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Proceedings of the Zonal Peer Review Pre-COSEWIC Assessment for Shortfin Mako (*Isurus oxyrinchus*) in Atlantic Canada

September 16, 2015
Dartmouth, Nova Scotia

Chairperson: Christie Whelan
Editor: Kristian Curran

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Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

Shortin Mako (*Isurus oxyrinchus*) was designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Threatened in Atlantic Canada in April 2006. COSEWIC has begun the 10-year review of classification for Shortfin Mako, as required pursuant to section 24 of the *Species at Risk Act* (SARA). A Shortfin Mako (Atlantic) pre-COSEWIC science review meeting was held September 16, 2015, at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia. The overall objectives of the meeting was to peer-review existing Fisheries and Oceans Canada information that may be relevant to the COSEWIC status review for Shortfin Mako, consider data related to the status and trends of, and threats to, the species inside and outside of Atlantic Canadian waters, and evaluate strengths and limitations of the information. Meeting participants felt the Working Paper discussed at the meeting presented sound scientific analyses based on the best available information on Shortfin Mako, and is acceptable for publication as a Research Document pending revision following discussions of the meeting. This Proceeding constitutes a record of meeting discussions.

Compte rendu de l'examen zonal par les pairs de l'examen pré-COSEPAC du requin-taupe bleu (*Isurus oxyrinchus*) au Canada

SOMMAIRE

En avril 2006, le requin-taupe bleu (*Isurus oxyrinchus*) a été désigné comme étant une espèce menacée au Canada atlantique par le Comité sur la situation des espèces en péril au Canada (COSEPAC). Le COSEPAC a entamé l'examen décennal de la classification du requin-taupe bleu, comme l'exige l'article 24 de la *Loi sur les espèces en péril* (LEP). Une réunion d'examen scientifique pré-COSEPAC du requin-taupe bleu (Atlantique) a été tenue le 16 septembre 2015 à l'Institut océanographique de Bedford, à Dartmouth, en Nouvelle-Écosse. Les objectifs globaux de la réunion consistaient à permettre à des pairs d'évaluer l'information existante de Pêches et Océans Canada pouvant servir à l'examen du statut du requin-taupe bleu établi par le COSEPAC et à évaluer les données sur la situation de l'espèce, les tendances observées et les menaces qui pèsent sur elle, tant dans les eaux du Canada atlantique que dans les eaux étrangères, ainsi que les points forts et les limites de cette information. Les participants à la réunion étaient d'avis que le document de travail abordé lors de la réunion présentait des analyses scientifiques éclairées basées sur la meilleure information disponible sur le requin-taupe bleu, et est acceptable pour la publication en tant que document de recherche en attendant la révision à la suite des discussions de la réunion. Ce compte rendu constitue un enregistrement des discussions de la réunion.

INTRODUCTION

Shortfin Mako (*Isurus oxyrinchus*) is one of two shark species in the genus *Isurus* and one of five species in the family Lamnidae or mackerel sharks (see: Campana et al. 2006; DFO 2006). They are known to migrate over long distances throughout the North Atlantic. In Atlantic Canadian waters, Shortfin Mako is typically associated with warm waters such as those of the Gulf Stream. They have been documented on Georges and Browns banks, along the continental shelf of Nova Scotia, and the Grand Banks of Newfoundland. There are only limited observations of Shortfin Mako in the Gulf of St. Lawrence.

Implementation of the federal *Species at Risk Act* (SARA), proclaimed in June 2003, commences with an assessment of a species' risk of extinction by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC is a non-government scientific advisory body that has been established under Section 14(1) of SARA to perform species assessments, which provide the scientific foundation for listing species pursuant to the *Act*. An assessment initiates the regulatory process whereby the competent Minister must decide whether to accept COSEWIC's assessment and add a species to Schedule 1 of SARA. This would result in legal protection for the species under the *Act*. If the species is already on Schedule 1 of SARA, the Minister may decide to keep the species on the list, reclassify it as per the COSEWIC assessment, or remove it from the list (Section 27 of SARA). Fisheries and Oceans Canada (DFO), as a generator and archivist of information on marine species and some freshwater species, is to provide COSEWIC with the best information available to ensure an accurate assessment of a species status is undertaken. Shortfin Mako in Atlantic Canada was assessed by COSEWIC as Threatened in April 2006. COSEWIC has begun the 10 year review of classification for Shortfin Mako, required pursuant to section 24 of the SARA.

A Shortfin Mako (Atlantic) pre-COSEWIC science peer-review meeting was held September 16, 2015, at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia (the meeting concluded in one day). The meeting Chairperson, Ms. Christie Whelan, introduced herself followed by an introduction of meeting participants (Appendix 1). The Chair thanked meeting participants for attending the DFO science advisory process. The Chair noted this was a science peer-review meeting in which no science advisory report would be completed. The overall objectives of the meeting was to peer-review existing DFO information that may be relevant to the anticipated COSEWIC status review for Shortfin Mako in Atlantic Canadian waters, to consider data related to the status and trends of and threats to this species inside and outside of Canadian waters, and evaluate the strengths and limitations of the information. The Chair provided a brief overview of the COSEWIC assessment process, including the role of the DFO Canadian Science Advisory Secretariat (CSAS) science advisory process in context of the assessment process, as outlined in the meeting Terms of Reference (Appendix 2). A formal agenda was not used to structure the meeting. To guide discussion, a Working Paper was provided to meeting participants on September 9, 2015, in advance of the meeting. This Proceeding constitutes a record of the meeting discussions.

PRESENTATION AND DISCUSSION

Presenter: Mark Showell
Rapporteur: Kristian Curran

INTRODUCTION

The science lead explained the context of the meeting and briefly outlined his intent to use the Working Paper to structure the presentation and discussion, with a focus on those sections

of the paper that have new or emerging results or that present calculations. It was noted that new information does exist since the last COSEWIC assessment of Shortfin Mako in 2006, although a challenge remains in obtaining good indices for such a widespread population that does not have a dedicated research survey of stock status. General comments on the Working Paper included: 1) describe abbreviations and acronyms; 2) re-organize consistent with the meeting Terms of Reference; 3) include a summary of knowledge under each Terms of Reference where possible, so the reader is aware of what is included in the Working Paper and what is not; and 4) only report on what is known of Shortfin Mako in Atlantic Canadian waters (not more broadly beyond Atlantic Canadian waters).

LIFE HISTORY CHARACTERISTICS

Life history characteristics of Shortfin Mako were discussed. The science lead noted there has been little advancement in knowledge of the species life history characteristics since 2006, most of which is published in the literature (e.g., fecundity, ageing, maturity, generation time, etc.). It was further noted that advancements in ageing methodologies over the years (e.g., radio-nucleotide method) have led to more refined age estimates for the species, and that earlier methods may have over-estimated ages (as inferred from growth models). Given COSEWIC appeared to use a now outdated growth model in 2006 the science lead recommended an updated growth model be considered for use in the upcoming assessment of the species. In general, understanding of Shortfin Mako generation time has changed from 14 years to 27 years.

A meeting reviewer noted that the value for natural mortality of 0.15 appeared to be on the high end relative to what the literature suggests, and recommended this section of the Working Paper refer back to the literature to capture the range of natural mortality values published for the species; in addition, the Working Paper should describe what different natural mortality values may mean for generation time (i.e., a lower natural mortality will result in a lower generation time), as well as what geographic areas various natural mortality values represented. The reviewer then inquired if a latency period of 3-years affects the generation time estimate presented in the paper. The Chair noted that COSEWIC may report on a range of generation times that employ various methods used to estimate this life history characteristic. Another reviewer suggested statements in the Working Paper such as “matured at a later age” and “lived longer” be quantified where possible to provide context.

A meeting participant noted that gestation, as characterized in the Working Paper, should be revisited more closely to ensure it is correct. The Chair noted that a range of maturity values would likely be included in the COSEWIC report, with reference to values observed in other Shortfin Mako populations (e.g. Pacific population). In the 2006 COSEWIC assessment report for Shortfin Mako (Atlantic) only age of first reproduction was included, which was viewed as an absolute minimum for generation time.

DISTRIBUTION, AREA OF OCCUPANCY AND DESIGNATABLE UNIT (TAGGING STUDIES AND GENETICS)

Distribution, area of occupancy, and designatable unit (DU) were discussed. The science lead noted that Pop-up Satellite Archival Tags (PSAT) information is still being evaluated to determine movement patterns of tagged sharks. It was noted the DU for the species includes much of the North Atlantic, with Atlantic Canadian waters constituting approximately 2.5% of the broader DU area. The science lead noted that the calculation of area of occupancy in Atlantic Canadian waters excluded the Gulf of St. Lawrence, given there have been few observations of Shortfin Mako in this area. It was agreed by meeting participants that the Gulf of St. Lawrence be included in this calculation given it is included in the estimate of the broader DU area.

A reviewer recommended tagging studies presented in the Working Paper be better described, including incorporation of summary statistics for the studies where available (e.g., time at large for PSAT tags). Further, additional DFO data that is not yet available publicly should also be included where possible (e.g., PSAT movement results). Another reviewer inquired as to why some tagging information was not included in the Working Paper (e.g., International Commission for the Conservation of Atlantic Tunas (ICCAT) data), and the science lead clarified that given it is not DFO's data it is not within the scope of this review. However, this data is readily available to the COSEWIC author. A meeting participant inquired if industry has observed any shift in distribution and/or abundance of Shortfin Mako in Atlantic Canadian waters over the last several years, with anecdotal evidence suggesting that no change in distribution has been observed (including a perceived increase in abundance over this time period).

Participants supported the overall approach for estimating area of occupancy. However, a meeting participant did inquire as to how the area of occupancy estimate for Canadian waters would be applied, and the science lead responded that it would be used to demonstrate stock structure and movement of Shortfin Mako in Atlantic Canadian waters relative to the broader DU area. The COSEWIC author further clarified that the scope of his assessment is that portion of the North Atlantic Shortfin Mako population within Atlantic Canadian waters, although broader data sources (e.g., ICCAT) would be used to inform his assessment if necessary.

HABITAT

Shortfin Mako habitat in Atlantic Canadian waters was discussed. The science lead noted there is no evidence of specific habitat features that support specific life history stages (e.g., pupping or mating grounds) for Shortfin Mako in Atlantic Canadian waters, although it was noted the species may prefer areas associated with warmer waters of the Gulf Stream. In response, a reviewer asked if water temperature could be better delineated (i.e., quantified) in the Working Paper. It was agreed by meeting participants that the Working Paper should not conclude 'no important habitat' in Atlantic Canadian waters, rather the conclusion should be 'no known evidence of important habitat' exists in Atlantic Canadian waters – such a conclusion being consistent with the current state-of-knowledge of Shortfin Mako habitat in Atlantic Canadian waters.

LANDINGS

Shortfin Mako landings in Atlantic Canadian waters were discussed. The science lead emphasized that observed catch and landings are two different information sources that often demonstrate different patterns. The science lead presented a range of Shortfin Mako landings information from Canada, U.S., Japan, and ICCAT (to name a few). An important point made is that when comparing landings from different data sources, any reporting issues/inaccuracies within the various data sources must be kept in mind. The science lead subsequently reviewed DFO Maritimes Region landings information in more detail (e.g., by region and by fishery). In general, a declining trend in landings (by mass) in Canada has been observed since the mid-1990s to present. Observer coverage by location for various fisheries was also reviewed, which corresponded well with landings data by location. The science lead noted that observer coverage on Georges Bank is much higher than other areas in the DFO Maritimes Region; which may explain in part higher rates of Shortfin Mako being observed in this area. Landings information in the DFO Newfoundland and Labrador Region was then reviewed. There has been increased Shortfin Mako landings observed in Newfoundland waters in recent years, which could be due to improved reporting and/or re-opening of fisheries such as Atlantic Cod. A meeting participant noted that the Northwest Atlantic Fisheries Organization (NAFO) landings

data in the offshore of Newfoundland beyond Canada's exclusive economic zone appeared to be an order of magnitude larger than landings within Canadian waters of the DFO Newfoundland and Labrador Region, so it was suggested this data be compared to Porbeagle landings data for validation.

A reviewer recommended U.S. landings (2004 onward) presented in the Working Paper should also be verified for accuracy, as 2004, 2006, and 2013 data appeared incorrect. A meeting participant noted the U.S. does not have dockside monitoring; thus, these data are highly speculative. The second reviewer recommended verifying the Japanese and ICCAT landings data for comparability to Canadian data (it is unclear if these data sources are prorated or a conglomerate of Shortfin Mako and inclusive of other species of sharks and rays). The science lead noted there is limited confidence in the accuracy of ICCAT landings values. In contrast, a meeting participant indicated that other countries data can be validated against ICCAT data to see if it is accurate or not. Further, this meeting participant noted in recent years ICCAT has put measures in place to ensure countries more accurately report landings of sharks – which has encouraged countries to backfill their data gaps with ICCAT – and that a degree of confidence has been restored to ICCAT data over the past several years for such reasons.

The science lead clarified the longline landings for DFO Maritimes Region represented combined pelagic and groundfish longline fisheries. The combining of fishery landings was done for DFO Newfoundland and Labrador Region data as well (it was noted that no pelagic longline fishing occurs in the Gulf of St. Lawrence). On this point, a meeting participant noted that text describing the pelagic versus other longline fisheries (e.g., halibut, otter trawl, and gillnet) in the Working Paper is confusing, and that one approach to combine (or not) landings information should be used throughout the Working Paper for consistency. On this, a meeting participant disagreed with the combining of fisheries landings information, as various longline fisheries differ in regulations so should be delineated more clearly in the landings data presented in the Working Paper. As an example, the meeting participant indicated that landings allows one to see how evolving fishery management measures have influenced landings through time, but that when combined together across multiple fisheries it is difficult to interpret how progress in management within an individual fishery has affected Shortfin Mako landings associated with the individual fishery through time.

The COSEWIC author inquired if fishery effort data could be included in the Working Paper, as this would help contextualize the landings data. The science lead noted that the pelagic longline fishery effort has declined through time; particularly, following introduction of an Individual Transferable Quota where the number of active vessels has declined from approximately 70 to 30. The COSEWIC author noted it would be good to include this type of information for all applicable fisheries, but for pelagic longline in particular given these fisheries account for the majority of Shortfin Mako landings. A meeting participant also suggested the Working Paper better describe details surrounding variability in landings trends, although the science lead did not believe characterizing inter-annual variability in the text was warranted given it is demonstrated graphically in associated landings figures.

In general, meeting participants felt the table on landings presented in the Working Paper required better description, so readers know how to compare the various data sources (i.e., directly comparable or not). It was also agreed: 1) maps of landings are to include "proportional circles" to better characterize the magnitude of landings (keeping the scale the same between figures); 2) include a map of total set locations versus observer data/landings (or all observer locations that do not have Shortfin Mako reports) to demonstrate how catch relates to the overall fishery effort; 3) develop a consistent approach for presenting landings data between the DFO Maritimes and DFO Newfoundland and Labrador regions (Tables 1 and 2 to be verified for accuracy); 4) include observer coverage numbers by fishery and region; and 5)

include a summary of the evolving management measures to demonstrate how this may relate to changes in landings and observer data (e.g., what has driven changes in landings). Other more minor proposed revisions to this section of the Working Paper included: 1) make terms consistent where possible (e.g. discards and bycatch); 2) change Scotia-Fundy to DFO Maritimes to be consistent with how regions are presently described; 3) Table 2 has an "other" landings category that is not captured in corresponding figure (add a footnote to the figure or include "others" landings data in the figure); and 4) revise figure titles and captions so they accurately reflect the data being presented (e.g. landings versus catch locations, etc.).

DISCARDS

Shortfin Mako discards by fishery were discussed. The science lead reminded meeting participants that the previous discussion focused on landings and not discards. The science lead explained that discards can be estimated using observer coverage information, with the same methods to estimate discards having been previously applied to Blue Shark and Porbeagle. In general, the method of estimation looks at a ratio of discards to landings on observed trips and then prorates to all reported landings using a five-year smoothing function. It was noted that discard estimates of individual pelagic longline fishing fleets may differ from the grouped estimate presented in the Working Paper due to differences in target species and/or fishing practices – this point is to be noted in the Working Paper.

It was asked if non-targeted sets for pelagic longline were included in the analysis (e.g., harpoon), as it was explained by a meeting participant some vessels have three gear types they can use when fishing (logbooks do not capture this level of detail). The concern is that if you do not take differences in gear type into account, the analysis could result in higher landings, which may artificially increase discard levels during proration (i.e., landings associated with targeted gear such as harpoon, for which you have control over the bycatch, should be removed from the prorated calculation on discards). It was recommended the science lead tease out information on gear type by looking at other information in the logbooks such as number of hooks. The science lead indicated that this would be addressed if not accounted for already in the analysis. It was noted by the DFO Resource Manager (Maritimes) that a new logbook system is to be used next year, which is to document this type of information. It was emphasized by meeting participants that the methods, assumptions, uncertainties, gaps, and limitations of estimating discards be well-described in the Working Paper.

A meeting participant, Aurelie Godin of Dalhousie University (Halifax, NS), then presented information on modeled at-sea observer data used to predict Shortfin Mako discards. The presenter noted that such an approach allows one to estimate uncertainty around the discard estimates, further noting that data on discards that she presented were not prorated to landings. The analysis combined observer data on Shortfin Mako acquired from DFO Quebec, Gulf, Maritimes, and Newfoundland and Labrador regions' databases, with fishing fleets being stratified into fleet sectors. The analysis primarily looked at pelagic longline fisheries. A meeting participant inquired as to how variability in observer coverage is incorporated into the modeled output, and the presenter responded that an Bayesian analysis with temporal/spatial considerations was used (further noting this approach has some limitations). Another meeting participant noted that discard data for large pelagic fisheries presented for January to March appeared incorrect, as the fishery has had no trips over this time period since the late-1990s. The presenter noted this figure would be revisited in her analysis to ensure only data from the last five years has been incorporated. It was noted by the Chair that these presented results would be provided to the COSEWIC author through a separate submission, and will not be incorporated into the final DFO Research Document.

INCIDENTAL MORTALITY

Estimates of incidental mortality for the pelagic longline fishery was discussed, given the greater degree of interaction between Shortfin Mako and the fishery relative to other types of fisheries that encounter the species. Again, it was noted incidental mortality estimates of individual pelagic longline fishing fleets may differ from the grouped estimate presented in the Working Paper due differences in target species and/or fishing practices – this point is to be noted in the Working Paper.

The science lead reviewed the method used for estimating post-release mortality. The basis of the estimate was the status of 528 Shortfin Mako characterized by at-sea observers in logbooks from the pelagic longline fishery (described as “healthy”, “injured”, “dead”, and “unknown”). It was noted that a protocol exists to harmonize observer and scientific protocols in support of incidental mortality estimation, although this protocol is only applied to fisheries in the DFO Maritimes Region. The science lead further noted 26 Shortfin Mako were tagged to estimate post-release mortality. The overall estimate of post-release mortality of Shortfin Mako returned to the water alive was 49%. A meeting participant inquired if the estimate accounted for dead sharks twice (in landings and release of dead sharks to the water), and the science lead indicated it did not, although the estimates would be reviewed prior to finalization of results presented in the Working Paper.

Again, it was agreed by meeting participants that the methods, assumptions, uncertainties, gaps, and limitations of estimating incidental mortality be well-described in the Working Paper.

OVERVIEW OF FISHERY MANAGEMENT FOR SHARK

The DFO Resource Manager (Maritimes) provided a brief overview of large pelagics fisheries in the context of Shortfin Mako landings (e.g. overview of fleets and fishing practices, overview of management practices in place, and changes in licence conditions over the years that would account for changes in landings, discards, etc.). The manager noted that the practice of finning was prohibited in Canada in 1994, and that a 100 tonne retention cap of Shortfin Mako is in place for Atlantic Canadian fisheries. Meeting participants requested further clarification on the retention cap, including what it may mean for fisheries if it were ever achieved. The manager noted the retention cap has never been reached so, to date, there has been no significant consideration as to what it may mean for Atlantic Canadian fisheries if it were ever achieved.

There was a brief discussion regarding differences between J-hooks and Circle-hooks. A meeting participant with intimate knowledge of fishing gear described the differences, noting that industry adopted Circle-hooks in their code of conduct prior to the hooks becoming a licence condition. The Resource Manager then described the recreation, hook-and-release, and derby fisheries associated with Shortfin Mako, noting that these sources of mortality remain low relative to the overall contribution to mortality from the commercial fishery. Mortality associated with these non-commercial fisheries are reported to DFO. It was agreed by meeting participants that an overview of fishery management practices related to Shortfin Mako be included in the Working Paper, given it assists in contextualizing changes observed in various Shortfin Mako indices (e.g., landings and discards).

STATUS (CATCH RATE, SIZE DISTRIBUTION AND AVERAGE LENGTH)

Various characteristics of species status in Atlantic Canadian waters were discussed (e.g. catch rate, size distribution, and average length). The science lead noted that catch rate is an index of abundance used when limited information exists for a species (e.g., absence of a survey). The science lead further noted that catch rate was standardized by vessel, area, targeted species, and seasons. It was noted that standardized catch rate in Atlantic Canadian waters appeared to

have declined relative to previous years. As noted in Fowler and Campana (2009), there was no evidence of a trend in the standardized catch rate from 1996-2007, although in the analysis presented here there appeared to be a decrease in catch rate since 2008. Other analyses of catch rates were reviewed, although it was noted that some of these studies were based on U.S. Northeast logbook data (not Atlantic Canadian data). It was noted that for Atlantic Canadian logbook data, one cannot determine if a 'zero' entry means no Shortfin Mako were caught or simply not observed, so these records were removed from the analysis; a limitation. A reviewer recommended the Working Paper include a better description of the method used to estimate catch rate, as it is important to be clear how this was done. A meeting participant further noted that estimating catch rate has a lot of underlying assumptions that need to be considered when analyzing the data; further encouraging a need for better description of the method in the paper.

The science lead pointed out that when comparing various estimates of standardized catch rate differences in plotting by weight or number can suggest different patterns of actual catch rate. It was further noted the Canadian standardized catch rate only goes back to 1996, given this is when the data is considered to be consistent (the science lead explained that integrating estimates prior to 1996 brings in different data sources that are not directly comparable). A reviewer noted the analysis of standardized catch rate presented in the Working Paper appeared to be constrained by available data (limited non-zero reports), as well as low observer coverage, and that such limitations should be reported upon more clearly in the document (numerically where possible; for example, inclusion of the number of samples used). The COSEWIC author requested a trend line be added to the presented figure if possible.

Catch size distribution was discussed. The science lead presented catch size distribution data by decade, as estimated from observer data. These findings were not included in the Working Paper, but would be incorporated prior to finalization of the Research Document. The science lead pointed out that results from 1986-1995 were largely driven by catch data from the foreign Japanese fleet, although the Japanese fleet tended to fish farther offshore during this time period when compared to Canadian fleets. The COSEWIC author requested the catch size distributions for the Japanese and Canadian fleets be separated and reported upon in different figures, and the science lead indicated this would be done. In general, the size distributions indicated that mature females are rarely observed in Atlantic Canadian waters. However, a meeting participant noted that catch size distribution might be a function of gear type, and this should be considered when evaluating the data. Specifically, large sharks are known to bite off gear; thus are never caught. As such, larger mature females might be in Atlantic Canadian waters, but simply not observed in the catch due to the type of gear being used. It was agreed a description of changes in gear type would be included in the "fishery management" section of the Working Paper. In addition, it was noted other sources of fishery data (e.g. gillnet) could be used to inform presence of larger-sized Shortfin Mako in Atlantic Canadian waters. Last, it was noted the recreational and derby fisheries typically do not capture Shortfin Mako, and that two shark surveys (2007 and 2009) completed by DFO also did not encounter Shortfin Mako.

Average length of shark was reported upon in 2006 (see: DFO 2006). Exploratory analysis completed in advance of this meeting indicated that no new results regarding average length exist.

CONCLUSION

Meeting participants felt the Working Paper presented sound scientific analyses based on the best available information on Shortfin Mako, and is acceptable for publication as a Research Document, pending revision following discussions of the meeting. Sincere efforts were made in

the science peer review process to acknowledge and address all comments and concerns raised by meeting participants provided they were appropriate and within the confines of acceptable peer review practice.

REFERENCES CITED

Campana, S.E., J. Brazner, and L. Marks. 2006. Assessment of the Recovery Potential of Shortfin Mako Sharks in Atlantic Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2006/091.

DFO. 2006. Recovery Potential Assessment Report of Shortfin Mako Sharks in Atlantic Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/051.

Fowler, G.M., and S.E. Campana. 2009. Commercial By-catch Rates of Shortfin Mako (*Isurus oxyrinchus*) from Longline Fisheries in the Canadian Atlantic. Collect. Vol. Sci. Pap. ICCAT 64(5): 1668-1676.

APPENDICES

APPENDIX 1: LIST OF MEETING PARTICIPANTS

Name	Affiliation
Atkinson, Troy	NS Swordfishermen's Association
Clark, Kirsten	DFO Maritimes / Population Ecology Division
Corke, Jarrett	WWF-Canada, Atlantic Region
Curran, Kristian	DFO Maritimes / Canadian Science Advisory Secretariat
Deller, Sarah	DFO Maritimes / Species at Risk Management
Fowler, Mark	DFO Maritimes / Population Ecology Division
Godin, Aurelie	WWF-Canada, Atlantic Region / Dalhousie University
Grant, Heather	Ecology Action Centre (EAC)
Kulka, Dave	DFO Science Emeritus
MacIntosh, Robert	DFO Maritimes / Policy and Economics
McNeely, Joshua	Maritime Aboriginal Peoples Council (MAPC) - IKANAWTIKET
Paul, Martin	Atlantic Policy Congress (APC)
Perrier, Erika	Confederacy of Mainland Mi’kmaq (CMM)
Ratelle, Stephanie	DFO Maritimes / Population Ecology Division
Seward, Jessica	MAPC- MAARS
Showell, Mark	DFO Maritimes / Population Ecology Division
Simpson, Mark R.	DFO Newfoundland / Marine Fish Species at Risk
Spence, Koren	DFO Maritimes / Species at Risk Management
Sweet, Marilyn	DFO Maritimes / Resource Management
Themelis, Daphne	DFO Maritimes / Population Ecology Division
Wallace, Scott	David Suzuki Foundation
Whelan, Christie	DFO Headquarters / Canadian Science Advisory Secretariat

APPENDIX 2: MEETING TERMS OF REFERENCE

Pre-COSEWIC Assessment for Shortfin Mako

Zonal Peer Review Meeting – Maritimes and Newfoundland & Labrador Regions

September 16, 2015
Dartmouth, NS

Chairpersons: Christie Whelan

TERMS OF REFERENCE

Context

The implementation of the federal *Species at Risk Act* (SARA), proclaimed in June 2003, begins with an assessment of a species' risk of extinction by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC is a non-government scientific advisory body that has been established under Section 14(1) of SARA to perform species assessments, which provide the scientific foundation for listing species under SARA. Therefore, an assessment initiates the regulatory process whereby the competent Minister must decide whether to accept COSEWIC's assessment and add a species to Schedule 1 of SARA, which would result in legal protection for the species under the Act. If the species is already on Schedule 1 of SARA, the Minister may decide to keep the species on the list, reclassify it as per the COSEWIC assessment, or to remove it from the list (Section 27 of SARA).

Fisheries and Oceans Canada (DFO), as a generator and archivist of information on marine species and some freshwater species, is to provide COSEWIC with the best information available to ensure that an accurate assessment of the status of a species can be undertaken.

The Shortfin Mako *(Isurus oxyrinchus) was designated as Threatened by COSEWIC in April 2006,* with the following justification:

As a large (maximum length 4.2 m), relatively late-maturing (7-8 years) pelagic shark, the species has life-history characteristics making it particularly susceptible to increased mortality from all sources, including human activities. The species is circumglobal in temperate and tropical waters. Individuals found in Atlantic Canada are considered part of a larger North Atlantic population. There does not appear to be any reason to assume that the Canadian Atlantic "population" is demographically or genetically independent from the larger Atlantic population, so the status of the species in Atlantic Canada should reflect the status throughout the North Atlantic. Although there is no decline in an indicator of status for the portion of the species that is in Atlantic Canada, two analyses suggest recent declines in the North Atlantic as a whole (40% 1986-2001; 50% 1971-2003). The main causes of the species' decline (mortality due to bycatch in longline and other fisheries) are understood and potentially reversible, but these sources of mortality have not been adequately reduced.

Shortfin Mako is schedule for re-assessment by COSEWIC in 2016.

Objectives

The overall objective of this meeting is to peer-review DFO existing information relevant to the COSEWIC status assessment for Shortfin Mako in Atlantic Canadian waters, considering data related to the status and trends of, and threats to this species inside and outside of Canadian waters, and the strengths and limitations of the information. This information will be available to COSEWIC, the authors of the species status report, and the co-chairs of the applicable COSEWIC Species Specialist Subcommittee. Publications from the peer-review meeting (see below) will be posted on the CSAS website.

Specifically, DFO information relevant to the following will be reviewed to the extent possible:

1) Life History Characteristics

- Growth parameters: age and/or length at maturity, maximum age and/or length
- Total and natural mortality rates and recruitment rates (if data are available)
- Fecundity
- Generation time
- Early life history patterns
- Specialised niche or habitat requirements

2) Review of Designatable Units

Available information on population differentiation, which could support a COSEWIC decision of which populations below the species' level would be suitable for assessment and designation, will be reviewed. Information on morphology, meristics, genetics and distribution will be considered and discussed.

See COSEWIC 2008 Guidelines for recognizing Designatable Units below the Species Level

3) Review the COSEWIC criteria for the species in Canada as a whole, and for each designatable units identified (if any).

COSEWIC Criterion – Declining Total Population

a. Summarize overall trends in population size (both number of mature individuals and total numbers in the population) over as long a period as possible and in particular for the past three generations (taken as mean age of parents). Additionally, present data on a scale appropriate to the data to clarify the rate of decline.

b. Identify threats to abundance— where declines have occurred over the past three generations, summarize the degree to which the causes of the declines are understood, and the evidence that the declines are a result of natural variability, habitat loss, fishing, or other human activity.

c. Where declines have occurred over the past three generations, summarize the evidence that the declines have ceased, are reversible, and the likely time scales for reversibility.

COSEWIC Criterion – Small Distribution and Decline or Fluctuation: for the species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

a. Summarise the current extent of occurrence (in km^2) in Canadian waters

b. Summarise the current area of occupancy (in km^2) in Canadian waters

c. Summarise changes in extent of occurrence and area of occupancy over as long a time as possible, and in particular, over the past three generations.

d. Summarise any evidence that there have been changes in the degree of fragmentation of the overall population, or a reduction in the number of meta-population units.

e. Summarise the proportion of the population that resides in Canadian waters, migration patterns (if any), and known breeding areas.

COSEWIC Criterion – Small Total Population Size and Decline and Very Small and Restricted: for the species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

a. Tabulate the best scientific estimates of the number of mature individuals;

b. If there are likely to be fewer than 10,000 mature individuals, summarize trends in numbers of mature individuals over the past 10 years or three generations, and, to the extent possible, causes for the trends.

Summarise the options for combining indicators to provide an assessment of status, and the caveats and uncertainties associated with each option.

For transboundary stocks, summarise the status of the population(s) outside of Canadian waters. State whether rescue from outside populations is likely.

4) Describe the Characteristics or Elements of the Species Habitat to the Extent Possible, and Threats to that Habitat

Habitat is defined as "in respect of aquatic species, spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced".

The phrasing of the following guidelines would be adapted to each specific species and some could be dropped on a case-by-case basis if considered *biologically* irrelevant. However, these questions should be posed even in cases when relatively little information is expected to be available, to ensure that every effort is made to consolidate whatever knowledge and information does exist on an aquatic species' habitat requirements, and made available to COSEWIC.

a. Describe the functional properties that a species' aquatic habitat must have to allow successful completion of all life history stages.

   In the best cases, the functional properties will include both features of the habitat occupied by the species and the mechanisms by which those habitat features play a role in the survivorship or fecundity of the species. However, in many cases the functional properties cannot be described beyond reporting patterns of distribution observed (or expected) in data sources, and general types of habitat feature known to be present in the area(s) of occurrence and suspected to have functional properties. Information will rarely be equally available for all life history stages of an aquatic species, and even distributional information may be missing for some stages. Science advice needs to be carefully worded in this regard to clearly communicate uncertainties and knowledge gaps.

b. Provide information on the spatial extent of the areas that are likely to have functional properties.

   Where geo-referenced data on habitat features are readily available, these data could be used to map and roughly quantify the locations and extent of the species' habitat. Generally however, it should be sufficient to provide narrative information on what is known of the extent of occurrence of the types of habitats identified. Many information sources, including Aboriginal Traditional Knowledge (ATK) and experiential knowledge, may contribute to these efforts.

c. Identify the activities most likely to threaten the functional properties, and provide information on the extent and consequences of those activities.

COSEWIC's operational guidelines require consideration of both the imminence of each identified threat, and the strength of evidence that the threat actually does cause harm to the species or its habitat. The information and advice from the Pre-COSEWIC review should provide whatever information is available on both of those points. In addition, the information and advice should include at least a narrative discussion of the magnitude of impact caused by each identified threat when it does occur.

d. Recommend research or analysis activities that are necessary.

   Usually the work on the other Guidelines will identify many knowledge gaps.

   Recommendations made and enacted at this stage in the overall process could result in much more information being available should a Recovery Potential Assessment be required for the species.

5) Describe to the Extent Possible Whether the Species has a Residence as Defined by SARA

SARA s. 2(1) defines Residence as "a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating."

6) Threats

A threat is any activity or process (both natural and anthropogenic) that has caused, is causing, or may cause harm, death, or behavioural changes to a species at risk or the destruction, degradation, and/or impairment of its habitat to the extent that population-level effects occur. Guidance is provided in: Environment Canada, 2007. Draft Guidelines on Identifying and Mitigating Threats to Species at Risk. *Species at Risk Act* Implementation Guidance.

List and describe threats to the species considering:

- Threats need to pose serious or irreversible damage to the species. It is important to determine the magnitude (severity), extent (spatial), frequency (temporal) and causal certainty of each threat.
- Naturally limiting factors, such as aging, disease and/or predation that limit the distribution and/or abundance of a species are not normally considered threats unless they are altered by human activity or may pose a threat to a critically small or isolated population.
- Distinction should be made between general threats (e.g. agriculture) and specific threats (e.g. siltation from tile drains), which are caused by general activities.
- The causal certainty of each threat must be assessed and explicitly stated as threats identified may be based on hypothesis testing (lab or field), observation, expert opinion or speculation.

7) Other

Finally, as time allows, review status and trends in other indicators that would be relevant to evaluating the risk of extinction of the species. This includes the likelihood of imminent or continuing decline in the abundance or distribution of the species, or that would otherwise be of value in preparation of COSEWIC Status Reports.

Expected Publications

- Proceedings
- Research Document(s)

Participation

- DFO Science
- DFO Species at Risk Management
- DFO Resource Management
- DFO Policy and Economics
- Provincial governments
- Fishing Industry
- Non-governmental organizations
- Aboriginal Communities / Organizations
- COSEWIC status report author and members