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# Proceedings of the Zonal Peer Review on the Pre-COSEWIC Assessment for Blue Shark (*Prionace glauca*)

**December 2, 2014**
**Dartmouth, Nova Scotia**

**Chairperson and Editor: Kristian Curran**

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Fisheries and Oceans Canada
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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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## TABLE OF CONTENTS

## SUMMARY

Blue shark (*Prionace glauca*) was designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as 'Special Concern' in the Atlantic and 'Data Deficient' in the Pacific' in 2006. The species' status is scheduled for re-assessment by COSEWIC in April 2016. A blue shark (Atlantic) pre-COSEWIC assessment science advisory meeting was held December 2, 2014, at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia. The overall objective of the meeting was to peer-review existing Fisheries and Oceans Canada (DFO) information that may be relevant to the anticipated COSEWIC status re-assessment for blue shark in 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. Meeting participants felt the Working Paper discussed at the meeting presented sound scientific analyses based on the best available information on blue shark, 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 par des pairs zonal sur le pré-COSEPAC concernant le requin bleu (*Prionace glauca*)


### SOMMAIRE

Le requin bleu (*Prionace glauca*) a été désigné par le Comité sur la situation des espèces en péril au Canada (COSEPAC) comme une « espèce préoccupante » dans l'Atlantique et comme une espèce « insuffisamment documentée » dans le Pacifique en 2006. Le statut de l'espèce fera l'objet d'une réévaluation par le COSEPAC en avril 2016. Une réunion de consultation scientifique préalable à l'évaluation du COSEPAC du requin bleu (Atlantique) a été tenue le 2 décembre 2014 à l'Institut océanographique de Bedford, à Dartmouth, en Nouvelle-Écosse. L'objectif global de la réunion était de permettre à des pairs d'évaluer l'information existante de Pêches et Océans Canada (MPO) pouvant servir à la réévaluation prévue du statut du requin bleu établi par le COSEPAC dans les eaux canadiennes, y compris les données sur la situation de l'espèce, les tendances observées et les menaces qui pèsent sur elle, tant dans les eaux canadiennes 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 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

The blue shark (*Prionace glauca)* is a large temperate and tropical pelagic shark species of the family Carcharhinidae that occurs in the Atlantic, Pacific and Indian oceans. The species is highly migratory, with tagging results suggesting that there is a single well-mixed population in the North Atlantic (Casey and Kohler 1991). In Canadian waters the blue shark (Atlantic) has been recorded in the offshore of southeastern Newfoundland, on the Grand Banks, Gulf of St. Lawrence, Scotian Shelf, and in the Bay of Fundy. At certain times of the year, it is probably the most abundant large shark species in eastern Canadian waters (Templeman 1963).

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 SARA. Thus, 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 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 a species status is undertaken. Blue shark (*Prionace glauca*) was designated by COSEWIC as Special Concern in 2006. The species' status is scheduled for re-assessment by COSEWIC in April 2016.

A blue shark (Atlantic) pre-COSEWIC assessment science advisory meeting was held December, 2, 2014, at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia. The meeting Chair-person, Mr. Kristian Curran, first introduced himself, followed by an introduction of meeting participants (Appendix 1). A member of the Nova Scotia Swordfishermen's Association (NSSA) could not attend the meeting in person due to unavoidable circumstance but, in absence, submitted written comments on behalf of the organization in advance of the meeting for discussion at the meeting. The Chair thanked meeting participants for attending the DFO Science Advisory Process. The Chair noted that this was a science peer-review meeting in which no science advisory report would be completed. The overall objective of the meeting was to peer-review existing DFO information that may be relevant to the anticipated COSEWIC status re-assessment for blue shark in 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. The Chair provided a brief overview of the Canadian Science Advisory Secretariat (CSAS) science advisory process and invited participants to review the meeting Terms of Reference (Appendix 2) and Agenda (Appendix 3). No revisions or additions were made to the Terms of Reference or Agenda. To guide discussion, a Working Paper was provided to meeting participants on November 28, 2014, in advance of the meeting date. This Proceeding constitutes a record of the meeting's discussions.

## PRESENTATION AND DISCUSSION

## REVIEW OF WORKING PAPER

**Rapporteur:** Kristian Curran

### Introduction

The lead author of the Working Paper, Dr. Steve Campana, introduced blue shark, explained the context of the meeting, and briefly outlined his intent of using the Working Paper to structure his presentation and discussion with a focus on those sections that have new or emerging results or that present calculations. It was noted that there is much new information since the last COSEWIC assessment of blue shark in 2006, although the challenge remains in obtaining good indices for a widespread population such as blue shark.

### Life-History

The life-history of blue shark is generally well-understood, and well-documented in the Working Paper and scientific literature, so it was not presented or discussed at the meeting.

### Distribution and Designatable Units

The author presented Figure 1 of the Working Paper (Figure 1 of the published Research Document), which outlined observed blue shark catch locations onboard commercial fishing vessels between 1998 and 2014 as observed by at-sea fishery observers operating in the DFO Maritimes Region. Meeting participants inquired as to why observations of at-sea fishery observers from other DFO regions were not included in the figure. A co-author of the Working Paper from the DFO Newfoundland and Labrador Region subsequently presented a second figure outlining blue shark commercial catch locations between 1980 and 2012 as observed by at-sea fishery observers operating within the DFO Newfoundland and Labrador Region (Figure 2 of the published Research Document). Sources of data in the DFO Newfoundland and Labrador Region figure included Northwest Atlantic Fisheries Organization (NAFO) landings data, at-sea fishery observer catch and discard data, and landings data from the regional landings database (ZIFF). On average, there have been approximately 12 t of blue shark landings in Newfoundland and Labrador waters for all fisheries since early-2000s, which is low compared to the landings reported in the DFO Maritimes region. It was noted that landings from NAFO may not be precise, as the data does not appear to be consistently reported each year. Notwithstanding, it was concluded that the two figures provided a good representation of where blue sharks are generally found in Atlantic Canada.

Results of blue shark tagging studies were then discussed – a tagging study in Rhode Island has been on-going for decades. The author noted that a limitation of tagging studies is that tag returns typically represent patterns of fishing behaviour, and do not necessarily demonstrate the range of sharks within the North Atlantic basin. A meeting participant inquired as to what tags have been used and the author indicated that conventional Floy® tags have been used. In the past 6-8 years, DFO scientists have been implementing a tag-and-release program at recreational shark derbies. A recreational shark derby is basically a shark fishing tournament. Half a dozen derbies occur per year, all in Nova Scotia, and participants are only permitted to keep sharks over 8 feet in length (since 2006), with the exception of sharks captured north of Cape Breton Island where there is an allowance for smaller sharks to be caught. Based on the recreational derby tagging study, results indicated that blue sharks exhibit a broad distribution throughout the North Atlantic.

Pop-up satellite archival tags (PSAT) provide results that are unbiased to fishing effort. Results of PSAT tags were presented, which further supported a broad distribution of blue sharks throughout the North Atlantic. All PSAT tags were active for 3-6 months, although 'tag tracks' reconstructed for individual sharks were not presented in the Working Paper given DFO Science was still analysing the data. In general, results of PSAT tags indicated that blue sharks reside in the Atlantic Canada region on-shelf in the spring and summer, moving off-shelf in the winter (coastal waters are too cold for sharks in the winter). In terms of a Designatable Unit (DU), a blue shark unit is not well contained in Atlantic Canadian waters. Blue sharks should be viewed as one large population that is broadly distributed throughout the North Atlantic. One meeting participant noted, however, that there could be various genetically-based, sub-populations of blue shark throughout the North Atlantic, which share one broad habitat but breed and pup in some smaller breeding grounds. The participant pointed to literature that suggested blue shark sub-areas may exist in the eastern Atlantic, Caribbean, and other areas, although he conceded that knowledge of this level of detail and certainty does not exist at this time.

There was discussion on the importance of the Gulf of St. Lawrence versus coastal shelf areas to blue shark in the summer, with the author noting that we have to rely on the recreational fishery for this type of information, but that blue shark are seldom observed in the inner Gulf of St. Lawrence with increasing observations in the outer Gulf of St. Lawrence and approaches of Cabot Strait/Laurentian Channel area. Further discussion focused on variables that influence blue shark abundance/distribution in general, and the author noted that water temperature is a big driver, and perhaps mating, although mating does not occur in Atlantic Canadian waters. It was further noted by a meeting participant that blue shark literature demonstrates a lot of structure at the ocean scale.

Figures 9 and 10 of the Working Paper (Figures 13 and 14 of the published Research Document) presented the proportion of blue shark in the large pelagic fishery longline sets versus the rest of the catch using observer records analyzed in five-year blocks. Results indicated that deep water areas off of the Southwestern Scotian Shelf and the Grand Banks had higher ratios of Blue Sharks relative to other areas. In contrast, lower ratios were observed in more southern waters, presumably due to warmer water temperatures. The data suggested there may be opportunity to further study and identify blue shark 'Areas to Avoid' in Atlantic Canadian waters both spatially and seasonally when blue shark abundance appears to be high. Such further study might be of benefit to industry, in terms of reducing effort, which may result in high proportions of blue shark bycatch. A meeting participant inquired as to whether the spatial and seasonal results could be driven by a few fishermen, and the author indicated that this was unlikely given that areas and seasons that exhibit the highest blue shark abundance are observed to overlap with areas and times when many fishermen fish. A next step is to analyze the data on a quarterly basis to see if more informed spatial measures can be developed to help minimize fishery and blue shark interaction, although it may be difficult to do this type of analysis based on seasonal coverage alone. Last, introducing real time oceanography could help identify areas and periods of strong overlap between fishing behavior and blue shark abundance.

## Abundance

Ideally, blue shark abundance estimates would be based on a fishery-independent survey; however, we do not have this type of survey to rely upon. The International Commission for the Conservation of Atlantic Tunas (ICCAT) has aimed to characterize the entire status of blue shark of the North Atlantic population through the compilation of all blue shark information held by applicable countries across the basin. The Commission's attempt to undertake a stock assessment in 2008, however, was hampered by inconsistency in available information and limited information that exists prior to the 1990s. A meeting participant asked the lead author

about his thoughts on the ICCAT assessment, whom replied, based on his expert opinion and knowledge of the species, that the assessment was likely optimistic (i.e. closer to virgin biomass rather than Maximum Sustainable Yield, or MSY, biomass). The author further noted that ICCAT intends to re-assess blue shark in 2015, with hopes that the next assessment will be much improved by additional data that may be available since the last assessment in 2008.

Blue shark abundance trends in both ICCAT and regional assessments demonstrate a modest decline since the 1990s. In recent years, DFO has placed a lot of effort into analyzing the recreational shark fishery index, although this has not proven helpful in characterizing blue shark abundance in Atlantic Canada. The author noted that the commercial Swordfish fishery provides a better index of blue shark abundance, since the two species correlate well spatially within marine waters of the region. It was asked if catch rates locally from Swordfish fisheries compare to catch rates of Swordfish fisheries throughout the North Atlantic, and the author indicated there is consistency amongst fisheries.

Figure 5 of the Working Paper (Figure 6 of the published Research Document) was discussed, which presents the predicted versus observed General Linear Model (GLM) catch rate index (kilograms per hook) for blue sharks caught and observed in the June-October Swordfish fishery. A meeting participant asked why the modeled predictions did not align with observations, and the author indicated that this is likely the result of relatively few vessels fishing Swordfish consistently, as well as limited observer coverage on the vessels. The author noted that observer coverage of the DFO Maritimes Swordfish fishery is less than 5%. A member of the DFO Maritimes Resource Management sector indicated that he believed observer coverage estimates of the fishery have been updated, demonstrating that coverage was 10% in recent years, dropping below 6% in 2013, and in 2014 is again expected to increase to 10%. The author noted that they do not see 10% coverage in 2014, based on existing data, and the two individuals were to follow-up on this difference in understanding in 2014 observer coverage. Despite this, the author highlighted the importance of observer information regarding blue shark, since it is a discard species. Further, the author emphasized that blue shark records by number are inconsistent and that records by weight are much better (this is why data in the Working Paper was presented by weight). The author concluded that Figure 5 of the Working Paper (Figure 6 of the published Research Document) reflects local variability in blue shark-Swordfish fishery interactions between years due to variability in water temperatures between years (e.g. Gulf Stream movement). Anecdotally, fishermen are observing more and not less blue shark in Atlantic Canadian waters, although it appears fewer individuals are fishing the Grand Banks.

Size structure of blue shark in Atlantic Canadian waters was not analyzed due to few females, and an overall size distribution in the commercial fishery being biased to males, which makes it difficult to define size structure of the population as a whole. The last blue shark COSEWIC assessment undertaken in 2006 did report an observed decline in mean blue shark size, but because of the small population of blue shark that reside in Atlantic Canadian waters this remains difficult to measure so was not included in the Working Paper. Atlantic-wide indices would be easier to calculate if small amounts of observer coverage existed. The author noted that the last ICCAT assessment appeared more optimistic in its findings for blue shark compared to what has been observed in more local and regional assessments.

## Habitat

The author presented what is known of blue shark habitat in Atlantic Canadian waters. It was noted that it is unusual to find blue shark in areas of less than 200 metres water depth, which is consistent with a pelagic shark species. Typically, blue shark are found in the upper 35 metres of the water column, but can dive much deeper waters (i.e. below 100 metres water depth) in

the late-Fall and Winter pursuing food (diel behaviour). Results were based on the behavior of approximately 35 sharks that were monitored using PSAT tags.

## Threats

Theats to blue shark in Altantic Canada were discussed. The only known threat to blue shark in Atlantic Canada is fishing. Table 3 in the Working Paper (Table 3 of the published Research Document) provided a summary of blue shark landing statistics from a range of sources, including: DFO, NAFO, and ICCAT, to name a few. Relative to blue shark landings from the North Atlantic, Atlantic Canada exhibits very low landing statistics – blue shark has low value in Canada. In contrast, relative to blue shark landings from Northwest Atlantic, Atlantic Canada exhibits higher landings, which included dead discards up until 2008 (reports of dead discards drop to zero after 2008). Countries that fish blue shark in international waters beyond Canada's Exclusive Economic Zone, which exhibit high landings, include: Japan, United States, and Spain. The author noted that compiling the table proved challenging, as different countries report in different manners (i.e. some are good and others are bad), so the values presented in the table should be considered minimums.

The author pointed out that total North Atlantic values (last column) are much higher than the nominal statistics for each country, as the values reflect an estimated number based on catch of Swordfish and Tuna reported to ICCAT rather than the sum of values reported by nation. It was further noted that the North Atlantic values (last column) were independently verified against fin shark records, and that Spain only began reporting in national values in 1997, which made ICCAT values problematic. A meeting participant noted that three periods of change appear to exist within the North Atlantic values (last column), and inquired if the periods reflected changes in reporting rather than changes in fishing effort or bycatch. The author indicated that reporting from 1996-1997 onward is likely believable and okay.

The presentation and discussion turned to the estimation of blue shark injury, incidental mortality, and a level of sustainable catch in Atlantic Canada. The author again noted that blue shark is almost entirely discarded by the fishery in Atlantic Canada, which makes it difficult to track the species. The author also noted that it is a labour-intensive process to estimate both blue shark catch and mortality. Since 2010, at-sea fishery observers have been doing a better job at reporting shark condition when bycaught in the fishery. The author noted that tagging studies have demonstrated that bycaught sharks released with a hook-in-jaw exhibited good survival, while sharks with more complicated hooking were more susceptible to mortality. Anecdotal information suggests that large pelagic longline fishing vessels in Atlantic Canada have turtle de-hooking kits on board, and this may be a means to improve post-release mortality of sharks incidentally hooked in Atlantic Canadian waters. The author, however, was unaware of anyone actually using turtle de-hookers to release blue shark and, if used, what the general post-release condition typically would be. An industry representative was not in attendance at the meeting to further inform this point.

It was noted that large pelagic longline fleets operating in Atlantic Canadian waters are primarily using circle hooks, which is a big improvement to reducing blue shark mortality compared to j-hooks that were previously used in the fishery. Circle hooks were phased into the fishery in the mid-2000s and became a requirement of the fishery by licence condition in 2012, although approximately 90% of the fishing industry was likely using circle hooks before 2012. Although circle hooks have not reduced the bycatch ratio of sharks (i.e. same amount is still being caught), they have decreased overall mortality rates of caught sharks. It remains, however, that pelagic longlines are the main source of Blue Shark mortality in Atlantic Canadian waters (stabilized at approximately 400 t since early-2000s). Catch rates from the recreational derby

fishery are not representative of patterns of the commercial fishery, with tagging results of the recreational derby fishery demonstrating that it has negligible impact on blue shark mortality.

The author noted that blue shark mortality from fishing in Atlantic Canadian waters is quite low relative to theoretical catch rate based on ICCAT assessment results (0.33 lower than what is theoretical), when compared to mortality for blue shark in all of the North Atlantic. There was discussion of the estimated Maximum Sustainable Yield (MSY) value derived in the Working Paper of approximately 87,000 tonnes, as one participant calculated an MSY of 400,000 tonnes. The author indicated that the instantaneous mortality rate is logarithmic and not additive, which accounts for the differences between the two values. In addition, ICCAT does not calculate Fishing MSY ($F_{MSY}$), although another meeting participant believed the estimate of 400,000 t was based on Biomass MSY ($B_{MSY}$) and not $F_{MSY}$, which resulted in the higher value than presented by the author. It was noted that the 2007 fishing mortality of 0.15 is quite low. Last, a meeting participant revisited estimates of bycatch, discard mortality, and sustainable catch presented by the author in 2009 (see: Campana et al. 2009), as they were based on blue shark directly and not based on fishery catch rates of other large pelagic species. The author indicated that the 2009 approach proved a challenge in comparing shark statistics between regions, as statistics from throughout the North Atlantic are not available. The author felt that the apportion of blue shark mortality associated with the Canadian fishery, as presented in the Working Paper, was more accurate than that estimated in 2009.

## Sources of Uncertainty

There was discussion throughout the presentation regarding various sources of uncertainty that might influence calculations and estimates that were presented in the Working Paper. Meeting participants agreed that limitations of the last ICCAT assessment to adequately characterize blue shark population status in the North Atlantic, in context of uncertainty in mortality estimates presented in the Working Paper, may require that additional precautionary measures be taken ensure the status of blue shark in Atlantic Canadian waters does not continue to decline. In general, it was felt that provided sources of uncertainty were identified in the Working Paper, and assumptions of calculations clearly defined, a reader of the report/ document would have an informed basis in which to interpret the results.

## Future Research Needs

A meeting participant asked if additional/future research needs were considered. The author noted that this was not in the Terms of Reference for the meeting, so was not considered or addressed in the Working Paper.

## Submitted Comments

Additional comments were provided in writing prior to commencement of the meeting. Typically, meeting participants are to attend in person to raise and discuss comments although, in this instance, the written comments were accepted for consideration given the experiences of the submitter and the unavoidable circumstance in which the individual could not participate. The submitted comments were read aloud to meeting participants one-by-one and considered collectively as a group. In some instances, the submitted comments resulted in revisions being incorporated into the Working Paper, and in other instances meeting participants did not agree with the comments or felt the Working Paper addressed the comments adequately. Two primary comments submitted in writing included: 1) disagreement with the approach used in the Working Paper to estimate MSY based on virgin biomass as a starting point; and 2) disagreement with the approach used in the Working Paper to estimate the portion of blue shark in relation to Atlantic Canadian large pelagic longline fleets. In both instances, the comments were given due

consideration. Additional text was added to the Working Paper to characterize limitations of a 'reported catch'-based approach to estimating MSY, to more clearly identify underlying assumptions of the approach used in the Working Paper to estimate MSY, and additional text and re-analysis added to the Working Paper to more clearly identify underlying assumptions of the approach used to estimate blue shark in relation to Atlantic Canadian large pelagic longline fleets (as well as a revised estimate of the portion value itself).

## CONCLUSIONS

Meeting participants felt the Working Paper presented sound scientific analyses based on the best available information on blue shark, and is acceptable for publication as a Research Document pending revision following discussions of the meeting. A meeting participant however still did not agree with the approaches used to estimate blue shark MSY or the portion of blue shark in relation to Atlantic Canadian large pelagic longline fleets. Although a range of approaches may be used to estimate such values, it is within DFO's purview to adopt its own approaches to analyses provided they are scientifically defensible, are meaningful, and clearly documented. Sincere efforts were made in this 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. In 2015, ICCAT intends to re-assess blue shark, and this will undoubtedly provide additional information upon which the future status of blue shark in Atlantic Canadian waters may be assessed.

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## APPENDICES

## APPENDIX 1: LIST OF MEETING PARTICIPANTS

***PRE-COSEWIC ASSESSMENT FOR BLUE SHARK***

Zonal Peer Review Meeting – Maritimes, Newfoundland and Labrador, Gulf Regions

December 2, 2014
Dartmouth, NS

Chairperson: Kristian Curran

**PARTICIPANTS LIST**

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| Carl MacDonald | Resource Management / DFO Maritimes |
| Michael Eagles | Resource Management / DFO Maritimes |
| Pierre Mallet | Resource Management / DFO Gulf |
| Koren Spence | Species at Risk Management / DFO Maritimes |
| Sarah Dellar | Species at Risk Management / DFO Maritimes |
| Dave Kulka | Representative / Species Specialist Subcommittee |
| Howard Powles | Management / University of Ottawa |
| Boris Worm | Biology / Dalhousie University |
| Manuel Dureuil | Biology / Dalhousie University |
| Aurelie Godin | Biology / Dalhousie University & World Wildlife Fund / Atlantic |
| Heather Grant | Ecology Action Centre / NS |
| Jarrett Corke | World Wildlife Fund / Atlantic |
| Joshua McNeely | Maritimes Aboriginal Peoples Council / IKANAWTIKET |
| *Troy Atkinson | Nova Scotia Swordfishermen's Association |

* *Not in attendance – written comments submitted in advance of meeting*

## APPENDIX 2: MEETING TERMS OF REFERENCE

***Pre-COSEWIC Assessment for Blue Shark***

Zonal Peer Review Meeting – Maritimes, Newfoundland and Labrador, Gulf and Quebec Regions

December 2, 2014
Dartmouth, NS

Chairperson: Kristian Curran

**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.

Blue Shark (*Prionace glauca*) was designated as Special Concern by COSEWIC in 2006, with the following justification:

*This species is a relatively productive shark (maximum age 16-20 years, mature at 4-6 years, generation time 8 years, 25-50 pups every two years), but as an elasmobranch, populations are susceptible to increased mortality from all sources including from human activities. The species is considered to have a single highly migratory population in the North Atlantic, of which a portion is present in Canadian waters seasonally. The abundance index which is considered to best represent the whole population has declined 60% 1986-2000 but another index shows no long-term trend for the whole population 1971-2003. Indices of abundance in and near the Canadian waters show variable trends from no decline to 60% decline from the 1980s to early 2000s. There is evidence for a decline in mean length in longline fisheries in Canadian waters 1986-2003. The primary threat is bycatch in pelagic longline fisheries; although the threat is understood and is reversible, it is not being effectively reduced through management. Assessing the impact of bycatch on the population would benefit from better information on proportion of individuals discarded which survive. It appears that recent fishery removals from the North Atlantic have been several tens of thousands of tons annually. Estimated Canadian removals, a small proportion of the total, have been declining since the early 1990s and recently have averaged around 600 t per year.*

Blue Shark is schedule for re-assessment by COSEWIC in April 2016.

### Objectives

The overall objective of this meeting is to peer-review DFO existing information relevant to the COSEWIC status assessment for Blue Shark in 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" at: http://www.cosewic.gc.ca/eng/sct0/assessment_process_e.cfm

**3) Review the COSEWIC criteria** for the species in Canada as a whole, and for each designatable units identified (if any) at:
http://www.cosewic.gc.ca/eng/sct0/assessment_process_e.cfm

**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.

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.

a) 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.

b) 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.

c) 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

**Participation**

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

## APPENDIX 3: MEETING AGENDA

***Pre-COSEWIC Assessment for Blue Shark***

Zonal Peer Review Meeting – Maritimes, Newfoundland and Labrador, Gulf and Quebec Regions

December 2, 2014
Dartmouth, NS

Chairperson: Kristian Curran

**AGENDA**

2 December 2014 – Tuesday

| | |
|---|---|
| 9:00-9:30 | Introduction |
| 9:30-10:30 | Life-history Information |
| 10:30-10:45 | Break |
| 10:45-12:00 | Population Assessment |
| 12:00-1:00 | Lunch (not provided) |
| 1:00-2:00 | Review of the Designatable Unit and COSEWIC Criteria |
| 2:00-2:15 | Break |
| 2:15-3:00 | Habitat Information |
| 3:00-4:00 | Threats |
| 4:00-5:00 | Discussion |