbean bleaching event which decimated coral cover all over the north eastern Caribbean is important in this respect. On a positive note, between 2011 and 2015, there is no indication that coral cover has further declined. Encouraging indications for reef resilience were that there are many small young coral colonies and there are very little signs of coral disease. Furthermore, Saba Bank is not a 'sponge reef' and sponges are not becoming dominant over corals, as is the case in several disturbed eutrophic reefs in the Caribbean. These findings seem to indicate that the Bank is relatively less disturbed. Even under the best circumstances, we have to add that restoration of coral reefs is a very slow process and might take several decades. Saba Bank will, however, not stay the same in the coming years, as it will continue to change due to climate change and this change must be considered in management plans. During the 2016 research expedition of NIOZ many new coral areas were discovered, as well as other habitats. At this moment knowledge is insufficient to set up a biologically sound benthic monitoring plan or management plan for the whole Bank – more basic knowledge of the bank is required.

Due to its high species and unique genetic diversity, the upstream position with respect to the wider western Atlantic, its large area of deeper reef, and relatively limited anthropogenic disturbance, Saba Bank serves as an important source population to the wider Caribbean. However, further research is necessary to establish to what extent and how it serves as a source and or sink for key species groups.

Fish communities: From surveys between 2011-2013 a reduction in snappers, groupers, and grunts has been observed, while there were noticeably more sharks. The visual surveys (UVC) in 2011, 2013 and 2015 demonstrated repeatedly that the biomass of key herbivorous fish families and key commercial fish families was low, indicating possibly a poor status of these fish families. Lionfish are present on the Bank, but their densities are lower compared to the neighbouring islands and no significant increase was seen between years 2011-2015 at 20-30m depth.

Sharks: Caribbean reef sharks, nurse sharks and tiger sharks were observed during the 155 baited video (BRUV) deployments across the Saba Bank. The relative abundance of reef sharks on the Saba Bank appeared to be higher compared to similar standardised BRUV surveys in the wider Caribbean region. Saba Bank appears to have relatively healthy reef shark populations. Results further suggest that the Saba Bank is an important nursery and adult habitat for Caribbean Reef and Nurse Sharks (possibly also for the Tiger Shark). Individual movement patterns based on tracking data point to small home ranges of the Reef and Nurse sharks which show that reserves and marine parks offer good opportunities to protect these shark species.

Fisheries: Most fishermen are positive towards working on regulations and working together with management. During 2012-2015 the West-Indian spiny lobster stock remained stable and total annual landings increased yearly due to increasing effort (number of fishing trips). The peak and subsequent gradual decline in annual in lobster landings as witnessed in recent years, mirror catch trends for the wider Caribbean region. A potentially healthy sign is the consistently large size of harvested lobsters between 2000 and 2015. The rules and regulations of both the lobster and deep-water snapper trap fisheries will need to be updated in the near future to provide the responsible management authorities with the appropriate tools to ensure a sustainable fisheries.

Marine mammals: There are at least 9 species that are regularly observed over the Saba Bank. Presence and temporal aspects of whale migration are being studied using passive acoustic monitoring as part of regional acoustic monitoring network together with the USA and France. Our results indicate intensive use by Humpback whales during the winter calving season as well as regular winter presence of the Minke whale.

Conservation activities: The Saba Bank Management Unit or SBMU was established by the Ministry of Economic Affairs in close cooperation with the Saba Conservation Foundation and the island government. From 2012-2014 a Shark Protection Plan was drafted for the Ministry of Economic Affairs. In 2015 the Yarari Marine Mammal and Shark Sanctuary was established. The "Save our Sharks" DCNA awareness project is being implemented from 2015-2017 (grant from Nat. Postcode Loterij). As part of a multi-year program funded by EZ, the collaborating parties are working out the steps needed towards implementing marine mammal management and policy measures for the Yarari Sanctuary.

Recommendations:

- Institutional responsibilities for policy and management activities need to be clearly defined: who needs to take leadership in what activity? What is the ultimate goal of the Dutch cabinet for the Saba Bank?
- Saba Bank Management Unit needs more capacity; currently only 2 people are employed in the unit; The current vessel is too small for unencumbered operations on the bank.
- Studies are needed to explore the impacts of climate change on the bank and what mitigation measures might be possible.
- A habitat map of Saba Bank is required that includes habitat identification, descriptions, and location, as well as the ecological significance for fisheries and/or coral reef resources. This baseline information is crucial to support management and monitoring.
- Ecosystem functioning and connectivity on the bank needs to be identified and assessed: how are coral reef areas, marine calcareous algal fields, marine algal fields, and other areas ecologically connected?
- Monitoring program (WOT). Continued monitoring of reefs, fisheries, marine mammals and sharks is necessary for sustainable use of the Bank's resources.
- The feasibility of zonation (of fisheries) needs to be determined including possibilities of closing a large portion of the bank (e.g. the part furthest away from Saba).
- Fisheries regulations need to be reviewed and amended.
- Quantitative fisheries management goals and objectives need to be formulated.
- Gear type and allowed quantity, needs to be linked to the fishing licenses.
- Research on methods to reduce shark bycatch is needed.
- Spawning aggregation areas for target species need to be identified for protection by seasonal closure.
- Escape hatches for undersized and bycatch species should become obligatory.
- The role of the Saba Bank for specific life stages of marine mammals, mating and calving and connectivity to adjacent reef systems still remains to be unravelled.
- Ship disturbance of whales needs to be studied by comparing noise logger data with vessel movements.
- Better data management is needed: data is getting lost (e.g. from navy) or not well preserved. Data coordination and sharing arrangements are needed to prevent further loss.

Program Saba Bank Symposium, 8 December 2016, Den Helder
https://www.wur.nl/en/project/Saba-Bank-research-programme-2011-2016.htm

- Opening - Lisa Becking (WMR-WUR)
- Where does our interest in Saba Bank come from? -Paul Hoetjes (MinEZ)
- State of the reefs: 3 expeditions to Saba Bank.- Erik Meesters (WMR-WUR)
- Fish and fisheries at Saba Bank. -Martin de Graaf (WMR-WUR)
- Importance of Saba Bank for local communities -Kai Wulf (Saba Conservation Foundation)
- Conservation of the bank.-Kalli de Meyer (DCNA)
- Research by NIOZ on the Saba Bank.- Fleur van Duyl (NIOZ)
- Coral diversity and historical collections of Saba Bank.- Bert Hoeksema (Naturalis)
- Shark habitat use. -Erwin Winter (WMR-WUR)
- Listening to the Bank: whales and dolphins. -Dick de Haan (WMR-WUR)
- Panel-discussion on future perspectives: protection, conservation, climate change, research & monitoring, sustainable use.
- Closing Remarks by Erik Meesters

Accountability

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This report has been written with great care. The scientific quality was internally assessed by a fellow researcher and the responsible Management Team member of Wageningen Marine Research.

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