PEER REVIEW REPORT

ID333 - Status Review Report for Porbeagle Shark (*Lamna nasus*)

In January 2010, the National Marine Fisheries Service (NMFS) received petitions, from Wild Earth Guardians (WEG) and the Humane Society of the United States (HSUS) requesting that we list porbeagle sharks throughout their entire range, or as Northwest Atlantic, Northeast Atlantic, and Mediterranean DPSs under the Endangered Species Act (ESA). In response to these petitions, we published a “negative” 90-finding on July 12, 2010, in which we concluded that the petitions did not present substantial scientific and commercial information indicating that listing under the ESA may be warranted.

In August 2011, the petitioners filed complaints in the U.S. District Court for the District of Columbia challenging our denial of the petitions. On November 14, 2014, the Court published a Memorandum Opinion granting the plaintiffs’ requests for summary judgment in part, denying our request for summary judgment, and vacating the 2010 90-day finding for porbeagle sharks. The Court ordered us to prepare a new 90-day finding; we published the new 90-day finding on March 27, 2015. We initiated a review of the status of the species consistent with the ESA mandate that listing determinations should be made on the basis of the best scientific and commercial information available. Under the ESA, if a petition is found to present substantial scientific or commercial information that the petitioned action may be warranted, a status review shall be promptly commenced (16 U.S.C. 1533(b)(3)(A)). We solicited review of the draft Status Review Report for Porbeagle Shark (*Lamna nasus*) from four potential reviewers. All four reviewers provided comments.

Reviewers (listed alphabetically):
- Andres Domingo, Dirección Nacional de Recursos Acuáticos (DINARA) Recursos Pelágicos, Montevideo, Uruguay
- Warren Joyce, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada
- Heather Marshall, Mote Marine Laboratory and Aquarium, Sarasota, FL
- Gregory Skomal, Massachusetts Division of Marine Fisheries, New Bedford, MA

Background:

Peer Reviewer Comments:

*A number of minor, editorial comments were received and addressed.*

General Comments not requiring a specific response

With the exception of the notes below, I found this draft Status Review Report to be well researched, with factually supported content, and scientifically valid.

Overall, I found the data considered to be well researched and collected from both fisheries dependent and independent data, collected for both distinct population segments (DPSs) for the porbeagle. Data considered was from multiple institutions and organizations, as well as
international sources. Not only was fisheries information considered, but tagging and genetic studies as well. The various stock assessment models run from different institutions were well considered, and conclusions drawn from them are logical. The ranking conclusions drawn for each considered risk for Demographics, Threats Assessment, and Overall Risk Summary are well considered, careful, and logical given all of the considered data.

The authors compiled and considered the best available information for these analyses.

Overall I found the report completed by the Porbeagle ERA Team to be very accurate and complete and I believe they have captured all the relevant data existing on the porbeagle shark. I do have a couple of comments and some small corrections of which I will discuss below. As well, I have included copies/links to two references of some very recent papers describing post-release mortality estimates of porbeagle, which you might consider for inclusion in this report.

Uncertainties within the data, such as the limited fisheries data within the Mediterranean Sea and southern hemisphere, were clearly identified, and conclusions drawn from these limited data sets were logical and scientifically sound.

The authors did an excellent job to identify and to take into consideration uncertainties in the existing data when conducting analyses and drawing conclusions.

I do not believe information to be missing or justifications lacking in this review.

**Comments and Responses**

My only comment centers on the definition of a single Distinct Population Segment in the North Atlantic. The authors base this decision on tagging data, the biological potential to move across the Atlantic, and genetic analyses. With the exception of a single animal, there is no evidence from tagging information that porbeagles move between the Northwest and Northeast Atlantic. Many species have the “biological potential” to move around the globe, but they don’t. With regard to genetic evidence, it is well known that genetic homogeneity can be achieved and maintained by the movement of a single animal per generation. So, the extent to which the Northeast and Northwest populations are mixing can be as low as 1 migrant per generation to homogenize these two populations. The tagging data support this low rate of transatlantic migration. Is this level of exchange sufficient to lump these two stocks into a single DPS?

**Specific comments on this issue:** (a) Page 12, Paragraph 2 – With the exception of a single animal, there is no evidence from tagging information that porbeagles move between the Northwest and Northeast Atlantic. Many species have the “biological potential” to move around the globe, but they don’t. (b) Page 14, Paragraph 1 – It is well known that genetic homogeneity can be achieved and maintained by the movement of a single animal per generation. So, the extent to which the Northeast and Northwest populations are mixing can be as low as 1 migrant per generation to homogenize these two populations. The tagging data support this low rate of transatlantic migration. Is this enough to lump these two stocks into a single DPS?

Additional text was added to the final status review report to more thoroughly explain the basis of the determination regarding only a single DPS in the North Atlantic. We acknowledge
mixing rates across the North Atlantic could be very low. However, the lack of differentiation in mtDNA within these regions indicates that female porbeagles must at least occasionally move between widely separated stock areas (Pade et al. 2006, Testerman et al. 2007). In order to be a DPS, a population must be discrete and significant; as explained more thoroughly in the final status review report, porbeagle sharks in the Northwest and Northeast Atlantic are not discrete.

Where Marshall et al. (2012) is cited for finding an at-vessel mortality rate of 24% for porbeagles, this data actually comes from unpublished data as cited in the article, these mortality rates were not collected in the stress physiology project. Perhaps this should be clarified in the review.

Clarifying text was added to the final status review report.

The new study below should be considered for the final version of this review Campana, S.E., Joyce, W., Fowler, M., and M. Showell. 2015. Discards, hooking, and post-release mortality of porbeagle (Lamna nasus), shortfin mako (Isurus oxyrinchus), and blue shark (Prionace glauca) in the Canadian pelagic longline fishery. *ICES Journal of Marine Science*, doi: 10.1093/icesjms/fsv234.

Relevant information from Campana et al. 2015 was added to the final status review report and cited as appropriate.

Concerning the presence of cancer in sharks, under section “Disease or Predation”, the National Geographic article is cited as saying there is a low incidence of cancer in porbeagle sharks specifically, which is a bit misleading, as the article is about cancer in sharks in general, and not specifically porbeagle sharks. Perhaps this can be reworded.

Clarifying text was added to the final status review report.


In this paper, a mean hooking mortality for porbeagles of 43.8% was found based on observed sharks in the large pelagic longline fishery. Post-release mortality estimates of porbeagles tagged with pSATs had a 10% mortality for healthy porbeagles (n=29) while injured porbeagles had a mortality rate of 75% (n=4). These results may have some implications to your report.
Relevant information from both references was added to the final status review report and cited as appropriate.

Page iii, Paragraph 2 –

- Common in the north Atlantic, the south Atlantic and the south Pacific, porbeagles have been caught at sea surface temperatures (SST) between 2 and 23°C, although most captures have fallen in the range of 8–20°C (Svetlov, 1978; Stevens et al., 1983; Lucifora and Menni, 1998; Francis and Stevens, 2000). It is not known if the porbeagle actually inhabits such a broad temperature range, as SST may be a poor indicator of ambient temperature for this species. Temperature and depth associations of porbeagle shark (Lamna nasus) in the northwest Atlantic. SE Campana, WN Joyce - Fisheries Oceanography, 2004 - Wiley Online Library; https://www.researchgate.net/profile/Steven_Campana/publication/227717695_Temperature_and_depth_associations_of_porbeagle_shark_%28Lamna_nasus%29_in_the_northwest_Atlantic/links/545a68ec0cf25c508c30f46e.pdf

The additional text on distribution in relation to sea surface temperature was determined not to be necessary in the final status review report. The suggested reference was used in the draft and final status review report.

Page 10, Paragraph 2 – Para calcular la talla de madurez de machos, se utilizó el LH, el LP y el grado de madurez de 137 individuos. En la Figura 12 se presenta la relación entre el LH el LP, y los individuos categorizados por grado de madurez. Se observa en los individuos juveniles/subadultos un rápido crecimiento de los pterigopodios entre los 130 y 170 cm, resultando en un modelo de tipo sigomidal. En la Figura 13 se presenta la relación entre el LH y el Índice LP, junto con las dos regresiones lineales. En este caso, el punto de corte entre ambas regresiones (170 cm) estaría representando la talla a la que el 100% de los individuos son maduros (LH100). Mediante una ojiva de madurez se calculó que el L50 es 147 cm, y LH100 es 164 cm (Figura 14). En relación a las tallas de madurez de las hembras, según lo observado en el Pacífico sudoccidental (Francis & Duffy, 2005), en este trabajo se observaron 83 individuos por encima de los 170 cm, pero de estos, tan solo 47 superaron los 180 cm (Figura 15). En todo el periodo de estudio tan solo se observó una hembra preñada, la misma media 199 cm y fue capturada en octubre de 2010 en aguas internacionales adyacentes de Argentina (41°39' S 50°28’ W) con una TSM de 18,6°C. Tenía 4 embriones; 2 machos, uno de 65 cm y otro de 63 cm, y dos hembras, una de 67 cm y otra de 66 cm Coincidentemente, otra hembra preñada con 2 embriones de aproximadamente 52 cm (60 cm LT) (un macho y una hembra) fue observada a principios de junio de 2010, con una TSM de 14,8°C, en la ZCP (36°35’S 53°33’ W) en un barco de la flota de bandera japonesa que opera en Uruguay (A. Domingo com. pers.). En base a la talla mínima registrada entre los individuos capturados (66 cm), y la talla más grande de los embriones observados (67 cm), se podría suponer que la talla de parición de la especie en el Atlántico sudoccidental estaría entre los 66 – 67 cm. Tomando estas tallas como referencia, se observó que individuos menores a 69 cm (n=11) fueron capturados de julio a enero, estando el máximo en Octubre (n=4), pudiendo considerarse estos meses como la época de parición. Forselledo, R. 2012. Distribucion, estructura poblacional y aspectos reproductivos del tiburon Pinocho Lamna nasus (Bonnaterre, 1788) en el Atlántico Sudoccidental. Tesis de Licenciatura en Ciencias Biologicas, Facultad de Ciencias, Universidad de la Republica, Montevideo.
Translated as: HL, LP, and the degree of maturity of 137 individuals was used to calculate the size at maturity of males. Figure 12 shows the relationship between LP and LH, and individuals categorized by state of maturity. Rapid growth of claspers is observed in juveniles/subadults between 130 and 170 cm, resulting in a model sigmoidal type. Figure 13 shows the relation between LH and the LP index, together with two linear regressions. In this case, the cutoff between the two regressions (170 cm) could be representing the length at which 100% of individuals are mature (LH 100). Based on a maturity ogive, L 50 was estimated is 147 cm, and LH 100 is 164 cm (Figure 14). In relation to the size of mature females, as observed in the Southwest Pacific (Francis & Duffy, 2005), in this study 83 individuals were observed above 170 cm, but of these, only 47 exceeded 180 cm (Figure 15). In the entire period of study only one pregnant female was observed, it measured 199 cm and was captured in October 2010 in adjacent international waters of Argentina (41° 39' S 50° 28' W) with TSM 18.6 ° C. It had 4 embryos; 2 males, one of 65 cm and a 63 cm, and two females, one of 67 cm and a 66 cm. Coincidentally, another pregnant female with 2 embryos approximately 52 cm (60 cm LT) (one male and one female) was observed in early June 2010 with TSM 14.8 ° C, in the PTA (36° 35' S 53° 33' W) on a ship of the Japanese fleet operating in Uruguay (A. Domingo pers. comm.). Based on the minimum size recorded among captured individuals (66 cm), and the largest size of the observed embryos (67 cm), one might assume that the size of calving of the species in the Southwest Atlantic would be between 66-67 cm. Taking these sizes as a reference, it was observed that individuals under 69 cm (n = 11) were caught from July to January, the highest being in October (n = 4), these months can be considered as the pupping season.

Forselledo, R. 2012. Distribution, population structure and reproductive aspects of Pinocchio Porbeagle shark (Bonnaterre, 1788) in the South West Atlantic. Thesis in Biological Sciences, Faculty of Science, University of the Republic, Montevideo.

Additional information on life history from Forselledo 2012 was added to the final status review report, and this reference was added.


This reference was added to the final status review report.

Suggested reference for the Northwest Atlantic (p. 15): A pre-COSEWIC assessment of Porbeagle Shark (Lamna nasus) in Newfoundland and Labrador waters M.R. Simpson and C.M. Miri Science Branch Fisheries and Oceans Canada P.O. Box 5667 St. John’s NL A1C 5X1

This reference was added to the final status review report.

Page 16, Paragraph 4 – I think it would be good to include some comment on the Canadian TAC decreasing while discussing the increase of porbeagle biomass in this section. I realize the TAC
is covered in detail later on in the report on page 26 but the report could include a note in the last line of this paragraph (“directed landings have been less than 250 mt since 2002”).

No changes were necessary in the final status review report as the TAC is covered in detail in the report.


*This information and reference was incorporated into the final status review report.*

Page 26, Paragraph 2 – the reference listed as Campana and Gibson, 2008 for TAC levels, I don’t know where this reference came from and wonder if the authors meant to reference the 2010 or 2012 paper? Not included in the Reference section either.

*The reference to Campana and Gibson 2008 was corrected to Campana et al. 2012 in the final status review report.*

Page 27, Paragraph 3 – The Canadian recreational fishery is also limited to rod and reel and should be noted.

*Clarifying text was added to the final status review report.*

Page 31, Paragraph 1 – DFO should be “Department of Fisheries and Oceans”. Change “Division” to “Department”.

*Text was corrected in the final status review report.*