Report of the ICCAT Shark Research and Data Collection Programme (SRDCP)
(Activity report for the period October 2023 - September 2024)

Background and programme objectives

During the 2014 Commission meeting, it was decided that an overall budget of €135,000 would be allocated to the Shark Research and Data Collection Programme (SRDCP). During the 2015 Blue Shark Data Preparatory Meeting (Tenerife, Spain, 23-27 March 2015) (ICCAT., 2016a), the Sharks Species Group (SSG) reviewed the proposal for implementation of the SRDCP that had been prepared in 2014 and identified national scientists who would be in charge of preparing proposals for receiving funds to carry out each of the research topics listed in the original proposal. During the 2015 Blue Shark Stock Assessment Meeting Oceanário de Lisboa, Lisbon, Portugal – 27-31 July 2015) (ICCAT., 2016b), and shortly thereafter, the following four project proposals covering different aspects of the life history, population structure, and fisheries of the shortfin mako were presented: a pan-Atlantic age and growth study; a population genetics study to investigate population structure and phylogeography; a post-release mortality study focusing on pelagic longline fisheries; and a satellite tagging study for determining movements and habitat use. For the first three years, the programme focused on these proposals and supported extensive collaborative work among national scientists with the aim of contributing information to the 2017 Shortfin Mako Stock Assessment Meeting (Madrid, Spain 12-16 June 2017) (ICCAT., 2018). Activities under the SRDCP have continued and been extended to include other sharks species such as porbeagle, silky shark, oceanic whitetip shark, longfin mako and hammerheads.

2024 activities

The following are the cumulative SRDCP activities conducted up to 2024:

Age and growth of shortfin mako in the Atlantic Ocean

The project leaders for this study are Dr Rui Coelho, Ms. Daniela Rosa and Ms. Catarina Santos, national scientists from EU-Portugal, with participation of scientists, and samples, from Brazil, EU-Portugal, Japan, Namibia, United States and Uruguay. There are still uncertainties about the age and growth parameters of shortfin mako and this project aims to update the available estimates by ageing specimens from both stocks in the Atlantic. To that end, a first step was to create an inventory of existing vertebral samples available at each national laboratory and carrying out additional sampling. Vertebrae samples were processed, and digital images uploaded to an ICCAT online repository.

A first age and growth workshop was organized in June 2016 by National Oceanic and Atmospheric Administration (NOAA)-NEFSC (Narragansett Laboratory), with the participation of the involved scientists, and an initial reference set for ageing samples was established (Coelho *et al.*, 2017). One biologist from each age-reading institution (EU-Portugal, United States and Uruguay) read and estimated the ages from all the samples, based on the agreed ages from the reference set, and growth models were developed based on those readings. For the North Atlantic, data from 375 specimens, ranging in size from 57 to 366 cm fork length (FL) for females and 52 to 279 cm FL for males, have been analysed. This initial work was completed in 2017 and presented in several SCRS papers (Rosa *et al.*, 2017). The growth models presented in Rosa *et al.* (2017) for the North Atlantic were used in the 2017 Shortfin Mako Stock Assessment Meeting (ICCAT., 2018). For the South Atlantic, data from 332 specimens, ranging in size from 90 to 330 cm FL for females and 81 to 250 cm FL for males were available at the time and have been analysed (Rosa *et al.*, 2018). Given the poorly estimated parameters, at the time the Group did not recommend the use of the growth curves for the South Atlantic stock, and it was noted that more samples were still required to develop more credible growth curves, particularly with specimens from the southeast region.

Since then, additional samples from Brazil, Japan and Namibia have been made available, totaling 883 vertebrae samples that are now available to the SRDCP for the South Atlantic Shortfin Mako stock. Due to the COVID-19 pandemic, laboratory work was much delayed during 2020 but resumed with some restrictions in 2021. Sample processing was completed, and all vertebrae have been digitally photographed and uploaded into an age reading platform. The age readings and analysis have been taking place since then.

The lack of samples from the extremes of the size distributions, most notably from large shortfin mako, has been resulting in some convergence issues in the estimation of growth curves or biologically unreasonable estimated parameters. Approaches to overcome the lack of samples from small and/or large size specimens are being explored through growth modeling once the age readings are complete (e.g., Bayesian models). During the 2024 September meeting, results obtained, and preliminary growth curves were presented, which included the use of alternative growth modelling, such as Bayesian approaches (Marquez *et al.,* 2024), which represent a great improvement. Further work and analysis are being made and updated results will be presented during the Shortfin mako shark Data Preparatory meeting schedule for 2025.

Age and growth other shark species in the Atlantic Ocean

During the 2023 Workshop on the Shark Research and Data Collection Programme (SRDCP) (hybrid, Madrid, Spain, 13-15 July 2023) (ICCAT, 2023), the Sharks Species Group agreed that, as the shortfin mako age and growth study was about to be finalized, it would be important to start working on the age and growth of some of the other priority species. Therefore, in 2024, the age and growth work for other species started. The first step was to undertake a compilation of vertebrae samples that are currently available at each laboratory for each species, that will help establish priorities for the upcoming years, keeping in mind that collection of new samples is now more complicated due to the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES) listings. Six CPCs completed the spreadsheet that was circulated and made available for participants to fill in with the available samples. The species included were: blue shark, oceanic whitetip, smooth hammerhead, bigeye thresher, silky shark, porbeagle, crocodile shark, and longfin mako. The results obtained, number of samples, area coverage, and size distribution, were presented during the September Species Group meeting. Based on these results, it was decided that priority would be given to the following three species: longfin mako (*Isurus paucus*), oceanic whitetip (*Carcharhinus longimanus*) and silky shark (*Carcharhinus falciformis*). In 2025, the objectives would include finalizing the compilation of the status of vertebrae processing from the various laboratories and continue processing and digitally imaging for species that have been selected and prioritized by the Group.

Genetic analysis of porbeagle in the Atlantic Ocean

The genetic population structure component of the SRDCP started in 2015, focused on shortfin mako (see previous reports for details). This study component is led by national scientist from Japan, Mr. Kotaro Yokawa at the beginning, and by Dr Yasuko Semba since 2017. The genetic analysis of population structure of porbeagle started in 2022.

During the Shark Species Group Meeting (hybrid/*Madrid, Spain, 20-21 September 2022*) a perspective of the genetic population structure of porbeagle was presented, based on muscle tissue samples collected from northwestern, northeastern, and southeastern Atlantic (Merino *et al.,* 2022). Advances of this study (Semba et Takeshima, 2023) were presented during the SRDCP Workshop (ICCAT, 2023) and during the Sharks Species Group (Takeshima *et al.,* 2023). Results of the analysis were based on the nuclear-genome-wide single nucleotide polymorphism (SNP) genotyping on 96 Atlantic porbeagle. A total of 1,427 loci and 95 individuals were retained as the final data sets of the nuclear genome genotype after various filtering process. The result of Principal Component Analysis (PCA) plots and individual-based clustering using nuclear genome genotyping data sets were well consistent, in that two distinct genetic groups of porbeagle, North and South porbeagle, exists in the Atlantic Ocean. In 2024, the coverage of sampling localities analysed and resolution of analysis was greatly improved, including samples from southwestern Atlantic, South Indian Ocean and South Pacific Ocean with application of draft reference genome of porbeagle. The results of genetic analyses based on data sets from mitogenomics and nuclear genome genotypes clearly demonstrated the existence of two distinct genetic groups – one in the North Atlantic and another in the Southern Hemisphere - these are two sibling species. The results from both genome analyses also strongly support no genetic differentiation between samples collected from the northeast and the northwest Atlantic Oceans as well as among samples collected from oceans in the Southern Hemisphere. The next steps will include the incorporation to the analysis of new samples to fill gaps in important geographical areas (e.g., the Mediterranean Sea in the North Atlantic Ocean and the southeastern Pacific Ocean) and focus on the transoceanic migration between SE Atlantic and SW Indian Ocean based on existing samples. These two points will improve our understanding of the nature of this species. by which it could lead us to the understanding of the connectivity of this species among areas of high interest (e.g., migrations between the southeastern and southwestern Atlantic, southeastern Atlantic and southwestern Indian Ocean).

Post-release mortality of shortfin mako in the Atlantic Ocean

The project leader for this study is Dr Andrés Domingo, a national scientist from Uruguay. The main purpose of this project is to quantify the post-release mortality of Atlantic shortfin makos on pelagic longlines to potentially contribute to their assessment and management. These data were non-existent when the project started. Survivorship Popup Satellite Archival Transmitting Tags (sPATs) were acquired and distributed to the participating laboratories for deployment in three main areas of the Atlantic: the Northwest Atlantic, the tropical Northeast Atlantic and equatorial region, and the Southwest Atlantic. A total of 14 sPATs have been deployed thus far by scientific observers from IPMA (EU-Portugal), Dirección Nacional de Recursos Acuático (DINARA (Uruguay), NOAA (USA), Brazil and EU-Spain, and additional information from 29 miniPATs was also available to estimate post-release mortality. Of the 35 specimens with available information, eight died (22.9%), whereas the remaining 27 survived (77.1%) for at least the first 30 days after tagging. The updated results from this project were reported and published in Miller *et al.* (2020). Tag deployment has continued and deployment of remaining miniPATs will be done during the second semester of 2023 and throughout 2024, depending on the opportunities. Status and advances of this study (Semba and Takeshima, 2023)were presented during the 2023 SRDCP Workshop (ICCAT, 2023). The results obtained so far will be updated for the upcoming shortfin mako 2025 stock assessment. Information from the latest tags deployed will be included, as well as information from other national tagging programmes that will be shared with the SRDCP.

Movements, stock boundaries and habitat use of shortfin mako in the Atlantic Ocean

The project leaders for this study are Dr Rui Coelho and Ms Catarina Santos, national scientists from EU-Portugal. The main purpose of this study is to use satellite telemetry to gather and provide information on stock boundaries, movement patterns and habitat use of shortfin mako in the Atlantic Ocean, to potentially contribute to their assessment and management. All Phase 1 (2015-2016) and Phase 2 (2016-2017) tags have been deployed (36 tags: 22 miniPATs and 14 sPATs). Regarding Phase 3 (2017-2018), of the 13 tags assigned to shortfin mako (out of 21 acquired tags, see **Table 1** below), 5 were deployed in the Atlantic Ocean and 8 were planned for deployment in the Indian Ocean (7 tags were already deployed) in order to assess inter-ocean movements of shortfin mako. Of the 20 tags acquired during Phase 4 (2018-2019), five were assigned and have been deployed on shortfin mako. More recently, three more tags were deployed in the Indian Ocean (2021 and 2022), with those being tags from previous project phases.

The results of this project through the end of 2019 with regards to shortfin mako were recently published in Santos *et al.* (2021). Overall, a total of 53 tags (31 miniPATs,14 sPATs, and 8 additional miniPATs from other projects) were deployed by observers on vessels from Brazil, EU-Portugal, EU-Spain, Uruguay, and the United States in the temperate NE and NW, Equatorial and SW Atlantic. Data from 34 of the 53 tags/specimens were available for a total of 1,877 tracking days recorded. The movement analysis showed that sharks tagged in the Northwest and Central Atlantic moved away from tagging sites, showing low to no apparent residency patterns, whereas sharks tagged in the Northeast and Southwest Atlantic spent large periods of time near the Canary Archipelago and Northwest Africa, and over shelf and oceanic waters off southern Brazil and Uruguay, respectively. These areas showed evidence of site fidelity and were identified as possible key areas for shortfin mako. Shortfin mako spent most of their time in temperate waters (18–22°C) above 90 m; however, data indicated the depth range extended from the surface down to 979 m, in water temperatures ranging between 7.4 and 29.9°C. Vertical behaviour of sharks seemed to be influenced by oceanographic features, and ranged from marked diel vertical movements, characterized by shallower mean depths during the night, to yo-yo diving behaviour with no clear diel pattern observed. Additional tags have been deployed since the publication of the article (Santos *et al.,* 2021), as well as tags from other national programs, that will be analyzed in order to update the study.

In 2021 and 2022, three tags were deployed in the Indian Ocean. However, those tags were from the batches that had battery problems and were deployed before the communication from Wildlife Computers to return the tags. As such, those tags failed to transmit data. There is still one tag assigned to shortfin mako in the project for the SW Indian Ocean, that has been returned to Wildlife Computers and is currently being repaired/replaced. The SW Indian Ocean remains as one of the priorities in order to study the possible connectivity of the species and to determine possible trans-oceanic movements.

Reproduction of shortfin mako and porbeagle in the Atlantic Ocean

The point of contact for this study has been Dr Enric Cortés, a national scientist from the United States. In 2017, a two-day hands-on training session on determination of reproductive maturity of porbeagle sharks was held at the Narragansett Rhode Island, NOAA Fisheries NEFSC Laboratory, led by Dr Lisa Natanson. The goal of the training was to establish standardized dissecting and sampling practices among researchers for more consistent collection of life history data. In 2020, a workshop on reproductive and other life history aspects of porbeagle and other pelagic sharks in the Atlantic Ocean was held at the Instituto Português do Mar e da Atmosfera (IPMA), in Olhão, Portugal. An overview of shark reproduction studies of porbeagle in the Northwest Atlantic Ocean was provided. Median size at maturity for males and females using data from all years was updated to 173.1 and 216.3 cm FL, respectively. There is no new information on the timing of mating, gestation period or average number of pups. The reproductive cycle of at least some portion of the population is biennial or triennial based on the finding of a resting stage. Workshop recommendations included an increase in hormone analysis to determine maturity and pregnancy of pelagic sharks, and to combine size data from various fleets to obtain more robust estimates of size at maturity and the overall reproductive cycle of porbeagle. Funds were designated for these reproduction studies, but due to different reasons, some associated with the COVID-19 pandemic, it was not possible to conduct sampling. Although some of the 2020 funds designated for reproduction studies were extended for a 6-month period, there were no planned activities for 2021, and it was not possible to conduct the postponed activities of 2020 in 2021. In 2022 it was decided to reactivate activities of this component of the SRDCP. Given this, in late 2023 a new study on the reproductive biology of the North Atlantic shortfin makos begun, based in the quantification of reproductive hormones (testosterone and 17β-estradiol) concentrations from muscle tissue samples collected from stored vertebrae. This technique has been found to serve, as a non-lethal means, to collect critical reproductive data for elasmobranchs. Results presented during 2024 suggested, that like for other oophagous sharks, muscle tissue can be used to assess reproductive characteristics (i.e., maturity, reproductive status) and can provide critical information regarding important reproductive habitats for the North Atlantic shortfin mako. In males, muscle T concentrations are related to the combined influences of maturity and reproductive seasonality. This highlights the importance of considering reproductive seasonality relative to when samples were collected while predicting sexual maturity based on T concentrations. In females, muscle E2 concentrations were highly variable, with very low or even undetectable concentrations commonly observed in immature sharks. Due to the lack of samples across months and the status provided from morphological data, the adult female samples herein were determined to be from females at a resting stage. Overall, the hormonal trends observed in this study are consistent with the current understanding of the role of reproductive hormones during sexual maturation and reproductive stages in sharks. The largest limitation of this study was the lack of samples available from mature females (both gravid and non-gravid). Next steps in this study will aim to obtain samples from mature females, likely in late 2025, to fill this gap.

Movements, stock boundaries and habitat use of porbeagle in the Atlantic Ocean

The project leaders for this study are Dr Andrés Domingo and Dr Rui Coelho, national scientists from Uruguay and EU-Portugal. The main purpose of this study is to use satellite telemetry to gather and provide information on stock boundaries, movement patterns and habitat use of porbeagle in the Atlantic Ocean, to potentially contribute to their assessment and management. Since the beginning of the programme, a total of 13 miniPATs acquired for this project were distributed to scientists from EU-France, EU-Portugal, and Norway, to be deployed in the North Atlantic, and to scientists from Uruguay to be deployed in the South Atlantic. Relevant to this activity and that related to porbeagle, the Sharks Species Group was informed of other ongoing national programmes that can contribute data. Other programmes include that of Canada, the US/NOAA programme, and Norway. The results obtained with tagging with provide important information for the genetic study.

To date, a total of nine POR tags have been deployed by EU-France, EU-Portugal, and Norway. In the initial years of the project, in 2018/2019, five sharks were tagged in the Northeast Atlantic, namely three in the Bay of Biscay/Celtic Sea area and one in the central NE Atlantic. Of the specimens tagged in the Bay of Biscay, three tended to stay in the same general area and one travelled West after a 3-month residency period in the Bay of Biscay. The shark tagged in the central North Atlantic appeared to have died shortly after tagging. The remaining tags available for porbeagle at the time had battery issues and had to be returned to Wildlife Computers for tag replacement. Part of those have now been returned, and the programme resumed in later 2022 and 2023. In this more recent period, 4 tags have been deployed by Norway, with one of those showing a long migration (~5,000 km) of a porbeagle specimen from colder northern Atlantic waters in the summer to warmer waters of the NE Atlantic in winter.

Movements, stock boundaries and habitat use of silky, oceanic whitetip, longfin mako, hammerheads, bigeye thresher and blue sharks in the Atlantic Ocean

The project leaders for this study are Dr Andrés Domingo, Dr Rui Coelho, Ms. Catarina C. Santos, and Dr John Carlson, national scientists from Uruguay, EU-Portugal, and the United States. A 2018 review of satellite tags previously deployed on these species in the Atlantic revealed that only three silky sharks had been tagged off Cuba, and oceanic whitetip sharks were tagged only in the NW Atlantic, but almost nowhere else in the Atlantic. These sharks are considered priority species, as they have been ranked with high vulnerability in the ICCAT shark Ecological Risk Assessments (ERAs) (Cortés *et al.*, 2010 and Cortés *et al.*, 2015), and retention of some are currently prohibited in ICCAT fisheries (i.e. *Recommendation by ICCAT on the conservation of oceanic whitetip shark caught in association with fisheries in the ICCAT Convention area* (Rec. 10-07), *Recommendation by ICCAT on hammerhead sharks (family sphyrnidae) caught in association with fisheries managed by ICCAT* (Rec. 10-08), *Recommendation by ICCAT on the conservation of silky sharks caught in association with ICCAT fisheries* (Rec. 11-08)). The SCRS decided that of 17 satellite tags that were acquired in 2019 for the SRDCP, 9 should be deployed on oceanic whitetip and hammerhead sharks and 8 on silky sharks. A total of 5 silky sharks, 3 oceanic whitetips and 1 scalloped hammerhead were tagged with miniPATs in 2018 and 2019, by EU-Portugal, Uruguayan and U.S. scientists/ scientific observers (in collaboration with the Cape Eleuthera Institute, and Florida State University) in the U.S. Gulf of Mexico, Caribbean Sea, and Atlantic Ocean. These tags were acquired in previous years (2017-2018) but were only deployed during late 2018 and 2019. With respect to tags acquired in 2019, a total 2 silky sharks and 3 oceanic whitetips were tagged by EU-Portugal scientific observers in the Equatorial region of the Atlantic Ocean. In addition, 1 smooth hammerhead was tagged by the Uruguayan team in the Southwest Atlantic Ocean. Due to battery issues with Wildlife Computer tags, a total of 11 tags had to be returned for replacement in early 2020. During 2021 and 2022, 6 tags were deployed on silky sharks in the U.S. Gulf of Mexico and 2 on oceanic whitetips in the equatorial region of the Atlantic Ocean. During 2023, three more silky shark tags have already been deployed so far in the NW Atlantic. From this species, which is currently being tagged, it is noted that the silky shark now has relatively good coverage in the Northwest Atlantic. The oceanic whitetip also had some relatively good tagging in the equatorial region, and hammerheads are being prioritized mostly in the SW Atlantic and tropical eastern Atlantic. It has been discussed that the species selected for this tagging activities are mostly bycatch and not commonly caught, and this represents a bigger challenge to achieve the proposed goal. So, the Group agreed that it would be helpful to conduct a dedicated ICCAT tagging campaign for these species. The first campaign was conducted in the second quarter of 2024 in the equatorial area, which resulted in the deployment of 15 PSAT tags, including 8 silky sharks, 3 bigeye threshers, 2 smooth hammerheads, 1 oceanic whitetip and 1 blue shark.

Other activities

The prospects of Close-Kin Mark-Recapture (CKMR) for shortfin mako sharks has been discussed as a robust way to assess abundance and productivity. At the beginning of these discussions, there was already a strong sampling programme in Brazil, and the capacity to do the necessary sampling in Namibia and South Africa from observer programmes, without the complications of high-seas CITES permits that seem to be an impediment to sampling in the North Atlantic. Based on the 2019 study design, those three programs could, within a few years, provide enough samples from a wide geographic area to assess the sustainability of current combined catches from the South Atlantic shortfin mako population. However, mainly due to the COVID-19 pandemic and the CITES issue, since early discussions in 2019, there has not been recent advances in the SRDCP regarding the CKMR studies. During the 2023 SRDCP Workshop (ICCAT, 2023), the discussion on the possibility of conducting this study was resumed. It was agreed by the participants that it is not possible to start this study until finding a way to overcome the CITES issues of shipping samples between countries, and thus accelerate the process.

Also, in 2021, external funding through NOAA Fisheries-Office of Protected Resources has been sought to determine genetic connectivity and absolute abundance through Close-Kin Mark Recapture for oceanic whitetip shark. Initially the project will focus on sequencing the genome of the oceanic whitetip using archived samples but will expand as more samples potentially become available through observer programs. A CITES Introduction from the Sea permit application has been submitted.

In 2023, the SRDCP Workshop (ICCAT, 2023) aimed reviewing the 10 years of the SRDCP, presenting and discussing the results obtained and the ongoing activities, and discussing the perspectives for the coming years. A historical view of the SRDCP was presented. The activities carried out were addressed: age and growth studies; genetics; movements and habitat utilization; post-release mortality; reproduction studies; improvement of available information for population assessment; other activities. Also, the difficulties faced by the programme and possible ways to overcome them were discussed. Future steps for the second phase of the program were also introduced and discussed, including new species that are part of the ICCAT agreement, advances in available information on pelagic sharks outside of the SRDCP, activities to be continued, new activities to be included.

Regarding conventional tagging, ICCAT acquired in 2024 stainless steel dart tags. This change in the dart type of conventional tags to be used in sharks is based on a study by Mas *et al.,* (2022) presented to the Group that demonstrate the higher efficiency of this tags compared to the single barb tags commonly used for other species. New tags have already been distributed for some observer programs that have the opportunity to tag sharks.

Table 1. List of ICCAT tags deployed and to be deployed by species. (Notes: *: tags to be deployed that are identified with * are all combined in the line with "LMA/FAL/OCS/SMA/BSH/Hammerheads"; ** tags deployed in those species are listed as species-specific in the lines above; *** some of those tags are currently (as of January 2025) in Wildlife Computers for battery issues fixing and/or replacement).

Species	Deployed (n)	To be deployed (n)
SMA	52	(*)
POR	9	2
SPL	1	(*)
SPZ	6	(*)
OCS	10	(*)
FAL	33	(*)
BSH	7	
BTH	4	
LMA/FAL/OCS/SMA/BSH/Hammerheads	(**)	36
Total	**122**	**38 (***)**
Grand total	**140**	

2025 Plan and activities

Age and growth of pelagic sharks the Atlantic Ocean

With regards to the ongoing work for shortfin mako, the main objective for 2025 is to complete the age and growth analysis of the south Atlantic stock and present it during the Data Preparatory meeting. All samples have been processed, and the age readings were conducted during 2023 and 2024. Results were presented during the September meeting in 2024, where the Group made comments and suggestions to the authors, who will update and improve the document.

In 2024, the SRDCP started an age and growth work for other species. The first step was to undertake a compilation of vertebrae samples that are currently available at each laboratory for each species, that will help establish priorities for the upcoming years. Based on the results presented, it was decided that priority would be given to the following three species: longfin mako (*Isurus paucus*), oceanic whitetip (*Carcharhinus longimanus*) and silky shark (*Carcharhinus falciformis*). In 2025, the objectives would include finalising the compilation of the status of vertebrae processing from the various laboratories, and continue processing and digitally imaging the species that have been selected and prioritized by the SCRS Sharks Species Group.

It is worth noting that the collection of new samples is now much more complicated due to CITES listings, albeit all efforts being made by ICCAT, namely raising this issue at CITES meetings

Genetic analysis of porbeagle in the Atlantic Ocean

During 2025, further analysis of mitochondrial genomics, with additional samples from southeastern Atlantic and southwestern Indian, will be conducted. Incorporation of additional samples from the missing important areas (e.g., the Mediterranean Sea in the North Atlantic Ocean and the southeastern Pacific Ocean) will be planned.

Post-release mortality of shortfin mako in the Atlantic Ocean/movements, stock boundaries and habitat use of shortfin mako in the Atlantic Ocean

With regards to the post-release mortality, the final analyses of that project will be prepared during 2024 and 2025 and will include additional tags deployed by South Africa in the Southwest Indian Ocean (Réunion, France) as part of the SRDCP, and also tags from other national tagging programs that will be shared with the SRDCP.

As for additional tagging, following the 2023 SRDCP Workshop (ICCAT, 2023), it was decided to re-open the effort for tagging shortfin mako, with prioritization on knowledge gaps for the species. The main areas of interest for future tagging are the SW and SE Atlantic, as well as in more oceanic areas that have not yet been fully covered in the past. Another priority is to tag large adult females, noting that to date this has not been possible. The vast majority of the shortfin mako females captured in pelagic longlines are juveniles and this lack of knowledge on the large females distribution is a current caveat in terms of knowledge, that fits under the Commission requests in the *Recommendation by ICCAT on the conservation of North Atlantic stock of shortfin mako caught in association with ICCAT fisheries* (Rec. 21-09) and the *Recommendation by ICCAT on the conservation of the South Atlantic stock of shortfin mako caught in association with ICCAT fisheries* (Rec. 22-11). The plan for 2025 with regards to shortfin mako tagging is to put some effort in those tagging priorities.

Movements and habitat use of porbeagle in the Atlantic Ocean

In 2025, after the replacement of tags with battery problems, we plan to continue with the deployment of the available miniPATs on this species. The deployments are planned by scientists from the United States and Norway in the North Atlantic.

Movements, stock boundaries and habitat use, and post-release survivorship of silky, oceanic whitetip, longfin mako, hammerheads, bigeye thresher and blue sharks in the Atlantic Ocean

There are currently 46 tags that are assigned to those species, namely silky, oceanic whitetip, longfin mako, hammerheads, bigeye thresher and blue shark. Those are expected to continue being deployed later in 2024 and during 2025 in various regions of the Atlantic and depending on the priorities and tagging opportunities. Given the success of the tagging campaign conducted in 2024, the Group requested funds to conduct a new tagging campaigns in 2025, prioritizing these species, and the following areas: Equatorial and tropical Atlantic; West African coast; Southwest Atlantic. Additional dedicated shark tagging campaigns are, therefore, planned for 2025, while opportunistic e-tagging will also continue, depending on the tagging opportunities within the national observer programmes and other national tagging programmes.

With regards to silky shark, the current coverage in the NW Atlantic is now good, so future efforts are being prioritized in other regions, especially the eastern Atlantic. With regards to hammerheads, the two current priority areas are the SW Atlantic and central eastern Atlantic. The species oceanic whitetip shark (*Carcharhinus longimanus*) (OCS) and bigeye thresher (*Alopias superciliosus*) (BTH) are being tagged opportunistically. With regards to blue shark, the addition of this species to the list was decided at the 2023 SRDCP Workshop (ICCAT, 2023), giving prioritization to knowledge gaps for the species, namely tagging large and possibly pregnant females across the Atlantic, tagging in the NW Atlantic and Mediterranean with the objective of determining possible links between those stocks, and tagging in the area around South Africa along the ICCAT/Indian Ocean Tuna Commission (IOTC) boundary, also to improve knowledge in terms of stock structure.

Reproduction of shortfin mako in the Atlantic Ocean

During the 2022 Intersessional Meeting of the Sharks Species Group (online, 16-18 May 2022) (ICCAT, 2022) the opportunity to resume studies related to the reproductive biology of the shortfin mako in the North Atlantic were discussed. The studies will be focused on hormone analysis to determine maturity and reproductive state of the species. The SRDCP already has some experience with this analysis as previous studies have been carried out for porbeagle in the North Atlantic. Unfortunately, this study had to be paused due to the COVID-19 pandemic and the impossibility of sampling. Hormones concentration study for the North Atlantic shortfin mako started in late 2023. The study will continue in 2025, aiming to increase the number of samples and to obtain samples from mature females.

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