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Proceedings of the Zonal Peer Review of the Recovery Potential Assessment for Porbeagle (*Lamna nasus*) in Atlantic Canada

February 19-20, 2015
Dartmouth, Nova Scotia

Chairperson: Christie Whelan
Editor: Kristian Curran

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December 2015

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

Porbeagle (*Lamna nasus*) was re-assessed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in May 2014. In support of listing recommendations for Porbeagle by the Minister of Fisheries and Oceans pursuant to the *Species at Risk Act* (SARA), Fisheries and Oceans Canada Science has been asked to undertake a Recovery Potential Assessment of the species. On February 19-20, 2015, a Porbeagle Recovery Potential Assessment science advisory meeting was held at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia. A Working Paper was discussed on the first day of the meeting, followed by discussion of a Science Advisory Report on the second day of the meeting. Review of the Science Advisory Report was not completed upon adjournment of the meeting. It was agreed by meeting participants that the science lead and meeting chair-person would coordinate completion of a draft report consistent with views expressed at the meeting on the Working Paper, and circulated as a revised draft Science Advisory Report by email for subsequent review and approval. All comments provided on the circulated report were addressed, and incorporated as necessary, jointly by the science lead and meeting chair. In general, meeting participants felt the Science Advisory Report and Working Paper presented sound scientific analyses based on the best available information on Porbeagle. It is noted, that Porbeagle discards and post-release mortality estimates presented at the meeting were grouped by fishery type (e.g. longline), and as such, these estimates might not be attributable equally to individual fishing fleets within groupings. 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.

Compte rendu de l’examen zonal par des pairs sur l’Évaluation du potentiel de rétablissement de la maraîche (*Lamna nasus*) au Canada atlantique

SOMMAIRE

En mai 2014, la maraîche (*Lamna nasus*) a fait l'objet d'une réévaluation par le Comité sur la situation des espèces en péril au Canada (COSEPAC), qui a jugé que cette espèce était en voie de disparition. Afin d'appuyer les recommandations relatives à l'inscription de la maraîche par la ministre des Pêches et des Océans en vertu de la *Loi sur les espèces en péril* (LEP), le Secteur des sciences de Pêches et Océans Canada a été chargé d'entreprendre une évaluation du potentiel de rétablissement de cette espèce. Les 19 et 20 février 2015, une réunion de consultation scientifique a eu lieu à l'Institut océanographique de Bedford, à Dartmouth (Nouvelle-Écosse), pour évaluer le potentiel de rétablissement de la maraîche. La première journée de cette réunion a été consacrée à l'examen d'un document de travail et la deuxième journée, à la discussion d'un avis scientifique. Il a toutefois été impossible de terminer l'examen de l'avis scientifique avant la levée de la séance. Les participants à la réunion conviennent que le scientifique principal et la présidente de la réunion coordonneront la rédaction d'un rapport préliminaire devant rendre compte fidèlement des vues exprimées durant la réunion au sujet du document de travail; ce rapport sera ensuite distribué par courriel à titre d'ébauche révisée de l'avis scientifique aux fins d'examen ultérieur et d'approbation. Tous les commentaires formulés au sujet du rapport distribué ont été examinés conjointement par le scientifique principal et la présidente de la réunion et ont été intégrés, au besoin. Dans l'ensemble, les participants estiment que l'avis scientifique et le document de travail présentent de solides analyses scientifiques fondées sur la meilleure information disponible sur la maraîche. On note toutefois que les estimations sur les rejets et sur la mortalité après la remise à l'eau de la maraîche, qui ont été présentées durant la réunion, avaient été regroupées par type de pêche (p. ex. pêche à la palangre); ces estimations pourraient donc ne pas pouvoir être attribuées également aux diverses flottilles de pêche qui composent ces regroupements. Des efforts sincères ont été déployés dans le cadre de ce processus d'examen scientifique par les pairs pour prendre connaissance de tous les commentaires et préoccupations soulevés par les participants et pour en tenir compte, à la condition qu'ils aient été appropriés et dans les limites d'une pratique d'examen par les pairs acceptable.

INTRODUCTION

Porbeagle (*Lamna nasus*) is a species of mackerel shark in the family Lamnidae. Porbeagle in the Northwest Atlantic Ocean is considered one population. The Northwest Atlantic population ranges from northern Newfoundland and Labrador to New Jersey, and possibly South Carolina, with mature females ranging farther south to the Sargasso Sea. This species is widely distributed in the Canadian Atlantic, being found in the Gulf of St. Lawrence, around Newfoundland and Labrador, on the Scotian Shelf, and in the Bay of Fundy. Most of the Northwest Atlantic population is found in Canadian waters at some point in its life history.

Porbeagle was first assessed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in May 2004. In preparation for its scheduled re-assessment by COSEWIC in 2014, Fisheries and Oceans Canada (DFO) Science conducted a pre-COSEWIC review of Porbeagle in September 2012 (Campana et al. 2013; Simpson and Miri, 2014). Porbeagle was re-assessed as Endangered by COSEWIC in May 2014. In support of listing recommendations for Porbeagle by the Minister of Fisheries and Oceans pursuant to the *Species at Risk Act* (SARA), DFO Science has been asked to undertake a Recovery Potential Assessment (RPA), based on the national RPA Guidance. The advice in the RPA may be used to inform both scientific and socio-economic aspects of the listing decision, development of a recovery strategy and action plan, and to support decision making with regards to the issuance of permits or agreements, and the formulation of exemptions and related conditions, as per sections 73, 74, 75, 77, 78 and 83(4) of SARA. It may also be used to prepare for the reporting requirements of SARA s.55. The advice generated via this process will update and/or consolidate any existing advice regarding this species.

A Porbeagle RPA science advisory meeting was held February 19-20, 2015, at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia. The meeting Chair-person Ms. Christie Whelan first introduced herself, followed by introductions of meeting participants (Appendix 1). The Chair thanked meeting participants for attending the DFO Science Advisory Process. The primary goals of the meeting were: 1) provide an objective review of the working paper to ensure information was complete; and 2) review the RPA science advisory report based on information and discussion at the meeting. 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 corrections were made to the Terms of Reference or Agenda. To guide discussion, a Working Paper was provided in advance of the meeting on February 13, 2015. A Science Advisory Report (SAR) was also a product of the meeting. This Proceeding constitutes a record of the discussion of the meeting.

PRESENTATIONS AND DISCUSSION

REVIEW OF WORKING PAPER AND SCIENCE ADVISORY REPORT

Rapporteur: Kristian Curran

Introduction

On the first day of the meeting, the lead scientist of the Working Paper, Dr. Steve Campana, introduced Porbeagle, 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. A draft SAR was

reviewed on the second day of the meeting, with discussion being led by the science lead and meeting chair-person.

Biology and Life History

A brief overview of Porbeagle biology and life history was presented, given much of this information is available in previous publications on the species. In general, Porbeagle are long-lived, with the larger sharks tending to be females. It was noted that Porbeagle prefer saline waters, which is why they are not observed in the Gulf of St. Lawrence estuary. In addition, Porbeagle are associated with oceanic fronts between warm and cold waters, with a preference for waters 5-15^{o}C in range, although Porbeagle have a tolerance for a much larger range of temperatures (i.e. 2-26 ^{o}C in range). Members of the fishing community attending the meeting as participants noted that in the past there was presence of a large population of female Porbeagle in the Bay of Fundy.

Distribution and Abundance

Porbeagle constitutes two separate stocks between the Northwest Atlantic and Northeast Atlantic. In waters of Atlantic Canada, Porbeagle tend to exhibit a lot of movement between Georges Bank in the offshore of southwest Nova Scotia and the Grand Banks in the offshore of southern Newfoundland. A meeting participant inquired if Porbeagle are found in the Gulf of St. Lawrence in Atlantic Canada, and it was noted they are found in these waters in low abundance. The science lead noted the take home message is that Porbeagle are widely distributed throughout waters of Atlantic Canada.

A meeting participant sought clarification on Figure 4 of the Working Paper regarding Porbeagle catch locations in pelagic longline fisheries; that is, does the figure include directed shark, swordfish, and offshore tuna longline fisheries, as terminology in the Working Paper tends to use ‘pelagic longline’ and ‘swordfish tuna’ synonymously. The science lead noted that the figure is intended to reflect Porbeagle distribution in Atlantic Canadian waters and not intended to link to fishing pressures. It was further noted that pressures confronting Porbeagle in Atlantic Canadian waters would be discussed in detail at a later point in the meeting. The science lead also noted that terminology characterizing pelagic fisheries would be revised for consistency in use throughout the paper.

In terms of Porbeagle abundance, four population models were run using different productivity parameters (see: Figure 8 in Working Paper – same figure number as in published Research Document). Results demonstrated similar overall patterns with variability largely observed in differing scale between modeled outputs. In general, the models indicate a recent upturn in species abundance. A meeting participant asked if uncertainty was estimated for each of the model runs, and the science lead noted that placing confidence intervals around modeled outputs is not possible, although the four models themselves were used to assess uncertainty in resultant estimates. Another participant inquired if low abundance observed in the 1970s was real or an effect of catches, and it was noted that abundance during this time period was in fact real given it coincided with a period of low catch rates. The science lead further noted that Porbeagle was able to recover over this time period at catch rates of 300 tonnes (t).

The science lead indicated he believed the trends in modeled abundance, but carried out two fishery independent surveys of Porbeagle to help verify the model estimates. It was noted that most shark are caught along the shelf break and deep basins of the Scotian Shelf, but also in the Bay of Fundy and on the Grand Banks (see: Figure 9 in Working Paper – same figure number as in published Research Document). The science lead noted that the surveys were designed to evaluate population model validity moving forward, noting that updates to the

Porbeagle population models would be unlikely to yield reasonable estimates of abundance. The science lead concluded that moving forward the only reliable way to evaluate Porbeagle population abundance is through a survey program.

A meeting participant inquired if any of the four models provided a better fit to data than others, and the science lead indicated that Model 3 appeared to yield the most realistic results, even though it did not exhibit the best fit. The science lead noted that the model in general is not flexible at incorporating the biology of sharks. In more recent years the model was fit to Catch per Unit Effort data, which supported an upturn in Porbeagle abundance. A meeting participant revisited the upturn in abundance observed in the 1970s inquiring if this was the result of a change in fishing behavior or increased food availability in the region (e.g. herring). The science lead again indicated low levels of Porbeagle fishing in the 1970s, and that food availability was not explored in the Working Paper. It was noted looking at herring and other prey species abundance could be undertaken to help explain increased Porbeagle abundance observed in the 1970s, as well as the more recent upturn in abundance.

The science lead reminded meeting participants that the current, slight upturn in modeled Porbeagle abundance was suggestive of the beginning of a Porbeagle recovery, but that 'recovery' and 'recovered' have two very different meanings.

Habitat and Residence

Habitat and residence of Porbeagle were discussed. In Atlantic Canada, two mating areas have been identified: Northeast Peak of Georges Bank and western Grand Banks (see: Figure 12 of Working Paper). Mating takes place in the summer (earlier on Georges), with pupping occurring in the Sargasso Sea. Porbeagle are known to give birth over a broad area of the Sargasso Sea, at 500 meter water depth, which allows for food protection during this life stage. There was significant discussion regarding Porbeagle mating areas in Atlantic Canada.

A meeting participant inquired as to how mating areas are identified, and the science lead replied that mating areas are identified where a high abundance of pregnant females are observed. Concern was subsequently expressed by a meeting participant that drawing boundaries on a map denoting mating areas, without discussion of the uncertainty associated with the boundaries, might give the wrong impression. The meeting participant suggested it might be better to describe the boundaries as areas of observed pregnant females rather than defining the areas as mating grounds. Further, the meeting participant noted that the Georges Bank area was only brought to the attention of scientists by the groundfish fleet, so the two identified areas are only known because of fishing patterns rather than being reflective of all potential areas where pregnant females may congregate in the region.

The science lead disagreed with these points, noting that several fleets fish in other regions of Atlantic Canada and have not reported any large presence of pregnant females in any other areas. A follow-up point was made that certain members of the fishing industry support both areas as areas where large females are often found, which was agreed to be a potential indicator of mating grounds but not necessarily conclusive of being mating grounds. In contrast, other members of the fishing industry indicated that on Georges Bank they have observed a high abundance of females not feeding (supported by stomach contents analysis), which is often followed by a large presence of males. The science lead indicated that this pattern is suggestive of mating and re-iterated his belief that Georges Bank is a Porbeagle mating ground. It was suggested that if data exists demonstrating a presence of females on Georges Bank, followed by an influx of males, this data should be included in the Working Paper. As a final point, the science lead noted that satellite tagging has been unsuccessful at showing movement

of females from Georges Bank to known pupping grounds in the Sargasso Sea (which would be indicative of mating followed by pupping behavior).

Human activities that may affect Porbeagle habitat in Atlantic Canada were briefly discussed. It was agreed that fishing, offshore petroleum exploration and development, and possibly the Maritime Link project, have the potential to affect Porbeagle habitat.

Landings, Discards and Post-release Mortality

Fishery landings of Porbeagle by country were reviewed. The science lead noted that landings by Canadian vessels have been declining since 2010, which is a large reflection of market conditions and not indicative of the presence/absence of Porbeagle in Atlantic Canadian waters. All Porbeagle landings in the Canadian Exclusive Economic Zone (EEZ) are from Canadian fleets, with no foreign fleets fishing in the EEZ over the last several years. A meeting participant noted that the International Commission for the Conservation of Atlantic Tunas (ICCAT) record of U.S. landings has exhibited a slight increase over the last three years, and that this data should be included in the Working Paper.

Concern was raised by a participant from the fishing industry that presenting landings data by type of fishery results in an aggregation of multiple fleets in some instances (e.g. longline fishery). The participant noted that this approach assigns landings to a general grouping of fleets that often exhibit very different behaviours in terms of their interaction with Porbeagle (this point was re-iterated in the following discussion on discard and post-release mortality estimates). The science lead acknowledged this limitation, but noted it would require considerable effort to disaggregate the information by individual fleet. The Science Advisory Report from the meeting formally acknowledged this point, noting that both landings and discard estimates reported in the future could be disaggregated by fleet given differences in observer coverage, fishing behaviour, and fishing locations of various fleets (particularly for the pelagic longline fleets).

Since 2010, fishery observers have been putting more effort into acquiring accurate observations of shark bycatch numbers and physical status (e.g. minor injury, major injury, or dead upon discard). The science lead presented analysis on shark bycatch, discards, and post-release mortality. Again, there was significant concern expressed by a meeting participant regarding the aggregation of discard and post-release mortality information by fishing type, as the approach assigns values to all associated fleets equally despite differences in fishing behaviour that might exist between fleets (and hence fleet-specific interaction with Porbeagle). The science lead again acknowledged this limitation to the analysis (further noted in the Science Advisory Report). A similar discussion regarding Observer coverage between different fishing fleets also occurred, and the meeting participant followed up with additional fleet-specific information provided to the science lead.

Post-release mortality is estimated from a proportion of pop-up satellite tags that demonstrate signs of mortality upon discard release, which is subsequently applied to total discard estimates for a fishery. The science lead presented results of a recent Porbeagle post-release tagging study, which he acknowledged was limited in scale, only providing a cursory look at what post-release mortality might look like – it was agreed that more research of this nature is required to develop greater confidence in post-release mortality estimates for Porbeagle. The science lead reviewed his research, noting that tagging results were treated separately by fishing gear. Concern was raised that assuming a post-release mortality rate of 100% for injured sharks in one of the studied fisheries based on two tags alone (n=2) might not provide an accurate reflection of overall mortality if additional tags were deployed . All agreed that a larger sample

size would provide more robust estimates. However, it was noted that the estimate for uninjured Porbeagle was much larger and thus more reliable.

Impacts of Porbeagle handling on tagging results were discussed, in that bringing Porbeagle on board for tagging may place additional stress on individual sharks (introducing bias into the overall results). The science lead indicated that he did not believe handling during tagging did have an effect on study results given that sharks were handled in the same manner between tagging programs for different fisheries, with tagging results being systematically different between fisheries suggesting that fishing bycatch between fisheries has a more significant influence on post-release survival/mortality than does shark handling during the tagging program. It remains that in some fisheries sharks are not brought on board when discarded, while the tagging program did bring sharks on board for tagging, and that the impact of this on post-release mortality tagging results might need to be explored further in the future.

Meeting participants noted that they could not replicate some of the post-release mortality calculations presented in the Working Paper, and the science lead indicated he would revisit his calculations to ensure accuracy (in particular the level of observer coverage by fishery that is used in the various calculations). It was agreed that text would be added to this section of the Working Paper to more clearly describe the analysis, as well as the underlying assumptions and limitations of the analysis (including a statement on ICCAT high seas estimates of Porbeagle). In addition, it was agreed text would be added to the Sources of Uncertainty section of the Science Advisory Report regarding post-release mortality estimates. Again, the science lead viewed the tagging study as preliminary results, noting again that more tagging studies of this nature would improve the estimates. Last, the science lead noted the approach to estimating post-release mortality is typical of that applied to many shark species (e.g. Shortfin Mako and Blue Shark).

Recovery Target

Four recovery trajectory models were presented at a Porbeagle assessment meeting held in 2012 (Campana et al., 2013). It was concluded at the 2012 meeting that 4% fishing mortality of Porbeagle would support species recovery. The science lead noted that in recent years fishery harvest levels of Porbeagle have been approximately 1-2%, suggesting that current fishing practice is likely not slowing the recovery of Porbeagle to any great degree. This was supported by anecdotal evidence from meeting participants of the fishing industry, whom have observed large numbers of small Porbeagle in Atlantic Canadian waters in recent years – a good sign that stock trajectory is increasing (but not necessarily a sign of recovery).

Given recovery targets are derived from abundance models, a meeting participant inquired as to what confidence there is in the modeled results, which are based on low observer coverage (and in consideration that anecdotal evidence suggests Porbeagle are being observed in greater abundance on the water). The science lead noted that modeled results are best viewed as population growth rates more so than absolute numbers or total biomass. With this in mind, it was noted that recovery targets need to be consistent with DFO's Precautionary Approach policy. In addition, it was agreed that the recovery target must incorporate a timeframe and be measurable. If abundance towards recovery is not being observed in the future, it was agreed that additional factors such as changes in foraging behaviour or prey availability might require further investigation as potential contributors.

Mitigation Measures

Meeting participants reviewed the proposed list of mitigation measures in support of minimizing any detrimental impacts of human activities on Porbeagle. It was agreed that the reference to

application of video monitoring systems for evaluating bycatch be noted as a measure for all fisheries (and not just certain fisheries). However, it was pointed out that video monitoring has limitations in many types of fisheries (e.g. trawl fisheries), as well as being prone to manipulation. In addition, the longline harpoon and trolling gear licence characterization in the Working Paper required correction and further clarification. Last, it was agreed that mitigation measures versus additional research requirements need to be separated out better within the Science Advisory Report.

Allowable Harm and Threats Assessment

It was noted that current total allowable catch (TAC) of Porbeagle is science-based. A meeting participant noted that the TAC is not currently being caught. In terms of overall allowable harm, it was agreed by all meeting participants that a lot of uncertainty exists within the proposed numbers, and that this requires consideration when applying the information to future decisions regarding management of the species.

There was significant discussion of the Threats Assessment table in the Science Advisory Report. A table was not completed for discussion prior to the meeting, and it was unclear by meeting participants exactly what criteria were used to objectively assess the various threats. A guidance document was provided to meeting participants to assist with the exercise (see: DFO 2014), although many meeting participants still were unclear as to how to interpret the various criteria being used. It was agreed for this exercise that the primary threat from a directed Porbeagle fishery presently does not exist given such a fishery is inactive. With this in mind, the chair advised that the remaining threats be evaluated in this context, and that text in the Science Advisory Report would be dedicated to characterizing cumulative effects.

Again, the limitation of aggregating fishing fleets by fishing type was discussed, so the threat assessment did attempt to identify threats associated with specific fisheries individually where possible. It remained that this exercise was not entirely clear, subject to a lot of discussion, with overall guidance being provided by meeting participants more familiar with this type of exercise.

Sources of Uncertainty

There was discussion throughout the meeting regarding various sources of uncertainty that might influence calculations and estimates presented in the Science Advisory Report and Working Paper. In general, it was felt that provided sources of uncertainty were identified in the Science Advisory Report and Working Paper, and assumptions and limitations of calculations clearly defined, a reader of the report/document would have an informed basis in which to interpret the scientific findings.

Science Advisory Report

The Science Advisory Report presented at the meeting did not receive complete review prior to meeting adjournment. It was agreed by meeting participants that the science lead and meeting chair-person would coordinate the completion of a draft report consistent with views expressed in the meeting on the Working Paper, and circulate as a revised draft Science Advisory Report by email for subsequent review and approval. All comments provided on the circulated report were addressed, and incorporated as necessary, jointly by the science lead and meeting chair.

CONCLUSIONS

Meeting participants felt the Science Advisory Report and Working Paper presented sound scientific analyses based on the best available information on Porbeagle. Both documents have been accepted for publication pending revision following discussions of the meeting and post-meeting Science Advisory Report comment and review. It is again noted that Porbeagle discards and post-release mortality estimates presented at the meeting were grouped by fishery type (e.g. longline) and, and as such, these estimates might not be attributable equally to individual fishing fleets within groupings. 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.

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APPENDICES

APPENDIX 1: LIST OF MEETING PARTICIPANTS

Name	Affiliation
Atkinson, Troy	NS Swordfishermen's Association
Brilliant, Sean	Canadian Wildlife Federation (CWF)
Campana, Steve	DFO Maritimes / Population Ecology Division (BIO)
Clark, Kirsten	DFO Maritimes / Population Ecology (SABS)
Couture, John	Unama'ki Institute of Natural Resources (UINR)
Curran, Kristian	DFO Maritimes / Centre for Science Advice
Deller, Sarah	DFO Maritimes / Species at Risk Management
Eagles, Mike	DFO Maritimes / Resource Management
Fowler, Mark	DFO Maritimes / Population Ecology Division (BIO)
Gaetan, Art*	Blue Shark Fishing Charters
Gibson, Jamie	DFO Maritimes / Population Ecology Division (BIO)
Goudie, Jim	Nunatsiavut Government
Grant, Heather	Ecology Action Centre (EAC)
Gray, Paddy*	LFA 33/Atlantic Shark Assn/Halifax Commercial Fisherman's Assn
Harris, Lei	DFO Maritimes / Population Ecology Division (SABS)
Hart, Donny*	Halifax West Commercial Fisherman's Assoc.
Houlihan, Dan	DFO Maritimes / Population Ecology Division (BIO)
James, Mike*	DFO Maritimes / Population Ecology Division (BIO)
Jayawardane, Aruna	Maliseet Nation Conservation Council (MNCC)
Jones, Ross	DFO Maritimes / Population Ecology Division (GFC)
MacIntosh, Robert	DFO Maritimes / Policy and Economics
McNeely, Joshua	Maritime Aboriginal Peoples Council (MAPC) - IKANAWTIKET
Perrier, Erika**	The Confederacy of Mainland Mi'kmaq/Mi'kmaw Conservation Group
Reyno, Frank	Atlantic Shark Association
Schleit, Katie	Ecology Action Centre (EAC)
Shaw, Jennifer	DFO NCR / Fish Population Science
Showell, Mark	DFO Maritimes / Population Ecology Division (BIO)
Simpson, Mark R.	DFO Newfoundland / Marine Fish Species at Risk
Smith, Colleen	DFO Maritimes / Policy and Economics
Spence, Koren	DFO Maritimes / Species at Risk Management
Vascotto, Kris	NS Dept. Fisheries & Aquaculture / Marine Fish
Whelan, Christie	DFO NCR / Oceans and Science
Wimmer, Tonya	WWF-Canada, Atlantic Region

* Attended Day 1 only
** Attended Day 2 only

APPENDIX 2: MEETING TERMS OF REFERENCE

Terms of Reference

Recovery Potential Assessment – Porbeagle (*Lamna nasus*)

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

February 19-20 2015
Dartmouth, Nova Scotia

Chairperson: Christie Whelan

Context:

After the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses an aquatic species as Threatened, Endangered or Extirpated, Fisheries and Oceans Canada (DFO) undertakes a number of actions required to support implementation of the *Species at Risk Act* (SARA). Many of these actions require scientific information on the current status of the wildlife species, threats to its survival and recovery, and the feasibility of recovery. Formulation of this scientific advice has typically been developed through a Recovery Potential Assessment (RPA) that is conducted shortly after the COSEWIC assessment. This timing allows for consideration of peer-reviewed scientific analyses into SARA processes including recovery planning.

Porbeagle (*Lamna nasus*) is a species pf mackerel shark in the family Lamnidae. Porbeagle in the Northwest Atlantic Ocean is considered one population. The Northwest Atlantic population ranges from northern Newfoundland and Labrador to New Jersey, and possibly South Carolina, with mature females ranging farther south to the Sargasso Sea. This species is widely distributed in the Canadian Atlantic, occuring the Gulf of St. Lawrence, around Newfoundland and Labrador, on the Scotian Shelf, and in the Bay of Fundy. Most of the Northwest Atlantic population is found within Canadian waters at some point in its life history.

Porbeagle was first assessed as Endangered by COSEWIC in May 2004. In preparation for its scheduled re-assessment by COSEWIC in 2014, in DFO Science conducted a pre-COSEWIC review of Porbeagle in September 2012 (Campana et al. 2013; Simpson and Miri, 2014). Porbeagle was re-assessed as Endangered by COSEWIC in May 2014.

In support of listing recommendations for Porbeagle by the Minister, DFO Science has been asked to undertake an RPA, based on the national RPA Guidance. The advice in the RPA may be used to inform both scientific and socio-economic aspects of the listing decision, development of a recovery strategy and action plan, and to support decision making with regards to the issuance of permits or agreements, and the formulation of exemptions and related conditions, as per sections 73, 74, 75, 77, 78 and 83(4) of SARA. It may also be used to prepare for the reporting requirements of SARA s.55. The advice generated via this process will update and/or consolidate any existing advice regarding this species.

Objective:

- To provide up-to-date information, and associated uncertainties, to address the following elements:

Biology, Abundance, Distribution and Life History Parameters

Element 1: Summarize the biology of Porbeagle.

Element 2: Evaluate the recent species trajectory for abundance, distribution and number of populations.

Element 3: Estimate the current or recent life-history parameters for Porbeagle.

Habitat and Residence Requirements

Element 4: Describe the habitat properties that Porbeagle needs for successful completion of all life-history stages. Describe the function(s), feature(s), and attribute(s) of the habitat, and quantify how the biological function(s) that specific habitat feature(s) provides varies with the state or amount of habitat, including carrying capacity limits, if any.

Element 5: Provide information on the spatial extent of the areas in Porbeagle's distribution that are likely to have these habitat properties.

Element 6: Quantify the presence and extent of spatial configuration constraints, if any, such as connectivity, barriers to access, etc.

Element 7: Evaluate to what extent the concept of residence applies to the species, and if so, describe the species' residence.

Threats and Limiting Factors to the Survival and Recovery of Porbeagle

Element 8: Assess and prioritize the threats to the survival and recovery of the Porbeagle.

Element 9: Identify the activities most likely to threaten (i.e., damage or destroy) the habitat properties identified in elements 4-5 and provide information on the extent and consequences of these activities.

Element 10: Assess any natural factors that will limit the survival and recovery of the Porbeagle.

Element 11: Discuss the potential ecological impacts of the threats identified in element 8 to the target species and other co-occurring species. List the possible benefits and disadvantages to the target species and other co-occurring species that may occur if the threats are abated. Identify existing monitoring efforts for the target species and other co-occurring species associated with each of the threats, and identify any knowledge gaps.

Recovery Targets

Element 12: Propose candidate abundance and distribution target(s) for recovery.

Element 13: Project expected population trajectories over a scientifically reasonable time frame (minimum of 10 years), and trajectories over time to the potential recovery target(s), given current Porbeagle population dynamics parameters.

Element 14: Provide advice on the degree to which supply of suitable habitat meets the demands of the species both at present and when the species reaches the potential recovery target(s) identified in element 12.

Element 15: Assess the probability that the potential recovery target(s) can be achieved under current rates of population dynamics parameters, and how that probability would vary with different mortality (especially lower) and productivity (especially higher) parameters.

Scenarios for Mitigation of Threats and Alternatives to Activities

Element 16: Develop an inventory of feasible mitigation measures and reasonable alternatives to the activities that are threats to the species and its habitat (as identified in elements 8 and 10).

Element 17: Develop an inventory of activities that could increase the productivity or survivorship parameters (as identified in elements 3 and 15).

Element 18: If current habitat supply may be insufficient to achieve recovery targets (see element 14), provide advice on the feasibility of restoring the habitat to higher values. Advice must be provided in the context of all available options for achieving abundance and distribution targets.

Element 19: Estimate the reduction in mortality rate expected by each of the mitigation measures or alternatives in element 16 and the increase in productivity or survivorship associated with each measure in element 17.

Element 20: Project expected population trajectory (and uncertainties) over a scientifically reasonable time frame and to the time of reaching recovery targets, given mortality rates and productivities associated with the specific measures identified for exploration in element 19. Include those that provide as high a probability of survivorship and recovery as possible for biologically realistic parameter values.

Element 21: Recommend parameter values for population productivity and starting mortality rates and, where necessary, specialized features of population models that would be required to allow exploration of additional scenarios as part of the assessment of economic, social, and cultural impacts in support of the listing process.

Allowable Harm Assessment

Element 22: Evaluate maximum human-induced mortality and habitat destruction that the species can sustain without jeopardizing its survival or recovery.

Expected Publications

- CSAS Science Advisory Report
- CSAS Proceedings
- CSAS Research Document

Participation

- Fisheries and Oceans Canada (DFO), Science, Fisheries Management, Ecosystem Management, and Policy & Economics
- Provincial Governments (NS, NB, NL)
- Academics
- Aboriginal Communities/Organizations
- Fishing Industry
- Environmental Non-Government Organizations
- Other Invited Experts

References

Campana, S.E., Gibson, A.J.F., Fowler, M., Dorey, A., and Joyce, W. 2013. Population Dynamics of Northwest Atlantic Porbeagle (*Lamna nasus*), with an Assessment of Status and Projections for Recovery. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/096. iv + 84 p.

COSEWIC. 2004. COSEWIC Assessment and Status Report on the Porbeagle Shark *Lamna nasus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. viii + 43 pp.

COSEWIC. 2014. COSEWIC Assessment and Status Report on the Porbeagle *Lamna nasus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 40 pp.

Simpson, M.R., and Miri, C.M. 2014. A Pre-COSEWIC Assessment of Porbeagle Shark (*Lamna nasus*) in Newfoundland and Labrador Waters. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/088. iv + 19 p.

APPENDIX 3: MEETING AGENDA

Agenda

Recovery Potential Assessment – Porbeagle (*Lamna nasus*)

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

February 19-20 2015

Lewis King Boardroom, BIO
Dartmouth, Nova Scotia

Chairperson: Christie Whelan

DRAFT AGENDA

19 February – Thursday

Time	*Topic*
9:00 – 9:15	Introduction (Chair)
9:15 – 10:15	Distribution and life history
10:15 – 10:30	*Break*
10:30 – 12:00	Abundance and habitat Threats
12:00 – 1:00	*Lunch* (not provided – cafeteria on site)
1:00 - 3:00	Recovery targets
3:00 – 3:15	*Break*
3:15 – 4:30	Mitigation options

20 February – Friday

Time	*Topic*
9:00 – 9:15	Introduction (Chair)
9:15 – 10:15	Revisit previous information as required
10:15 – 10:30	*Break*
10:30 – 12:00	Draft SAR
12:00 – 1:00	*Lunch* (not provided – cafeteria on site)
1:00 - 3:00	Finalize SAR
3:00 – 3:15	*Break*
3:15 – 4:15	Wrap up
4:15 – 4:30	Close and Adjournment (Chair)