Wageningen Marine Research policy brief

February 26, 2018

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Graaf, M. de, Brunel, T. Nagelkerke, L. and A.O. Debrot. 2017. Status and trends Saba Bank fisheries: 2015. WMR-rapport C077/17. 127 pp.

Saba bank fisheries: reasons for cautious optimism

The main fishing activities taking place on the Saba Bank are directed towards spiny lobsters and deep-water redfish (snappers). In the period 2012-2015 the total fishery landings grew from 78.4 tons to 135.2 tons and involved 10 boats. About 60% of the annual commercial effort (in terms of fishing trips) is directed towards the lobster and 40% towards redfish. Pelagic fishing for wahoo and dolphin fish and directed reef fish fishing is currently almost negligible, representing only about 2% of total landings by weight. Continued sightings by fishermen and Saba Bank Management Unit (SBMU) of fishing activities by foreign fishing vessels without commercial or recreational fishing license, (even inside the seasonal closed area during the Red Hind spawning aggregation season) suggest that parties must remain vigilant to foreign IUU. This likely is a small problem, but no structured recent assessments are available on IUU for the bank.

Lobster trap fishery:

This fishery began during the 1980s with the advent of tourism on St. Maarten. About 84 % of the bank is potentially suitable for this fishery, but the actual suitability of different areas remains unknown and likely differs significantly. Even though some fishing takes place almost everywhere on the bank, most fishing activity is concentrated in the quadrants closest to port (Saba). Over the last 5 years the effort (in terms of trap deployments or trap lifts) of the lobster fishery increased by 50%, with a corresponding doubling in the lobster landings. So from 2012 to 2015 the annual number of traps sets increased from about 48 000 traps set/y to about 73 000/y. Concomitantly, annual catches have steadily increased from 37 to about 76 tons (in 2015). The observed pattern of catches for the Saba Bank since 2000 has appeared to mirror regional catch patterns (which are driven by regional recruitment patterns) but not local fishing pressure on the bank.

The average size of landed lobsters appears to have fluctuated between 108 and 118 mm carapace length (CL) since 2000, with no signs of significant decrease in average lobster size landed (which might have suggested overfishing). In fact, the average size of lobsters landed remains consistently high compared to other fisheries of the region. The landing of sublegal lobsters (<95 mm CL) has steadily decreased from about 28% in 2012 to about 4% in 2015.

There appear to be no indications of overfishing in the Saba Bank lobster trap fishery. We recommend to:

- **develop a spiny lobster fishery management plan with quantifiable objectives, targets and reference points, as well as harvest goals and enforcement strategies that are simple, robust and cost-effective,**
- **for the near future, use of escape slots of 38 mm to reduce fish (by)catch, most of which is currently discarded,**
- **conduct further work to test the potential utility of even wider escape slots,**

- **require escape panels to be attached with only hemp or cotton.**

Options to continue with (or include) in that plan would be:

- **continued limits to the number of fishing licences.**
- **a maximum number of traps per licence (currently about 300 per fisherman).**
- **a total limit to traps deployed in the fishery (ie. a combined limit to licences x fish traps per licence),**
- **registry and visible marking of all traps and trap sets (on the marker buoy for easy field identification) to help prevent gear loss, and gear theft,**
- **a total quota for the combined catch should be implemented to serve as a cap the total harvest.**
- **align management of spiny lobster with the lobster conservation and management declaration of the 17 island state Caribbean Regional Fisheries Mechanism (CRFM, Annex 5) and the WECAFC Lobster Working Group.**

Mixed reef fishes:

The lobster fishery results in a certain degree of associated fish catch. This bycatch is composed of a broad range of reef fish species. About 33% of the mixed reef fish (by weight) is discarded. The landed catches of mixed reef fish have increased from 6.6t to 13.6t between 2012 and 2015, representing on average about 10% of the overall total catch (all species combined) on Saba Bank. Reef fish catches per trap on Saba Bank appeared to be low compared to other areas. These low yields can in part be due to the low reef fish densities on Saba Bank as estimated in fisheries-independent studies. Lower fish catchability of traps designed for lobsters likely also contributes to lower catches compared to studies using fish traps. The current low fish density on the reef in contrast to former high densities, is unlikely to be caused by recent overexploitation but to one or a combination of factors such as a naturally lower biomass of reef fish, historic overfishing and losses of habitat for reef fishes due to bleaching-induced coral mortalities.

Redfish fishery:

The "redfish" fishery is also largely conducted using traps. These are typically deployed at depths of between 50 en 250 m and catch mainly silk snapper, *Lutjanus vivanus* (69% by weight), blackfin snapper *Lutjanus buccanella* (10%), vermillion snapper, *Rhomboplites aurorubens* (7%), and "others" (14%). In 2000, redfish was exclusively caught by line. However, by 2007 most snapper was being caught using fish traps and by 2012 there was practically no more line fishing for snapper. These shifts in gear use coincided with a change in fish size, (and species composition) from large adult snapper to smaller sub-adult snapper of about 30 cm fork length.

In 2007 the average number of traps lifted per calendar day was 28 traps/day while in 2012 it was about 33 traps/day and in 2015 about 25 traps/day. The recent changes in total annual catch appear to be largely driven by changes in effort. This peaked in 2014 (at 537 total trips) but was less in 2015 (481 trips). These most recent data hence suggest no worrisome developments for this fishery, other than that the current fish stock is significantly (75%) lower than in the early 1970s "virgin" state. There is currently a small but growing fishery using deep-water long lines to target redfish in deeper waters (average depth: 260 m) where catches are dominated by the wenchman snapper (*Pristipomoides aquilonaris*) and the queen snapper (*Etelis oculatus*).

From our trap research we recommend to:

- **require escape slots of 25 mm (in contrast to the lobster fishery where the 38 mm escape slots are recommended)**

- **require escape panels to be attached with hemp or cotton to limit ghost fishing riske**

At present, and based on limited data from the 1970s average CPUE appears to be 75% lower compared with underexploited conditions in the 1970s. Much lower CPUE that under virgin conditions is normal in fished stocks and need not indicate overfishing. Nevertheless, the status of the redfish trap fishery is perceived by the fishers as undesirable.. Based on this perception, on the 1st April 2017, a six-month closed season was implemented through an agreement between fishermen. Some fishermen have also moved their snapper traps to shallower waters. At this stage it is unclear how shallow the traps are set and what fish species are being targeted (likely the lane snapper (sand silk snapper, *Lutjanus synagris*). The ability of the Saba fishermen to come with measures to restrain their own effort is much to be applauded.

There appear to be no worrisome signs of overfishing.

Our recommendations are:

- **develop a management plan (with quantifiable objectives, targets, reference points and indicators) for the deep-water snapper fishery,**
- **establish limits to the number of fishing licences,**
- **establish a maximum number of traps per licence (currently about 300 per fisherman),**
- **establish a total limit to traps deployed in the fishery (ie. a combined limit to licences x fish traps per licence),**
- **implement registry and visible marking of all traps and trap sets (on the marker buoy for easy field identification) to help prevent gear loss, and gear theft,**
- **a total quota for the combined catch can serve to cap the total harvest,**
- **set a maximum size of a snapper trap,**
- **set a maximum number of hooks on a vertical longline**
- **require the use of escape slots of 25 mm and panel attachments of cotton or hemp.**
- **set a maximum depth for modified snapper traps during the closed season.**

Shark bycatch

Sharks are considered unwanted bycatch or nuisance in especially the lobster trap fishery. Nurse sharks, are caught in around 60% of the trips using lobster traps but most of the time in low numbers (less than 7 sharks per trips). The estimated annual number of discarded nurse sharks varied between 1712 and 2499 individuals, mainly coming from the lobster fishery. Almost all sharks are discarded (reportedly alive) and very few sharks are killed and landed. Further on-board observation is clearly needed to obtain direct figures on shark catch rates (and of the fish bycatch).

As the Saba Bank is a designated shark sanctuary since August 2015, we recommend to:

- **work together with the fishermen to fully eliminate all shark taken and ensure that they are released unharmed.**
- **to develop nurse shark exclusion devices for the lobster traps to protect the nurse sharks and to reduce the damage to fishing gear and catch.**

Sustainable fish and lobster traps

Biodegradable panels: Biodegradable panels did not show any degradation during a 480 day-long experiment but tested panel attachment materials did. Attachment material with short breakage time (max. 20 days) as required in the current fishery regulations may not be accepted by fishers due to potential loss of catch and time associated with replacing the panels. It is recommended to adjust the breakage time to 3-4 months and to clearly describe in the regulations the type and diameter of the material that is to be used to attach the biodegradable panel. Our studies show that the average

deterioration time in days (including range between brackets) for escape panels attached with hemp and cotton is respectively, 105 (85-114), 150 (128-241). These materials are recommended and yield breakage times of 3-4 months. All other options such as wire or hog rings lasted more than a year and are not recommended.

Ghost fishing: In 2012-2015 Saban fishers lost on average 0.6 lobster traps per fishing trip, resulting in ca. 400-600 derelict lobster traps annually. Derelict traps kill 2.7 to 7 lobsters and 2.7 - 3.9 kg of reef fish per trap per year. We estimate ghost fishing to kill 2160-4680 kg of reef fish (18-39% of commercial reef fish landings in kg) and 2160-8400 (2600-10000 kg) lobster (4-16% of commercial lobster landings in kg). we estimate the total annual kill by ghost fishing amounts to $23000 - $51000 for reef fish and $46000-$176000 for lobster. Fortunately, simple modification to lobster traps such as correctly functioning escape panels will significantly reduce mortality from ghost fishing.

Escape slots: We examined the effects of biodegradable panels with 2 trap designs (large, 5ft D-type traps and small, 4ft M-type traps) as well as the effect of 25 and 38 mm escape slots on reef fish bycatch and sub-adult snapper catches. Trap type (largely relating to size) did not affect the average number of lobsters or fish caught per trap. The only exception was for the white grunt for which the catch rates (in numbers) were markedly higher in the larger traps. However catch rates in terms of weight of bycatch were almost double for the large traps with 25mm escape vents compared with the control traps. This difference was mainly due to an increase in the catch rate of species of intermediate economic value. So the larger traps catch no more lobster but do catch a lot more bycatch. Hence the larger traps are not recommended.

Lobster traps: Our results indicate that both trap types with escape slot had higher catch rates for lobster than the control traps. There was a significant difference of 0.55 lobster per trap for the experiment with the 38 mm escape vent. The difference for the 25 mm escape slot was not significant (0.20 lobster per trap). The results suggest that crowding with fish reduces lobster entry into traps.

It was different for reef fish bycatch. Escape slots of 25 mm greatly increased the catch rate of bycatch species like grunts. In contrast, the 38 mm escape vent reduced the catch rates of bycatch substantially; by about 60% for the D-type traps, and 80% for the M-type traps. The most important result of these experiment is the observation that both 25mm and 38 mm escape slots and trap size (4ft M-trap or 5ft-D traps) appeared to have little negative effect on lobster catches. The traps with 38 mm escape slots even caught significantly more lobsters (ca. 0.5 lobsters per trap). Therefore, the bycatch of mixed reef fish in the lobster trap fishery could be limited by regulating trap size and the use of escape slots. Reducing trap size and/or implementing 38 mm escape slots will drastically reduce the amount of mixed reef fish without impacting (possibly even improving) the catch of lobster. The potential utility of even wider escape slots, could be investigated, but until that time, 38 mm escape slots should be implemented.

Snapper traps: Escape slots of 25 mm seem to increase (marketable) snapper catch (in weight yield) by about 20% (though not statistically significant). In contrast, escape slots of 38 mm greatly reduced marketable snapper catches. A 25 mm escape slot also increased the proportion of vermillion snapper in the catch.

So as for the effect of escape slots on marketable fish catch the results are consistent: the 25 mm slot increases fish catch. We suggest that this might mean that when traps become too crowded (with small useless fish), less marketable fish will enter. By using 25 mm escape slots, small, non-target species easily escape thereby creating more room in the trap for target species. On the other hand, the 38 mm slot lets almost all marketable fish escape too and yields low catches. Clearly the 38 mm slot is too wide for effective snapper fishing.

Queen conch

After the de facto (but not formal) closure of the conch fishery on the Saba Bank in the mid-1990s, the queen conch population appears to have greatly recovered. Out of the 131 transects conducted during

our video survey, adult conch were found in 91 transects, ranging from 16 conch/ha to 882 conch/ha (mean 130.8 conch/ha, 99.7–161.8 95% CI). In 52 transects (40 % of all transects) more than 100 conch/ha were found. Much of the Saba Bank has conch densities that could justify a limited fishery. A mean density of 100 adult conch/ha should be the minimum to avoid the risk that recruitment might be impaired. This means that at present a controlled limited fishery might be possible, if judiciously controlled and regulated.

If a fishery is re-opened, it is recommended to: 1) introduce a minimum legal size at 10mm lip thickness and an annual closed season during May-September, 2) ensure that queen conch are landed with shell, 3) regular stock assessment are conducted to adjust the quota and avoid recruitment impairment, 4) identify and open only those areas to the fishery where densities are high enough, 5) set strict regulations on harvesting methods to prevent development of dangerous 'hookah' fishing practices. Any development of a conch fishery will take time as both bringing the species in from the sea to land and export will require permits.

Lionfish

Average catches in the last three years amount to about 0.75 lionfish per deep-water snapper trap hauled. Shallow-water CPUE is much lower. The availability of lionfish bycatch has led to a local market arising. Based on this, several fishermen have expressed interest in testing special traps which concentrate and trap lionfish and may allow the development of a directed deep-water lionfish fishery.