9.13 SHK – SHARKS

An intersessional meeting was held from May 20-24 2019 in Madrid (Anon. 2018i) to update projections on the North Atlantic shortfin mako (*Isurus oxyrinchus*) stocks based on the 2017 assessment (Anon. 2017i), information about the status of the blue shark (*Prionace glauca*) is available in the 2015 report of the assessment (Anon. 2016), while information about the status of the porbeagle (*Lamna nasus*) stock is available in the SCRS 2009 report of the assessment of that species (Anon. 2010b). An Ecological Risk Assessment had also been conducted for 16 shark species (20 stocks), which is detailed in the Report of the 2013 Intersessional Meeting of the Sharks Species Group (Anon. 2014a).

SHK-1. Biology

A great variety of shark species are found within the ICCAT Convention area, from coastal to oceanic species. Biological strategies of these sharks are very diverse and are adapted to the needs within their respective ecosystems where they occupy a very high position in the trophic chain as active predators. Therefore, generalization as regards to the biology of these very diverse species results in inevitable inaccuracies, as would occur for teleosts. To date, ICCAT has prioritized the biological study and assessment of the major sharks of the epipelagic system as these species are more susceptible to being caught as by-catch by oceanic fleets targeting tuna and tuna-like species. Among these shark species there are some of special prevalence and with an extensive geographical distribution within the oceanic-epipelagic ecosystem, such as the blue shark and shortfin mako shark, and others with less or even limited prevalence, such as porbeagle, hammerhead sharks, thresher sharks, and white sharks.

Blue shark, shortfin mako and porbeagle are large pelagic sharks that show a wide geographic distribution; the first two from tropical to temperate waters worldwide, while the porbeagle has a distribution associated with cold-temperate waters. Shortfin mako and porbeagle have an aplacental viviparity with an oophagy reproductive system, which limits their fecundity but increases the probability of survival of their young. The blue shark is placental viviparous and has an average litter size of 35 individuals, while the shortfin mako has an average litter size of around 12 and the porbeagle a litter size of usually just four individuals. Although high uncertainty regarding their biology remains, available life history traits (slow growth, late maturity and small litter size) indicate that they are vulnerable to overfishing. A behavioral characteristic of these species is their tendency to segregate temporally and spatially by size and/or sex, during feeding, mating-reproduction, gestation and birth processes. Tagging studies have suggested that they exhibit large-scale migratory behaviour and periodic vertical movement, but the lack of information on some components of the populations precludes a complete understanding of their distribution/migration pattern by ontogenetic stage and in some cases identifying their pupping/mating grounds. Numerous aspects of the biology of these species are still poorly understood or completely unknown, particularly for some regions, which contributes to increased uncertainty in quantitative and qualitative assessments.

SHK-2. Fishery indicators

Earlier reviews of the shark database resulted in recommendations to improve data reporting on shark catches. Though global statistics on shark catches included in the database have improved, they are still insufficient to permit the Committee to provide quantitative advice on stock status for most stocks with sufficient precision to guide fishery management toward optimal harvest levels. While reported and estimated catches for blue shark, shortfin mako and porbeagle are still generally subject to higher levels of uncertainty than the major tuna stocks, they have been considered sufficiently complete for the purpose of quantitative stock assessment, and are provided in **SHK-Table 1** and **SHK-Figures 1 and 2**.

Multiple standardized CPUE data series for blue shark were used in 2015 for both the North and South Atlantic stocks. For the North Atlantic stock eight indices of abundance were used. For both stocks, the series were generally flat or showed increasing trends, which conflicted with the also increasing catch tendencies, especially for the South Atlantic stock (**SHK-Figure 3**).

The CPUE series available for the 2017 shortfin mako stock assessments showed decreasing trends since approximately 2010 for the North Atlantic stock and generally increasing trends since approximately 2008 for the South Atlantic stock. (**SHK-Figures 4-5**).

During the porbeagle assessment in 2009, standardized CPUE data were presented for three of the four stocks (NE, NW and SW) (**SHK-Figure 6**). These series when referring to fisheries targeting porbeagle may not reflect the global abundance of the stock and where they refer to sharks caught as by-catch they could be highly variable.

With regard to the 16 species (20 stocks) included in the 2012 ERA, the Committee believes that, in spite of existing uncertainties, results are more robust than those obtained in the 2008 ERA. With this information the Committee considers it easier to identify those species that are most vulnerable and to prioritize research and management measures (**SHK-Table 2**) on those. These ERAs are conditional on the biological parameters used to estimate productivity as well as the susceptibility values for the different fleets. The Committee highlights the higher participation of scientists from diverse CPCs, who provided valuable data for this ERA.

SHK-3. State of the stocks

Stock assessments and Ecological Risk Assessments carried out for elasmobranchs within the ICCAT Convention area have focused only on Atlantic stocks, and not on shark stocks in the Mediterranean Sea, to date. The 2012 ERA conducted by the Committee was a quantitative assessment consisting of a risk analysis to evaluate the biological productivity of these stocks and a susceptibility analysis to assess their propensity to capture and mortality in pelagic longline fisheries. Three metrics were used to calculate vulnerability (Euclidean distance, a multiplicative index, and the arithmetic mean of the productivity and susceptibility ranks). The five stocks with the lowest productivity were the bigeye thresher (*Alopias superciliosus*), sandbar (*Carcharhinus plumbeus*), longfin mako (*Isurus paucus*), night (*Carcharhinus signatus*), and South Atlantic silky shark (*Carcharhinus falciformis*). The highest susceptibility values corresponded to shortfin mako (*Isurus oxyrinchus*), North and South Atlantic blue sharks (*Prionace glauca*), porbeagle (*Lamna nasus*), and bigeye thresher. Based on the results, the bigeye thresher, longfin and shortfin makos, porbeagle, and night sharks were the most vulnerable stocks. In contrast, North and South Atlantic scalloped hammerheads (*Sphyrna lewini*), smooth hammerhead (*Sphyrna zygaena*), and North and South Atlantic pelagic stingray (*Pteroplatytrygon violacea*) had the lowest vulnerabilities. The Committee observed that the data regarding night shark distribution was considered to be incomplete and therefore the results with regard to this species should be considered preliminary.

SHK-3.1 Blue shark

Considerable progress was made on the integration of new data sources, in particular size data, and modelling approaches, particularly model structure, in the 2015 assessment of the status of the stock of North Atlantic blue shark. For both the North and South Atlantic stocks, uncertainty in data inputs and model configuration was explored through sensitivity analysis. Although sensitivity analyses did not cover the full range of possible uncertainty, they revealed that results were sensitive to structural assumptions of the models. All the production model formulations had difficulty fitting the flat or increasing trends in the CPUE series combined with increasing catch trends. Overall, assessment results were uncertain (e.g. the absolute abundance varied by an order of magnitude between models with different structures) and should be interpreted with caution.

For the North Atlantic stock, all scenarios considered with the Bayesian surplus production model and the integrated model (SS3) indicated that the stock was not overfished and that overfishing was not occurring, as was also concluded in the 2008 stock assessment (**SHK-Figure 7**). However, the Committee acknowledged that there still remained a high uncertainty in data inputs and model structural assumptions, by virtue of which the possibility of the stock being overfished and overfishing occurring could not be ruled out. The Committee identified a better definition of fleets for SS3 and a more in-depth historical catch reconstruction, especially discard estimates, as some of the main sources of uncertainty that may help to improve model fit and provide a more certain stock status in the future.

For the South Atlantic stock, all scenarios with the Bayesian surplus production model estimated that the stock was not overfished and that overfishing was not occurring, as concluded in the 2008 stock assessment. Estimates obtained with the Bayesian state-space surplus production model formulation should be considered more reliable than other Bayesian production models. These were less optimistic, predicting that the stock could be overfished and overfishing could be occurring (**SHK-Figure 8**). Acknowledging the high uncertainty of the results, the Committee cannot rule out that the stock is overfished and experiencing overfishing.

SHK-3.2 Shortfin mako shark

The 2017 assessment of the status of North and South Atlantic stocks of shortfin mako shark was conducted with updated time series of relative abundance and annual Task I catches (C1), life history, and with the inclusion of length composition data. An alternative series of catch data based on ratios of shark catches to catches of the main target species (C2) was also estimated and used in the assessments. The results obtained in this evaluation are not comparable to those obtained in the last assessment conducted in 2012 because the input data and model structures have changed significantly: the catch time series are different (1950-2015 for the 2017 assessment and 1971-2010 for the 2012 assessment) and were derived using different assumptions; the CPUE series in the North have been decreasing since 2010 (the last year in the 2012 assessment models); some of the biological inputs have changed (growth curve, natural mortality at age) and some are now sex specific for the North; with the new biological inputs the intrinsic rate of population growth (r_{max}) for the North Atlantic used to construct prior distributions is now about half that used in the 2012 assessment; and additional length composition data also became available for the North. Additionally, in 2012 only a Bayesian production model (BSP1) and a catch-free age-structured production (CFASPM) model were used, whereas more modeling platforms that more fully use the data available were explored in the current assessment (BSP2JAGS [Just Another Gibbs Sampler emulating the Bayesian production model], JABBA [Just Another Bayesian Biomass Assessment], CMSY [Catch at MSY], and SS3 [Stock Synthesis 3]). It is the Committee's view that the 2017 stock assessment represents a significant improvement in our understanding of current stock status, for North Atlantic shortfin mako in particular. In particular, the production models assuming both observation and process errors fit the indices of abundance considerably better than models assuming only observation errors as used in the 2012 stock assessment.

For the North Atlantic stock, results of nine stock assessment model runs were selected to provide stock status and management advice. Although all results indicated that stock abundance in 2015 was below B_{MSY}, results of the production models (BSP2JAGS and JABBA) were more pessimistic (B/B_{MSY} deterministic estimates ranged from 0.57 to 0.85) and those of the age-structured model (SS3), which indicated that stock abundance was near MSY ($SSF/SSF_{MSY} = 0.95$ where SSF is spawning stock fecundity), were less pessimistic. F was overwhelmingly above F_{MSY} (**SHK-Figure 9**), with a combined 90% probability from all the models of being in an overfished state and experiencing overfishing (**SHK-Figure 10**).

For the South Atlantic stock, 4 assessment model runs (2 BSP2JAGS runs and 2 CMSY runs) were considered to provide stock status and management advice. The combined probability of the stock being overfished was 32.5% and that of experiencing overfishing was 41.9% (**SHK-Figure 11**). The combined probabilities from all the models of being in the red, yellow, and green quadrants of the Kobe plot are provided in **SHK-Figure 12**. Based on the diagnostics of model performance, the estimates of unsustainable harvest rates appear to be fairly robust at this stage whereas the biomass depletion and B/B_{MSY} estimates must be treated with caution. The Committee considers results for the South Atlantic to be highly uncertain owing to the conflict between catch and CPUE data. For both stocks, the CPUE series generally showed a trend similar to that of the catches, particularly the South Atlantic stock, which was problematic for the stock assessments based on production models.

SHK-3.3 Porbeagle shark

In 2009, the Committee attempted an assessment of the four porbeagle stocks in the Atlantic Ocean: Northwest, Northeast, Southwest and Southeast. In general, data for Southern hemisphere porbeagle are too limited to provide a robust indication on the status of the stocks. For the Southwest, limited data indicate a decline in CPUE in the Uruguayan fleet, with models suggesting a potential decline in porbeagle abundance to levels below MSY and fishing mortality rates above those producing MSY (**SHK-Figure 13**). However, catch and other data are generally too limited to allow definition of sustainable harvest levels. Catch

reconstruction indicates that reported landings grossly underestimate actual landings. For the Southeast, information and data are too limited to assess their status. Available catch rate patterns suggest stability since the early 1990s, but this trend cannot be viewed in a longer-term context and thus are not informative on current levels relative to B_{MSY}.

The Northeast Atlantic stock has the longest history of commercial exploitation. A lack of CPUE data for the peak of the fishery adds considerable uncertainty in identifying the status relative to virgin biomass. Exploratory assessments indicate that biomass is below B_{MSY} and that recent fishing mortality is near or above F_{MSY} (**SHK-Figure 14**). Recovery of this stock to B_{MSY} under no fishing mortality is estimated to take ca. 15-34 years. The 2009 EU TAC of 436 t in effect for the Northeast Atlantic may have allowed the stock to remain stable, at its depleted biomass level, under most credible model scenarios. Since 2010 the EU TAC has been set at zero.

The Canadian assessment of the Northwest Atlantic porbeagle stock indicated that biomass is depleted to well below B_{MSY}, but recent fishing mortality is below F_{MSY} and recent biomass appears to be increasing. Additional modelling using a surplus production approach indicated a similar view of stock status, i.e. depletion to below B_{MSY} and fishing mortality rates also below F_{MSY} (**SHK-Figure 15**). The Canadian assessment projected that with no fishing mortality, the stock could rebuild to B_{MSY} in approximately 20-60 years, whereas surplus-production based projections indicated 20 years would suffice. Under the Canadian strategy of a 4% exploitation rate, the stock was expected to recover in 30 to 100+ years according to the Canadian projections.

During the 2009 porbeagle assessment, both porbeagle stocks in the northwest and northeast Atlantic were estimated to be overfished, with the northeastern stock being more highly depleted. In addition, porbeagle received a high vulnerability ranking in the 2008 and 2012 ERAs. The main source of fishing mortality on these stocks was from directed porbeagle fisheries which are not under the Commission's direct mandate.

SHK-4. Outlook

SHK-4.1 Blue shark

Due to the difficulty of determining current status (2013) for both the North and South Atlantic stocks of blue shark, in particular absolute population abundance, the Committee in 2015 considered that it was not appropriate to conduct quantitative projections of future stock condition based on the range of scenarios considered at the stock assessment meeting.

SHK-4.2 Shortfin mako

In 2017, projections could only be carried out with the BSP2JAGS production model for the North Atlantic and no projections could be conducted for the South Atlantic due to the uncertainty in stock status. The Committee noted that the Kobe II strategy matrices presented in 2017 may not reflect the full range of uncertainty in the outlook because projections were not carried out with SS3 due to technical reasons and because the model was still under development. In 2019, projections for the North Atlantic were carried out with Stock Synthesis only. The Committee noted that because the fishery mainly focuses on juvenile animals, the production models (BSP2JAGS and others) are only tracking juvenile abundance and thus the projections are not informative about trends in the mature population, which would lag behind the trends in the exploitable population by the number of years it takes new recruits to reach maturity.

The Committee combined the Stock Synthesis status results from two runs that were reflective of different productivity hypotheses (run 1 and run 3) for making projections (**SHK Figure 16**). Projections were carried out to 2070 because they incorporate two generation times. Run 1 was added because the Committee recognized that it incorporates another hypothesis on the productivity of the stock (expressed through a different stock-recruit relationship) more in line with some of the production model estimates of productivity, but unlike production models, it can incorporate the necessary time lag effects caused by gear selectivity and the maturity of the stock. The projection results from the combined models showed that (**SHK Table 3**): i) a zero TAC will allow the stock to be rebuilt and without overfishing (in the green quadrant of the Kobe plot) by 2045 with a 53% probability; ii) regardless of the TAC, the spawning stock fecundity will continue to decline until 2035 before any increases can occur owing to the time it takes juveniles to reach maturity; iii) to be in the green quadrant of the Kobe plot with at least 60% probability

by 2070, the realized TAC has to be 300 t or less; and iv) a TAC of 700 t would end overfishing immediately with a 57% probability, but it would only have a 41% probability of rebuilding the stock by 2070. Although there is large uncertainty in the future productivity assumption for this stock, the projections show that there is a long lag time (ca. 20 years) between when management measures are implemented and when stock size starts to rebuild due to the biology of the species.

SHK-4.3 Porbeagle

Projections for porbeagle were not conducted in the 2009 assessment because of the great uncertainty in determining stock status for any of the stocks.

In 2017, ICCAT scientists participated in the Areas Beyond National Jurisdiction (ABNJ) Southern Hemisphere assessment for porbeagle. In December 2017, the Common Oceans ABNJ Tuna Project released its assessment of Southern Hemisphere porbeagle sharks, noting complications associated with lack of information on catches and biological characteristics. The risk assessment evaluates whether current fisheries impacts exceed a maximum impact sustainable threshold (MIST) based on population productivity. Although available data indicate very low risk that the Southern Hemisphere porbeagle shark is subject to overfishing, the study recommends data improvement through liaison between regional fishery bodies, including ICCAT.

SHK-5. Effect of current regulations

SHK-5.1 Shortfin mako

The Commission adopted Rec. 17-08, which aims to reduce the fishing mortality to end overfishing of the northern stock of shortfin mako. It does this by strengthening data collection (including collection of statistics on discards, biological parameters, weight of landing products,…) and establishing regulatory options (including promoting fish releases in a manner that increases survival, establishing minimum sizes,…) for ICCAT CPCs. In response to this recommendation several CPCs have adopted national regulations. Rec. 17-08 will be reviewed by the Commission in 2019.

The Committee conducted projections incorporating different hypotheses about stock productivity which suggested that the stock could rebuild to the biomass that supports MSY with a 60% probability if the TAC=0 by 2050. Additionally, the Committee also reviewed the probability of success of several of the measures contemplated in ICCAT Rec. 17-08 through additional projections for shortfin mako (using only the base run from Stock Synthesis—run 3). Specifically, alternative TAC, minimum size limit, and live release measures were explored with two tools: Stock Synthesis and the Decision Support Tool (DST). The Committee noted that fixed TACs with size regulations (210 cm fork length for females and 180 cm fork length for males) accelerated stock recovery. However, these projections implicitly assumed that fish released below the size limit had 100% post-release survival. The Committee also explored the effect of live release regulations (through reduction in fishing mortality but considering a post-release mortality rate of 25%) contemplated in Rec. 17-08 and found that all projection scenarios resulted in population declines until 2035 regardless of the fixed level of fishing mortality used and that the biomass that supports MSY was only reached by 2070 for the fishing mortality equal zero scenario.

Projections with the DST revealed that if fishers are unable to avoid catching shortfin makos and those discarded have a substantial mortality rate, then it is necessary to greatly decrease the retained catch to allow the stock to rebuild. Size limits and other strategies to release live sharks must be accompanied by a reduction in retained catch. The Committee thus concluded that a live release approach may be a way to reduce F if discard mortality rates are low, but other management measures such as reduction of soak time, time-area closures, and safe handling and best practices for the release of live specimens may also be required to further reduce incidental mortality. The Committee also noted that a slot limit that protects some mature age groups may be appropriate, although selectivity on those ages is low.

The Committee noted that North Atlantic catches increased from 2,964 t in 2015 to 3,347 t in 2016 and then decreased to 3,116 t in 2017, and that they further decreased to 2,388 t in 2018. It is not clear if the decrease can be attributed to Rec. 17-08 or to continued decrease in stock size. Projections (**SHK-Table 3**) indicate that this current catch will not allow the stock to rebuild by 2070 and overfishing will continue. 2019 is the first full year during which Rec. 17-08 applies. The Committee will not be able to review 2019 shortfin mako catches until after 31 July 2020 (noting that it will provide the Committee with only one year of data).

The Committee had insufficient information to determine which ICCAT recommendations regarding possible conservation measures (Rec. 17-08) were implemented for which fleet, making it difficult to evaluate the effect of the possible conservation measures by fleet in the projections. Nevertheless, a general evaluation of the effect of the conservation measures was undertaken which showed that they are insufficient to rebuild the stock within the specified timeframe.

SHK-5.2 Blue shark

The Commission adopted Rec. 16-12, which in paragraph 2 establishes a catch limit for blue sharks in the North Atlantic (39,102 t as the average of two consecutive years). At present, the Committee is not in a position to assess the effect of this measure because the recommendation only came into effect in 2017. However, the Committee noted that the preliminary catches in 2016 and 2017 were 44,067 t and 39,675 t, respectively.

In 2013 Uruguay prohibited retention of porbeagle sharks and Canadian directed fisheries for porbeagle have also been closed since 2013. The other main porbeagle directed fishery in the North Atlantic (EU) ceased operations in 2010. For the North Atlantic stock, catches increased from 119 t in 2010 to 156 t in 2013 and have been decreasing thereafter; for the South Atlantic stock, catches increased slightly from 29 t in 2013 to 38 t in 2014 and decreased to less than 4 t since 2015 (**SHK-Figure 1**).

The General Fisheries Commission for the Mediterranean (GFCM) adopted ICCAT's thresher shark Recommendation (banning retention of bigeye threshers *Alopias superciliosus*) in 2010. In 2012, the GFCM adopted Recommendation GFCM/36/2012/3 prohibiting finning, beheading and skinning of specimens. Beheaded and skinned sharks cannot be marketed at first sale markets and it is prohibited to purchase, offer for sale or sell shark fins. Moreover, it prohibits the retention, transhipment, landing, display and sale of the 24 elasmobranch species listed under Annex II of the Barcelona Convention *Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean* including shortfin mako, porbeagle, smooth hammerhead (*Sphyrna zygaena*), scalloped hammerhead (*Sphyrna lewini*), and great hammerhead (*Sphyrna mokarran).* The European Union implemented this measure for relevant EU Member States in 2015.

Porbeagle, hammerheads, oceanic whitetip sharks *(Carcharhinus longimanus)*, and manta rays *(Mobula birostris, M. alfredi)* were listed under Appendix II of the Convention on International Trade in Endangered Species (CITES) in 2013. Threshers *(Alopias* spp.), silky sharks *(Carcharhinus falciformis)* and the remaining mobulids were added in 2016 (effective October 2017). CITES Appendix II carries a requirement that Parties issue export permits based on findings that take is legal and sustainable. Development of these "non-detriment findings" and related permitting processes is underway.

Parties to the Convention on Migratory Species (CMS) have listed 29 elasmobranch species under its Appendices. Appendix II, which signals a commitment to international cooperation toward conservation, includes makos, porbeagles, hammerheads, threshers, and silky sharks. Mobulid rays are listed on Appendix I, which mandates strict protection. CMS has developed a Memorandum of Understanding specific to sharks as well as a Conservation Action Plan which may aid in implementation of CMS listings for elasmobranchs.

SHK-6. Management recommendations

Precautionary management measures should be considered particularly for stocks where there is the greatest biological vulnerability and conservation concern, and for which there are very few data and/or great uncertainty in assessment results. Management measures should ideally be species-specific whenever possible.

Considering the need to improve stock assessments of pelagic shark species impacted by ICCAT fisheries and bearing in mind Rec. 12-05 as well as the various previous recommendations which made the submission of shark data mandatory, the Committee strongly urges the CPCs to provide the corresponding statistics, including discards (dead and alive), of all ICCAT fisheries, including recreational and artisanal fisheries, and to the extent possible non-ICCAT fisheries capturing these species. The Committee considers that a basic premise for correctly evaluating the status of any stock is to have a solid basis to estimate total removals.

The Committee reiterates that the CPCs provide estimates of shark catches in both ICCAT and non-ICCAT fisheries for species that are oceanic, pelagic, and highly migratory within the ICCAT Convention area. The magnitude of shark entanglements in FADs should be investigated. Methods for mitigating shark by-catch in fisheries also need to be investigated and applied.

SHK-6.1 Blue shark

Considering the uncertainty in stock status results for the South Atlantic stock, the Committee strongly recommends that the Commission considers a precautionary approach for this stock. If the Commission chose to use the same approach taken for the North Atlantic stock, the average catch of the final five years used in the assessment model (28,923 t for 2009-2013) could be used as an upper limit. For the North Atlantic stock, while all model formulations explored predicted that the stock was not overfished and that overfishing was not occurring, the level of uncertainty in the data inputs and model structural assumptions was high enough to prevent the Committee from reaching a consensus on a specific management recommendation.

SHK-6.2 Shortfin mako

The Committee conducted new projections using two Stock Synthesis model scenarios that incorporated important aspects of shortfin mako biology. This was a feature that was not possible with the production model projections developed in the 2017 assessment (Anon. 2008a) and, therefore, the Committee considers the new projections as a better representation of the stock dynamics. The stock synthesis projections indicated that: i) a zero TAC will allow the stock to be rebuilt and without overfishing (in the green quadrant of the Kobe plot) by 2045 with a 53% probability; ii) regardless of the TAC (including a TAC of 0 t), the stock will continue to decline until 2035 before any biomass increases can occur; iii) a TAC of 500 t, including dead discards has only a 52% probability of rebuilding the stock to the green quadrant in 2070; iv) to be in the green quadrant of the Kobe plot with at least 60% probability by 2070, the realized TAC has to be 300 t or less; v) lower TACs achieve rebuilding in shorter time frames; and vi) a TAC of 700 t would end overfishing immediately with a 57% probability, but this TAC would only have a 41% probability of rebuilding the stock by 2070.

The Committee agreed that the projections that addressed the exceptions in Rec. 17-08 indicated that any retention of shortfin makos will not permit the recovery of the stock by year 2070. A range of TAC options with a range of time frames and associated probabilities of rebuilding are included in **SHK Table 3**. Given the vulnerable biological characteristics of this stock and the pessimistic projections, to accelerate the rate of recovery and to increase the probability of success the Committee recommends that the Commission adopt a non-retention policy without exception in the North Atlantic as it has already done with other shark species caught as bycatch in ICCAT fisheries.

Given that fishery development in the South predictably follows that in the North and that the biological characteristics of the stock are similar, there is a significant risk that this stock could follow a similar history to that of the North stock. If the stock declines it will, like the North stock, require a long time for rebuilding even after significant catch reductions. To avoid this situation and considering the uncertainty in the stock status, the Committee recommends that, at a minimum catches should not exceed the minimum catch in the last five years of the assessment (2011-2015; 2,001 t with catch scenario C1 [Task I catches]).

The Committee emphasized that reporting all sources of mortality is an essential element to decrease the uncertainty in stock assessment results, and particularly the report of estimated dead discards for all fisheries. Although the reporting of dead discards is already part of the ICCAT data reporting obligations (Rec. 17-08), the requirement has been ignored by many CPCs. The reporting of dead discards and live releases is of the utmost importance.

The Committee indicated that additional measures can potentially further reduce incidental mortality, including safe handling and best practices for the release of live specimens (since post release survival can reach 77%). These and other measures are documented in papers published on the WCPFC's Bycatch Management Information System website. Gear restrictions/modification and time area closures also have the potential to reduce mortality. However, gear restriction/modification would require dedicated field work (e.g. the deployment of hook timers to measure the time that sharks are on the line), while the level of catch and effort data currently submitted to the Secretariat makes it difficult to evaluate time/area closures.

The Committee emphasized that the Kobe II Strategy Matrix (K2SM) does not capture all the uncertainties associated with the fishery and the biology of the species. In addition, the length of the projection period (50 years) requested by the Commission implies that estimates at the end of the projection period are highly uncertain. Therefore, the Committee advised that the results of the K2SM should be interpreted with caution. In particular, if the decrease in mature females is related not only to the catch of immature females, but to other, unknown causes, the management measures above may not lead to the recovery of the stock.

The Committee emphasizes that there will be a need for CPCs to strengthen their monitoring and data collection efforts by species to monitor the future status of the stocks, including but not limited to total estimated dead discards and the estimation of CPUEs using observer data.

SHK-6.3 Porbeagle

The Committee recommends that the Commission work with countries catching porbeagle and relevant RFMOs to ensure recovery of North Atlantic porbeagle stocks (e.g. ICES, NAFO). In particular, porbeagle fishing mortality should be kept at levels in line with scientific advice and with catches not exceeding the current level. New targeted porbeagle fisheries should be prevented, porbeagles retrieved alive should be released following best handling practices to increase survivorship, and all catches should be reported. Management measures and data collection should be harmonized as much as possible among all relevant RFMOs dealing with these stocks, and ICCAT should facilitate appropriate communication.

NORTH ATLANTIC BLUE SHARK SUMMARY

Current Yield (2018)		33,853 t[1]
Yield (2013)		36,748 t[2]
Relative Biomass	B_{2013}/B_{MSY}	1.35-3.45[3]
	B_{2013}/B_0	0.75-0.98[4]
Relative Fishing Mortality	F_{MSY}	0.19-0.20[4]
	F_{2013}/F_{MSY}	0.04-0.75[5]
Stock Status (2013)	Overfished	Not likely [6]
	Overfishing	Not likely [6]
Management Measures in Effect:		Rec. 16-12

[1] Task I catch.
[2] Estimated catch used in the 2015 assessments.
[3] Range obtained with the Bayesian Surplus Production (BSP) and SS3 models. Value from SS3 is SSF/SSF_{MSY}.
[4] Range obtained with the BSP model.
[5] Range obtained with the BSP and SS3 models.
[6] Although the models explored indicate the stock is not overfished and overfishing is not occurring, the Committee acknowledges that there still remains a high level of uncertainty.

SOUTH ATLANTIC BLUE SHARK SUMMARY

Current Yield (2018)		34,309t[1]
Yield (2013)		20,799 t[2]
Relative Biomass	B_{2013}/B_{MSY}	0.78-2.03[3]
	B_{2013}/B_0	0.39-1.00[3]
Relative Fishing Mortality	F_{MSY}	0.10-0.20[3]
	F_{2013}/F_{MSY}	0.01-1.19[3]
Stock Status (2013)	Overfished	Undetermined[4]
	Overfishing	Undetermined[4]

[1] Task I catch.
[2] Estimated catch used in the 2015 assessments.
[3] Range obtained with the Bayesian Surplus Production (BSP) and State-Space Bayesian Surplus Production (SS-BSP) models.
[4] Given the uncertainty in stock status, the Committee cannot make a determination but cautions that the stock may have been overfished and overfishing may have occurred in recent years.

NORTH ATLANTIC SHORTFIN MAKO SUMMARY

Current Yield (2018)		2,388 t[1]
Yield (2015)		3,227 t[2]
Relative Biomass	B_{2015}/B_{MSY}	0.57-0.95[3]
	B_{2015}/B_0	0.34-0.57[4]
Relative Fishing Mortality	F_{MSY}	0.015-0.056[5]
	F_{2015}/F_{MSY}	1.93-4.38[6]
Stock Status (2015)	Overfished	Yes
	Overfishing	Yes
Management Measures in Effect:		Rec. 17-08, Rec. 04-10, Rec. 07-06 Rec. 10-06, Rec. 14-06

[1] Task I catch.
[2] Task I catch used in the stock assessment.
[3] Range obtained from 8 Bayesian production and 1 SS3 model runs. Value from SS3 is SSF/SSF_{MSY}. Low value is lowest value from 4 production model (JABBA) runs and high value is from the SS3 base run.
[4] Range obtained from 8 Bayesian production and 1 SS3 model runs. Value from SS3 is SSF/SSF_0. Low value is lowest value from 4 production model (JABBA) runs and high value is highest value from 4 production model (BSP2JAGS) model runs.
[5] Range obtained from 8 Bayesian production and 1 SS3 model runs. Value from SS3 is SSF_{MSY}. Low value is lowest value from 4 production model (JABBA and BSP2JAGS) runs and high value is from the SS3 base run.
[6] Range obtained from 8 Bayesian production and 1 SS3 model runs. Values from the production models are H (harvest rates). Low value is lowest value from 4 production model (BSP2JAGS) runs and high value is from the SS3 base run and highest value from 4 production model (JABBA) runs.

SOUTH ATLANTIC SHORTFIN MAKO SUMMARY

Current Yield (2018)		3,158t[1]
Yield (2015)		2,686 t[2]
Relative Biomass	B_{2015}/B_{MSY}	0.65-1.75[3]
	B_{2015}/B_0	0.32-1.18[4]
Relative Fishing Mortality:	F_{MSY}	0.030-0.034[5]
	F_{2015}/F_{MSY}	0.86-3.67[6]
Stock status (2015)	Overfished	Possibly[7]
	Overfishing	Possibly[7]
Management Measures in Effect:		Rec. 04-10, Rec. 07-06, Rec. 10-06, Rec. 14-06

[1] Task I catch.
[2] Task I catch from the stock assessment.
[3] Range obtained from 2 Bayesian production (BSP2JAGS) and 2 catch-only (CMSY) model runs. Low value is lowest value from the CMSY model runs and high value is highest value from the BSP2JAGS model runs.
[4] Range obtained from 2 Bayesian production (BSP2JAGS) and 2 catch-only (CMSY) model runs. Low value is lowest value from the CMSY model runs and high value is highest value from the BSP2JAGS model runs.
[5] Range obtained from 2 Bayesian production (BSP2JAGS) and 2 catch-only (CMSY) model runs. Low value is from the BSP2JAGS model runs and high value is from the CMSY model runs.
[6] Range obtained from 2 Bayesian production (BSP2JAGS) and 2 catch-only (CMSY) model runs. Low value is lowest value from the BSP2JAGS model runs and high value is highest value from the CMSY model runs.
[7] The Committee considers that results have a high degree of uncertainty.

NORTHWEST ATLANTIC PORBEAGLE SUMMARY

Yield (2008)		144.3 t[1]
Relative Biomass	B_{2008}/B_{MSY}	0.43-0.65[2]
Relative Fishing Mortality	F_{MSY}	0.025-0.075[3]
	F_{2008}/F_{MSY}	0.03-0.36[4]
Domestic Management Measures in Effect		TACs of 185 t and 11.3 t[5]
Stock Status (2008)	Overfished	Yes
	Overfishing	No
Management Measures in Effect:		Rec. 15-06

[1] Estimated catch allocated to the Northwest stock area. Not updated as area boundaries have not been formally defined.
[2] Range obtained from age-structured model (Canadian assessment; low) and BSP model (high). Value from Canadian assessment is in numbers; value from BSP in biomass. All values in parentheses are CVs.
[3] Range obtained from BSP model (low) and age-structured model (high).
[4] Range obtained from BSP model (low) and age-structured model (high).
[5] The TAC for the Canadian EEZ was 185 t (in 2008) (MSY catch is 250 t); the TAC for the USA is 11.3 t (dressed weight).

SOUTHWEST ATLANTIC PORBEAGLE SUMMARY

Yield (2008)		164.6 t[1]
Relative Biomass	B_{2008}/B_{MSY}	0.36-0.78[2]
Relative Fishing Mortality	F_{MSY}	0.025-0.033[3]
	F_{2008}/F_{MSY}	0.31-10.78[4]
Stock Status (2008)	Overfished	Yes
	Overfishing	Undetermined[5]
Management Measures in Effect:		Rec. 15-06 [6]

[1] Estimated catch allocated to the Southwest stock area. Not updated as area boundaries have not been formally defined.
[2] Range obtained from BSP (low and high) and CFASP models. Value from CFASP model (SSB/SSB_{MSY}) was 0.48 (0.20).
[3] Range obtained from BSP (low) and CFASP (high) models.
[4] Range obtained from BSP (low and high) and CFASP models. Value from CFASP model was 1.72 (0.51).
[5] Given the uncertainty in stock status, the Committee cannot make a determination but cautions that overfishing may have occurred in recent years.
[6] Retention of porbeagle sharks has been prohibited in Uruguay since 2013.

NORTHEAST ATLANTIC PORBEAGLE SUMMARY

Yield (2008)		287 t[1]
Relative Biomass	B_{2008}/B_{MSY}	0.09-1.93[2]
Relative Fishing Mortality	F_{MSY}	0.02-0.03[3]
	F_{2008}/F_{MSY}	0.04-3.45[4]
Stock Status (2008)	Overfished	Yes
	Overfishing	No
Management Measures in Effect		Rec. 15-06 [5] Maximum landing length of 210 cm FL[5]

[1] Estimated catch allocated to the Northeast stock area. Not updated as area boundaries have not been formally defined.
[2] Range obtained from BSP (high) and ASPM (low) models. Value from ASPM model is SSB/SSB_{MSY}. The value of 1.93 from the BSP corresponds to a biologically unrealistic scenario; all results from the other BSP scenarios ranged from 0.29 to 1.05.
[3] Range obtained from the BSP and ASPM models (low and high for both models).
[4] Range obtained from BSP (low) and ASPM (high) models. The value of 0.04 from the BSP corresponds to a biologically unrealistic scenario; all results from the BSP scenarios ranged from 0.70 to 1.26.
[5] In the European Union the TAC has been set at zero t since 2010.

BSH-Table 1. Estimated catches (t) of blue shark (Prionace glauca) by area, gear and flag. (v2, 2019-10-02)
BSH-Tableau 1. Prises estimées (t) de peau bleue (Prionace glauca) par zone, engin et pavillon. (v2, 2019-10-02)
BSH-Tabla 1. Capturas estimadas de tiburón azul (Prionace glauca) por area, arte y bandera. (v2, 2019-10-02)

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
TOTAL				11301	11585	11651	39580	35624	37023	40664	35220	32765	37983	36306	43072	43889	50464	53903	58843	65195	73198	63245	57833	62961	62791	70214	68142	68220
	ATN			8592	8468	7396	29285	26764	26172	28174	21128	20066	23006	21741	22359	23218	26927	30725	35199	37180	38089	36782	37061	36579	39627	44068	39664	33853
	ATS			2704	3108	4252	10145	8797	10829	12444	14044	12682	14966	14440	20642	20493	23487	23097	23459	27799	35069	26421	20672	26148	22498	25417	28373	34309
	MED			6	8	2	150	63	22	45	47	17	11	125	72	178	50	81	185	216	40	42	100	235	665	729	105	58
Landings	ATN		Longline	7646	7548	6131	28678	26153	25382	27305	20699	19290	22881	21297	22167	23068	26811	30516	35032	36954	37783	36553	36878	36245	38777	42859	38493	32654
			Other surf.	373	300	560	428	419	682	732	324	708	70	380	126	104	63	80	63	59	100	109	74	205	726	1121	1033	1086
	ATS		Longline	2704	3108	4246	10135	8790	10801	12444	14043	12678	14960	14341	20638	20434	23417	22708	23453	27785	34532	25878	20387	24203	21736	24643	27662	33546
			Other surf.	0	0	0	6	4	27	0	1	4	6	99	3	59	10	375	6	14	534	411	152	1831	635	634	487	664
	MED		Longline	5	8	2	150	63	22	45	47	17	11	43	72	83	48	81	18	50	40	41	68	190	664	728	92	54
			Other surf.	1	0	0	0	0	0	0	0	0	0	81	0	95	2	1	167	165	0	0	32	45	1	2	13	4
Discards	ATN		Longline	572	621	602	180	170	104	137	105	68	55	63	66	45	53	129	102	167	205	119	109	128	124	88	138	112
			Other surf.	0	0	103	0	22	4	0	0	0	0	1	0	0	0	1	1	1	2	1	0	0	0	0	0	0
	ATS		Longline	0	0	7	5	4	1	0	0	0	0	0	0	0	60	14	0	0	4	132	132	114	122	139	218	99
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	7	0
	MED		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Landings	ATN	CP	Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	6	7	4
			Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114	461	1039	903	1216	392	4	6	201	317
			Brazil	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Canada	1260	1494	528	831	612	547	624	581	836	346	965	1134	977	843	0	0	0	0	1	0	0	0	0	0	0
			Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			China PR	0	0	0	0	0	0	0	185	104	148	0	0	0	367	109	88	53	109	98	327	0	1	27	2	6
			EU.Denmark	1	2	3	1	1	0	2	1	13	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.España	0	0	0	24497	22504	21811	24112	17362	15666	15975	17314	15006	15464	17038	20788	24465	26094	27988	28666	28562	29041	30078	29019	27316	21685
			EU.France	350	266	278	213	163	399	395	207	221	57	106	120	99	167	119	84	122	115	31	216	132	259	352	124	94
			EU.Ireland	0	0	0	0	0	66	31	66	11	2	0	0	0	0	0	0	0	1	3	2	1	0	0	0	**0**
			EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**0**
			EU.Portugal	4669	4722	4843	2630	2440	2227	2081	2110	2265	5643	2025	4027	4338	5283	6167	6252	8261	6509	3768	3694	3060	3859	7819	5664	5195
			EU.United Kingdom	0	12	0	0	1	0	12	9	6	4	6	5	3	6	6	96	8	10	8	10	10	12	17	11	6
			FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**0**
			Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Japan	1203	1145	618	489	340	357	273	350	386	558	1035	1729	1434	1921	2531	2007	1763	1227	2437	1808	3287	4011	4217	4444	4111
			Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	537	299	327	113	0	10	103	92
			Liberia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
			Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	873	1623	1475	1644
			Mauritania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93	0	**0**
			Mexico	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**0**
			Panama	0	0	0	0	0	9	0	0	0	0	0	0	254	892	613	1575	0	0	0	289	153	0	262	0	437
			Senegal	0	0	0	0	0	0	0	0	456	0	0	0	0	43	134	255	56	0	5	12	17	13	3	4	1
			St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	119	0	**0**
			Trinidad and Tobago	0	0	0	0	0	0	0	0	6	3	2	1	1	0	2	8	9	11	11	8	10	4	2	2	0
			U.S.A.	31	24	284	214	256	217	291	40	0	1	7	2	2	1	9	5	11	71	60	36	44	32	31	24	19
			UK.Bermuda	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Venezuela	18	16	6	27	7	47	43	47	29	40	10	28	12	19	8	73	75	117	98	52	113	129	116	105	
		NCC	Chinese Taipei	487	167	132	203	246	384	165	59	0	171	206	240	588	292	110	73	99	148	94	113	77	220	259	42	122
			Suriname	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	181	281	0	0	0	0	**0**
	ATS	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	**0**
			Belize	0	0	0	0	0	0	0	0	0	0	37	259	0	236	109	0	273	243	483	234	171	105	167	200	222
			Brazil	0	0	743	1103	0	179	1683	2173	1971	2166	1667	2523	2591	2258	1986	1274	1500	1980	1607	2013	2551	2420	1334	2177	3011
			China PR	0	0	0	0	0	0	0	565	316	452	0	0	0	585	40	109	41	131	84	64	48	20	30	283	127

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92	16	9	8	247
			EU.España	0	0	0	5272	5574	7173	6951	7743	5368	6626	7366	6410	8724	8942	9615	13099	13953	16978	14348	10473	11447	10133	10107	11486	13515
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**0**
			EU.Portugal	0	847	867	1336	876	1110	2134	2562	2324	1841	1863	3184	2751	4493	4866	5358	6338	7642	2424	1646	1622	2420	5609	6663	8015
			EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	239	0	0	14	0	0	0	0	0	0	0	0	0	**0**
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Ghana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1583	396	436	479	416
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	6	0	0
			Japan	1388	437	425	506	510	536	221	182	343	331	209	236	525	896	1789	981	1161	1483	3060	2255	3232	2277	2127	3112	3495
			Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	222	125	112	61	10	71	252	87	192
			Namibia	0	0	0	0	0	0	0	0	2213	2316	1906	6616	3536	3419	1829	207	2352	2957	1439	1147	2471	2137	2775	1357	3290
			Panama	0	0	0	0	0	168	22	0	0	0	0	0	0	0	521	0	0	0	0	0	0	0	0	0	**0**
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			S. Tomé e Príncipe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143	147	152	156	206	183	0	
			Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	203	51	60	0	18	15	11	**0**
			South Africa	0	0	0	0	23	21	0	83	63	232	128	154	90	82	126	119	125	318	158	179	524	402	356	418	403
			St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	**0**
			U.S.A.	0	0	0	0	0	0	0	4	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Uruguay	84	57	259	180	248	118	81	66	85	480	462	376	232	337	359	942	208	725	433	130	0	0	0	0	**0**
		NCC	Chinese Taipei	1232	1767	1952	1737	1559	1496	1353	665	0	521	800	866	1805	2177	1843	1356	1625	2138	1941	2125	2128	1731	1853	1852	1276
		NCO	Benin	0	0	0	6	4	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	MED	CP	Algerie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7
			EU.Cyprus	0	0	0	0	0	0	9	0	0	3	6	5	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.España	0	0	0	146	59	20	31	6	3	3	4	8	61	3	2	7	48	38	39	37	53	65	58	40	19
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	5	15	0	2	2
			EU.Italy	0	0	0	0	0	0	0	0	0	0	113	1	95	46	75	175	165	0	0	57	173	0	18	59	17
			EU.Malta	1	1	1	2	2	2	1	1	1	0	0	0	0	1	1	2	1	1	2	2	4	5	3	4	2
			EU.Portugal	0	0	0	0	2	0	5	41	14	3	0	56	22	0	0	0	2	0	0	0	0	0	0	0	**0**
			Japan	5	7	1	1	0	0	0	0	0	1	1	2	0	0	2	0	0	0	0	0	0	0	0	0	**0**
			Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	580	650	0	10
Discards	ATN	CP	Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	16	32	71
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	1	29	
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			U.S.A.	572	618	704	180	192	100	137	106	68	55	65	66	45	54	130	103	167	206	106	99	122	82	43	42	11
			UK.Bermuda	0	3	1	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	10	6	19	27	34	31
	ATS	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	60	14	0	0	0	0	0	0	0	0	0	
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
			EU.España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	1	0
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
			Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	2
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
			South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
			U.S.A.	0	0	7	5	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	132	132	112	122	139	201	97
	MED	CP	EU.España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

SMA-Table 1. Estimated catches (t) of Shortfin mako (Isurus oxyrinchus) by area, gear and flag. (v2, 2019-10-02)
SMA-Tableau 1. Prises estimées (t) de Taupe bleue (Isurus oxyrinchus) par région, engin et pavillon. (v2, 2019-10-02)
SMA-Tabla 1. Capturas estimadas de Marrajo dientuso (Isurus oxyrinchus) por área, arte y bandera. (v2, 2019-10-02)

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
TOTAL				5841	8406	7701	5727	5861	4469	5179	4792	5531	7225	6528	6970	6620	6946	5682	6605	7254	6979	7338	5778	6126	5739	6111	5902	5547
	ATN			3659	5306	5306	3534	3845	2858	2587	2677	3426	3987	4000	3695	3574	4158	3800	4541	4767	3718	4431	3595	2852	2964	3347	3116	2388
	ATS			2182	3100	2395	2187	2008	1606	2588	2107	2103	3235	2526	3259	3036	2786	1881	2063	2486	3258	2905	2183	3274	2774	2765	2786	3158
	MED			0	0	0	6	8	5	4	7	2	2	2	17	10	2	1	1	2	2	2	0	0	0	0	0	1
Landings	ATN		Longline	3306	3828	5053	3351	3670	2756	2267	2446	3155	3970	3572	3387	3302	3976	3622	4344	4587	3496	4145	3312	2576	2638	3118	2713	1990
			Other surf.	331	1448	252	183	175	99	320	231	271	17	429	308	273	175	169	177	178	213	267	278	264	316	221	397	369
	ATS		Longline	2161	3085	2379	2163	1996	1596	2565	2090	2088	3204	2450	3245	2992	2745	1799	2057	2485	3196	2842	2149	3241	2760	2748	2620	3149
			Other surf.	21	15	16	25	12	10	22	18	15	31	76	14	43	30	82	7	1	62	55	34	31	12	13	162	7
	MED		Longline	0	0	0	6	8	5	4	7	2	2	2	17	10	2	1	1	2	2	2	0	0	0	0	0	
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Discards	ATN		Longline	21	29	1	0	0	0	0	0	0	0	0	0	0	7	9	20	2	9	19	5	12	10	8	4	28
			Other surf.	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
	ATS		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	8	0	2	2	3	3	2
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
	MED		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Landings	ATN	CP	Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3	3	**0**
			Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	28	69	114	99	1	1	1	9	12
			Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Canada	0	111	67	110	69	70	78	69	78	73	80	91	71	72	43	53	41	37	29	35	55	85	82	109	53
			China PR	0	0	0	0	0	0	0	0	0	0	0	0	0	81	16	19	29	18	24	11	5	2	4	2	**0**
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.España	2164	2209	3294	2416	2223	2051	1561	1684	2047	2068	2088	1751	1918	1814	1895	2216	2091	1667	2308	1509	1481	1362	1574	1784	1165
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	2	0	0	0	1	1	2	1	0
			EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.Portugal	649	657	691	354	307	327	318	378	415	1249	473	1109	951	1540	1033	1169	1432	1045	1023	820	219	222	264	276	272
			EU.United Kingdom	0	0	0	0	0	2	3	2	1	1	1	0	0	0	1	15	0	0	0	0	0	0	0	0	**0**
			FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	4	0	0	4	0	0	0	0	**0**
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Japan	214	592	790	258	892	120	138	105	438	267	572	0	0	82	131	98	116	53	56	33	69	45	74	89	20
			Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	27	15	8	2	1	3	5
			Maroc	0	0	0	0	0	0	0	0	0	147	169	215	220	151	283	476	636	420	406	667	624	947	1050	450	594
			Mauritania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	**0**
			Mexico	0	10	0	0	0	0	10	16	0	10	6	9	5	8	6	7	8	8	8	4	4	4	3	5	2
			Panama	0	0	0	0	0	1	0	0	0	0	0	0	0	49	33	39	0	0	0	19	7	0	0	0	**0**
			Philippines	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
			Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	8	17	21	0	0	2	0	2	2	2	68	68
			St. Vincent and Grenadines	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	**0**
			Trinidad and Tobago	0	0	0	0	0	1	0	1	2	3	1	2	1	1	1	1	1	0	2	1	1	1	1	2	2
			U.S.A.	574	1658	400	345	296	198	414	350	372	106	477	422	353	319	296	314	335	331	365	355	345	255	262	299	165
			UK.Bermuda	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Venezuela	7	7	17	9	8	6	9	24	21	28	64	27	14	19	8	41	27	20	33	9	13	7	7	9	
		NCC	Chinese Taipei	29	32	45	42	47	75	56	47	53	37	70	68	40	6	23	11	14	13	14	8	4	13	7	1	**0**

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
		NCO	Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	
	ATS	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	**0**
			Belize	0	0	0	0	0	0	0	0	0	0	0	38	0	17	2	0	32	59	78	88	1	15	14	34	15
			Brazil	95	119	83	190	233	27	219	409	226	283	238	426	210	145	203	99	128	192	196	276	268	173	124	275	399
			China PR	45	23	27	19	74	126	305	22	208	260	68	45	70	77	6	24	32	29	8	9	9	5	3	1	**0**
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Côte d'Ivoire	20	13	15	23	10	10	9	15	15	30	15	14	16	25	0	5	7	0	20	34	19	11	13	161	4
			EU.España	552	1084	1482	1356	984	861	1090	1235	811	1158	703	584	664	654	628	922	1192	1535	1207	1083	1077	862	882	1049	1044
			EU.Portugal	0	92	94	165	116	119	388	140	56	625	13	242	493	375	321	502	336	409	176	132	127	158	393	503	300
			EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	11	0	0	0	0	0	0	0	0	**0**
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Japan	1369	1617	514	244	267	151	264	56	133	118	398	0	0	72	115	108	103	132	291	114	182	109	77	96	93
			Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	13	7	7	4	4	18	8	9
			Namibia	0	0	0	0	0	1	0	0	459	375	509	1415	1243	1002	295	23	307	377	586	9	950	661	799	194	980
			Panama	0	0	0	0	0	24	1	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	**0**
			Philippines	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	34	23	0	11	6	39	4
			South Africa	24	49	37	31	171	67	116	70	12	116	101	111	86	224	137	146	152	218	108	250	476	613	339	305	244
			UK.Sta Helena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Uruguay	12	17	26	20	23	21	35	40	38	188	249	146	68	36	41	106	23	76	36	1	0	0	0	0	**0**
			Vanuatu	0	0	0	0	0	0	0	0	0	0	52	12	13	1	0	0	0	0	0	0	0	0	0	0	**0**
		NCC	Chinese Taipei	65	87	117	139	130	198	162	120	146	83	180	226	166	147	124	117	144	203	150	157	158	152	92	85	64
	MED	CP	EU.Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	**0**
			EU.España	0	0	0	6	7	5	3	2	2	2	2	2	4	1	0	0	1	2	2	0	0	0	0	0	**0**
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
			EU.Portugal	0	0	0	0	1	0	1	5	0	0	0	15	5	0	0	0	0	0	0	0	0	0	0	0	**0**
			Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Discards	ATN	CP	Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
			Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
			Mexico	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			U.S.A.	21	28	1	0	0	0	0	0	0	0	0	0	0	7	10	20	2	9	18	5	11	8	6	4	1
			UK.Bermuda	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	3
	ATS	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
		EU.España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
		El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	2	2	3	3	2
MED	CP	EU.España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

POR-Table 1. Estimated catches (t) of porbeagle (Lamna nasus) by area, gear and flag. (v2, 2019-10-02)
POR-Tableau 1. Prises estimées (t) de requin-taupe commun (Lamna nasus) par zone, engin et pavillon. (v2, 2019-10-02)
POR-Tabla 1. Capturas estimadas de marrajo sardinero (Lamna nasus) por area, arte y bandera. (v2, 2019-10-02)

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
TOTAL				3049	2343	1952	2055	1779	1649	1769	1203	1075	887	954	740	642	671	613	485	136	90	149	185	66	59	22	30	17
	ATN			2770	2173	1640	1877	1516	1471	1555	1081	892	690	842	605	519	522	527	421	119	68	111	156	28	56	20	29	12
	ATS			279	170	311	178	262	178	214	121	182	196	109	133	122	149	85	62	16	21	37	29	38	4	1	0	4
	MED			0	0	1	0	1	0	1	1	0	0	3	2	1	0	2	1	1	0	1	0	0	0	1	1	0
Landings	ATN		Longline	1826	1485	1262	1459	1158	1063	1018	607	352	292	528	288	271	392	356	203	85	38	79	115	8	8	4	2	1
			Other surf.	943	687	378	417	357	408	537	474	541	398	315	316	248	130	170	219	31	29	32	39	12	12	11	15	7
	ATS		Longline	277	170	310	174	260	172	213	121	182	196	109	133	122	149	85	62	16	21	37	29	13	4	1	0	4
			Other surf.	1	0	0	4	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	
	MED		Longline	0	0	1	0	1	0	1	1	0	0	2	2	0	0	2	1	0	0	1	0	0	0	0	0	0
			Other surf.	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0
Discards	ATN		Longline	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	2	8	34	3	9	2
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
	ATS		Longline	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Landings	ATN	CP	Barbados	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Canada	1575	1353	1051	1334	1070	965	902	499	237	142	232	202	192	93	124	62	83	30	33	19	9	4	2	2	1
			EU.Denmark	93	86	72	69	85	107	73	76	42	21	20	4	3	2	1	0	0	0	2	0	0	0	0	0	0
			EU.España	52	19	41	25	25	18	13	24	54	27	11	14	34	8	41	77	0	0	0	0	0	0	0	0	**0**
			EU.France	820	565	267	315	219	240	410	361	461	303	413	276	194	354	311	228	0	2	4	0	0	3	0	1	0
			EU.Germany	0	0	0	0	2	0	17	1	3	5	7	5	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.Ireland	0	0	0	0	0	8	2	6	3	11	18	3	4	8	7	3	0	0	0	0	0	0	0	0	**0**
			EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.Portugal	1	1	1	1	1	0	7	4	10	101	50	14	6	0	3	17	7	0	0	0	0	0	0	0	0
			EU.Sweden	2	2	1	1	1	1	1	1	0	0	5	0	0	1	0	0	0	0	0	0	0	0	0	0	
			EU.United Kingdom	0	0	0	0	1	6	8	12	10	25	24	24	11	26	15	11	0	0	0	0	0	0	0	0	**0**
			FR.St Pierre et Miquelon	0	7	40	13	20	0	13	2	1	2	4	0	0	0	1	0	0	0	0	0	0	0	0	0	**0**
			Iceland	4	6	5	3	4	2	2	3	2	1	1	0	1	0	1	0	1	0	0	0	0	0	0	0	**0**
			Japan	29	15	15	13	19	41	47	52	21	7	20	27	18	17	10	13	13	14	49	98	0	0	2	0	**0**
			Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Liberia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
			Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	**0**
			Norway	24	26	28	17	27	32	22	11	14	19	24	8	27	10	12	10	12	11	17	9	5	4	6	6	3
			U.S.A.	106	35	78	56	13	3	1	1	1	0	1	0	0	0	1	1	1	11	4	27	6	8	4	8	3
			Venezuela	4	1	7	2	8	9	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NCC	Chinese Taipei	10	12	27	18	13	27	19	18	22	12	8	7	5	3	0	0	0	0	0	0	0	0	0	0	**0**
		NCO	Cuba	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	
			Faroe Islands	48	44	8	9	7	10	13	8	10	14	5	19	21	0	0	0	0	0	0	0	0	0	0	0	
	ATS	CP	Brazil	32	49	33	36	38	58	60	67	74	49	37	52	32	23	0	0	0	2	0	0	0	0	0	0	**0**
			China PR	1	0	0	0	0	13	36	4	0	5	4	2	2	6	0	0	0	0	0	0	0	0	0	0	**0**
			EU.Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.España	35	43	28	27	2	14	7	14	2	9	4	0	3	5	4	13	0	0	0	0	0	0	0	0	**0**
			EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
			EU.Poland	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.Portugal	0	0	0	1	0	0	0	1	1	1	4	2	1	2	0	0	0	0	0	0	0	0	0	0	**0**
			Ghana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	**0**
			Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Japan	14	6	9	14	1	2	7	4	3	2	11	3	3	9	41	34	8	7	25	15	13	4	1	0	**0**
			Korea Rep.	2	1	6	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	14	0	0	0	0	4
			Panama	24	4	21	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Philippines	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	0	0	0	0	0	0	0	0	
			Uruguay	0	3	0	5	13	2	4	0	8	34	8	28	34	3	40	14	6	12	12	0	0	0	0	0	**0**
			Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NCC	Chinese Taipei	146	57	168	65	170	73	84	29	93	95	39	43	47	99	0	0	2	0	0	1	0	0	0	0	**0**
		NCO	Argentina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Benin	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Chile	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cuba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Falklands	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (Flag related)	22	8	46	23	37	11	15	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	MED	CP	EU.Italy	0	0	0	0	0	0	0	0	0	0	2	1	1	0	2	0	0	0	0	0	0	0	1	1	0
			EU.Malta	0	0	1	0	1	0	1	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	**0**
Discards	ATN	CP	Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	2	3
			Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			U.S.A.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	2	7	34	1	9	1
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATS	CP	Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Uruguay	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SHK-Table 2. Vulnerability ranks for 20 stocks of pelagic sharks calculated with three methods: Euclidean distance (v1), multiplicative (v2), and arithmetic mean (v3). A lower rank indicates higher risk. Stocks listed in decreasing risk order according to the sum of the three indices. Red highlight indicates risks scores 1-5; yellow, 6-10; blue, 11-15; and green, 16-20. Productivity values ranked from lowest to highest.

BTH=bigeye thresher; LMA=longfin mako; SMA=shortfin mako; POR=porbeagle; CCS=night shark; FAL SA=silky shark South Atlantic; CCP=sandbar shark; OCS=oceanic whitetip; FAL NA=silky shark North Atlantic; ALV=thresher shark; BSH NA=blue shark North Atlantic; DUS=dusky shark; SPK=great hammerhead; BSH SA=blue shark South Atlantic; TIG=tiger shark; PLS SA=pelagic stingray South Atlantic; SPL NA=scalloped hammerhead North Atlantic; SPZ=smooth hammerhead; SPL SA=scalloped hammerhead South Atlantic; PLS NA=pelagic stingray North Atlantic.

Stock	v_1	v_2	v_3
BTH	3	1	1
LMA	5	3	2
SMA	1	8	2
POR	2	7	4
CCS	11	4	5
FAL SA	12	5	6
CCP	15	2	6
OCS	4	13	8
FAL NA	8	11	8
ALV	9	14	11
BSH NA	6	19	10
DUS	17	6	12
SPK	14	10	13
BSH SA	7	20	14
TIG	10	16	15
PLS SA	18	9	16
SPL NA	16	12	16
SPZ	13	17	18
SPL SA	19	15	19
PLS NA	20	18	20

SHK-Table 3. Stock Synthesis model runs 1 and 3 combined Markov Chain Monte Carlo (MCMC, long chain) Kobe II risk matrix for North Atlantic shortfin mako projection results: Probability that the fishing mortality (F) will be below the fishing mortality rate at MSY ($F < F_{MSY}$; top panel), probability that the spawning stock fecundity (SSF) will exceed the level that will produce MSY ($SSF > SSF_{MSY}$; middle panel), and the probability of both $F < F_{MSY}$ and $SSF > SSF_{MSY}$ (bottom panel).

Probability that $F<F_{MSY}$

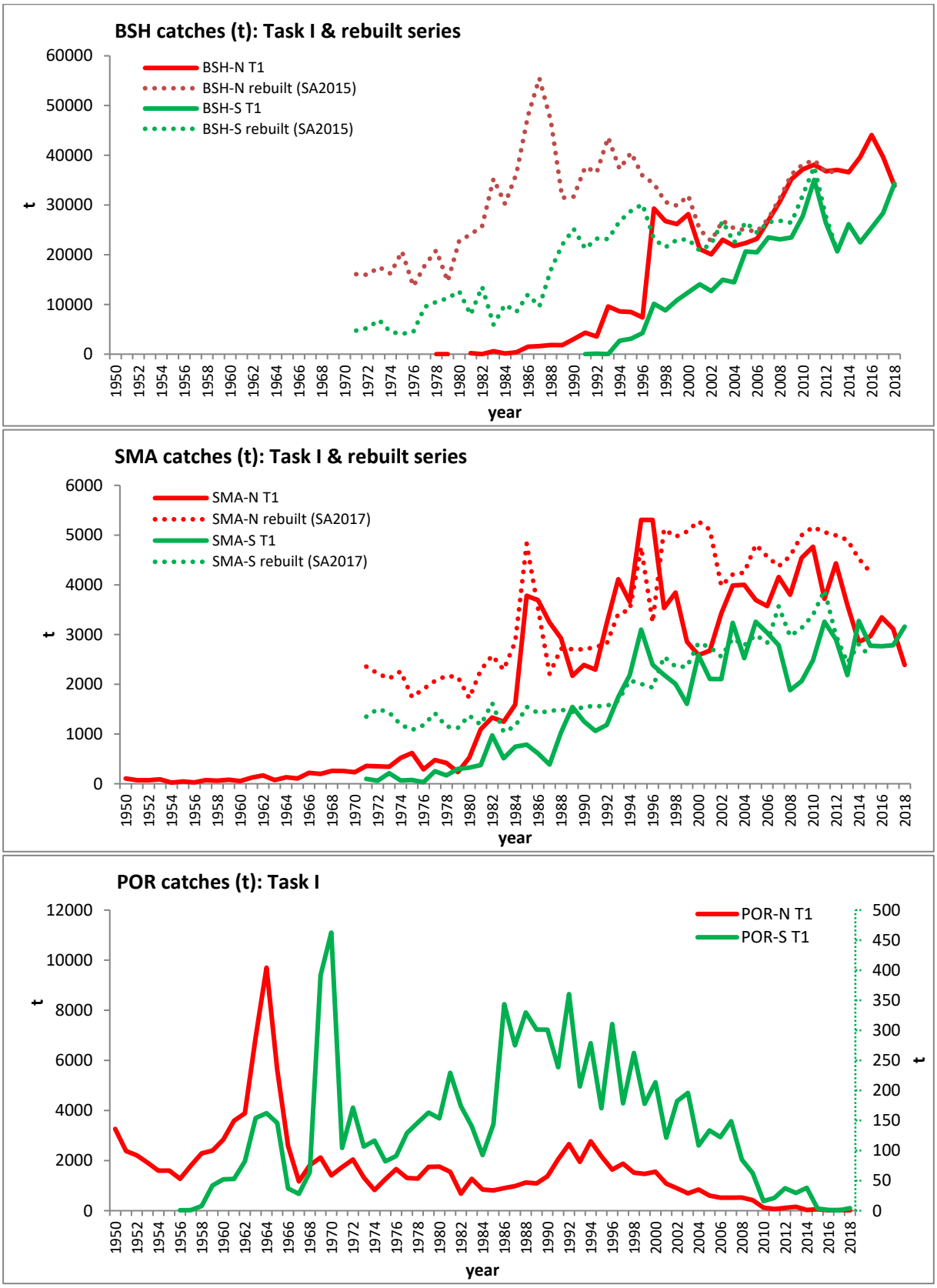
TAC (t)	2019	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070
0	100	100	100	100	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100	100	100	100	100
200	100	100	100	100	100	100	100	100	100	100	100	100
300	100	100	100	100	100	100	100	100	100	100	100	100
400	100	100	100	100	100	100	100	100	100	100	100	100
500	96	99	100	100	100	100	100	100	100	100	100	100
600	81	89	99	99	98	96	95	97	97	97	96	95
700	57	69	93	92	88	82	80	83	84	85	82	82
800*	32	45	76	77	70	63	62	64	67	67	65	63
900	15	24	57	58	51	46	44	47	51	49	49	48
1000	5	11	37	38	31	27	26	28	30	31	30	30
1100	2	4	19	21	17	13	11	13	14	14	14	13

Probability that $SSF>SSF_{MSY}$

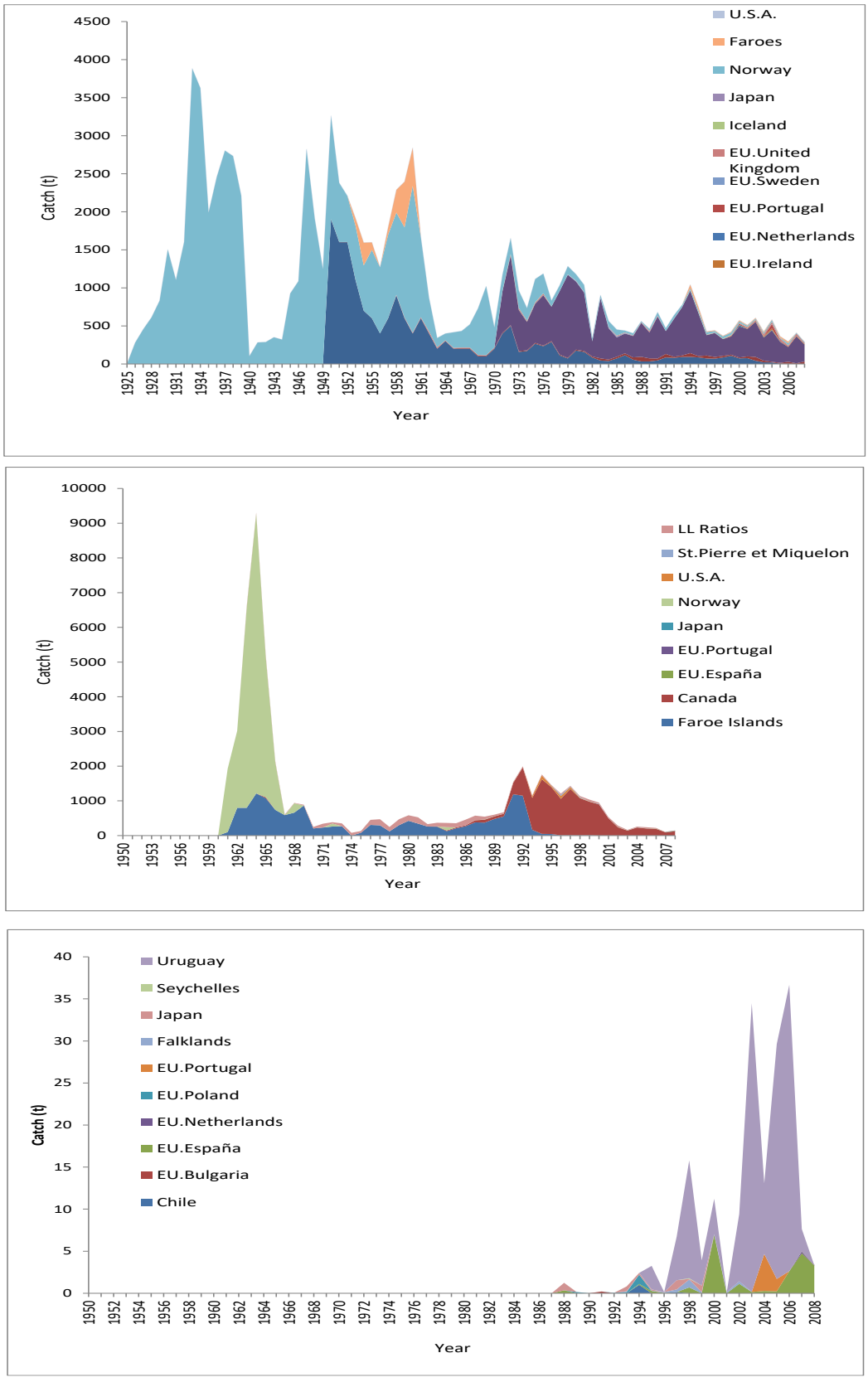
TAC (t)	2019	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070
0	46	42	24	14	11	33	53	60	63	67	72	81
100	46	42	24	13	10	29	49	56	59	61	66	73
200	46	42	24	13	9	26	47	54	55	57	61	66
300	46	42	24	12	9	22	42	50	52	53	56	60
400	46	42	24	12	8	19	39	47	49	50	52	55
500*	46	42	24	12	7	17	34	42	45	47	49	52
600	46	42	24	12	7	14	28	37	40	41	43	47
700	46	42	24	11	6	11	23	31	34	35	37	41
800	46	42	23	11	6	10	19	26	27	28	30	32
900	46	42	23	11	5	8	16	20	21	21	23	24
1000	46	42	23	11	5	7	12	16	16	15	15	17
1100	46	42	23	10	5	6	10	12	12	11	10	10

Probability of being in the green zone ($F<F_{MSY}$ and $SSF>SSF_{MSY}$)

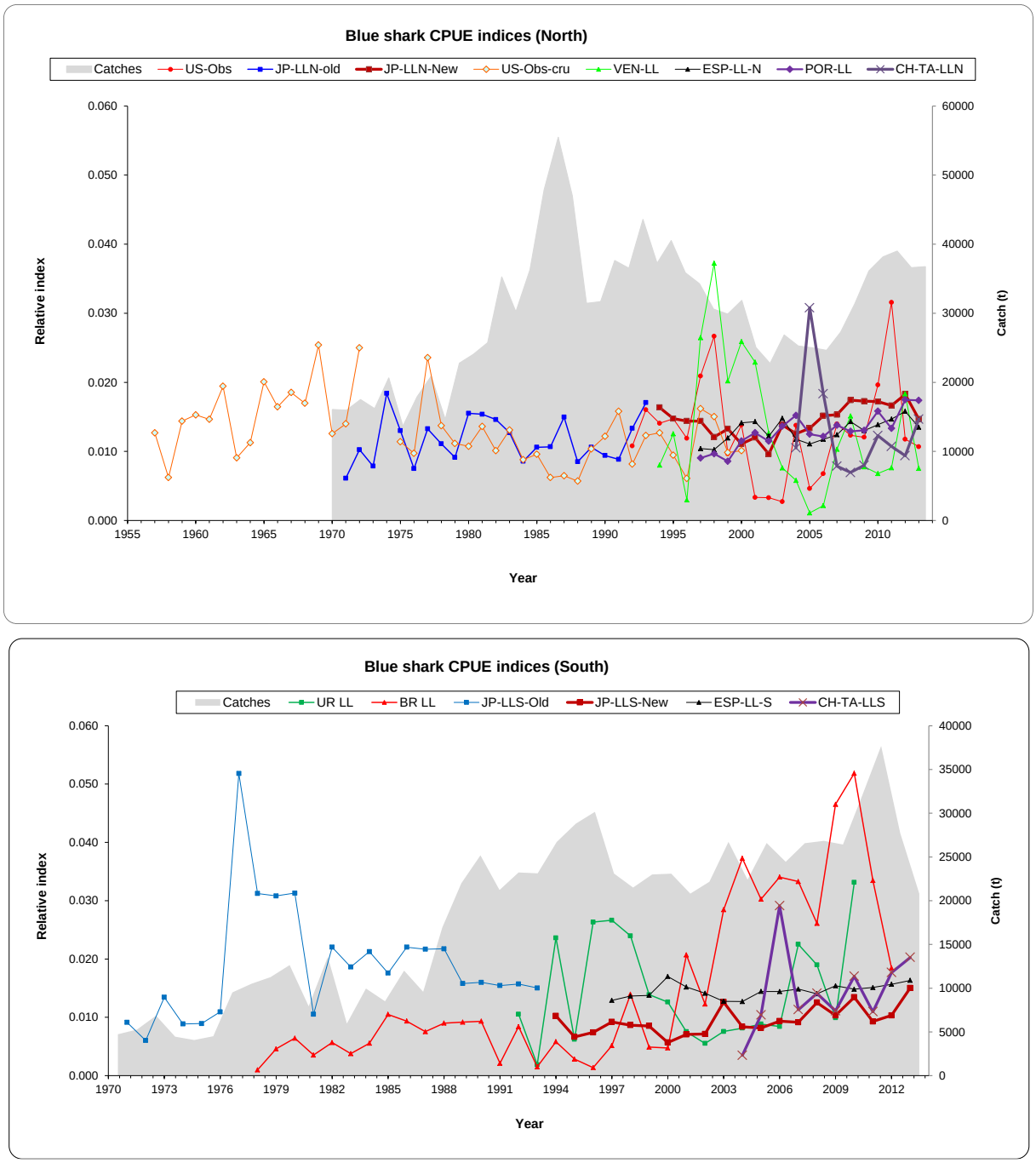
TAC (t)	2019	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070
0	46	42	24	14	11	33	53	60	63	67	72	81
100	46	42	24	13	10	29	49	56	59	61	66	73
200	46	42	24	13	9	26	47	54	55	57	61	66
300	46	42	24	12	9	22	42	50	52	53	56	60
400	46	42	24	12	8	19	39	47	49	50	52	55
500*	46	42	24	12	7	17	34	42	45	47	49	52
600	45	42	24	12	7	14	28	37	40	41	43	47
700	41	41	24	11	6	11	23	31	34	35	37	41
800	27	34	23	11	6	10	19	26	27	28	30	32
900	14	21	23	11	5	8	15	20	21	21	23	24
1000	5	10	20	10	5	7	12	15	15	14	14	16
1100	2	4	14	9	4	5	7	9	9	8	8	8



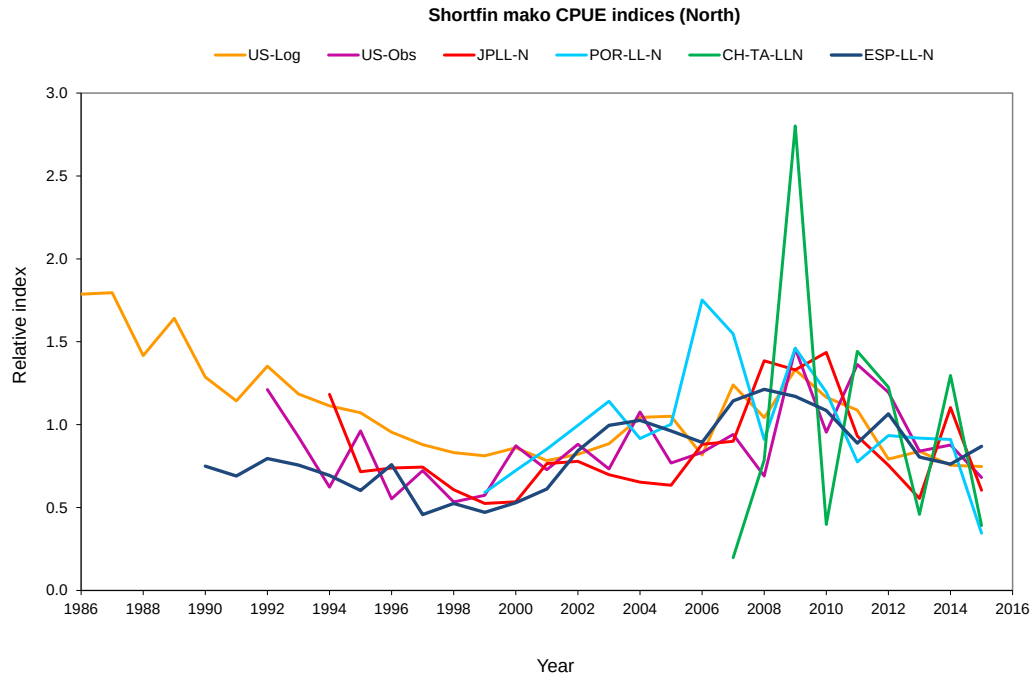
SHK-Figure 1. Blue shark (BSH, top panel) and shortfin mako (SMA, middle panel) catches reported to ICCAT (Task I) and estimated by the Committee, and Task I porbeagle (POR bottom panel, POR-S catch series is preliminary).



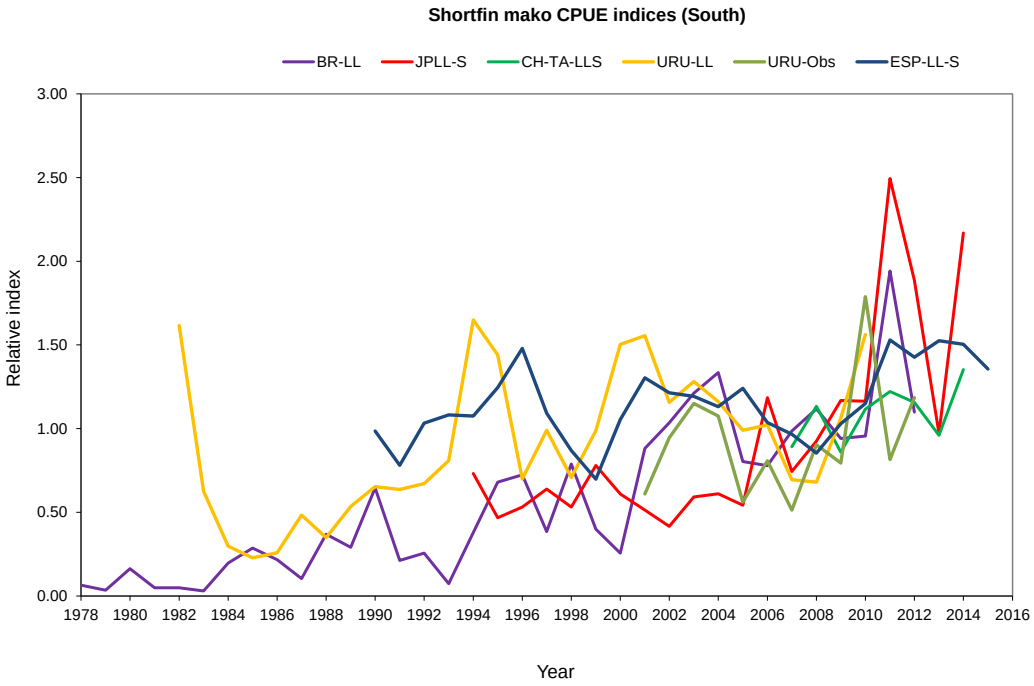
SHK Figure 2. Catch by flag of porbeagle sharks from the northeast Atlantic (top), northwest Atlantic (middle), and southwest Atlantic (bottom) used in the 2009 stock assessment. While these catches are considered the best available, NE catches are believed to underestimate the pelagic longline catches for this species, those from the NW include non-reporting fleets, which in this case represent a small proportion of the total, and those from the SW are Task I data also believed to significantly underestimate actual catches by all fleets.



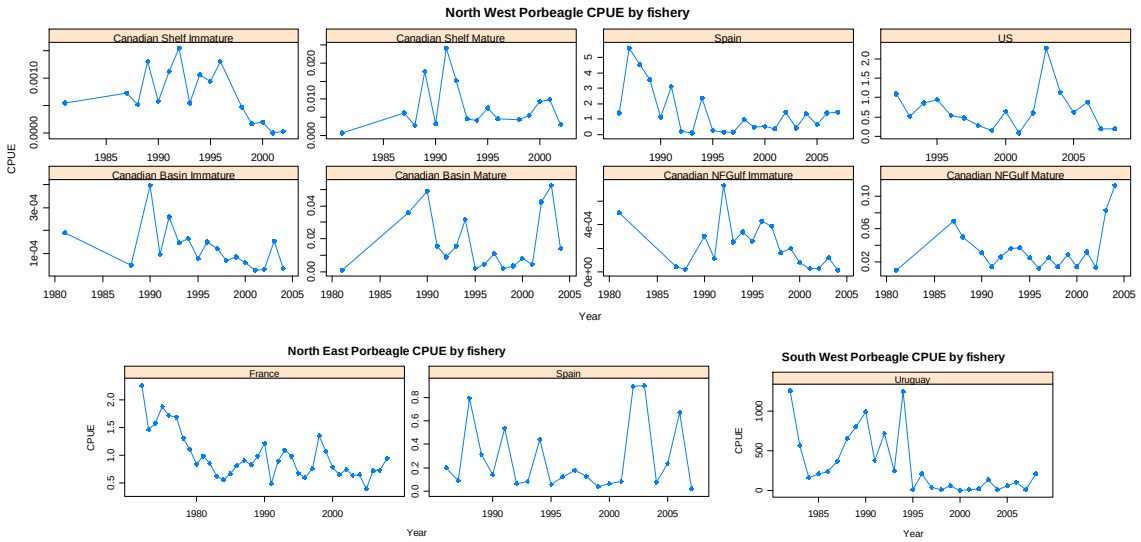
SHK-Figure 3. CPUE series used in the 2015 assessments of North and South Atlantic blue shark (BSH) stocks. Total catches (in t) used in the assessments are also shown.



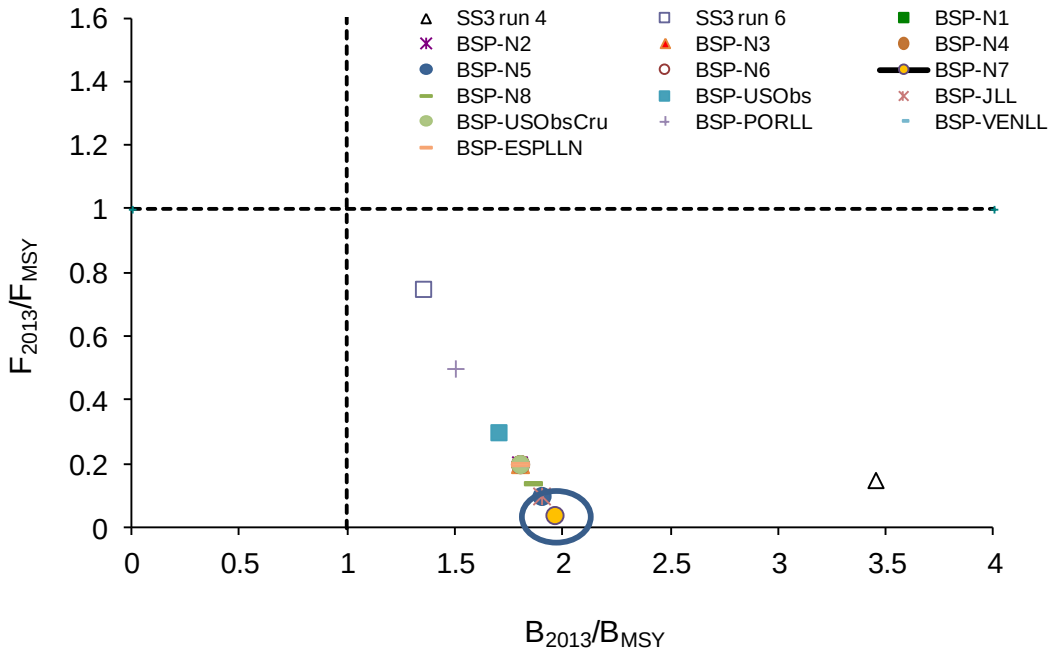
SHK-Figure 4. Indices of abundance for North Atlantic shortfin mako shark used in the 2017 stock assessment.



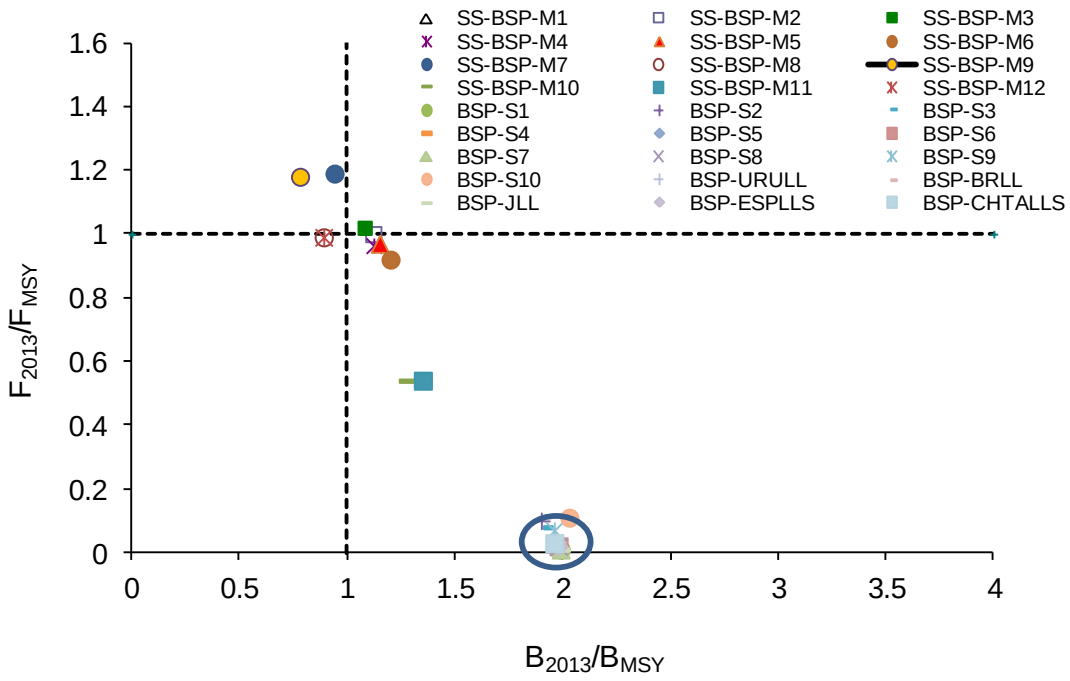
SHK-Figure 5. Indices of abundance for South Atlantic shortfin mako shark used in the 2017 stock assessment.



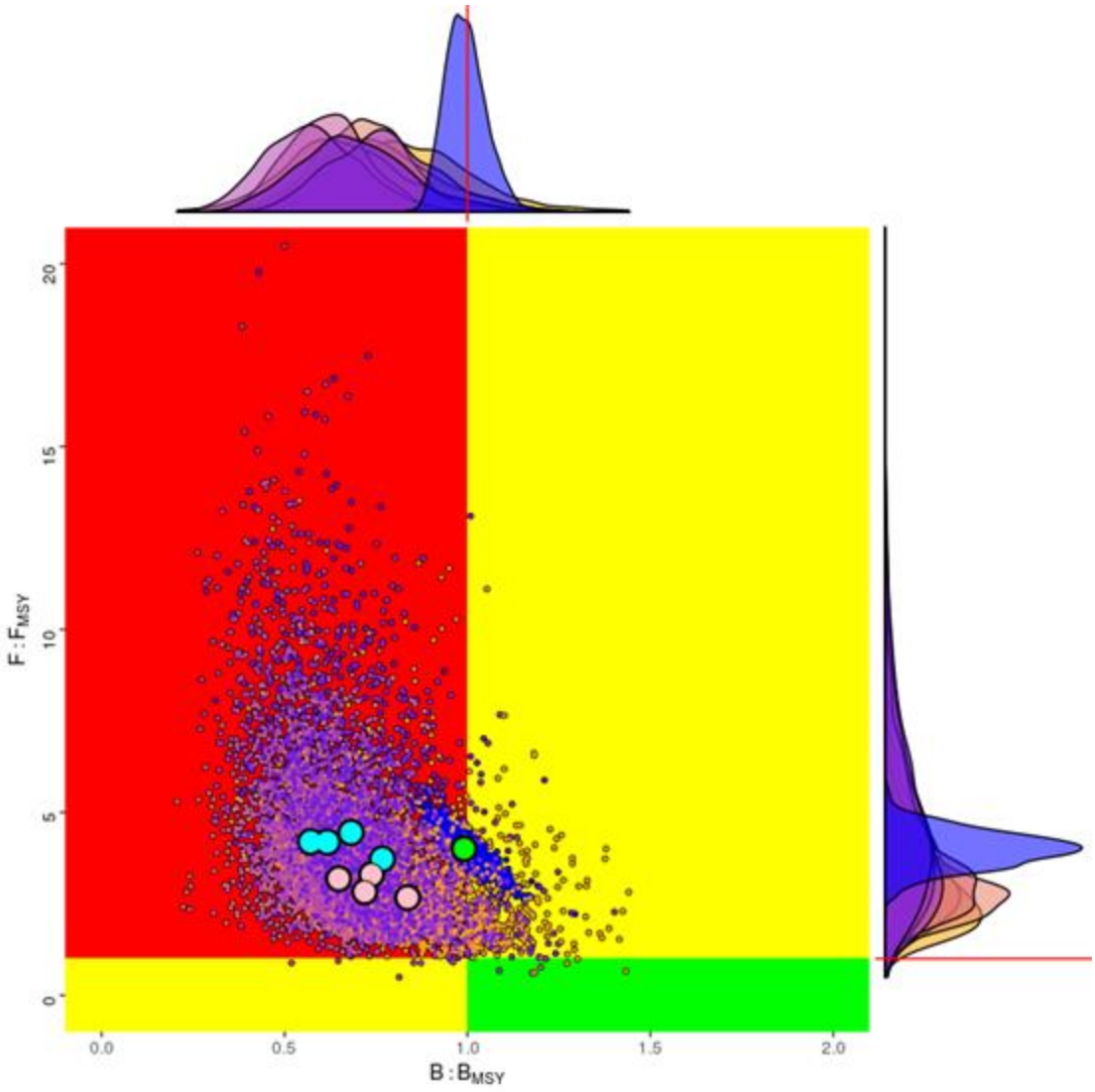
SHK-Figure 6. CPUE series for the porbeagle used in the last (2009) assessment NW stock (upper figures), NE stock (lower left figures) and SW stock (lower right figure).



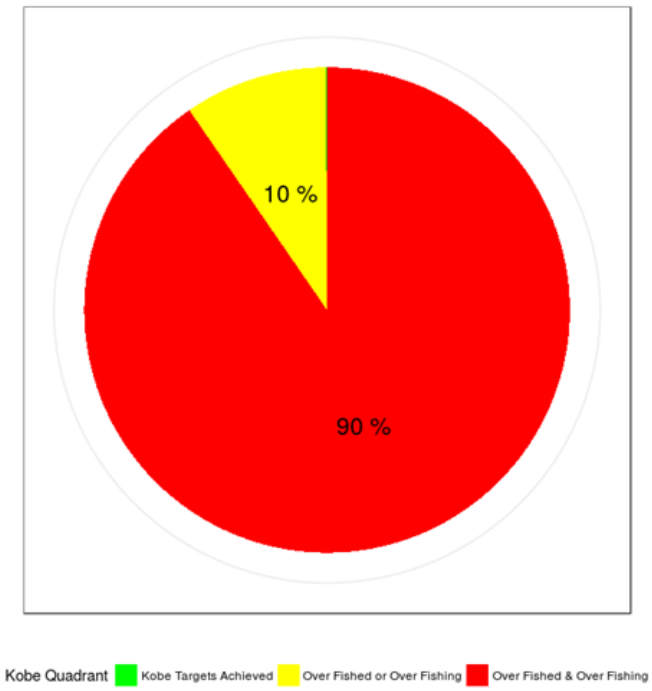
SHK-Figure 7. Phase plots summarizing scenario outputs for the current (for 2013) stock status of North Atlantic blue shark (BSH). BSP=Bayesian surplus production model; SS3=Stock synthesis model. The circle denotes common status for several BSP runs. Note that the x-axis values for SS3 are SSF_{2013}/SSF_{MSY}.



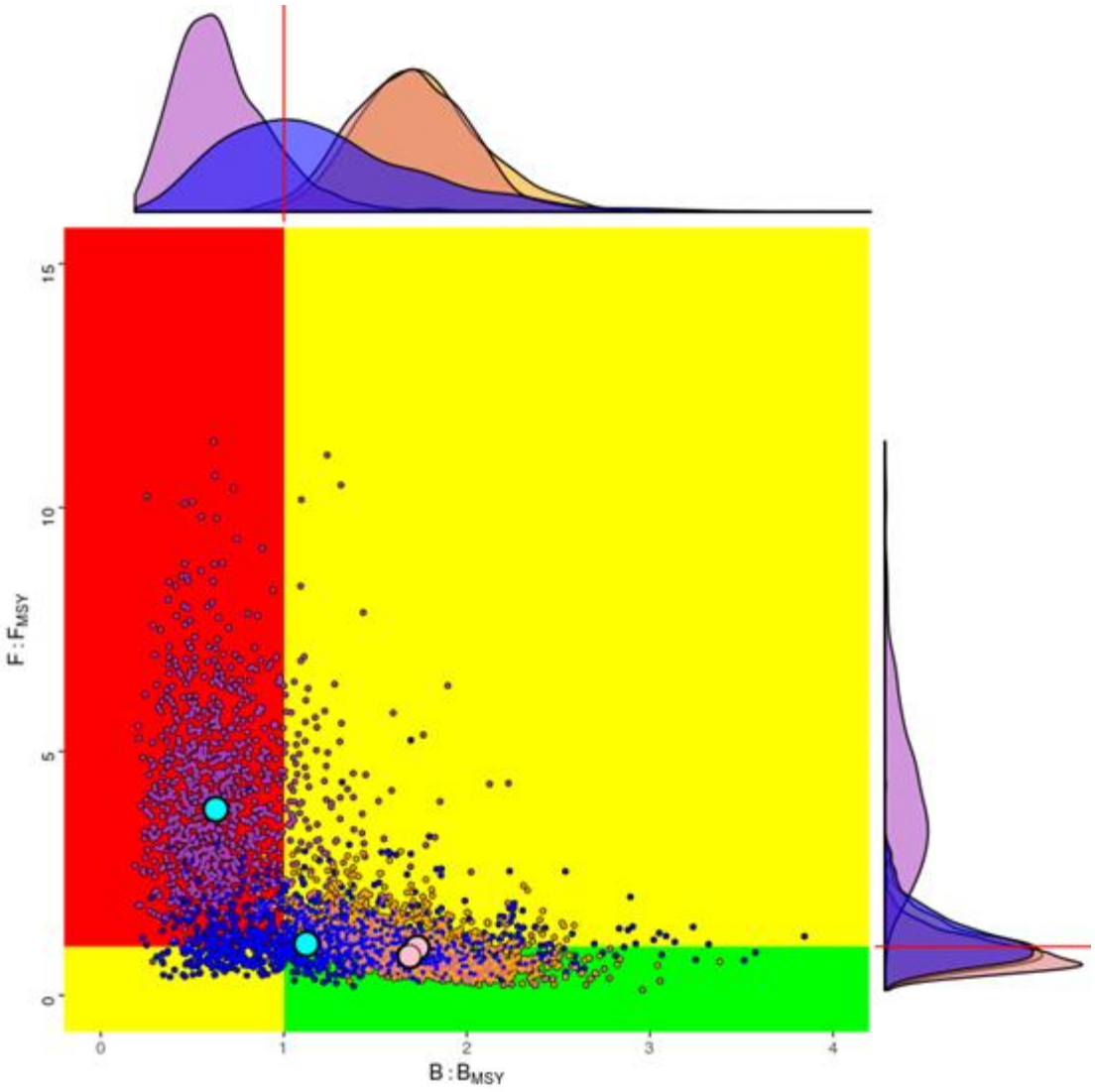
SHK-Figure 8. Phase plots summarizing scenario outputs for the current (for 2013) stock status of South Atlantic blue shark (BSH). BSP=Bayesian surplus production model; SS-BSP=State-space Bayesian surplus production model. The circle denotes common status for several BSP runs.



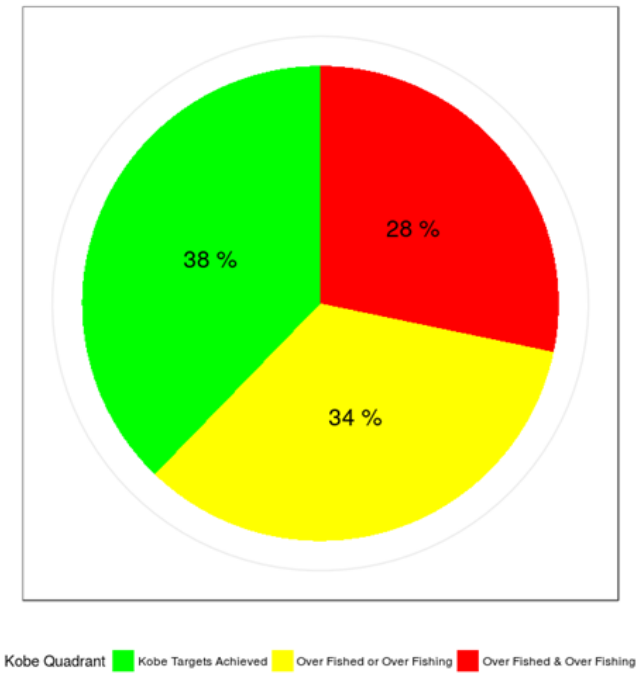
SHK-Figure 9. Stock status (2015) of North Atlantic shortfin makos based on Bayesian production models (4 BSP2JAGS and 4 JABBA runs) and 1 length-based, age-structured model (SS3). The clouds of points are the bootstrap estimates for all model runs showing uncertainty around the median point estimate for each of nine model formulations (BSP2JAGS: solid pink circles; JABBA: solid cyan circles; SS3: solid green circle). The marginal density plots shown are the frequency distributions of the bootstrap estimates for each model with respect to relative biomass (top) and relative fishing mortality (right). The red lines are the benchmark levels (ratios equal to 1).



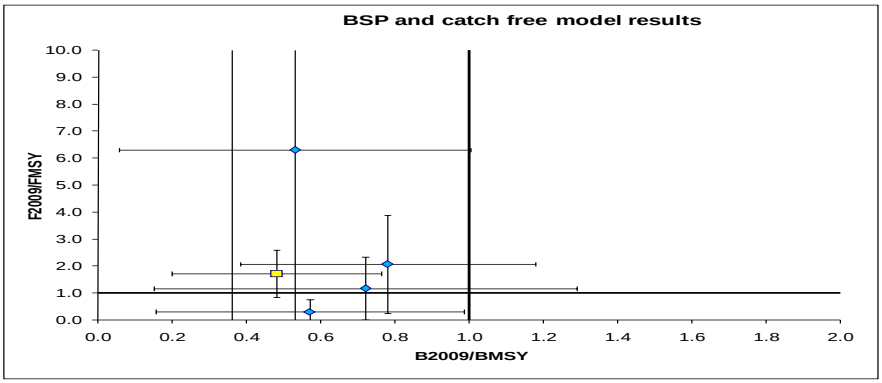
SHK-Figure 10. Kobe pie chart summarizing stock status (for 2015) for North Atlantic shortfin makos based on Bayesian production models (4 BSP2JAGS and 4 JABBA runs) and 1 length-based age-structured model (SS3). Probability of being in the green quadrant is less than 0.5%.



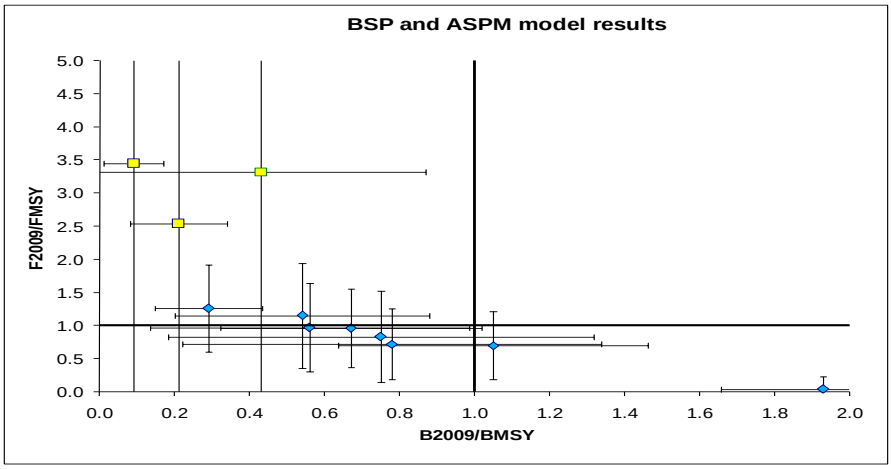
SHK-Figure 11. Stock status (2015) of South Atlantic shortfin makos based on a Bayesian production model (BSP2JAGS) and a catch-only model (CMSY). The clouds of points are the bootstrap estimates for all models combined showing uncertainty around the median point estimate for each of four model formulations (BSP2JAGS: solid pink circles; CMSY: solid cyan circles). The marginal density plots shown are the frequency distributions of the bootstrap estimates for each model with respect to relative biomass (top) and relative fishing mortality (right). The red lines are the benchmark levels (ratios equal to 1).



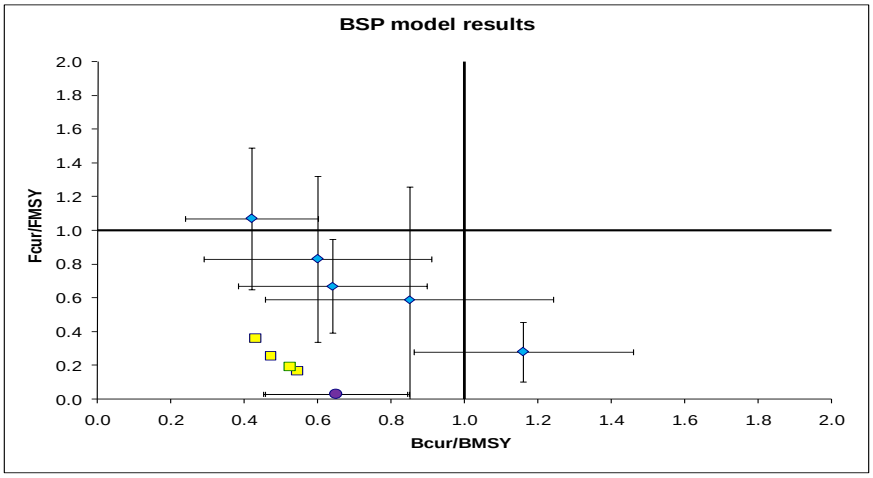
SHK-Figure 12. Kobe pie chart summarizing stock status (for 2015) for South Atlantic shortfin makos based on a Bayesian production model (2 BSP2JAGS runs) and a catch-only model (2 CMSY runs).



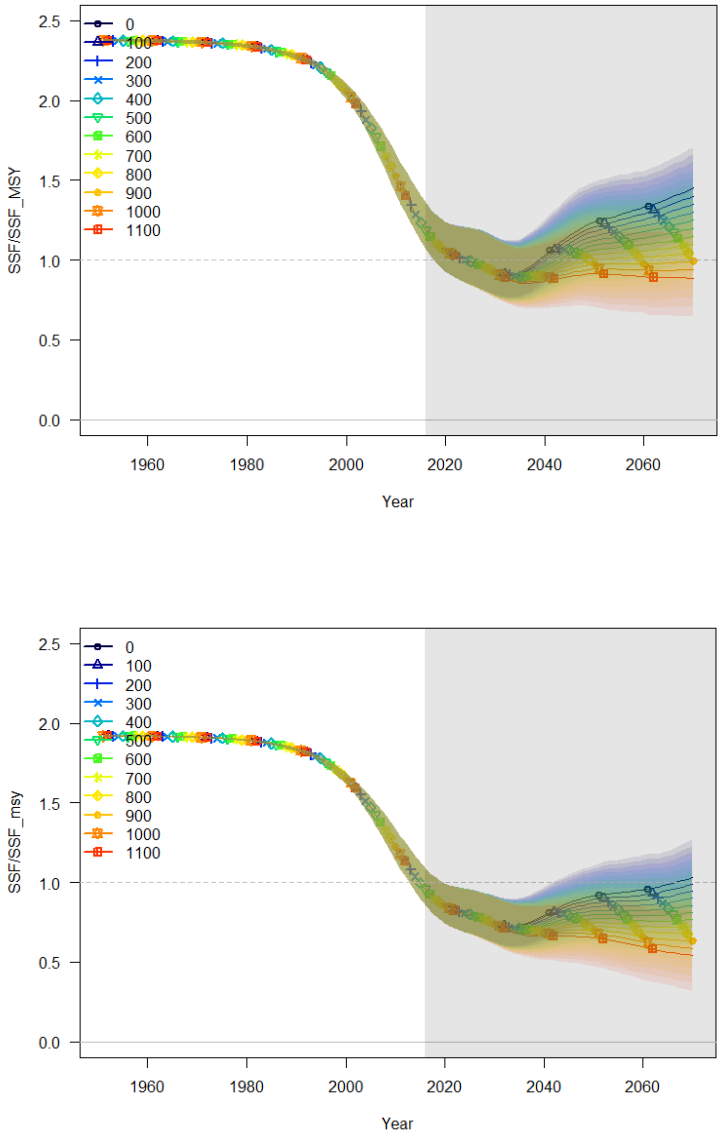
SHK-Figure 13. Phase plot for the southwest Atlantic porbeagle, showing status in 2009 from both the BSP model runs (diamonds) and the catch free age structured production model (square) results. Error bars are plus and minus one standard deviation.



SHK-Figure 14. Phase plot showing current status (for 2009) of northeast Atlantic porbeagle for the BSP model (diamonds) and the ASPM model (squares). Error bars are plus and minus one standard deviation.



SHK-Figure 15. Phase plot showing the northwest Atlantic porbeagle expected value of B/B_{MSY} and F/F_{MSY} in the current year, which is either 2005 (diamonds) or 2009 (circle), as well as approximate values from Campana *et al.* 2010 (squares). B/B_{MSY} was approximated from Campana *et al.* 2010 as N2009/N1961 times 2. Error bars are plus and minus one standard deviation.



SHK-Figure 16. Constant catch projections (0 – 1100 t) from Stock Synthesis model run 1 (top panel) and run 3 (bottom panel) for the North Atlantic shortfin mako (Anon. 2019). Solid lines are medians and shaded areas are 95% credible intervals.