APPENDIX A

Agenda

Monday, 7 December 2009

1. Arrival and registration
2. Welcome by Ichiro Nomura (Assistant Director-General, FAO Fisheries and Aquaculture Department)
3. Introduction of participants
4. Selection of Panel Chairperson
5. Panel terms of reference, objectives and work programme for the meeting
6. Overview of the CITES listing criteria (Res.Conf. 9.24 [Rev. CoP14])
7. Presentations by proponents of each of the four proposals dealing with shark species, followed by questions from the Panel
8. Panel discussion on the four proposals

Tuesday, 8 December 2009

9. Panel discussion on the four proposals
10. Discussion with proponents of the four shark proposals (Mr Gerhard Adams, Ms Sarah Fowler and Mr Ingo W. Stuermer, EC; Mr John Carlson, NOAA)

Wednesday, 9 December 2009

11. Preparation of draft reports on shark proposals
12. Presentation by the FAO consultants of preliminary assessments of the proposals on i) Coralliidae and ii) *Thunnus thynnus*.

Thursday, 10 December 2009

13. Presentations by proponents of the proposals on i) Coralliidae and ii) *Thunnus thynnus*, followed by questions from the Panel
14. Presentation by ICCAT Secretariat on the outcomes of the ICCAT Scientific Committee meeting in September 2009 in relation to *Thunnus thynnus* and the decisions adopted by the Commission in Recife, followed by questions from the Panel
15. Panel discussion on the two proposals

Friday, 11 December 2009

16. Panel discussion on the two proposals
17. Discussion with Proponents of the Coralliidae and *Thunnus thynnus* (Ms Roberts, NOAA, United States of America and Mr Restrepo, ICCAT)
18. Preparation of draft reports on Coralliidae and *Thunnus thynnus*

Saturday, 12 December 2009

19. Finalization of reports on all six proposals
20. Clearance and adoption of reports by Panel

APPENDIX B

List of participants

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APPENDIX C

Welcome speech by Mr Ichiro Nomura, Assistant Director-General, FAO Fisheries and Aquaculture Department

It is my pleasure to welcome you to this third meeting of the FAO Expert Advisory Panel for the Assessment of Proposals to Amend Appendices I and II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Concerning Commercially-exploited Aquatic Species.

You have been selected, in your individual capacity and not as a representative of any country or organisation, on the basis of your particular expertise to assist FAO to undertake these tasks. For many of you this will be your first experience of the Panel but several of you also participated in one or both former meetings that were able to deliver very satisfactory reports. Those of you who were present at the previous two CITES Conference of Parties know that the Panel reports were welcomed and taken very seriously. The last CITES CoP14 followed all the recommendations of the Panel even in some controversial cases. This shows the extent to which the advice of the Panel is trusted and respected by Parties. This respect puts a big responsibility on all of us to ensure that the Panel produces reliable, objective and thorough advice. We are very grateful that you have accepted this challenge and have dedicated your time and expertise to assist us.

To help the current Panel to keep up with the good work of the previous ones, we prepared preliminary evaluations to serve as working documents for the Panel. We hope that these will allow the Panel to consider each proposal efficiently, to focus quickly on the more difficult or uncertain aspects, if any, in each proposal, and to formulate solid and justified conclusions.

It may not always be possible for the Panel to reach agreement on the evaluation of all proposals and there may be differing views in some instances. I do urge you to do all that you can to achieve consensus and to express your agreed conclusions clearly and unambiguously. Where consensus is not possible, the Panel report should equally clearly describe and motivate the conflicting opinions to allow CITES Parties to evaluate them and make up their own minds.

I thank you all for giving up your time to help us in this important meeting, especially as I know you are all very busy and some of you have had to rearrange your schedules to be able to attend. I also thank Mr David Morgan of the CITES Secretariat for joining us at this meeting and for the cooperation and assistance given by CITES in the work we have been undertaking in relation to CITES and commercially-exploited aquatic species. We have developed a close and positive working relationship with the CITES Secretarial which is valued by both organizations. I must mention though that at present, we do have an important difference of opinion with the CITES Secretariat with regard to the interpretation of the listing criteria. The manner in which this is resolved could have considerable implications for the Convention in the future. However, this issue need not concern the Panel and, as you know, your task is not to evaluate the criteria but to apply them and, in doing this, we have asked you to adhere to the science-based interpretation that is the FAO understanding of what the majority of CITES Parties adopted in 2004. We hope that the CITES Parties will resolve this issue at their Conference next year in a manner that will enable the Convention to fulfil its important mandate in the most effective manner.

The meeting of this Expert Advisory Panel has again been financially supported by the FAO Regular Programme and also by Japan and the United States of America, and I would like to thank these two countries for their generous gesture.

Finally, I sincerely hope that the hard work on the Panel leaves you some time to relax in Rome and to enjoy some of the many attractions that the Eternal City has to offer

I wish you a fruitful and enjoyable meeting.

APPENDIX D

Terms of reference for an Ad Hoc Expert Advisory Panel for Assessment of Proposals to CITES[1]

1. FAO will establish an Ad Hoc Expert Advisory Panel for the Assessment of Proposals to Amend CITES Appendices I and II.
2. The Panel shall be established by the FAO Secretariat in advance of each Conference of the Parties, according to its standard rules and procedures and observing, as appropriate, the principle of equitable geographical representation, drawing from a roster of recognized experts, to be established, consisting of scientific and technical specialists in commercially-exploited aquatic species.
3. The Panel members shall participate in the Panel in their personal capacity as experts, and not as representatives of governments or organizations.
4. The Panel will consist of a core group of no more than 10 experts, supplemented for each proposal by up to 10 specialists on the species being considered and aspects of fisheries management relevant to that species.
5. For each proposal the Panel shall:
   - assess each proposal from a scientific perspective in accordance with the CITES biological listing criteria, taking account of the recommendations on the criteria made to CITES by FAO;
   - comment, as appropriate, on technical aspects of the proposal in relation to biology, ecology, trade and management issues, as well as, to the extent possible, the likely effectiveness for conservation.
6. In preparing its report, the Panel will consider the information contained in the proposal and any additional information received by the specified deadline from FAO Members and relevant regional fisheries management organizations (RFMOs). In addition, it may ask for comments on any proposed amendment, or any aspect of a proposed amendment, from an expert who is not a member of the Panel if it so decides.
7. The Advisory Panel shall make a report based on its assessment and review, providing information and advice as appropriate on each listing proposal. The Panel shall finalize the advisory report no later than ?? days[2] before the start of the CITES Conference of the Parties where the proposed amendment will be addressed. The advisory report shall be distributed as soon as it is finalized to all Members of FAO, and to the CITES Secretariat with a request that they distribute it to all CITES Parties.
8. The general sequence of events will be as follows:
   - Proposals received by CITES
   - Proposals forwarded by CITES Secretariat to FAO
   - FAO forwards proposals to FAO Members and RFMOs and notifies them of deadline for receipt of comments
   - Member and RFMO comments and input received by FAO
   - Panel meets and prepares advisory report on each proposal
   - Panel report reviewed by FAO Secretariat and forwarded to FAO Members, RFMOs and CITES Secretariat.

[1] Taken from Appendix E of the Report of the twenty-fifth Session of COFI, FAO, Rome, 24-28 February 2003
[2] To be discussed with CITES.

APPENDIX E

FAO Expert Advisory Panel assessment report: scalloped hammerhead and related species

CoP 15 Proposal 15

SPECIES:

Sphyrna lewini – Scalloped hammerhead shark plus *Sphyrna mokarran* (great hammerhead shark), *Sphyrna zygaena* (smooth hammerhead shark), *Carcharhinus plumbeus* (sandbar shark), *Carcharhinus obscurus* (dusky shark).

PROPOSAL:

Inclusion of *Sphyrna lewini* in Appendix II in accordance with Article II paragraph 2(a); inclusion of *Sphyrna mokarran*, *Sphyrna zygaena*, *Carcharhinus plumbeus*, *Carcharhinus obscurus* in Appendix II in accordance with Article II paragraph 2(b).

Basis for proposal:

Sphyrna lewini: The proposal indicates that *Sphyraena lewini* qualifies for inclusion in Appendix II because it is overexploited for its fins, which are highly valued in trade, and has experienced historic declines of at least 15–20% from the baseline. In addition recent rates of decline are projected to drive the species down from the current level to a historical extent of decline consistent with the Appendix I criteria within approximately a 10-year period.

Sphyrna mokarran, Sphyrna zygaena, Carcharhinus plumbeus, Carcharhinus obscurus: The specimens of the species in the form in which they are traded resemble specimens of a species included in Appendix II under the provisions of Article II, paragraph 2(a), or in Appendix I, such that enforcement officers who encounter specimens of CITES-listed species, are unlikely to be able to distinguish between them. The proposal indicates (Section 9) that fins from all these species are morphologically similar, thin and falcate, with dorsal fin height longer than the base, and that traders often lump fins from these five species together.

ASSESSMENT SUMMARY

The FAO Expert Panel concluded that the available evidence supports the proposal to include scalloped hammerhead (*Sphyrna lewini*) in CITES Appendix II in accordance with Article II paragraph 2(a), along with the look-alike species, great hammerhead shark (*S. mokarran*) and smooth hammerhead shark (*S. zygaena*), in accordance with Article II paragraph 2(b). However, it considered that there is insufficient evidence to also include sandbar shark (*Carcharhincus plumbeus*) and dusky shark (*C. obscurus*) in accordance with Article II paragraph 2(b), due to inadequate evidence relating to “look-alike” considerations.

The Panel concluded that this was a species of low productivity.

When evaluated on a population by population basis, two historically large scalloped hammerhead populations proposed for listing were considered to meet the Appendix II decline criterion.

In the Northwest Atlantic Ocean, the most robust information is from a population assessment based on multiple data sets that showed an extent of decline of 83% between 1981 and 2005. This meets the Appendix II decline criterion for a low productivity species. In the Southwest Atlantic Ocean, hammerhead sharks were targeted by several fisheries that have subsequently collapsed (overall extent of decline up to 90%). Scalloped hammerhead appear to have been relatively abundant in the past in this area, but are now generally too sparse to support target fisheries.

Information for judging the extent of decline elsewhere is only available for a few areas. In the Pacific Ocean, datasets that provide compelling evidence of substantial declines include beach-protection net data from the Southwest Pacific that indicate a 65–85% decline over a 44 year period spanning 1963–2007, and sightings data from the eastern Pacific that indicate a 71% decline over a 12 year period spanning 1992–2004. In the western Indian Ocean, beach-protection net data indicate a 64% decline over a 25 year period spanning 1978–2003.

Although the Panel was not able to locate reliable time series of data for other areas, consideration of life history information (philopatry, coastal distribution, vulnerability to fishing at all stages of life, and behaviour) and high demand for fins led the Panel to conclude that levels of decline are likely to be similar elsewhere. Based on these considerations and evidence of substantial declines that meet or nearly meet the Appendix II decline criteria in all areas where adequate time series exist, the Panel considered that, overall, scalloped hammerhead meets the decline criterion for Appendix II.

Fins for this species are in demand and are of relatively high value in the world market, and there is evidence that international trade has resulted in targeting of this species for its fins. Currrently, it appears that several target fisheries have collapsed and most catches constitute bycatch from fisheries targeting other species.

In the area where the largest decline has been observed, the Northwest Atlantic, increasingly stringent management measures are being implemented for a species complex of which scalloped hammerhead is a part, which may mitigate risk. In other areas, finning bans may support management but there are no strong management measures in place for this species.

With respect to the proposal to list four other shark species (great hammerhead shark, smooth hammerhead shark, sandbar shark, dusky shark) in accordance with Article II paragraph 2(b), the Panel concluded that the information available justified the case for great and smooth hammerheads, but did not justify the case for sandbar and dusky sharks, as products from these two species do not resemble those of the scalloped hammerhead to the extent that regulation of trade was required to protect the scalloped hammerhead. Evidence was available that fins of scalloped and smooth hammerhead are not separated in the China, Hong Kong Special Administrative Region (SAR) market, so there is clear justification for an Article II paragraph 2(b) listing of the latter. Similarly, fins of these two species and the great hammerhead closely resemble each other, such that the latter species might be included in a “look-alike” group. However the reasoning provided for including sandbar and dusky shark, and for not including other species of sharks, did not appear strong.

Assessing Article II paragraph 2(b) proposals for exploited sharks whose fins are in trade is complicated by a lack of information on the “taxonomy” of fins (as might be provided in an identification guide) and the lack of standards in CITES for making decisions on Article II paragraph 2(b) listings. The former difficulty is being addressed by the United States of America which are preparing an identification guide to fins, and the latter could be addressed by a technical consultation on Article II paragraph 2 (b) listings of commercially exploited aquatic species, perhaps organized by FAO.

PANEL COMMENTS

Biological considerations

Population assessed

Scalloped hammerhead is a circumglobal shark species found in coastal warm temperate and tropical seas (Compagno, 1984; Fowler *et al.*, 2005). Like other hammerhead sharks, this species is primarily found on continental shelves and in deep water adjacent to them, to depths of at least 275 m, but is rarely found in open ocean areas.

A study of global genetic structure based on mitochondrial DNA (Duncan *et al.*, 2006) showed strong geographic population subdivisions, corresponding to ocean barriers to migration. The proposal cites an unpublished study which provides further detail on genetic structure (Chapman, Pinhal and

Shivji, 2009 in review, cited in the proposal). The strong population substructure may account for differences in life history parameters between ocean basins.

Productivity level

Most values of life history parameters are consistent with a low productivity level (Table 1). Information is available from the Northwest Atlantic (Piercy *et al.*, 2007), western Indian Ocean (Dudley and Simpfendorfer, 2006), western Pacific (Chen *et al.*, 1990) and eastern Pacific (Tolentino and Mendoza, 2001) (Table 1). Values from the western Pacific (Chen *et al.*, 1990) indicate a faster growth rate than in other parts of the world and suggest that productivity may be considered medium in this area; however recent studies have cast doubt on this result (J. Carlson, pers. comm.).

The detailed life history modelling study of Cortes (2002) provides very different results for *S. lewini* from the Northwest Gulf of Mexico and western Pacific (Table 1), no doubt based on differing observations of life history parameters in these two areas. This study generated a relatively high estimate of population growth rate for *S. lewini* from the western Pacific, the second highest of 41 populations of sharks compared, while estimated population growth rate of *S. lewini* from the Gulf of Mexico was about in the middle of the 41 populations considered. Western Pacific *S. lewini* would correspond to a high or medium productivity level based on this study, while Gulf of Mexico individuals would be rated low productivity (Table 1).

Population status and trends

Decline

A number of abundance indices are available from different parts of the range (proposal; Table 2), but these are of varying reliability as indices for this species. In some cases indices are for scalloped hammerhead as a species, in others for a complex of hammerhead sharks (*Sphyrna* spp.), in yet others for a broader shark complex.

Northwest Atlantic Ocean

Hayes, Jiao and Cortes (2009), based on a population assessment of scalloped hammerhead shark using two forms of surplus production model and incorporating multiple abundance indices (including those listed below), found an extent of decline of 83% from 1980–2005 (Figure 1). Their study indicates that the population has been increasing since 1995 and that there is a high probability of population recovery under most plausible scenarios, although the time to recovery varies with fishery removals (Table 3). However, they note that surplus production models are often overly optimistic in estimating rebuilding times.

Jiao, Hayes and Cortes (2009) conducted an assessment of the hammerhead shark complex (scalloped, smooth, great), concluding that recent depletion level (extent of decline) would be 91–93% for 1980–2005, based on ratio of current number to N_{MSY} and the fact that N_{MSY} is half of unexploited biomass.

Myers *et al.* (2007) summarized abundance trends for scalloped hammerhead and other shark species from a number of survey and commercial catch per unit of effort (CPUE) databases. A 31-year survey in North Carolina coastal waters (University of North Carolina) showed an instantaneous rate of decline of 0.127 for scalloped hammerhead, equivalent to a 98% extent of decline over the series (Figure 2). A SEAMAP survey in coastal waters of the southeast United States of America showed an instantaneous rate of increase for scalloped hammerhead of 0.094 over 17 years; the authors note that this was one of only 2 out of 31 shark abundance trends which showed an increase, and hypothesised that since the individuals taken were mostly juveniles, the increase could reflect release of competition and/or predation due to decline in abundance of large sharks. Commercial logbook and observer time series for all hammerheads pooled (noting that scalloped hammerhead was the most abundant of the three species in the group) showed extents of decline of 91% and 79% respectively over 14–15 yr series, based on instantaneous rate of decline estimates. Myers *et al. (*2007) indicate an instantaneous rate of decline from a meta-analysis of trends from several surveys of approximately 0.05 (Figure 3).

Baum *et al.* (2003), apparently based on the same logbook data set as Myers *et al. (*2007) indicated a decline from 1986 to 2000 of 89% in commercial CPUE of pooled hammerhead species (Figure 4), and noted that this species group had declined in all fishing areas examined (Figure 5). Burgess *et al. (*2005) provided arguments that the declines in abundance indices observed by Baum *et al. (*2003) were probably greater than population declines, while Baum, Kehler and Myers (2005) in responding to this critique provided arguments that their estimates of population decline were robust.

Two survey indices from Ingram *et al. (*2005) are included (Table 2) since they were included in the proposal, however these are considered of low reliability for scalloped hammerheads since they are based on all coastal sharks, of which scalloped hammerhead made up only 6–7%. Inspection of survey CPUEs for this complex showed no trend for the Atlantic coast of the United States of America for 1995–2005 and for the Gulf of Mexico coast 1995–2003, contrary to the interpretation in the proposal.

Catches of scalloped hammerheads have declined substantially over the period 1981–2005, from maximum annual catches of over 40 000 individuals in some years in the early 1980s to 2 600–6 000 in the last three years of the series (Figure 6) (Hayes, Jiao and Cortes, 2009). Recreational catches made up almost all the total harvest in the early years of the series, while these have declined to less than 1 000 per year recently; commercial catches increased beginning in the early 1990s. Harvest levels have been affected by increasingly stringent management measures (NMFS, 2006) and should not be considered a reliable measure of abundance.

Southwest Atlantic

Information from southern Brazil fisheries targeting hammerhead sharaks (Kotas, pers. comm.), shows strong declines from 2000 to 2008 in two of three available series : surface longline CPUE and bottom gillnet CPUE declined by 80% or more (Figure 7). Surface gillnet CPUE varied without trend (Figure 7). Catch and CPUE information from the same fishery (Kotas *et al.*, 2008) indicates that these fluctuated by about a factor of 5 between 1995 and 2005, with a decline in the last years of the series (Fig 8). Catch would not be a strong abundance index. The targeted hammerhead fishery was abandoned after 2008 because the species had become rare (Kotas, pers. comm.)

Vooren, Klippel and Galina (2005) provide information from this area for an earlier period, 1993 to 2001. Annual landings of hammerheads (*S. lewini* and *S. zygaena* combined) in the main fishing ports in southern Brazil (Rio Grande and Itajai) increased from 30 tonnes in 1992 to 700 tonnes in 1994 and oscillated from 100 to 300 tonnes between 1995 and 2002 (Figure 9). Vooren *et al. (*2005) noted that landings may not represent the actual catches of hammerheads in the region because of shark finning practices. CPUE of the oceanic gillnet fisheries varied between 100 and 300 kg per trip without a clear trend from 1992 to 2002 (Figure 9). CPUE of longline fisheries increased from 1993 to 2000 and then declined to 2002 (Figure 10). Effort data used to calculate CPUE were not corrected for changes in the size of gillnets or in number of hooks in the longline fisheries (C. Vooren, pers. comm.). The CPUE of recreational fisheries targeted to neonate hammerheads in shallow coastal waters also do not show a clear trend from 1999 and 2004, but possibly indicate a decline after 2001 (Figure 11). Based on the above results the authors concluded that hammerheads were not threatened in southern Brazil but that effective conservation measures were needed to maintain the population at its current level of abundance.

Mediterranean Sea

The proposal indicates that Ferretti *et al. (*2008) show a 99% decline in scalloped hammerhead. However Ferretti *et al. (*2008) indicate that *Sphyrna zygaena* is the only species of hammerhead covered by their indices, and that other species occurred only sporadically. Accordingly this was not considered an appropriate index for scalloped hammerhead.

Western Indian Ocean

In an analysis of CPUE in large-mesh gillnets used to protect beaches from sharks, Dudley and Simpfendorfer (2006) indicated a steady decline in abundance between 1978 and 2003; level at the end is 35% of that at the beginning of the series, i.e. an extent of decline of 65% (Figure 12).

The proposal (p. 10) cites FAO landings data for scalloped hammerhead in Oman as varying between 2 800 and 8 300 tonnes/year, with peaks in the mid 1980s and late 1990s, and a 2000 value of 4 000 tonnes.

Western Pacific Ocean

De Jong and Simpfendorfer (2009) reported a decline of over 85% in scalloped hammerhead standardized CPUE over 44 years in a beach protection net programme in eastern Australia (northern Queensland). The Panel was advised that a range of 65 –85% was consistent with the most recent analyses of this information (Simpfendorfer, personal communication to the Panel).

Gribble *et al.* (2005) presented catch and CPUE for all species combined in the Queensland shark fishery, in which *S. lewini* is one of the most important species (2^{nd} in abundance and 18% of the total shark catch on 4 observed trips). Both catch and CPUE (all fisheries combined, kg/day) increased steadily from the late 1980s to the early 2000s (Figure 13). This index cannot be considered to be of high reliability for *S. lewini* as there are no data on species composition over time, and this could well have changed.

Eastern Pacific Ocean

Myers *et al. (*n.d.) found a 71% decline in a diver visual sightings index for scalloped hammerhead in a protected area in the Cocos Islands, from 1992 to 2002.

Small population size

The only population estimate available is that of Hayes, Jiao and Cortes (2009) for the Northwest Atlantic, 24 500 individuals (a misprint on their figure suggests ca 2 000 individuals).

No worldwide population estimate is available.

Restricted distribution

No estimate of distribution area is available but given that this species is circumglobal in tropical and warm temperate waters it can be concluded that it does not have a restricted distribution.

Other indices

Myers *et al. (*2007) presented information on change in length of scalloped hammerhead in the Northwest Atlantic, which indicates that there has been a slight decline over the period sampled (Figure 14).

Dudley and Simpfendorfer (2006) found no trend in length of females, and a significant increasing trend for males, for the Southwest Indian Ocean over the period observed (1978 –2003) (Figure 15).

Assessment relative to quantitative criteria

Decline

Under the CITES criteria for commercially-exploited aquatic species (Conf Res 9.24 Rev CoP14), a decline to 15–20% of the historical baseline for a low productivity species might justify consideration for Appendix I. For listing on Appendix II, being “near” this level might justify consideration, “near” for a low productivity species being 20–30% of the historical abundance level (15–20% + 5–10%).

The Panel concluded that this is a low productivity species.

No overall population decline index is available for comparison with the guidelines. Indices in the individual areas are considered below. Most relevant indices available show declines consistent with the criterion threshold for listing a low productivity species on Appendix II.

In the Northwest Atlantic, the most robust index of abundance available (Hayes, Jiao and Cortes, 2009) indicates a historical extent of decline of some 83% from 1980 to 2005. This assessment indicates that numbers have been increasing in the period 1995–2005, and that the increase would be expected to continue under most plausible catch scenarios. The results of this assessment are consistent with an assessment of three hammerhead species pooled (Jiao, 2009) which indicated a historical extent of decline of 91–93% in the period 1980 –2005. These assessments incorporate other abundance index series available for the Northwest Atlantic (Table 2), some of which show conflicting trends. The 83% or 91–93% extents of decline would be consistent with the decline criterion for an Appendix II listing.

For the Southwest Atlantic two of three CPUE time series available for fisheries in southern Brazil historical extents of decline of the order of 80% or more for the period 2000–2008. These are the most recent data available in this area, following earlier time series which show inconsistent trends. This fishery closed subsequent to 2008 because low abundance of the hammerhead sharks targeted no longer justified fishing.

For the western Indian Ocean, the 64% historical extent of decline 1978–2003 of Dudley and Simpfendorfer (2006) would not be consistent with Appendix II decline guidelines, but does indicate a substantial, sustained decline.

In the Pacific Ocean, the historical extent of decline of 71% for 1992–2002 (Cocos Islands, eastern Pacific) is consistent with Appendix II listing, while the extent of decline of 65–85% over 44 years (northern Queensland, western Pacific) is consistent with or at least very close to the decline criterion for Appendix II listing.

Small population

No global population estimate is available for this species, although an estimate for the Northwest Atlantic is available.

The CITES guideline is considered generally inappropriate for populations of commercially-exploited marine species, except for a few species such as some sessile or semi-sessile species, some species with extremely low productivity, and some small endemics (FAO, 2001).

Restricted distribution

No guidelines for restricted area of distribution are provided in the CITES Criteria, which indicate that thresholds should be taxon-specific (Conf Res 9.24 Rev CoP14). FAO (2001) recommended that historical extent of decline in area of distribution would be a better measure of extinction risk than absolute value of distributional area, but that if no other suitable information is available and absolute area of distribution has to be used for an exploited fish population, analyses should be on a case-by-case basis as no numeric guideline is universally applicable.

No estimate of global distribution area is available but given the circumglobal distribution of the species, it would not appear to be characterised by a restricted distribution.

Were trends due to natural fluctuations?

There is no indication in the materials consulted that natural fluctuations caused any of the observed abundance trends.

Risk and mitigating factors

Fins from this species are in high demand and are easily preserved and transported, and the species co-exists with other high-value pelagic species and is readily taken as bycatch.

Risk in the Northwest Atlantic may be mitigated by the existence of a US NMFS Fishery Management Plan for Highly Migratory Species, including scalloped hammerhead shark, which is managed as one of 11 species in a “large coastal shark” (LCS) complex (NMFS, 2006; NMFS, 2008). Reduced harvest quotas for the LCS complex and other stricter regulations were introduced with the 2006 version of the management plan (NMFS, 2006) and its followup amendments (NMFS, 2008). Managememt measures for the LCS complex are supported by periodic assessments (e.g. NOAA, 2006), although since these are at the level of the species complex they may not track status of individual species well.

Risks may be mitigated by existence of shark-finning bans in 21 countries and the European Union, and in 9 regional fisheries management organizations, although provisions of these bans and thresholds (for example, ratio of fins to carcass weights in landings) are variable (Camhi *et al.*, 2009 Table 5.7) and compliance is likely to be variable.

Trade considerations

Trade in scalloped hammerhead parts and derivatives

Scalloped hammerhead is exploited in many parts of its range, both in directed shark fisheries or as bycatch in fisheries for pelagic and demersal species. Recreational fisheries are or have been important in some parts of the range, for example the United States of America (Hayes, Jiao and Cortes, 2009), Australia (Gribble *et al.*, 2005) and Brazil (Vooren *et al.*, 2005) but would not contribute significantly to trade.

Although meat, oil and hides are used, they are apparently not widely traded, with the possible exception of meat products in some areas (proposal). Meat is not as palatable as for some other species (for example porbeagle) but is consumed and may be processed (salted and/or dried) for transport. Limited trade in meat is documented in east Africa, west Africa and South America (sources cited in proposal, Section 6.3.1).

Fins are widely traded and demand is high. Trade statistics are not available, since this species (as most other shark species) does not have its own customs code under systems currently in international use (Harmonized Tariff Schedule). Recent work on quantities of fins of different shark species transiting the China, Hong Kong SAR fin market has helped clarify amounts of scalloped hammerhead fins in trade.

The China, Hong Kong SAR fin market has represented a substantial proportion of the global trade in shark fins: 65–80% in 1980–90, 50–65% from 1991–1995, 44–59% from 1996–2000, 30–50% following 2000 (Clarke 2008). The decline in China, Hong Kong SAR ’s share of world trade is attributed to increasing trade through mainland China, where statistics are difficult to obtain (Clarke, Milner-Gulland and Cemare, 2007). Despite the estimated decline over time in share of the world trade transiting China, Hong Kong SAR , total imports to China, Hong Kong SAR increased during the 1990s (Figure 14), suggesting that total world trade in shark fins was increasing during this period.

Hammerhead fins are highly valued in the international fin trade, with high recent prices for the various species ($88 to $135/kg, Clarke Ph. D. thesis 2003 cited in proposal) providing evidence of high demand. Shark fins are a traditional luxury or celebration commodity in China, and a recent trend of rising incomes in mainland China is considered a key driver of increasing demand for shark fins (Clarke, Milner-Gulland and Cemare, 2007).

Fins of scalloped hammerhead and Smooth hammerhead (*S. zygaena*) together made up 4.4% of fins traded in the China, Hong Kong SAR market (Clarke *et al.*, 2006, Table 5) between November 2002 and February 2004.

Overall, it seems clear that scalloped hammerhead fins are an important product in the international fin trade, although a relatively minor component of the overall trade. Hammerhead sharks are a target species in some areas, while in others they are taken as bycatch in fisheries targeting tuna-like or other shark species. Ease of processing and storage of dried fins facilitates trade, and the products command relatively prices in trade.

Basis for Article II paragraph (2b) (“look-alike”) Appendix II listing of Great hammerhead shark, Smooth hammerhead shark, Sandbar shark, Dusky shark

As indicated in the CITES listing criteria (Resolution Conf. 9.24 Rev. CoP 14), listing of the four shark species named above could be justified if the parts and derivatives of these species in trade resemble those of the listed Appendix II species (scalloped hammerhead in this case) to the extent that enforcement officers would be unable to distinguish them.

The proposal provides little detail on the basis for the proposed listing of these four species. It notes (section 9) that fins from the five species are morphologically similar (thin, falcate, dorsal fin height higher than base) and are often lumped together and sorted separately from those of other species in markets. No comparative information is provided on pectoral or caudal fins, which are also in trade (Clarke *et al.,* 2006).

China, Hong Kong SAR traders are generally able to identify fins in trade to species or to small species groups, as indicated by a comparison of categories of shark fins used by traders in the China, Hong Kong SAR market with species identifications based on DNA testing (Clarke *et al.,* 2006). The degree of correspondence between the trader categories and the DNA identification ranged from 62% ("bai qing", corresponding to Sandbar shark) and 95% ("chun chi", corresponding to a mix of scalloped and smooth hammerhead) (Clarke *et al.,* 2006; Table 3). When there was lack of correspondence, a variety of species was miscategorised by traders. Scalloped and Smooth hammerhead were not separated by traders but pooled in a single category, with a high rate of correspondence between the market category and the identification to this species pair (95%).

This study (Clarke *et al.,* 2006) did not indicate that the five species covered by this proposal were lumped together in the market. While scalloped and smooth hammerheads were lumped into a single category, each of the other three species proposed for listing under Article II paragraph 2(b) had its own category in the market, with a relatively high rate of correspondence between the trader category and the species: correspondence for great hammerhead ("gu pian") was 86%, for sandbar shark ("bai qing") 74%, for dusky shark ("hai hu") 85% (Clarke *et al.,* 2006; Table 3).

This study indicates that it is possible to identify shark fins in trade to species, with the important exception of scalloped and Smooth hammerhead which are not currently separated. However, expert knowledge and experience are doubtless required to attain the level of identification demonstrated in the China, Hong Kong SAR market. Accordingly, this study supports the argument that enforcement officers with general knowledge (possibly even with some additional identification materials) would have difficulty identifying fins in trade to species. Available DNA technology could provide a backup to identification but current technology is generally considered not to provide useful techniques for routine separation of species at customs posts.

Clearly, scalloped and smooth hammerhead fins cannot be distinguished, or are not distinguished, even with expert knowledge. Fins of all three hammerhead species are quite similar, to the extent that separating them would be difficult for non-experts. However the proposal and other information available do not provide adequate information to support the argument that sandbar and dusky sharks should be considered for listing in accordance with Article II paragraph 2(b), if scalloped hammerhead is listed in accordance with Article II paragraph 2(a).

Implementation issues

Introduction from the sea

Based on current knowledge of distribution, scalloped hammerhead is primarily a species of continental shelf and coastal waters, and is uncommon in oceanic waters (Compagno 1984; Fowler *et al.,* 2005). Most of the fisheries which exploit this species operate within continental shelf waters rather than in the open ocean. As such, most harvests would be from waters within state Extended Economic Zones, for which the Introduction from the Sea provisions of CITES would not apply. The same would be true for the two other hammerhead species proposed under Article II paragraph 2(b).

Basis for findings: legally-obtained, non-detrimental

Non-detriment findings (NDFs) are the responsibility of the exporting country and must show that exports are not detrimental to survival of the species, that is, that they are consistent with sustainable harvesting. Development of an NDF requires appropriate scientific capacity, biological information on the species, and an approach to demonstrating that exports are based on sustainable harvests. Quality of NDFs is assured by review in the Scientific Committees of CITES (Animals and Plants

Committees) and in individual parties. FAO (2004, paras 28–29) provides some guidance on NDFs in a fisheries context.

For the Northwest Atlantic, NDFs could be based on the recent assessments of this species (Hayes, Jiao and Cortes, 2009; Jiao, Hayes and Cortes, 2009). The US Fisheries Management Plan (NMFS, 2006) treats scalloped hammerhead as one of 11 species in a large coastal shark complex, and as such does not include a quota for this species alone, but harvest levels consistent with stock rebuilding have been determined (Hayes, Jiao and Cortes, 2009) and NDFs could be issued for harvests consistent with such levels.

For other parts of the distribution, no species-specific assessments are available which could provide a basis for NDFs.

There appear to be no restrictions on harvest of this species in any part of the range, so there would be no difficulty in providing a finding that specimens were legally obtained but, under these circumstances, such a finding would be meaningless in relation to assuring sustainable use.

Identification of products in trade

Fins are the principal product in trade. Although fin traders are generally able to identify fins to species consistently, accuracy is not 100%, and two species of hammerheads (scalloped and smooth) are not differentiated even by expert traders in the market (Clarke *et al.*, 2006). The proposal indicates that fins of the five species covered by this proposal are morphologically similar to the extent that Article II paragraph 2(b) listing is justified for four species, but provides little background information.

Accurate recording of international trade in sharks is seriously hampered by the absence of any species-specific reporting mechanism. To address this, the Conference of the Parties should encourage the World Customs Organization to establish specific headings within the standardized tariff classification of the Harmonized System to record trade in sharks and their products at the species level.

"Look-alike" issues

Although non-experts would probably have difficulty separating shark fins in trade, there is little widely-available information on identifying shark fins to species and on separating these at the present time. Further, CITES does not have clear standards for making decisions on whether to list species under Article II paragraph 2(b). Development of identification materials for shark fins, and development of standards for making decisions on "look-alike" listings would help support assessment of future listing proposals.

Likely effectiveness of a CITES Appendix II listing

An Appendix II listing for hammerhead shark might improve monitoring of catches at the species level (through documentation of trade flows) and assessment of sustainabililty of harvests (through provision of non-detriment findings). Few national markets for hammerhead shark products exist, so most of the products in trade would move internationally and would thus come under the Appendix II regulatory provisions. However it is also possible that enhanced regulation of trade would encourage more sustainable use of this species and thus reduce pressure on stocks.

For the four species proposed for listing under Article II paragraph 2(b) the same comments are relevant.

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TABLES AND FIGURES

Table 1. Information for assessing productivity of scalloped hammerhead.

Parameter	Information	Productivity	Source
Intrinsic rate of increase	a. NW Atlantic – 0.082 (λ = 1.086) b. W. Pacific – 0.472 (λ = 1.600) c. W. Indian Ocean r = 0.103 d. R_{2M} = 0.028	a. Low b. High c. Low d. Low	a. Cortes, 2002 b. Cortes, 2002 c. Dudley and Simpfendorfer, 2006 d. Smith *et al.*, 1998
Natural mortality	M = 0.129	Low	Smith *et al.*, 1998
Age at maturity	a. W. Indian Ocean – 11 yr b. Females – 15 yr	a. Low b. Low	a. Dudley and Simpfendorfer 2006 b. Smith *et al.*, 1998
Maximum age	a. NW Atlantic – 30.5 yr b. W. Indian Ocean – 30 yr c. 35 yr	a. Low b. Low c. Low	a. Piercy *et al.*, 2007 b. Dudley and Simpfendorfer 2006 c. Smith *et al.*, 1998
von Bertalanffy K	a. NW Atlantic – Male 0.13 Female 0.09 b. W. Indian Ocean – 0.057 c. W. Pacific – Male 0.222 Female 0.249 d. E. Pacific – Male 0.131 Female 0.156	a. Low b. Low c. Medium d. Low	a. Piercy *et al.*, 2007 b. de Bruyn 2000 cited in Dudley and Simpfendorfer 2006 c. Chen *et al.*, 1990 cited in proposal d. Tolentino and Mendoza 2001
Generation time	a. NW Atlantic – 16.7 yr b. W. Indian Ocean – 18.3 yr c. W. Pacific – 5.7 yr	a. Low b. Low c. Medium (H)	a. Cortes 2002 b. Dudley and Simpfendorfer 2006 c. Cortes 2002

Table 2. Decline indices for scalloped hammerhead.

Criterion	Index	Trend	Basis	Coverage	Reliability	Source
Northwest Atlantic	Abundance estimate from population assessment	EOD 83%	Surplus production model, multiple indices, 1980–2005	Atlantic coast United States of America	Assessment based on multiple surveys (5)	Hayes *et al.*, 2009
	Abundance estimate from population assessment	EOD 91% to 93%	Surplus production model for mixed hammerhead species, probabilistic, multiple indices, 1980–2005	Atlantic coast United States of America	Assessment based on multiple surveys, for mixed species (5-)	Jiao *et al.*, 2009
	Catches, recreational and commercial	EOD ca 90%	Inspection of figure, 1981–2005	United States of America Atlantic coast	Catches, uncorrected for effort (2)	Hayes *et al.*, 2009
	CPUE, UNC research survey	EOD 98%	Instantaneous decline -0.127 over 31 yr (1973–2003)	North Carolina coastal	Designed survey (5)	Myers *et al.*, 2007 Table S5
	CPUE, SEAMAP survey	Increase	Instantaneous increase 0.094 over 17 yr (1989–2005)	Southeast United States of America coast	Designed survey (5)	Myers *et al.*, 2007 Table S5
	CPUE, commercial logbook (all hammerheads)	EOD 91%	Instantaneous decline –0.158 over 15 yr (1986–2000)	Northwest Atlantic	Pooled species, commercial data (3)	Myers *et al.*, 2007 Table S5

Table 2 (cont.)

Criterion	**Index**	**Trend**	**Basis**	**Coverage**	**Reliability**	**Source**
	CPUE, commercial observers (all hammerheads)	EOD 79%	Instantaneous decline 0.110 over 14 yr (1992–2005)	Northwest Atlantic	Pooled species, commercial observer data (3)	Myers *et al.*, 2007 Table S5
	CPUE, commercial logbooks (all hammerheads, mainly Scalloped)	EOD 89%	Calculated by authors, 1986–2000	Northwest Atlantic	Pooled species, commercial logbooks (3)	Baum *et al.*, 2003
	CPUE, longline survey	No trend	Inspection of figure, 1995–2005	Atlantic coast United States of America	Pooled coastal sharks, scalloped hammerhead is 6% of total (1–2)	Ingram *et al.*, 2005 Figure 39
	CPUE, longline survey	No trend	Inspection of figure, 1995–2003	Gulf of Mexico, United States of America	Pooled coastal sharks, scalloped hammerhead is 7% of total (1–2)	Ingram *et al.*, 2005 Figure 42
Southwest Atlantic	CPUE, surface gillnet	Decline 80% or more	Inspection of figure, 2000–2008	Southern Brazil	Unstandardized CPUE, scalloped hammerhead (3)	Kotas, J.E. personal communication to the Panel
	CPUE, bottom gillnet	Decline 80% or more	Inspection of figure, 2000–2008	Southern Brazil	Unstandardized CPUE, scalloped hammerhead (3)	Kotas, J.E. personal communication to the Panel
	CPUE, surface longline	No trend	Inspection of figure, 2000–2008	Southern Brazil	Unstandardised CPUE, scalloped hammerhead (3)	Kotas, J.E. personal communication to the Panel
	CPUE (*S. lewini* and *S. zygaena*) gillnet fisheries	No trend	Inspection of figure, 1992–2002	Southern Brazil	Pooled species, uncorrected effort data (1–2)	Vooren *et al.*, 2005

Table 2 (cont.)

Criterion	Index	Trend	Basis	Coverage	Reliability	Source
	CPUE (*S. lewini* and *S. zygaena*) longline fisheries	Increase from 1993 to 2000, decline from 2000–2002	Inspection of figure, 1992–2002	Southern Brazil	Pooled species, uncorrected effort data (1–2)	Vooren *et al.* (2005)
	CPUE (*S. lewini* and *S. zygaena*) recreational fisheries	No trend, possible decline from 2001	Inspection of figure, 1999–2004	Southern Brazil	Pooled species, commercial data (2)	Vooren *et al.* (2005)
Western Indian Ocean	CPUE, shark protection nets	EOD 65%	Inspection of figure, 1978–2003	South Africa	Good species identification, designed for sharks (5)	Dudley and Simpfendorfer 2006 Fig.2
Western Pacific Ocean	CPUE, all fisheries, all sharks	Increasing trend	Inspection of figure, 1978–2003	Queensland, Australia	All shark species combined, all fisheries combined (1–2)	Gribble *et al.*, 2005 Fig 2.
	CPUE, shark protection nets	Decline 65–85%	Provided by authors	Queensland, Australia	Hammerhead sharks, standardized CPUE (5)	De Jong and Simpfendorfer 2009
Eastern Pacific Ocean	Diver sightings index	Decline 71%	Provided by authors	Cocos Islands, Costa Rica	Visual sightings (5)	Myers *et al.*, n.d.

Table 3. Probability (%) that the stock of scalloped hammerheads will rebuild (i.e., attain a final population size greater than NMSY) in 10, 20, and 30 years under several constant-catch scenarios (relative to the catch in 2005) using the BASE scenario with the Fox surplus-production model. Source: Hayes *et al.*, 2009.

		Percent of 2005 catch (number)			
		50	69	100	150
Time frame	No catch	(2 068)	(2 853)	(4 135)	(6 203)
10 years	95	85	70	58	20
20 years	99	96	92	86	50
30 years	99	98	96	91	63

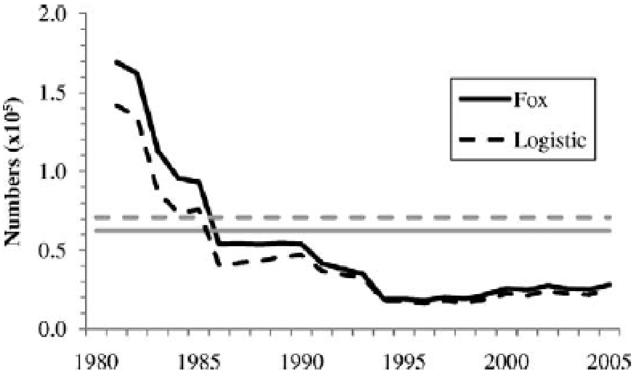


Figure 1. Scalloped hammerhead population estimates from two models, 1981–2005. Grey lines are MSY levels for the two models. Source: Hayes *et al.*, 2009.

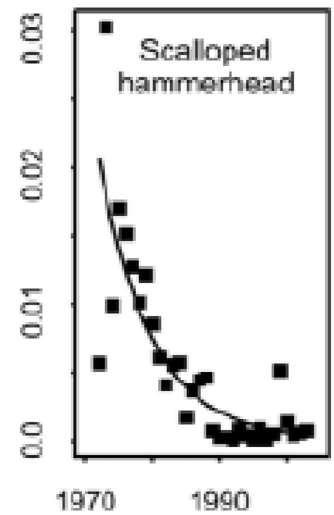


Figure 2. Abundance trend, scalloped hammerhead, UNC survey. Source: Myers *et al.*, 2007, Figure 1.

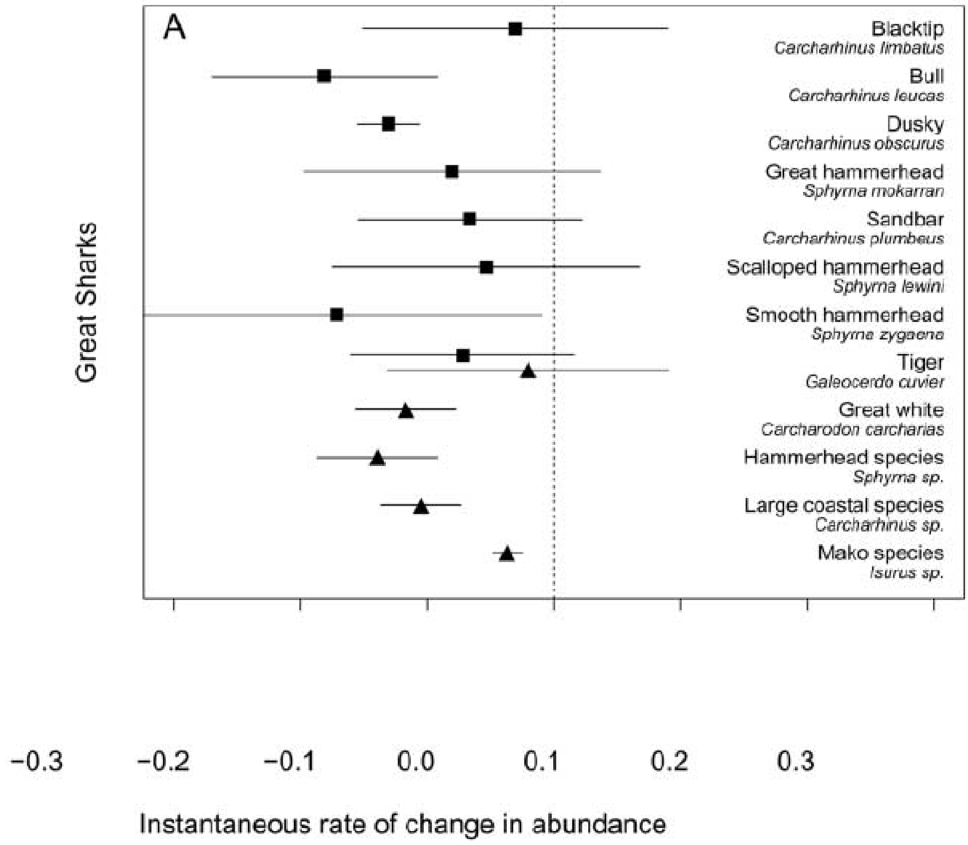


Figure 3. Instantaneous rate of change in abundance, meta-analysis of multiple research surveys. Mean time span of surveys 28 yrs. Source: Myers *et al.*, 2007 Figure 2.

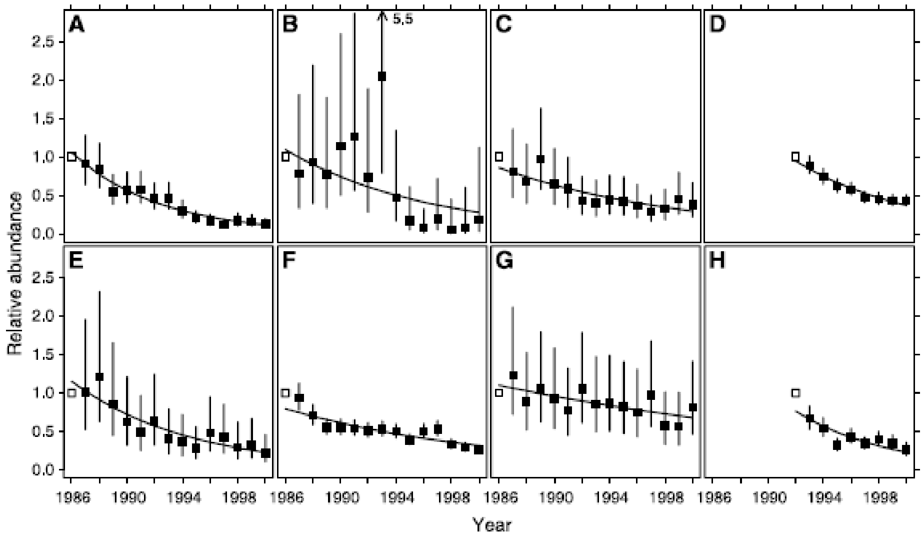


Figure 4. Changes in abundance indices. A = hammerhead sharks pooled. Source: Baum *et al.*, 2003 Figure 2.

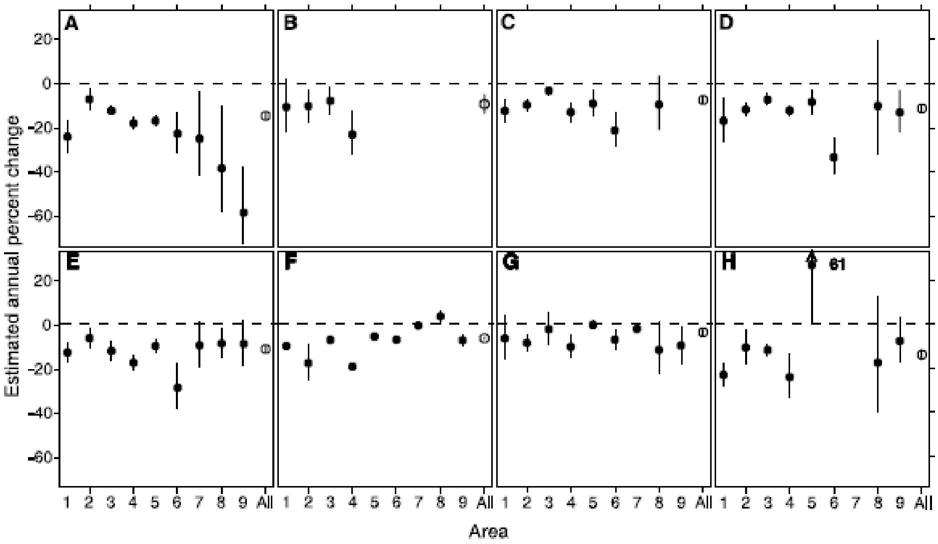


Figure 5. Annual rate of change in abundance, 1986–2000, in 10 subareas of the Northwest Atlantic. A = hammerhead sharks pooled. Source: Baum *et al.,* 2003 Figure 3

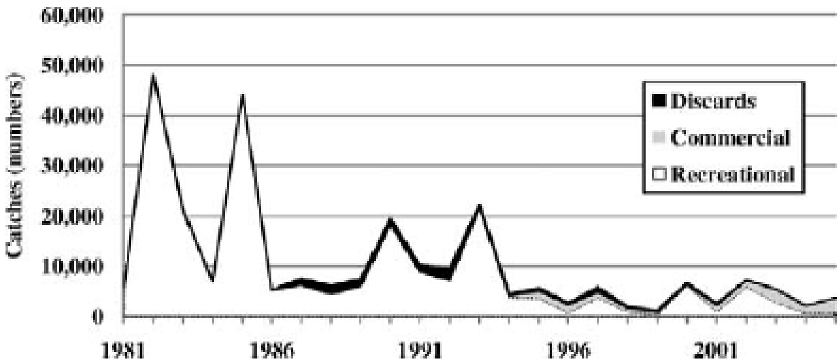
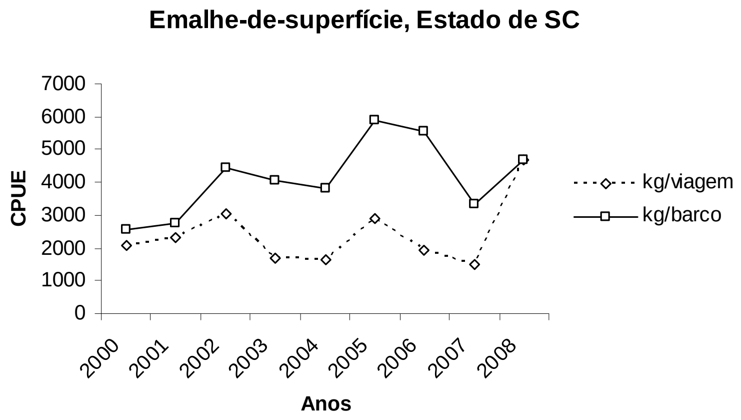
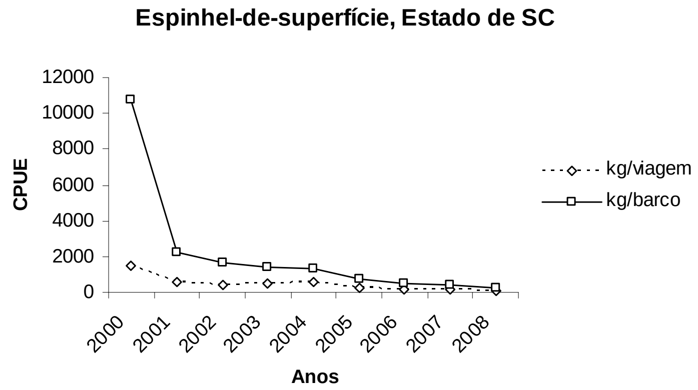


Figure 6. US catches of scalloped hammerhead. Source: Hayes *et al.,* 2009.





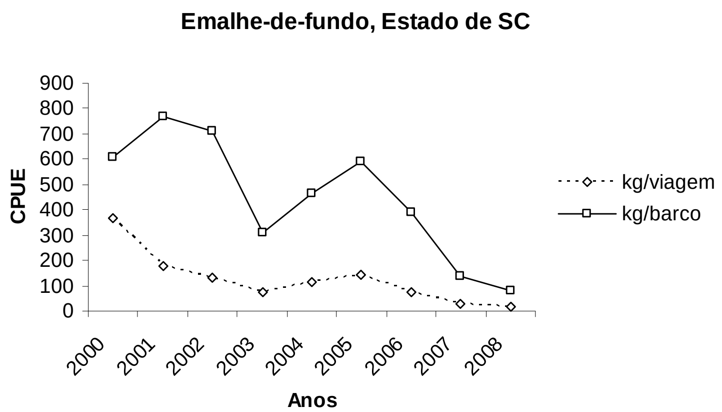


Figure 7. CPUE, scalloped hammerhead, southern Brazil. Dashed lines: kg/trip; solid lines: kg/vessel. Top: surface gillnet; middle: surface longline; bottom: bottom gillnet. Source: Kotas, pers. comm.

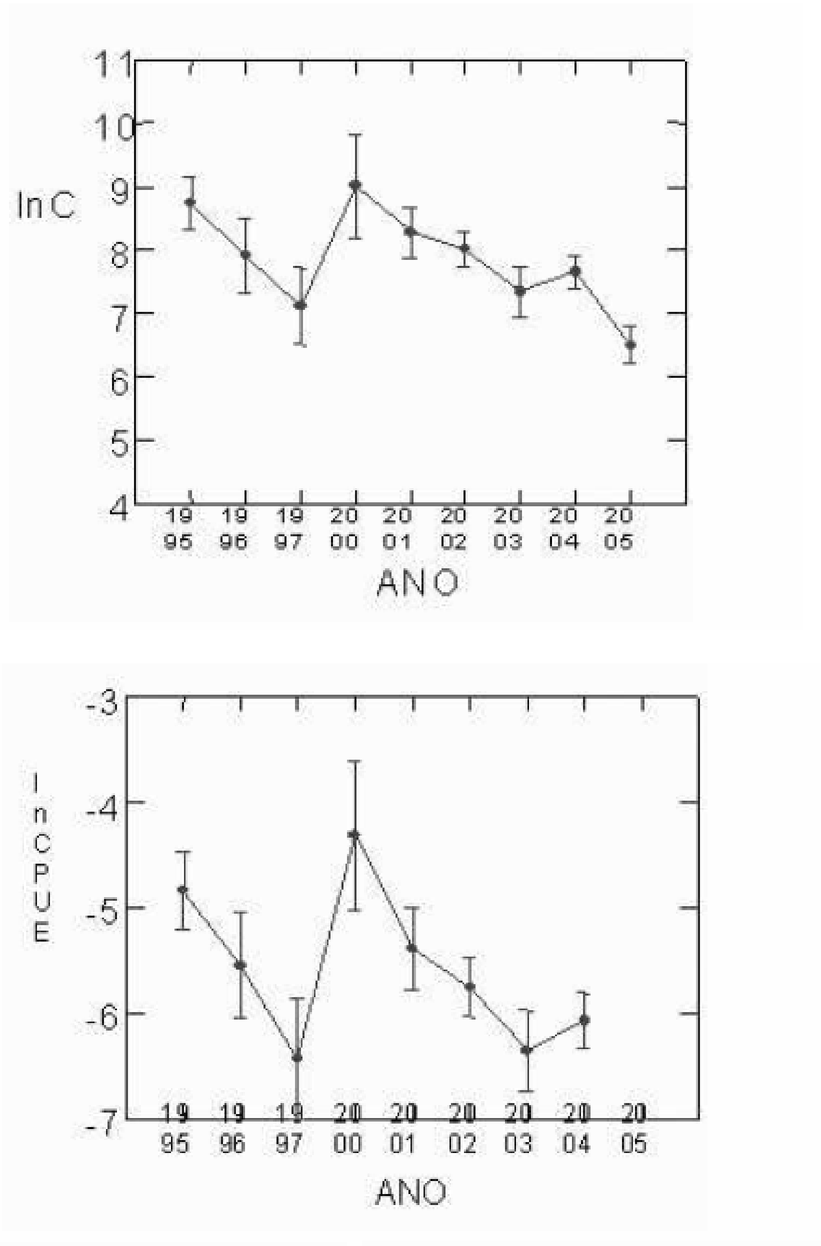


Figure 8. Catch (kg) (top) and CPUE (kg/m2 of net) (bottom) of pooled scalloped and smooth hammerheads, surface gillnets, southern Brazil. Source: Kotas *et al.*, 2008.

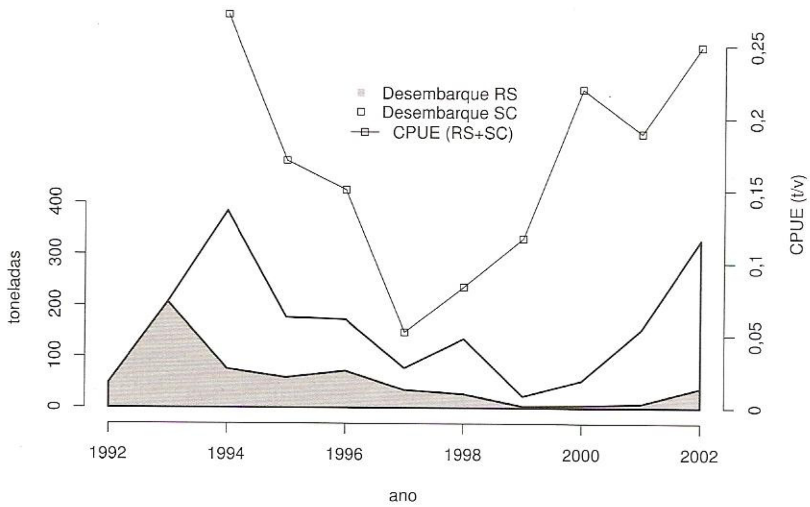


Figure 9. Landings and cpue of oceanic gillnet fisheries in southern Brazil (Vooren *et al.*, 2005).

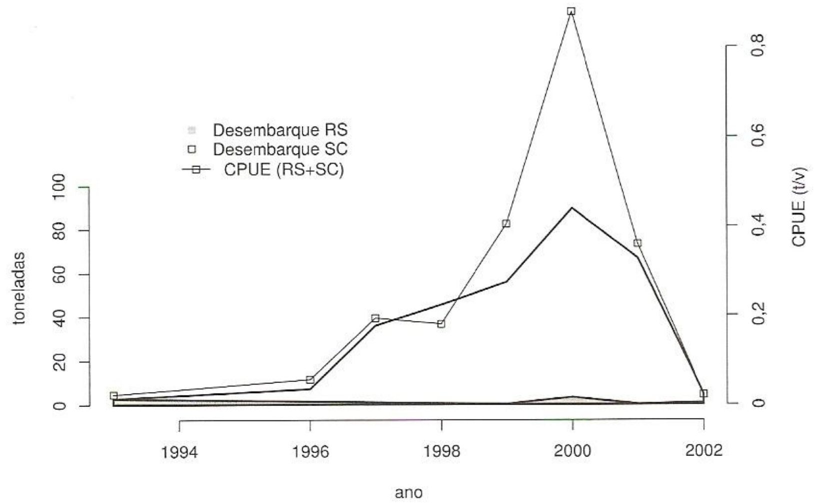


Figure 10. Landings and cpue of longline fisheries in southern Brazil (Vooren *et al.*,, 2005)

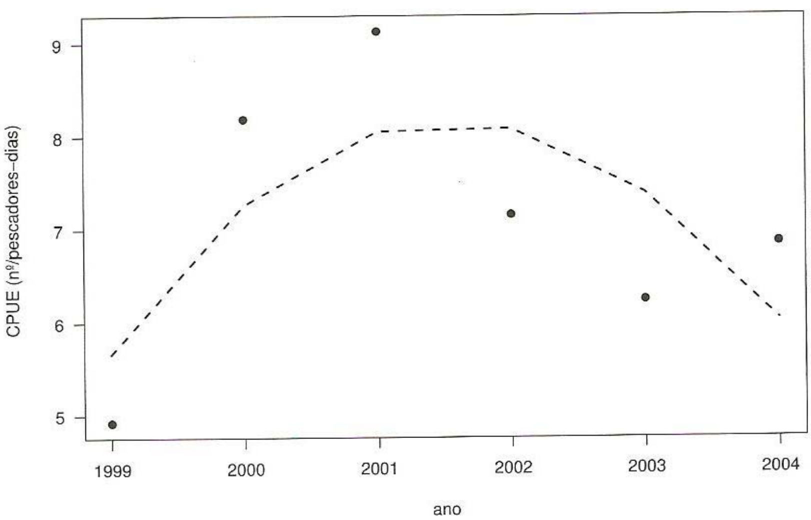


Figure 11. Catch per unit of effort (numbers/fisher/day) of the recreational fishery targeted to neonate hammerheads in southern Brazil (Vooren *et al.*, 2005).

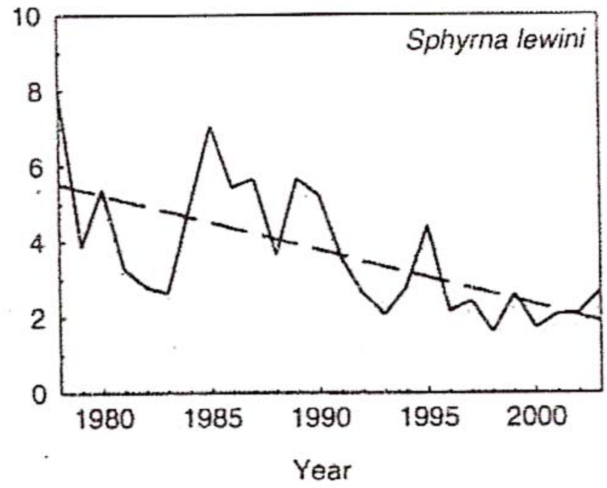


Figure 12. Annual CPUE of scalloped hammerhead in the KwaZulu-Natal beach protection programme, 1978–2003. Units are number/km net/yr. Source: Dudley and Simpfendorfer (2006).

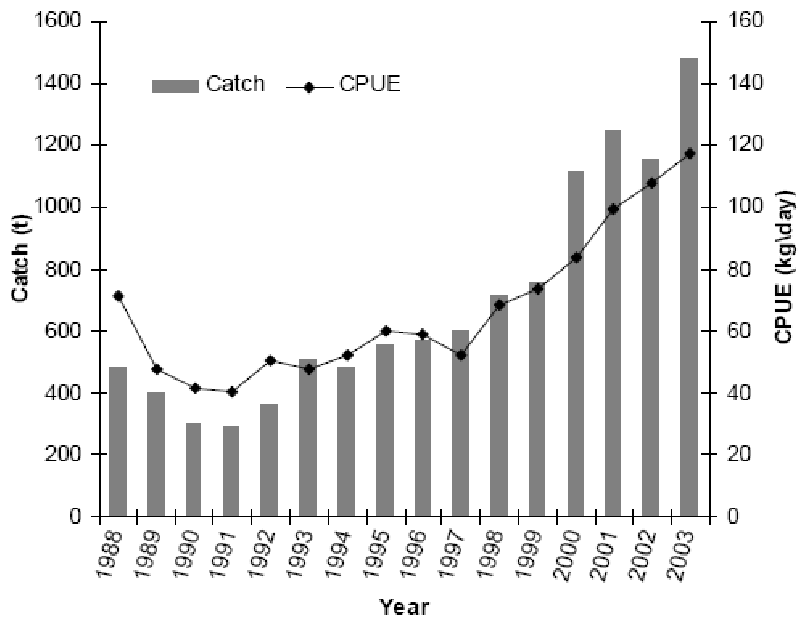


Figure 13. Annual catch and catch per unit, all fisheries combined, all shark species combined, Australian east coast. *S. lewini* made up 18% of the total catch on 4 observed trips. Source: Gribble *et al.*, 2005.

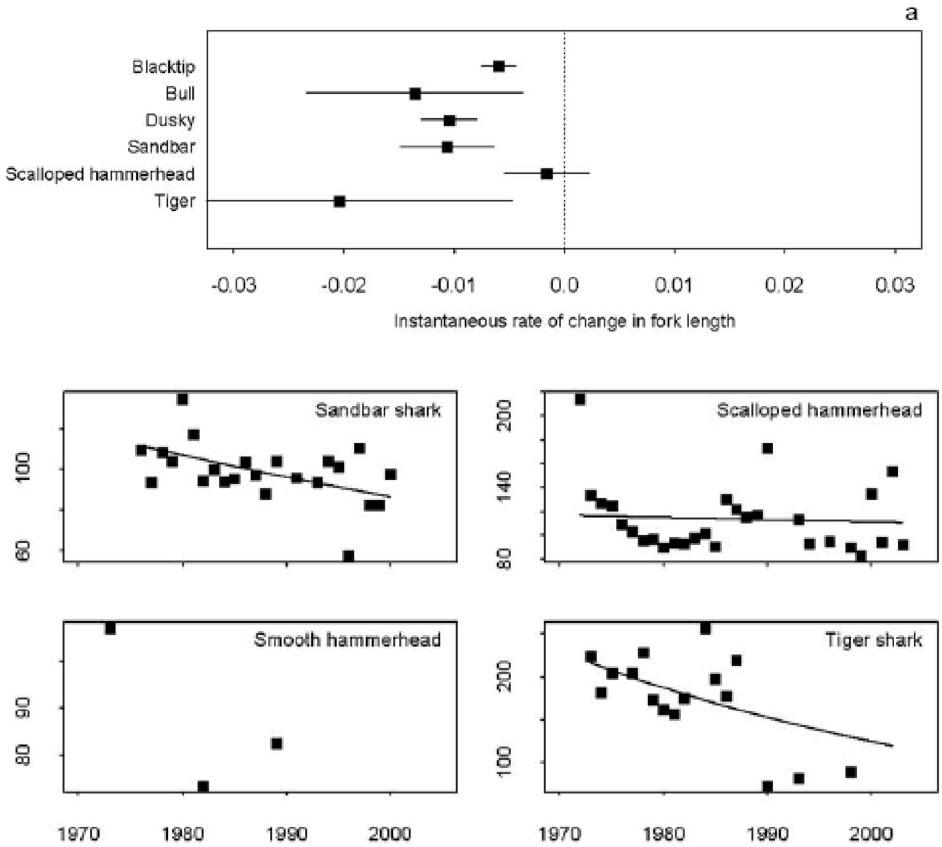


Figure 14. Changes in fork length, scalloped hammerhead, North Carolina shark survey. In lower figure, y-axis is fork length. Source: Myers *et al.*, 2007, supplementary material, Figure S3.

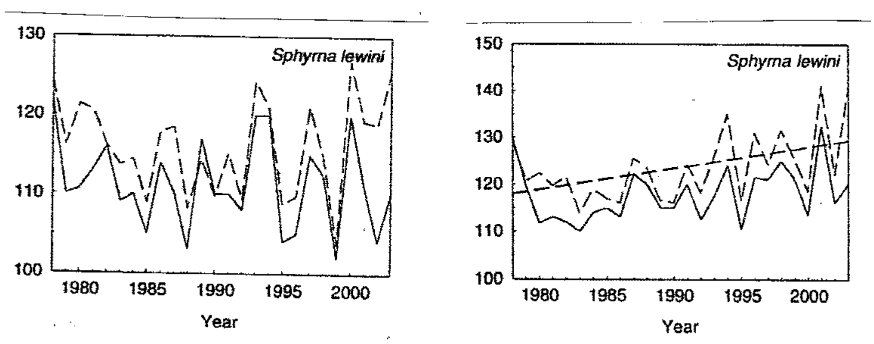


Figure 15. Annual median (solid line) and mean (dashed line) sizes (precaudal length) of scalloped hammerhead caught in the KwaZulu-Natal beach protection program, 1978–2003. Left panel: females; right panel: males. Straight line fit to male data indicates a significant regression.

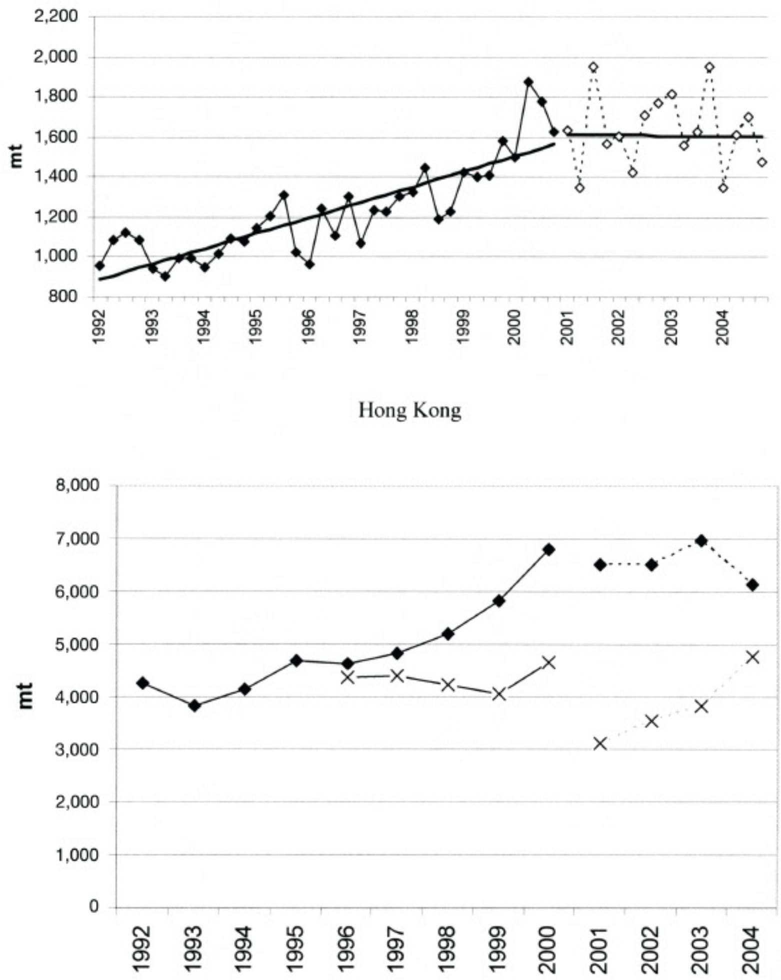


Figure 16. Imports of shark fins to China, Hong Kong SAR and mainland China. Upper figure: quarterly imports to China, Hong Kong SAR (a change in statistical reporting means values before and after 2001 are not strictly comparable). Lower figure: annual imports to China, Hong Kong SAR (solid symbols) and mainland China (x's). Source: Clarke *et al.*, 2007.

APPENDIX F

FAO Expert Advisory Panel assessment report: Oceanic whitetip shark

CoP15 Proposal 16

SPECIES: *Carcharhinus longimanus* – Oceanic whitetip shark

PROPOSAL: Inclusion of *Carcharhinus longimanus* in Appendix II in accordance with Article II paragraph 2(a) of the Convention and satisfying Criterion A in Annex 2a of Resolution Conf. 9.24 (Rev. CoP14).

Basis for proposal: It is known, or can be inferred or projected, that the regulation of trade in the species is necessary to avoid it becoming eligible for inclusion in Appendix I in the near future.

The proposal indicates that this low-productivity species has undergone declines of 60–70% in the Northwest and Central Atlantic Ocean, and up to a 10-fold decline in abundance in the Central Pacific Ocean, that the species is overexploited for its fins which are large and highly valued in trade, and that the species is likely to become threatened with extinction unless international trade is regulated and monitored.

ASSESSMENT SUMMARY

The FAO Expert Panel concluded that, on balance, the available evidence supports the proposal to include the Oceanic whitetip shark, *Carcharhinus longimanus,* in CITES Appendix II.

The Panel concluded that this was a species of low productivity.

There is a paucity of quantitative data with which to determine global trends in this widely-distributed tropical Oceanic shark. All the available indices are based on fishery catch per unit effort (CPUE). Two regional studies provide long time series (45–50 years) that show historical extents of decline conforming to the Appendix II decline criterion, and a short (10 years) recent time series in one area also shows a historical extent of decline consistent with the Appendix II decline criterion. Information from other areas is very limited and difficult to interpret.

In the Northwest Atlantic, the longest time series (1950s to 1990s) shows a substantial extent of decline consistent with the Appendix II decline criterion. This series is based on different approaches in the early and late parts of the time series (research vessels and commercial vessels with observer coverage respectively), but areas sampled and gear used were generally consistent and efforts were made to standardize the data sets. Trends in longline CPUE for large pelagic teleost species show larger declines than were seen over similar periods from more detailed stock assessments, raising questions about the reliability of long-term CPUE trend information; however no stock assessments of Oceanic whitetip are available. Indices from the Northwest Atlantic covering more recent periods (1992–2005) showed continuing declines.

In the Central Pacific, the longest time series (1950s to 1999–2002) shows a substantial extent of decline consistent with the Appendix II decline criterion. As with the Northwest Atlantic, approaches in early and late periods were different (research vessels and observed commercial longliners respectively) and areas covered were also somewhat different, but gear was similar and efforts were made to standardize the data sets. Interpretation of this series is complicated by the same issue as for the Northwest Atlantic, a discrepancy between population trends over long periods in CPUE series and in more detailed assessments for teleost species, but again no detailed assessment of Oceanic whitetip is available for comparison. A set of shorter time series (1960s to early 1990s) shows declines in four subareas of the Central Pacific, but not to levels consistent with the Appendix II decline criterion, when information uncorrected for depths of sets is considered. When corrected data is considered trends are conflicting. However this document indicates that further standardisation is required. More recent series (1995–2005) show a continuing large decline.

In the eastern Pacific, the only available index shows a very large historical extent of decline, consistent with the Appendix II decline criterion, over a short time period (1994–2006). This is based on information from a purse seine fishery which takes relatively low numbers of this species, and occurred after a lengthy period during which this species would have been harvested in longline fisheries, suggesting that such a rapid decline during this recent period may not reflect population changes reliably.

Fins for this species are in demand and of high value in the world market, and there is evidence that international trade is driving exploitation. This species is generally not targeted, but is taken as bycatch in fisheries targeting other species. The Panel noted that a large proportion of individuals captured as bycatch could be released alive.

Demand in the international shark fin trade and bycatch in high-seas tuna fisheries constitute important risk factors for the species. Each of the five Tuna Regional Fisheries Management Organizations has a management measure requiring vessels to have fins onboard that total no more than 5% of the weight of sharks onboard, up to the first point of landing. A number of countries have adopted finning bans but no species-specific international or domestic management measures are in place. Sustainable management requires that, where they had not done so, range States develop and implement National Plans of Action for sharks.

With respect to the likely effectiveness of a CITES Appendix II listing, the Panel concluded that the resulting regulatory measures could aid management of this species by improving catch monitoring and encouraging assessments of sustainability of harvests. Most harvests would be from international waters, falling under the Introduction from the Sea provisions of the Convention. These would require catch documentation to the species level for specimens entering the jurisdiction of a State from international waters, along with a non-detriment finding indicating that the harvest was sustainable.

PANEL COMMENTS

Biological considerations

Population assessed

Oceanic whitetip shark is a circumglobal, oceanic shark of tropical and subtropical waters, usually found between latitudes 35° N and 30° S and at temperatures warmer than 20°C (Compagno 1984; Fowler *et al.*, 2005). It is normally found offshore in oceanic waters, or near oceanic islands. The species primarily occurs in surface waters at less than 100 m depth, based on unpublished pop-up satellite tag observations off Hawaii (Musyl, unpublished, cited in Burgess *et al.*,, 2005) and on observations of decreasing catch rate between 80 and 280 m (Nakano *et al.*, 1997 cited in Bonfil *et al.*, 2008).

No studies have been done of population structure of this species. Kohler, Casey and Turner, (1998, p. 49) summarize results of tagging 542 individuals between 1962 and 1993 in the Atlantic Ocean. Six individuals were recaptured, with a maximum distance travelled of 2 270 km (1 226 nm) and a maximum movement of 32 km/day (17.5 nm/day). Studies of population structuring have been identified as a priority in the Pacific because of different CPUE trends between eastern and western Pacific (IATTC 2007a).

Productivity level

Life history characteristics of Oceanic whitetip are associated with low or medium productivity (Table 1). Information on life history characteristics associated with productivity level is available from the Southwest Atlantic (Lessa, Marcante S. and Pagleranil., 1999) and the western Pacific (Seki, Taniuchi and Hakano, 1998). This information has been used to derive rate of increase and generation time estimates (Smith, Au and Show, 1998; Cortes 2002; Cortes 2008). Growth rate (as indexed by von Bertalanffy K) and intrinsic rate of population increase are consistent with low productivity, while age at maturity and generation time indicate medium productivity (or low to medium).

Population status and trends

Decline

Abundance indices from several parts of the range are available (Table 2).

Northwest Atlantic

Baum and Myers (2004) compared longline CPUE from research surveys in 1954–1957 (“the 1950s”) to those from observed commercial longline sets in 1995–1999 (“the 1990s”) in the Gulf of Mexico (Figure 1). A severe decline in Oceanic whitetip CPUE was observed, equivalent to a 99.3% extent of decline; 3 individuals were taken in 275 sets in the 1990s compared to 397 individuals in 170 sets in the 1950s. The authors made efforts to ensure comparability of methods between the two periods and outlined sources of uncertainty in making the comparison.

Baum *et al.* (2003) found an extent of decline of 70% in CPUE based on logbook records in the Northwest Atlantic pelagic longline fishery between 1992 and 2000 (Figure 2), and indicated that declining CPUE trends had been observed in almost all subareas of the fishery area (Figure 3). The exception was a substantial increase in CPUE in Subarea 5, the US mid-Atlantic (Cape Hatteras to Cape Cod).

The methods and results of Baum *et al.* (2003) and Baum and Myers (2004) were critiqued by Burgess *et al.* (2005), who agreed that abundance of large pelagic sharks has declined but presented arguments that the population declines were probably less severe than indicated by these indices. Of particular relevance to Oceanic whitetip, Burgess *et al.* (2005) noted that change from steel to monofilament leaders between the 1950s and 1990s could have reduced catchability of all large sharks, while increasing average depths of sets during the same period could have reduced catchability of the surface-living Oceanic whitetip. Reductions in catchability due to a shift from steel to monofilament leaders are cited in Burgess *et al.* (2005). Baum, Kehler and Myers (2005) in responding to the critique indicated that their model had in part addressed the change in depth of sets, but agreed that change in catchability with change in leader material needed further study. They noted that subtle changes in methods of setting gear could have large effects on catch rates, and that for some species of large sharks catch rates on monofilament were higher than on steel leaders. Nonetheless, Baum, Kehler and Myers (2005) concluded that their estimated decline rates were robust.

Ingram *et al.* (in preparation), in a study of the effect of different leader materials on CPUE of oceanic sharks, determined that with equivalent methods but a wire leader, catch rates of Baum and Myers (2004) for the recent period would have been 0.55 rather than 0.02 (as estimated by Baum and Myers 2004 using nylon leaders). Comparing the recent 0.55 value with the Baum *et al.* (2003) value of 4.62 for the 1950s gives an extent of decline of 88%.

Cortes, Brown and beerkircher (2007) found less severe declines over a shorter time period (1992–2003/2005) than those above. Declines of 57% in logbook CPUE from the commercial longline fishery, and of 9% in observer CPUE from the same fleet, were provided. Observer CPUE is considered more reliable than logbook CPUE.

Central Pacific

Ward and Myers (2005) compared longline CPUE from research surveys in 1951–1958 (“the 1950s”) (880 sets) to those from commercial longline fisheries with observers aboard in 1999–2002 (“the 1990s”) (505 sets) (Figure 4). They estimated a 10-fold decrease in CPUE, to 0.099 over the time period www.esapubs.org/archive/ecol/E086/043/appendix-A.htm. The authors made efforts to ensure comparability of methods between the two periods and have outlined sources of uncertainty in making the comparison. Distribution of sampling in the two periods was different although areas overlapped.

Polacheck (2006) has provided evidence that declines in longline CPUE of large pelagic fishes over long periods may overestimate population declines. This has been shown to occur for large pelagic species other than sharks, for which detailed stock assessments are available to compare with CPUE trends.

Matsunaga and Nakano (1999) provided information on longline CPUE changes between 1967–70 (“the 1960s”) and 1992–95 (“the 1990s”) in four contiguous subareas of the Central Pacific. For the later period, they provided information which had been corrected for a difference in depths sampled compared to the earlier period, as well as uncorrected information (Table 3). The uncorrected data show declines in all four subareas, ranging from 5% to 53%, while the corrected data show declines in two subareas and increases in two subareas. They noted that further standardisation of data sets is required to clarify the extent of change.

Walsh, Bigelow and Sender (2009), comparing observer data on commercial longline sets in 1995–2000 and 2004–2006, showed a 76% extent of decline in nominal CPUE in deep sets (median depth of deepest hook 248 m) and a 53% decline in shallow sets (median depth of deepest hook 60 m) (deep and shallow sets also differed in gear configuration and bait). More weight should be given to the information from shallow sets given the shallow-living habits of this species. The authors noted that area differences may have affected the estimated trends.

Eastern Pacific

Background information for design of a shark research program for the IATTC (IATTC, 2007b) indicates that purse seine CPUE on floating objects of Oceanic whitetip has experienced an extent of decline greater than 95% in the eastern Pacific between 1994 and 2006 (Figure 5). This is based on an unstandardized index using observer data from 100% of sets during the short period of time that fish aggregating devices have been used (details in Roman-Verdesoto and Orozco-Zoller, 2005). However the purse seine catches have been relatively small compared to those of the longline fishery which has operated in this area over the last 50 years.

Western Pacific

Longline CPUE of Oceanic whitetip has reportedly not declined since the early 1990s in the western Pacific (IATTC 2007a). This observation, without additional information, is contained in a proposal for studies of shark status by the IATTC.

Southwest Atlantic

Unstandardized CPUE observations are available from several papers on this species which may provide a basis for comparing abundance levels in different periods. Domingo (2004) recorded catch rates of 0.006 (1998–2003) while Domingo *et al.* (2007) found catch rates ranging between 0.022 to 0.491 individuals per hooks in 2003–2006. The more recent catch rates are higher but these are probably affected by differences in methodology, season and fishing areas between studies. In the equatorial SW Atlantic Oceanic whitetips were reported as the second most abundant shark outnumbered only by blue shark in research surveys between 1992–97 (Lessa, Marcante and Paglerani, 1999). However, data from observers on the Uruguayan surface longline fleet in the south and equatorial Atlantic does not confirm this; highest CPUE recorded did not exceed 0.491 samples/1 000 hooks for the 2003–2006 period with only 63 Oceanic whitetips caught on 2 279 169 hooks (Domingo *et al.*, 2007). Hazin *et al.* (2007) noted that total catch of the Oceanic whitetip has shown a continuous decline over the past 6 years (2000–2005) from about 640 tonnes to 80 tonnes. It was noted that the Spanish longline fleet increased its effort in the South Atlantic in the early to mid 1990s and that expansion of fishing activities by southern coastal countries, such as Brazil and Uruguay, also contributed to increased effort at this time (SCRS 2009).

Southeast Atlantic

Castro and Mejuto (1995) recorded a catch rate in this area of 0.26 per 1 000 hooks in the mid-1990s, and Domingo (2004) and Domingo *et al.* (2007) recorded catch rates of 0.09 (2003) and 0.08 (2003–06), respectively. The more recent values are lower but could have been affected by differences in methodology and study areas.

Other areas

Observations on confiscated fin caches from high-seas longline fleets in 2004 from both the South Atlantic and Southwest Indian Ocean noted very few Oceanic whitetip fins (J. Stevens, personal communication, 12 December). Information from the eastern Atlantic, Southwest Pacific and Indian Ocean is very limited with some observations suggesting no declines, but the basis for most of these was not available. For the Oceanic blue shark, for which much more information is available, it has proved difficult to build a consistent picture of stock status as abundance trend information is sometimes conflicting.

Small population size

No estimates of population abundance are available.

Restricted distribution

No estimate of distribution area is available but this species is circumglobal in oceanic waters so can be considered to have a very large distribution.

Other indices

Baum and Myers (2004) observed a 35% decline in average weight of individuals taken (from 86.4 kg to 56.1 kg) , comparing longline catches in the 1950s with those in the 1990s. Ward and Myers (2005) observed a 50% decline in average weight of individuals taken, from approximately 40 kg in the 1950s to approximately 20 kg in the 1990s (Figure 6). They noted that the decline in biomass, considering the concurrent declines in abundance (80%) and average weight (50%), would have been substantial.

Assessment relative to quantitative criteria

Decline

Oceanic whitetip should be considered a low productivity species, based on the available life history information (Table 1).

Under the CITES criteria for commercially-exploited aquatic species (Conf Res 9.24 Rev CoP14), a decline to 15–20% of the historical baseline for a low productivity species might justify consideration for Appendix I. For listing on Appendix II, being "near" this level might justify consideration, "near" for a low productivity species being 20–30% of the historical abundance level (15–20% + 5–10%). For a medium productivity species, the Appendix I level would be 10–15% of the baseline, the Appendix II ("near") level 15–25%. FAO (2001) advised that in examining historical extent of decline, the longest time horizon possible should be examined.

No overall population decline index is available for comparison with the guidelines. Indices in the individual areas are considered below.

In the Northwest Atlantic (Gulf of Mexico), Baum and Myers (2004) estimated an extent of decline of over 99% in approximately 40 years. Correcting this with recent information on leader materials gives an extent of decline of 88%. Recent rates of decline for the Northwest Atlantic are provided by Baum *et al.* (2003) (70% 1992–2000), and Cortes, Brown and Beerkircher (2007) (57% 1992–2005 for logbook data, 9% 1992–2003 for observer data, with more weight to the latter). The historical extent of decline would be consistent with an Appendix II listing, if it portrays population abundance accurately. The long time series of Baum and Myers (2004) should be interpreted in light of the evidence of Polacheck (2006) that long-term CPUE series may overestimate population declines of large pelagic fishes.

In the Central Pacific the longest time horizon is provided by Ward and Myers (2005), who indicated a historical extent of decline of 90% over a period of approximately 40 years Again this should be interpreted in the context of the evidence of Polacheck (2006) that long CPUE series may overestimate abundance declines in large pelagic species. Matsunaga and Nakano (1999) indicate consistent declines in four subareas, but not to Appendix II levels, from the last 1960s to the early 1990s (approximately 34 years), using uncorrected data, and a mixed pattern of declines and increases using corrected data. This paper indicates that further standardisation would be required to fully interpret the data. A recent rate of decline of 76% (deep sets) or 53% (shallow sets, more appropriate information for this species) over an approximately 10-year period (1995–2000 vs 2004–2006) is provided by Walsh, Bigelow and Sender (2009). The Ward and Myers and Walsh, Bigelow and Sender indices would be consistent with an Appendix II listing for a low or medium productivity species. The Matsunaga and Nakano (1999) information do not show a decline to Appendix II levels but are for a shorter time period than Ward and Myers.

In the eastern Pacific the longest time series available is 13 years (1994–2006) (IATTC 2007b) and indicates a substantial decline of over 95%. The information appears to be robust but is surprising considering the long history of longline exploitation prior to the beginning of this time series, and the relatively low removals by this fishery. This decline would be consistent with an Appendix II decline level.

In the south Atlantic, observations of relative CPUEs suggest a decline in the Southeast Atlantic and there is conflicting information in the Southwest Atlantic. These unstandardized observations do not appear adequate to support a decision based on the decline criterion.

In the western Pacific, IATTC (2007a) indicates no decline but for an unknown time period and without explanation of the basis. Information available is not highly reliable but would not be consistent with an Appendix II listing.

Information presented at the meeting indicated that Oceanic whitetip have recently been a rather uncommon species off South Africa.

Small population

As no population estimate is available, it is not possible to assess Oceanic whitetip against this criterion. However, the species is widely distributed and probably occurs in relatively large numbers worldwide.

Restricted distribution

As a species occurring circumglobally in tropical and subtropical waters, Oceanic whitetip cannot be characterized as a species with a restricted distribution.

Were trends due to natural fluctuations?

There is no indication in the sources available that declines were due to natural fluctuations.

Risk and mitigating factors

Fins from this species are in high demand and are easily preserved and transported. The species is one of the most common bycatch species in tuna fisheries in offshore tropical waters, although they are seldom explicitly targeted (Bonfil, Clarke and Nakano, 2008). Individuals taken as bycatch could be released alive if products were of low value.

Reduction in abundance of large mature individuals is a potential risk factor for large shark species. Both in the Northwest Atlantic (Baum and Myers 2004) and in the Central Pacific (Ward and Myers 2005), declines in mean weight were observed concurrent with declines in abundance indices. These data have not been analysed to show changes in proportion of mature individuals but may indicate that large mature individuals have decreased in abundance over the periods observed.

Risk has been mitigated by the introduction of finning bans in 21 countries and the European Union, as well by nine Regional Fisheries Management Organisations (Camhi *et al.*, 2009 Table 5.7). Each of the five Tuna Regional Fisheries Management Organizations has a management measure requiring vessels to have onboard fins that total no more than 5% of the weight of sharks onboard, up to the first point of landing. These bans may reduce mortality or at least improve monitoring of shark catches. However compliance with these management measures is likely to be variable.

The finning ban in the US Hawaii-based longline fishery introduced in 2001 has acted to reduce mortality on Oceanic whitetip and other large shark species (Walsh, Bigelow and Sender, 2009). In 1995–2000, prior to the ban, a large proportion of Oceanic whitetip were finned (72.3% in deep sets and 52.7% from shallow sets), as was the case with other large sharks (Walsh, Bigelow and Sender, 2009, Table 3). In 2004–2006, following the ban, almost all sharks were released, although some were dead on release. Minimum mortality estimates declined substantially with the finning ban, from 81.9% to 25.6% in deep sets and from 61.3% to 9.1% in shallow sets (Walsh, Bigelow and Sender, 2009, Table 3).

Trade considerations

Oceanic whitetip is exploited in many parts of its range, primarily as bycatch in oceanic longline fisheries targeting large pelagic species (tunas, swordfishes and others). In most areas Oceanic whitetip makes up a relatively small proportion of longline catches, and catch rates are relatively low, but total global catch may be substantial. Clarke *et al.* (2006a) (Figure 7) estimated total annual catches of Oceanic whitetip, based on trade data from the China, Hong Kong SAR fin market, at 200 000 to 1 200 000 individuals or 22 000–42 000 t.

Meat and skins may be used, and may be traded on a small scale, but the principal product in trade is fins. Oceanic whitetip meat from longline bycatch has been marketed in Europe, North America and Asia (Rose, 1996; Vannuccini, 1999). Skins may be used for leather products in the United States of America and Mexico (Rose, 1996).

Market preferences for fins of shark species are variable, but Oceanic whitetip are a preferred species in many fin markets and make up part of the "first choice" category in the China, Hong Kong SAR fin market (Vannuccini, 1999). Oceanic whitetip fins reportedly command high prices in the China, Hong Kong SAR market (US $45–$85/kg, proposal).

Trade statistics for Oceanic whitetip fins are not available, since this species (as most other shark species) does not have its own customs code under systems currently in international use (Harmonized Tariff Schedule). Recent work on quantities of fins of different shark species transiting the China, Hong Kong SAR fin market has provided information on the relative importance of Oceanic whitetip fins in trade.

The China, Hong Kong SAR market has represented a substantial proportion of the global trade in shark fins: 65–80% in 1980–90, 50–65% from 1991–1995, 44–59% from 1996–2000, 30–50% following 2000 (Clarke 2008). The decline in China, Hong Kong SAR's share of world trade is attributed to increasing trade through mainland China, where statistics are difficult to obtain (Clarke, Milner-Gulland and Cemare, 2007). Despite the estimated decline over time in share of the world trade transiting China, Hong Kong SAR, total imports to China, Hong Kong SAR increased during the 1990s (Figure 8), suggesting that total world trade in shark fins was increasing during this period. Shark fins are a traditional luxury or celebration commodity in China, and a recent trend of rising incomes in mainland China is considered a key driver of increasing demand for shark fins (Clarke, Milner-Gulland and Cemare, 2007).

Fins of Oceanic whitetip made up 1.8% of fins traded in the China, Hong Kong SAR market (Clarke *et al.*, 2006b Table 5) between November 2002 and February 2004.

In summary, it seems clear that Oceanic whitetip fins are an important product in the international fin trade, although a relatively small component of the overall trade. This species appears not to be targeted in fisheries for trade, but is taken as bycatch in fisheries targeting other species. Ease of processing and storage of dried fins facilitates trade, and the products command relatively high prices in trade.

Implementation issues

Introduction from the sea

Given that Oceanic whitetip is a species of the open ocean, rather than of continental shelves, and therefore primarily occurs in the marine environment not under the jurisdiction of any State, introduction from the sea (i.e. transport of captured specimens from international waters to areas under national jurisdiction) would be expected to occur often. Under CITES such transport of specimens listed on Appendix II would require a certificate from the state to whose jurisdiction the specimens were brought, including a non-detriment finding.

Basis for findings: legally-obtained, non-detrimental

Export permits for Appendix II species must be accompanied by a certificate attesting that the specimens were legally obtained. There appears to be no current and specific national or RFMO regulations on harvest of Oceanic whitetip, other than the blanket ban on finning of harvested sharks in a number of countries and RFMOs and the requirement under the FAO Compliance Agreement[1] and the UN Fish Stocks Agreement[2] for States to require vessels entitled to fly their flags to have an authorization to fish in areas beyond national jurisdiction. To this end, a small number of States have made it a requirement in national legislation for vessels entitled to fly their flags to have an authorization to fish on the high seas or in areas beyond national jurisdiction. Other than the potential of some control in these few states, there would appear to be little impediment to jurisdictions certifying that specimens were legally obtained, should an Appendix II listing come into effect.

Export permits for products from Appendix II species must also be accompanied by non-detriment findings (NDFs) showing that exports are not detrimental to survival of the species, that is, that they are consistent with sustainable harvesting. Development of an NDF requires appropriate scientific capacity, biological information on the species, and a framework for demonstrating that exports are based on sustainable harvests. Quality of NDFs is assured by review in the Scientific Committees of CITES (Animals and Plants Committees) and within individual parties. FAO (2004, paras 28–29) provides some guidance on NDFs in a fisheries context.

There appears to be little current basis for developing NDFs for Oceanic whitetip, as no assessments of population status and allowable harvests are available for any parts of the range.

Identification of products in trade

The proposal indicates that fins from Oceanic whitetip are one of the most distinctive products in the Asian shark fin trade, possessing characteristic morphological and colour characters which facilitate identification. Traders in the China, Hong Kong SAR fin market classify Oceanic whitetip fins to a single product category ("Liu Qui") with a high degree of accuracy (100% on a sample of 23 fins) (Clarke *et al.*, 2006b).

Shark species codes

Accurate recording of international trade in sharks is seriously hampered by the absence of any species-specific reporting mechanism. To address this, the Panel suggested that the Conference of the Parties encourage the World Customs Organization to establish specific headings within the standardized tariff classification of the Harmonized System to record trade in sharks and their products at the species level.

[1] The Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas

[2] Agreement for the Implementation of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks

"Look-alike" issues

CITES allows for Appendix II listing of species whose parts and derivatives resemble those of other Appendix I or II species to the extent that enforcement officers who encounter such products are unlikely to be able to distinguish between them (Article II paragraph 2 (b)).

From the information available, fins of Oceanic whitetip are relatively distinctive, and could possibly be distinguished from those of other species by enforcement officers using identification manuals.

Likely effectiveness of a CITES Appendix II listing

A CITES Appendix II listing could have significant impacts on monitoring and assessment of species status. Since most harvest is expected to be from international waters, the catch documents required under the Introduction from the Sea provisions would provide species –level information on catches which were brought from international waters to national jurisdiction. The requirement for non-detriment findings to accompany such transfer of specimens or products could contribute to developing better assessments of species status.

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TABLES AND FIGURES

Table 1. Information for assessing productivity of Oceanic whitetip.

Parameter	Information	Productivity	Source
Intrinsic rate of increase	General – r_{2M} = 0.067 General – 0.067 (from λ = 1.069) Western/Central Pacific – 0.11 (from λ = 1.117)	Low Low Low	Smith *et al.*, 1998 Cortes 2008 Cortes 2002
Natural mortality			
Age at maturity	Southwest Atlantic – 6–7 years (both sexes) West Pacific – 4–5 years (both sexes)	Medium Medium	Lessa *et al.*, 1999 Seki *et al.*, 1998
Maximum age			
von Bertalanffy K	Southwest Atlantic – 0.075 back-calculated lengths (0.099 observed lengths) West Pacific – 0.103	Low Low	Lessa *et al.*, 1999 Seki *et al.*, 1998
Generation time	General – 10 years General – 11.1 years Western/Central Pacific – 7 years	Low/Medium Low Medium	Cortes *et al.*, 2008 cited in proposal Cortes 2008 Cortes 2002

Table 2. Decline indices for Oceanic whitetip.

Criterion	Index	Trend	Basis	Coverage	Reliability	Source
North-west Atlantic	CPUE longline	EOD 99%	Calculated by authors, 1950s to 1990s	Gulf of Mexico	Research surveys (1950s), observers (1990s) (4–5)	Baum and Myers 2004
	CPUE longline	EOD 88%	Calculated by authors, 1950s to 1990s	Gulf of Mexico	Research surveys (1950s), observers (1990s) (4–5)	Baum and Myers 2004 corrected by Ingram *et al.*, in prep
	CPUE, commer. longline	EOD 70%	Calculated by authors, 1992–2000	Northwest Atlantic	Commercial logbook data (3)	Baum *et al.*, 2003
	CPUE longline	EOD 57%	1986–2005 CPUE logbooks	Northwest Atlantic	Commercial logbook data (3)	Cortes *et al.*, 2007
	CPUE longline	EOD 9%	1992–2005 CPUE observed sets	Northwest Atlantic	Observer program data (4)	Cortes *et al.*, 2007

Table 2 (cont.)

Criterion	Index	Trend	Basis	Coverage	Reliability	Source
SW Atlantic	CPUE longline	Increase from late 1990s to early 2000s	Comparison of observations from different sources	Various parts of the Southwest Atlantic	Comparison of unstandardized CPUEs from different sources (3–)	Domingo *et al.*, 2007
SE Atlantic	CPUE longline	Decrease from mid 1990s to 2006	Comparison of observations from different sources	Southeast Atlantic	Comparison of unstandardized CPUEs from different sources (3–)	Domingo *et al.*, 2007
Western Pacific	CPUE, longline	"No decline"	Unknown	Western Pacific Ocean	Basis unknown	IATTC 2006
Central Pacific	CPUE longline	EOD 90%	Calculated by authors, 1950s to 1990s	Central Pacific Ocean	Research surveys (1950s), observers (1990s) (4–5)	Ward and Myers 2005
	CPUE longline	EOD 76% in deep sets, 53% in shallow sets	Calculated by authors, 1995–2000 vs 2004–2006	Central Pacific Ocean	Observer data from commercial fleet (4) Information from shallow sets should be given higher weight	Walsh *et al.*, 2009
	CPUE longline	EOD 53%, 5%, 27%, 52% in 4 subareas	Late 1960s to mid-1990s	Central Pacific, uncorrected for depth changes	Unstandardized CPUE (3)	Matsunaga and Nakano 1999 (see Table 3 of present report)
	CPUE longline	EOD 32%, 31% in 2 subareas; increases of 38%, 4% in 2 subareas	Late 1960s to mid-1990s	Central Pacific, corrected for depth changes	Unstandardized CPUE (3)	Matsunaga and Nakano 1999 (see Table 3 of present report)
Eastern Pacific	CPUE, observed purse seine sets on floating objects	EOD 95%	Inspection of figure, 1994–2006	Eastern Pacific Ocean	Standardized, observer data (4)	IATTC 2007a, b

Table 3. Catch rate observations and decline calculations in Central Pacific. 0–10E, 0–10W etc are different subareas of the Central Pacific. "Uncorrected" are 1990 observations uncorrected for depth changes between periods; "corrected" are 1990s observations corrected for depth differences. In "Decline" row, positive numbers are declines, negative numbers are increases. Source: Matsunaga and Nakano 1999.

Years	***Uncorrected***				***Corrected***			
	0–10E	0–10W	10–20E	10–20W	0–10E	0–10W	10–20E	10–20W
1960s	1,6	1,73	0,51	0,77	1,6	1,73	0,51	0,77
1990s	0,76	1,65	0,37	0,37	1,09	2,38	0,53	0,53
Decline	53	5	27	52	32	-38	-4	31

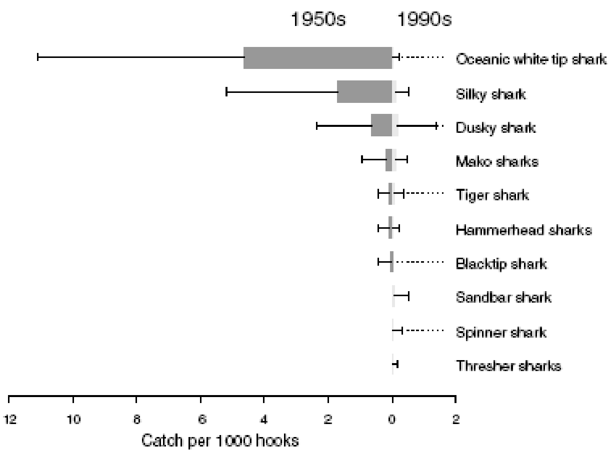

Figure 1. Mean catch rates (+/- SD) in 1950s (longline research survey) and 1990s (commercial observer from longline fleet) from Gulf of Mexico. Source : Baum and Myers 2004.

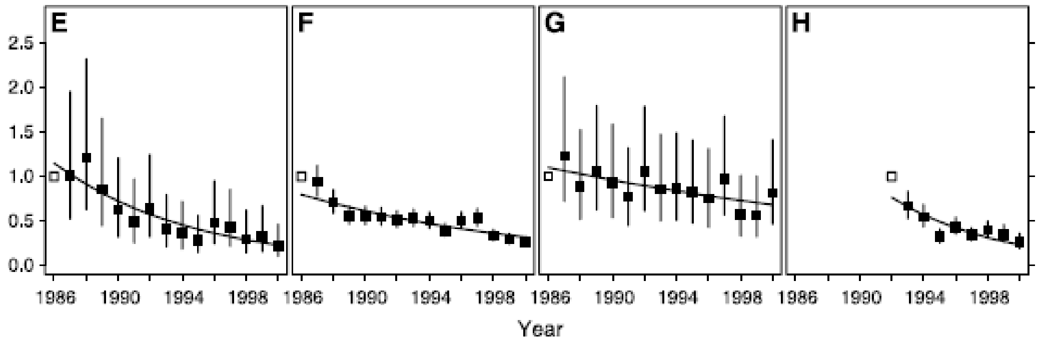

Figure 2. Relative abundance index (CPUE) of oceanic sharks in the NW Atlantic from logbook records in the pelagic long line fishery. H = Oceanic whitetip. Source: Baum *et al.,* 2003.

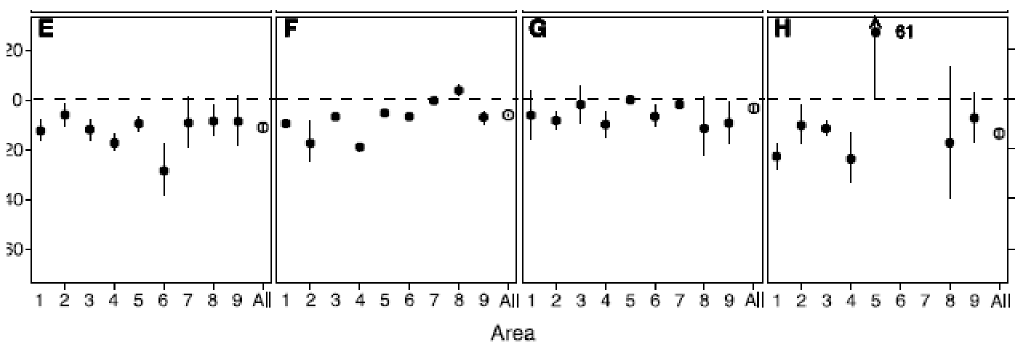

Figure 3. Rate of change in abundance over time in subareas of the NW Atlantic. H = Oceanic whitetip. Source: Baum *et al.,* 2003.

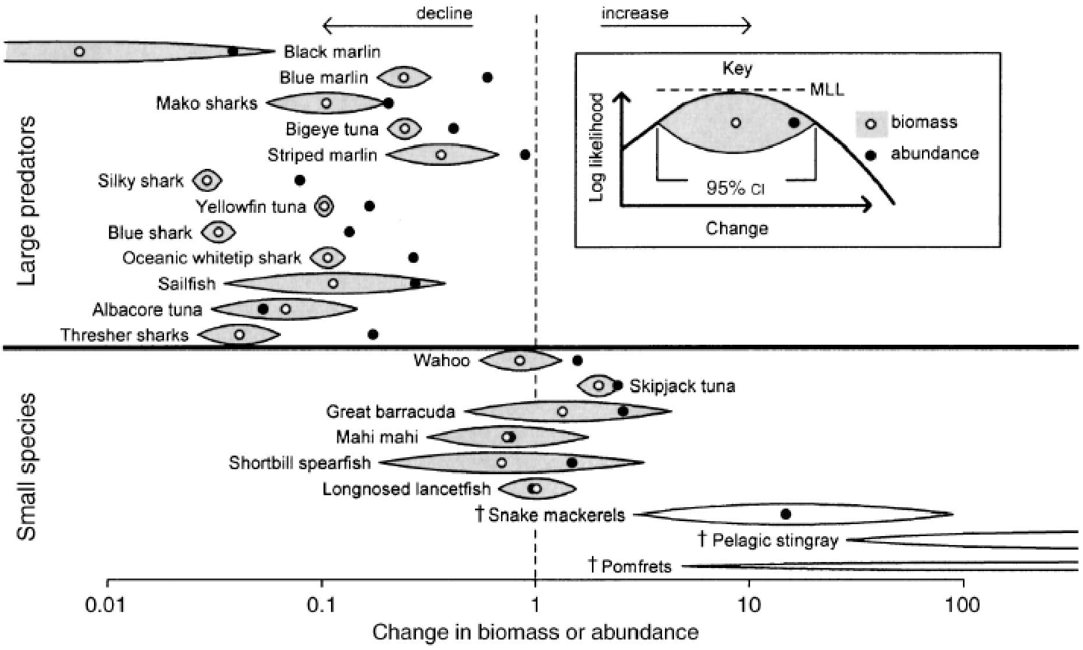

Figure 4. Change in biomass and abundance between 1950s and 1990s, Central Pacific Ocean. Source: Ward and Myers 2005.

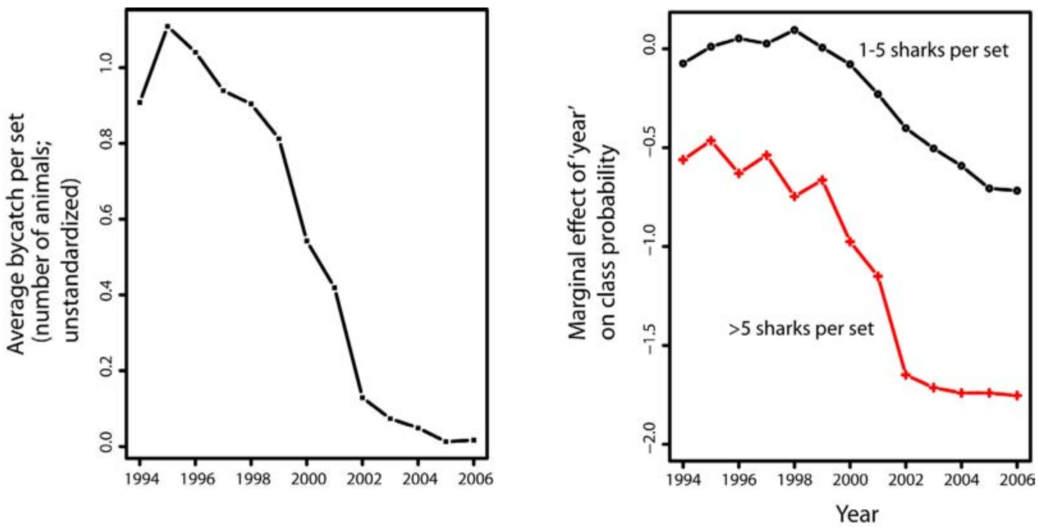

Figure 5. CPUE of Oceanic whitetip sharks, purse seine research surveys, eastern Pacific Ocean (left panel). Source: IATTC 2008.

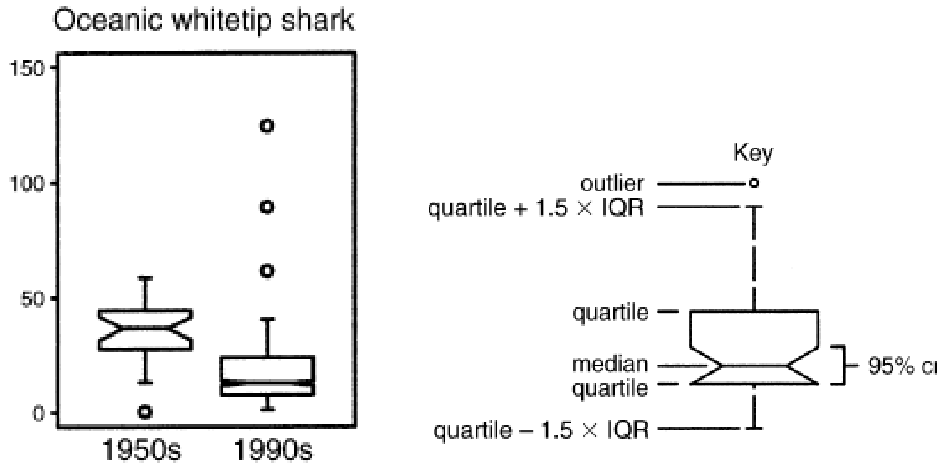

Figure 6. Change in mean body mass (kg), longline-caught individuals, Central Pacific Ocean. Source: Ward and Myers (2005)

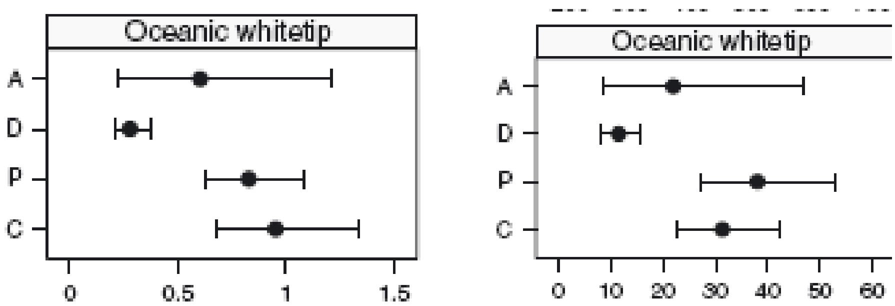

Figure 7. Estimated annual catches of Oceanic whitetip based on trade data from China, Hong Kong SAR fin market. Left panel – thousands of individuals. Right panel – tonnes. Estimates based on dorsal fins (D), pectoral fins (P), caudal fins (C) and a mixture distribution (A). Source: Clarke *et al.*, 2006a.

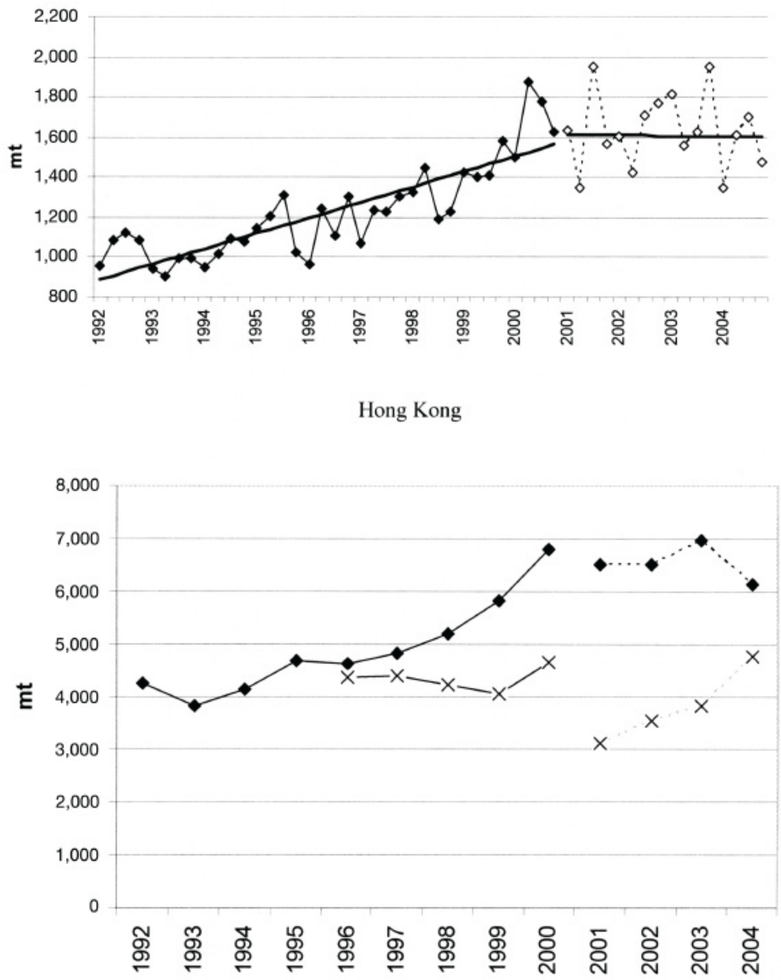

Figure 8. Imports of shark fins to China, Hong Kong SAR and mainland China. Upper figure: quarterly imports to China, Hong Kong SAR (a change in statistical reporting means values before and after 2001 are not strictly comparable). Lower figure: annual imports to China, Hong Kong SAR (solid symbols) and mainland China (x's). Source: Clarke *et al.*, 2007.

APPENDIX G

FAO Expert Advisory Panel assessment report: porbeagle shark

CoP15 Proposal 17

SPECIES: *Lamna nasus* – Porbeagle shark

PROPOSAL: Inclusion of *Lamna nasus* (Bonnaterre, 1788) in Appendix II in accordance with Article II 2(a) and (b).

Basis for proposal: The proposal states that the regulation of trade in the species is necessary to avoid it becoming eligible for inclusion in Appendix I in the near future (consistent with Annex 2a A), and that regulation of trade in the species is required to ensure that the harvest of specimens from the wild is not reducing the wild population to a level at which its survival might be threatened by continued harvesting or other influences (consistent with Annex 2a B). According to the proposal the North and Southwest Atlantic and Mediterranean stocks meet the decline criteria for a low productivity species while other southern hemisphere stocks are likely to experience similar decreases unless international trade regulations are put in place. In addition stocks that do not qualify for listing under criteria specified by Article II 2(a) are proposed to be listed under Article II 2(b) to avoid implementation problems resulting from the split listing of the species.

ASSESSMENT SUMMARY

The FAO Expert Panel concluded that the available evidence supports the proposal to include porbeagleshark, *Lamna nasus*, in CITES Appendix II.

When evaluated on a population by population basis, the historically large porbeagle populations in the North Atlantic (Northeast and Northwest) and Mediterranean were considered to meet the Appendix II decline criterion.

Porbeagles in the Northeast Atlantic Ocean were considered to meet the Appendix II decline criterion, with no evidence that the decline has ceased. Past management has been inadequate. The decline in population abundance of the Northwest Atlantic meets the Appendix II decline criterion, although the population is currently recovering. Although no stock assessment has been performed, the tuna trap catch data for porbeagle in the Mediterranean indicate that this population also meets the Appendix II decline criterion. New assessments for the Southwest Atlantic indicated substantial declines, but results were too uncertain to determine whether porbeagle in this region meet the decline criterion for Appendix II.

The status of other southern hemisphere populations (excluding the Southwest Atlantic) was considered to be above Appendix II decline thresholds. The proposal refers to additional stocks that qualify under Article II paragraph 2(b), which the Panel was not able to identify.

The Panel took note of the wording of CITES Resolution Conf. 9.24 (Rev. CoP14) indicating that Parties had resolved to adopt measures that are proportionate to the anticipated risks to the species when considering proposals to amend the Appendices. In this case, the Panel considered that populations representing most of the historical abundance of the species globally met the decline criteria for Appendix II. Therefore, listing the smaller, less exploited southern hemisphere populations as well would be consistent with the proportionate risks to the species as a whole.

Although adequate management measures are in place in some regions, there are others where appropriate management is urgently needed. Risk to the Northwest Atlantic population is mitigated by population rebuilding and the implementation of both Canadian and United States management plans designed to rebuild stocks. In other populations, sustainable management requires that, where they have not done so, range States develop and implement National Plans of Action for sharks.

In the event of a CITES listing, porbeagle caught in the European Union waters would likely be traded within the EU, and thus not be subject to CITES trade limitations. In the Northwest Atlantic, most porbeagle are harvested within the EEZs under rigorous management, which should form the basis for non-detriment findings. A CITES listing would also result in better monitoring of catches entering international trade from all stocks. Introduction from the Sea would only be an important issue for high seas longline fleets, which sometimes take porbeagle shark as bycatch. .

In its 2007 deliberations, the Panel concluded that the species did not meet the biological decline criterion for inclusion in CITES Appendix II. The additional information available to the current Panel included a stock assessment for the Northeast Atlantic and additional information for the Mediterranean and Southwest Atlantic stocks. On the basis of this additional information, the species as a whole now warrants listing under Appendix II.

PANEL COMMENTS

Biological considerations

Population assessed

Porbeagle, *Lamna nasus* (Bonnaterre, 1788), is distributed throughout the North Atlantic Ocean and in a broad circumglobal band in the southern hemisphere. porbeagle generally occurs in the Northwest and Northeast Atlantic Ocean. Tagging studies indicate that populations in the Northwest and Northeast Atlantic are distinct (COSEWIC, 2004), although occasional movements between the two areas have been observed (ICES, 2006b). The Northwest Atlantic population migrates seasonally between southern Newfoundland/the southern Gulf of St. Lawrence, and Massachusetts (COSEWIC, 2004). A single stock is considered to exist in the Northeast Atlantic (ICES, 2006a). Evidence from Japanese catches in high seas longline fishing fleets could indicate the potential for a third stock of porbeagle off Iceland (Matsumoto, 2005; FAO, 2007). Stock boundaries in the southern hemisphere are unclear. Apparently a stock in the Southwest Atlantic could include waters of the Southeast Pacific and a stock in the Southeast Atlantic could include waters of the Southwest Indian Ocean, but not enough data is available to confirm these hypotheses (SCRS, 2009)

Productivity level

Biological information indicates that the species falls into the category of “low” productivity (Campana *et al.,* 2001; Natanson, Mello and Campana, 2002; FAO 2007) (Table 1). Age determination has been validated up to at least 26 years but ages may be underestimated in older fish (Campana, Natanson and Myklevoll, 2002; Francis, Campana and Jones, 2007). Fecundity in Porbeagle is very low at an average of 3.9 pups per female with females giving birth annually (Campana *et al.,* 2001). There is no relationship between fecundity and age (Jensen *et al.,* 2002). Age at maturity in the Northwest Atlantic was estimated at 8 years for males and 13 years for females (Jensen *et al*., 2002). The intrinsic rate of increase of the population was estimated between 0.026 and 0.07. Porbeagle off New Zealand may be less productive than stocks in the North Atlantic Ocean. A recent study of New Zealand Porbeagle estimated age at maturity at 8–11 years for males and 15–18 years for females, while longevity may be around 65 years (Francis, Campana and Jones, 2007).

Population status and trends

Small population size

Available estimates for the Northwest Atlantic population are 11–14 thousand mature females, 33–38 thousand mature individuals, and 196–207 thousand total individuals (SCRS, 2009). For the Northeast

Atlantic population size was estimated between 127 and 204 thousand individuals (SCRS, 2009). No information on population size is available from other areas where the species occurs.

Restricted distribution

The extent of occurrence in Canada is estimated at 1.2 million km^2, while the area of occupancy in Canada from recent catch locations is estimated at 830 000 km^2; range is not known to have changed since the fishery began in 1961 (COSEWIC, 2004; FAO 2007). Area of occupancy and extent of occurrence for the Northwest Atlantic would be greater than these values. There is no evidence that local depletion exists in this area for Porbeagle because tagging data suggest this species is highly migratory. Area of occurrence in Norwegian waters is estimated at 395 000 km^2 (A. Bjorne pers. comm.). The area of occurrence in the Northeast Atlantic would be considerably larger than that. No information on distribution area is available from other areas where the species occurs, but it is a widely distributed species in the Northeast Atlantic and southern hemisphere (FAO, 2007).

Decline

Because this species occurs in several widely separated areas, and in distinct populations, no single abundance index can be applied to the species as a whole. Assessment of decline in abundance of the species can only be calculated using abundance indices from as many parts of the species' distribution as possible. Trend information for each stock is summarized in Table 2.

Northeast Atlantic

Available catch and CPUE time series data were used by ICCAT's Standing Committee on Research and Statistics (SCRS, 2009) to assess the status of the Northeast Atlantic stock of Porbeagle. Two assessment models were used by SCRS (2009): a surplus production and an age structured production model. Both models used catch data from 1926 and CPUE data from Spanish (1981–2007) and French (1972–2008) longline fleets. Results from satisfactory runs of the surplus production model (runs based on the longest time series and based on realistic values for the unexploited population size) estimated that the current population size is between 15% and 39% of the unexploited population size (Figure 1). Results from the age structured production model estimated that the current stock biomass is 6% in biomass and 7% in numbers of the unexploited population size (Figure 2). Current fishing mortality is estimated between 2.3 and 3.5 of the fishing mortality that would maximize yield in the long run. SCRS (2009) concluded that all the models that used biologically plausible assumptions about unfished biomass inferred that the population is currently depleted. However, the results of both assessment models are considered highly uncertain, given that the majority of the fishery removals occurred before data were available to estimate abundance trends (SCRS, 2009).

Forward projections of the stock based on the surplus production model indicated that the current TAC of 436 tonnes is likely to cause the population to remain fairly stable at a low biomass level. Rebuilding of the stock could take several decades under lower fishing mortality rates. In the absence of better information to assess the status of the stock, the management recommendation of ICES is to prohibit the target fishing for Porbeagle, to limit the bycatch and to prohibit landings (SCRS, 2009).

Catch per unit of effort data from the French longliners decreased by one third between the early 1970s and early 1980s and since then has oscillated without a trend. The Spanish CPUE has also oscillated without a trend since the mid-1980s (Figure 3; SCRS, 2009). As noted above, both CPUE time series were used in the stock assessment models for the Northeast Atlantic stock.

Updated catch data were used in the proposal to demonstrate a decline in the Northeast Atlantic stock, as done in the previous proposal submission (FAO, 2007). In the Northeast Atlantic the species has been fished by many European countries, mainly by Norway, Denmark, France, Faroes and Spain. Total landings in the Northeast Atlantic declined from an average of 2 953 tonnes in 1933–37 to 388 tonnes in 2004–08 (Figure 4). Landings of the Norwegian and Danish fleets are currently about 1% of their historical peaks in the 1930s and 1950s, respectively (Table 2). French longliners started targeting Porbeagle in the 1970s. Catches peaked in 1979 at 1 092 tonnes and are currently about 291 tonnes per year. The species is also caught opportunistically as bycatch in Spanish longliners targeting swordfish and sharks in the Atlantic. Reported catches have oscillated without a trend since the early 1970s, being always below 70 t/yr. As stated by FAO (2007), landings data do not provide an accurate index of abundance because changes in landings may be influenced by market conditions and management measures rather than abundance of the species.

Mediterranean

The proposal compiled different sources of information suggesting the disappearance of Porbeagles in the Mediterranean. It is not known if the Porbeagles in the Mediterranean are part of a separate stock from the Northeast Atlantic. Declines of more than 99% in catches of lamnid sharks (including Porbeagle) in tuna traps in the Ligurian Sea were estimated between 1950 and 2006 (Figure 5; Ferretti *et al*., 2008). Ferretti *et al.* (2008) also estimated declines of more than 98% in the cpue of longline fisheries in the Ionian Sea between 1978 and 1999. The authors noted however that the cpue in the beginning of the time series was already very low (in the order 0.2 sharks/1000 hooks).

Reported landings to FAO have been below 4 tonnes per year since 1970; the highest landings on record (11 tonnes) were reported by Algeria in 2007. Neither the Panel nor an Algerian fisheries representative could confirm the reliability of the catch data reported by Algeria.

Northwest Atlantic

Landings in the Northwest Atlantic fishery were high in the early 1960s, declined to low levels during the 1970s and 1980s, increased during the early 1990s and declined to low values in the early 2000s (Figure 6; Gibson and Campana, 2005). Recent catches are 4% of the historical maximum levels (Table 2) due to strict quota regulations.

Two assessment models were used by SCRS (2009) to estimate the status of Porbeagle shark in the Northwest Atlantic: a surplus production model and an age structured model. Results from the surplus production model applied to data through 2009 estimated that current stock biomass is about 32% of the stock biomass in 1961 (Figure 7). According to the age structured model the current population size is about 22% to 27% of its size in 1961 (Figure 8). The number of mature females in the population is estimated at 12% to 16% of the estimated number in 1961. Both models indicate that population size has stabilized and is undergoing a slow recovery in recent years. The current population size is about 95% to 103% of its size in 2001, and a recovery to B_{MSY} levels is likely to occur in about 20 years with no fishing.

Southern Hemisphere

Catch per unit of effort data of Porbeagle caught as bycatch in the Uruguayan pelagic longline fleet shows a declining trend from 1982 to 2008 (Figure 9). Changes in the Uruguayan CPUE time series occurred too quickly to be explicable solely on the basis of abundance changes, but alternate abundance indices were not available (SCRS 2009). Therefore the Uruguayan CPUE time series was used by SCRS (2009) to assess the status of the Porbeagle stock in the Southwest Atlantic using a surplus production model. Because of suspected high levels of unreported catches from all tuna longline fleets operating in the area, the model included estimates of potential total catches based on pelagic longline fishing effort and the ratios of Porbeagle to other species in the pelagic longline catch. Results indicated that the current stock biomass is about 18–39% of the unexploited stock size, depending on the assumption made about unreported catches (Figure 10). The Uruguayan CPUE data was also used by SCRS (2009) to assess the stock using a catch free age structured production model. The model estimated that the current spawning stock biomass is 18% of the unexploited level and 54% of the biomass in 1982 (Figure 11). SCRS (2009) concluded that despite the convergence of the methods in showing potential declines in porbeagle abundance in the Southwest Atlantic, data are too limited to provide a robust indication on the status of the stock.

Other data available from the southern hemisphere are from bycatch fisheries, including in Japanese longline fisheries for southern bluefin tuna, and in the New Zealand and Argentina longline and trawl fisheries. porbeagle is one of the main pelagic shark species, following blue shark, caught by the southern bluefin tuna fishery of Japan (Matsunaga, 2009). Standardized CPUE data from this fleet showed no trend from 1992 to 2007 (Figure 12). Reported landings in New Zealand reached a peak of 300 tonnes in 1998–99 and declined by 75% since then to a low of 55 tonnes in 2005–06 (Figure 13). Unstandardized catch per unit of effort of New Zealand tuna longline fishery derived from observer data collected between 1992 and 2005 suggests a declining trend in stock abundance during the period

(Figure 14). However it is noted in the proposal that declines may not necessarily reflect changes in abundance because of low observer coverage and changes in fishing operations. Reference is also made to the decline of 40% in porbeagle landings from longline fisheries operating off New Zealand between 1997 and 2003 (FAO, 2007). porbeagle bycatch in the demersal fisheries on the southern Patagonian shelf has been estimated at 20–70 tonnes over the period 2003–2006 (Waessle, 2007). No updated information is presented in this regard.

Other indices

Average length of individuals taken in Northwest Atlantic fisheries declined from over 200 cm in 1960–1980, to 140–150 cm in 1999–2000 (Campana *et al.*, 2001;Figure 15).

Assessment relative to quantitative criteria

Small population

The estimate of total population size for the Northwest Atlantic is 11 000–14 000 mature females, and 196–207 thousand total individuals. For the Northeast Atlantic total population size is 127 000– 204 000 individuals. The total population size in the North Atlantic would be therefore at least 323 000 individuals. Total population size worldwide would be well above this. These estimates are well above the general guideline (5000) for small population size provided in the CITES definitions (CITES Conf. Res. 9.24 Rev CoP14). The species is therefore not characterized by a small population size.

Restricted distribution

No guidelines for restricted area of distribution are provided in the CITES Criteria, which indicate that thresholds should be taxon-specific (Conf Res 9.24 Rev CoP14). FAO (2001) recommended that historical extent of decline in area of distribution would be a better measure of extinction risk than absolute value of distributional area, but that if no other suitable information is available and absolute area of distribution has to be used for an exploited fish population, analyses should be on a case-by-case basis as no numeric guideline is universally applicable.

Estimated distribution area for the species would be substantially greater than estimates for Canada where extent of occurrence is 1.2 m km^2 and area of occupancy 830 000 km^2. For the Northeast Atlantic the area of occurrence would be at least 395 000 km2. . Therefore, as concluded by FAO (2007), the species is not characterized by a “restricted” distribution.

Decline

Under the CITES criteria for commercially-exploited aquatic species (Conf Res 9.24 Rev CoP14), a decline to 15–20% of the historical baseline for a low productivity species might justify consideration for Appendix I. For listing on Appendix II, being “near” this level might justify consideration, which for a low productivity species would be 20–30% of the historical level (15–20% + 5–10%).

No overall population decline index is available for comparison with the guidelines. Information from different areas is summarized below.

For the Northwest Atlantic population, the current mature female population estimated with an age structured model is 12–16% of the historical baseline prior to major fisheries (1961), while the total population is 22–27% of that historical baseline. Results from a surplus production model applied to the same time series of data estimated that current stock biomass is about 32% of the stock biomass in 1961, which is only slightly above the decline threshold of 30% for an Appendix II listing. These results indicate the population in the Northwest Atlantic meets the criterion for Appendix II, as concluded in the previous Panel report (FAO, 2007). The population is under a conservative harvesting regime in Canada and United States of America, which is expected to allow the recovery of the stock. Recovery to target levels will however take decades due to the low productivity of the species. As noted by SCRS (2009), there is probably unreported catch in the high seas within the stock area and increased effort in these areas could compromise stock recovery efforts.

For the Northeast Atlantic, assessment against the decline criterion is more difficult due to the lack of long term indices of abundance. The only CPUE data available are from longline fisheries from 1972 to 2008, well after the historical peak in landings in the 1930s. Stock assessment results based on the available catch and CPUE data indicate that current population size is about 15–39% of the unexploited population size, according to one modeling approach, and 6% in biomass and 7% in numbers of the unexploited population size according to another modeling approach. Despite the uncertainties of the results, these levels of decline put the Northeast Atlantic stock generally within the decline threshold for an Appendix II listing.

In the Mediterranean, a decline of more than 99% in catches in tuna traps was estimated between 1950 and 2006. Although catches are not generally an appropriate measure of abundance trends, catch data from the fixed tuna traps were considered a relatively reliable source of information about abundance trends. Considering in addition the estimated decline of more than 98% in longline CPUE between 1978 and 1999 and other anecdotal information about the disappearance of the species, the Panel concluded that the decline in porbeagle abundance in the Mediterranean meets the criterion for an Appendix II listing.

For the southern hemisphere, information was patchy and the time series were short (1982 to 2008). Stock assessment based on CPUE data from the Uruguayan fleet and on reconstructed catches in the Southwest Atlantic estimated current stock biomass at about 18% and 39% of the unexploited stock size. This level of decline would be generally within the decline criterion for an Appendix II listing. However, the results were considered highly uncertain because of data limitations. The Panel concluded that other stocks in the southern hemisphere are probably not lightly fished but may be above the Appendix II decline criteria threshold.

In summary the Panel concluded that the available evidence indicates that the stocks of porbeagle in the north Atlantic (Northwest and Northeast stocks) and Mediterranean Sea meet the decline criteria for inclusion in CITES Appendix II. The status of stocks in the southern hemisphere is more uncertain but overall the Panel considered that these stocks are likely to be above the decline threshold for an Appendix II listing.

The Panel took notice of the wording of Resolution Conf. 9.24 (Rev. CoP14) indicating that Parties had resolved to adopt measures that are proportionate to the anticipated risks to the species when considering proposals to amend the Appendices. In this case, the Panel considered that populations representing a large proportion of historical abundance of the species globally (North Atlantic) met the decline criteria for Appendix II. Therefore, listing the smaller, less exploited southern hemisphere populations as well would be consistent with the proportionate risks to the species as a whole.

The proposal refers to additional stocks that qualify for inclusion on Appendix II in accordance with Article II paragraph 2(b) which the Panel was not able to identify.

Were trends due to natural fluctuations?

There is no evidence that observed trends were due to natural fluctuations.

Risk factors and mitigating factors

Different risk factors for the species were noted in FAO (2007). Life history characteristics, such as low fecundity, slow growth and late maturation, make the species particularly vulnerable to mortality from human activities including fishing. Such vulnerability factors are addressed in the decline criterion threshold for a low productivity species. The high value of products from the species (meat, fins) in domestic and international markets constitutes another risk to the conservation of the species. In addition the species is taken with longline fishing gear both in directed fisheries and as bycatch for other high-value species such as tuna and swordfish. Therefore even with appropriate management measures and controls some level of fishing mortality is likely to be maintained because of bycatch.

Unreported catch represents a significant potential risk factor as this will constrain developing accurate information on stock status. Even in the area where stock information is considered best, the Northwest Atlantic, unreported catch is apparently being taken (Campana and Gibson, 2008) and it is estimated that worldwide real catches are substantially above reported catches (SCRS, 2009).

The existence of rebuilding plans in the United States and Canada represents an important mitigating factor for the Northwest Atlantic population. Catch quotas have been reduced to levels that will support the population recovery, but recovery will take decades because of the low productivity of the species (SCRS, 2009). Catches in the high seas areas of the North Atlantic may undermine these efforts if they are not strictly regulated.

Recent regulations adopted under the European Common Fisheries Policy, including restrictive quotas for the directed fishery, maximum landing size and the banning of shark finning, can mitigate to some extent the risk to the Northeast Atlantic population. The recently established European Community Action Plan for the Conservation and Management of Sharks may lead to the adoption of several measures to rebuild depleted stocks of sharks, including Porbeagle. The entering into force of the European Union Regulation 1005/2008 establishing catch certification requirements for imports into the EU is expected to mitigate IUU fisheries to a certain extent.

In the southern hemisphere, mitigating factors include Argentinean regulations prohibiting finning (Consejo Federal Pesquero, Res. 13/2009) and requiring all live captures of sharks greater than 1.6 metres to be released by Argentinean longline and trawl fisheries (Consejo Federal Pesquero, Res. 13/2003). Moreover, Argentina has a 100 percent observer coverage requirement for longline fisheries which provides accurate catch estimates for porbeagle (FAO, 2007). New Zealand has included porbeagle under a quota management system since 2004.

In addition, measures adopted by Regional Fishery Management Organizations are likely to have some effect on the conservation of sharks. For instance, since 2007 ICCAT requires Parties to reduce the mortality of porbeagle sharks in directed fisheries where a peer-reviewed stock assessment is not available (proposal). The proposal also refers to the recent moratorium on directed shark fishing in the area of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) until data become available to assess fishing impacts on sharks. Finally, the FAO International Plan of Action for the Conservation and Management of Sharks urges shark fishing nations to implement conservation and management plans which will lead to sustainable utilization of sharks. Strengthening the implementation of the IPOA-Sharks by countries and RFMOs could be expected to benefit the conservation of porbeagle throughout its range.

Trade considerations

Porbeagle shark products, particularly the meat and fins, are highly valued in markets and accordingly are in demand (proposal; Rose, 1996; Fowler *et al.*, 2004; FAO, 2007). However, as noted in the proposal, the lack of species-specific landings and trade data make it impossible to assess the volume of catches supplying domestic and international trade.

The high value of porbeagle meat in European countries is well documented (proposal; Vannucinni, 1999; FAO, 2007). Based on catch data reported to FAO, EU Member States took 60% and 75% of the global reported porbeagle catches in 2006 and 2007, respectively. Trade in porbeagle meat between France, Spain and Italy has been documented but this is within the EU so is not considered "international" (FAO, 2007). Exports of porbeagle meat from Canada to the United States of America and EU, from Japan to the EU, and from the EU to the United States of America have been documented in earlier studies (Vannuccini, 1999), but the quantification of these transactions could not be done because of the lack of any customs code for porbeagle in the Customs Hamonized System (proposal).

Besides the meat, fins of porbeagle are also highly valued. According to the proposal porbeagle is among the preferred species for fins in Indonesia. The species is among the main species frequently used in the global fin market (Shivji *et al.*, 2002; cited in the proposal). In this regard, FAO (2007) noted that "Porbeagle fins are found in markets in China, Hong Kong, Special Administrative Region, and internationally (proposal; Shivji *et al*., 2002), but are apparently not one of the common species in the China Hong Kong, SAR dried fin market, possibly because fins in that market primarily come from areas other than those where porbeagle is most abundant (Northwest and Northeast Atlantic) (Table 2 in Clarke *et al*., 2006)". Other products probably in trade cited in the proposal are hides, liver oil and cartilage, but the actual traded volumes are unknown.

In the absence of any new information, the conclusions of FAO (2007) with respect to trade in porbeagle products remain valid and relevant. "Trade in porbeagle parts (primarily meat and fins) was determined by the panel to be a factor affecting Porbeagle catch. However, porbeagle caught in EU waters would likely be traded within the EU, and thus not be subject to CITES trade limitations. In the Northwest Atlantic, most porbeagles harvested to supply trade are managed under existing Canadian and United States management plans supporting population growth" (FAO, 2007).

Implementation issues

Introduction from the sea

As stated in the proposal and also in FAO (2007), most porbeagles are harvested within the Exclusive Economic Zones (EEZs) and as such introduction from the sea would only be a significant issue for those individual taken by high seas longline fleets. Porbeagle is known to be taken as bycatch in Japanese, Korean and Taiwan Province of China longline fisheries operating in the high seas. Estimates of Japanese bycatch ranging from 15 to 280 tonnes annually between 2000 and 2002 are reported in the proposal. The landing of these specimens would need to be accompanied by Introduction from Sea and Non-detriment findings certificates. Exactly how these certification processes would be carried out is still a matter of debate within CITES. Some level of involvement of Regional Fisheries Management Organization is expected in areas where such organizations have been established with mandate over shark fisheries.

Non-detriment findings

Non-detriment findings (NDFs) are the responsibility of the exporting country and must show that exports are not detrimental to survival of the species, that is, that they are consistent with sustainable harvesting. Development of an NDF requires appropriate scientific capacity, biological information on the species, and an approach to demonstrating that exports are based on sustainable harvests.

For the Northwest Atlantic population, the basis for non-detriment findings should follow the current rebuilding plans and TACs established by Canada and UNITED STATES OF AMERICA based on results from a stock assessment. For the Northeast Atlantic, scientific advice is available on which NDFs could be based. In addition, the recently adopted European Community Action Plan for the Conservation and Management of Sharks may eventually provide the management reference points needed to evaluate non detriment findings. For porbeagle introduced from the sea, existing RFMOs could be used to provide the basis for NDFs (FAO, 2007). Resources and tools are available to inform other CITES Parties on the necessary information and steps to be taken in the making of NDFs (Rosser and Haywood, 2002; Anonymous, 2008).

Findings that specimens were legally obtained

Porbeagle harvests from the Northwest Atlantic population are regulated under the Canadian and United States of America management plans. Exports of products based on legal harvesting under these management plans would qualify as legally obtained for CITES. In the Northeast Atlantic, recently established EU regulations for porbeagle catches, including specific TAC, maximum landing size and no finning measures, provides the basis to judge if takes were legally obtained. TACs for the species have also been established by New Zealand, Norway and Faroe Islands, and a maximum landing size is in place in Argentina. Regulations controlling shark finning is also in place in many countries and regional fisheries management organizations. Exports from these countries and areas that are in agreement with the established regulations would qualify as legally binding under CITES.

Identification of products in trade

FAO (2007) noted that "it would probably be difficult for a non-expert to distinguish meat of porbeagle from that of other similar lamnoid sharks in trade such as shortfin mako. Dorsal fins from large shark species may also be difficult to distinguish, although porbeagle dorsal fins have a characteristic white rear edge (proposal). Accordingly, a basis for unequivocal identification of porbeagle products in trade does not appear to exist. DNA techniques are not considered practical as initial screening tools although they may be useful for secondary inspections or enforcement (CITES, 2006)". According to the proposal, such techniques for porbeagle are already available and could be used for distinguishing between southern and northern hemisphere stocks.

"Look-alike" issues

In relation to "look-alike" issues, FAO (2007) noted that "listing for "look-alike" reasons (i.e., listing on Appendix II under Article II paragraph 2 (b) of the Convention) is justified when enforcement officers who encounter specimens of CITES-listed species are unable to distinguish between them and unlisted species. Trade in porbeagle products is predominantly meat and fins. If the trade in products was undermining the conservation effectiveness of a porbeagle listing, and tools such as identification guides and DNA tests were not feasible, there would be potential justification for proposals to list other species of sharks on the basis that their products resemble those of porbeagle in trade, were porbeagle shark to be listed on Appendix II".

The proposal cites Resolution Conf. 9.24 (Rev. CoP14) Annex 2b (listing in accordance with Article II paragraph 2 (b)) to justify the listing in Appendix II of "stocks that do not qualify under Annex 2a". Considering that the stocks proposed to be listed under Article II paragraph 2 (a) ("Annex 2a") comprise all known stocks of porbeagle shark (Northwest and Northeast Atlantic, Mediterranean, Southwest Atlantic and other southern hemisphere stocks), the Panel considered that there were no other stocks to be evaluated against Annex 2b criteria for listing in accordance with Article II paragaraph 2(b).

Likely effectiveness of a CITES Appendix II listing

The impact of a CITES Appendix II listing on species status depends on several factors including the extent to which international trade (as opposed to exploitation for national utilization) is driving exploitation; the relative importance of directed harvest for trade and of other sources of mortality including incidental catch; and the actual effects of the listing.

Although porbeagle products are traded internationally, the actual proportion of the catches that are in international trade remains unknown due to the lack of specific customs codes for the species. However, as noted by FAO (2007), much of the harvest in the EU is apparently for internal markets, and thus would not be subject to CITES provisions. Therefore the listing would have little impact on the status of the Northeast Atlantic stock. For other stocks, restrictions on trade resulting from an Appendix II listing might result in a diversion of product from international to national markets, since the meat and fins are of high quality.

The existence of rebuilding plans in the United States and Canada was recognized as an important mitigating measure for the Northwest Atlantic population. The listing in Appendix II would probably strengthen the efforts to keep harvesting for trade commensurate with the rebuilding plan for this stock.

Under an Appendix II listing, landings of porbeagle caught in high seas fisheries would require certificates of introduction from the sea accompanied by non detriment findings. Although high seas catches are believed to be minor compared to the levels of takes within EEZs, improving the control of high sea catches is expected to strengthen current management measures in place for the Northwest and Northeast stocks.

The Panel also noted that a CITES listing is expected to result in better monitoring of catches entering international trade from all stocks. The improved catch monitoring could have a beneficial effect on the management of the species in all parts of its range.

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TABLES AND FIGURES

Table 1. Information for assessing productivity level of Porbeagle. Unless otherwise indicated, information is from the proposal. "Productivity" is relative to guidelines in FAO 2001.

Parameter	**Information**	**Productivity**	**Source**
Intrinsic rate of increase	0.05–0.07 (North Atlantic) 0.026 (Southwestern Pacific)	Low (less than 0.14)	Proposal; Campana *et al.*, 2001
Natural mortality	0.10 (immature), 0.15 (mature males), 0.20 (mature females) (Northwest Atlantic)	Low (less than 0.2)	Proposal; Campana *et al.*, 2001
Age at maturity	Female: 50% mature at 13 yr (N. Atlantic), 15–19 yr (S. Pacific Male: 50% mature at 8 yr (N. Atlantic), 8–10 yr (S. Pacific)	Low (greater than 8 yr)	Proposal; Campana *et al.*, 2001; Francis, Campana and Jones., 2007
Maximum age	> 29 – 45 years (Northwest Atlantic) 60 years (Southern hemisphere)	Low (greater than 25 yr)	Proposal; Francis, Campana and Jones., 2007, SCRS, 2009.
K	0.07, Northwest Atlantic	Low (less than 0.15)	Natanson, Mello and Campana., 2002

Table 2. Decline indices for Porbeagle. Reliability indices refer to FAO (2001).

Area	Index	Trend	Basis	Coverage	Reliability	Source
NE Atlantic	Landings	Landings declined to 13% of historical peak of 2 953 tonnes in 1933–37.	Average landings 1933–37 vs. 2004–08	Northeast Atlantic	Catch data (2)	Proposal; SCRS, 2009.
	Landings	Danish landings declined from average of 1380 tonnes in 1950–54 to 6 tonnes in 2004–08 (< 1%)	Average landings 1950–54 vs. 2004–08	Danish fleet	Catch data (2)	Proposal; SCRS (2009)
	Landings	Norwegian landings decline from 2 953 t/yr in mid-1930s to less than 20 t/yr in 2004–08 (<1% of peak)	Average landings 1933–37 vs 2004–08	Norwegian fleet	Catch data (2)	Proposal
	CPUE	No trend since mi-1980s	Inspection	Spanish longline fleet	Catch per unit of effort (standardized?) (4)	Proposal, SCRS (2009)
	CPUE	Decline by 1/3 from early 1970s and 2004–08	Inspection	French longline fleet	Catch per unit of effort (standardized) (4)	Proposal, SCRS (2009)
	Stock biomass	Decline to 15% to 39% of unexploited biomass	Surplus production model	Northeast Atlantic, 1926 – 2008.	Population model based on catch data and catch per unit of effort (standardized) (4)	Proposal, SCRS (2009)
	Stock biomass and numbers	Decline to 6% in biomass and 7% in numbers of unexploited biomass	Age structured production model	Northeast Atlantic, 1926 – 2008.	Population model based on catch data and catch per unit of effort (standardized) (4)	Proposal, SCRS (2009)

Table 2 (cont.)

Area	Index	Trend	Basis	Coverage	Reliability	Source
Mediterranean	Compiled observations, landings	“Virtually disappeared”	Landings recorded in FAOFishstat, observations in research surveys.	Mediterranean	Catch data (2), observations (1)	Proposal
	Catches lamnid sharks in tuna traps	Decline of 99% between 1950 and 2006.	GLM of catches over time	Ligurian Sea	Catch data (2)	Proposal, Ferretti *et al.*,(2008)
	Cpue lamnid sharks in pelagic longlines	Decline of 98% between 1978 and 1999	GLM of cpue over time	Ionian Sea	Catch per unit of effort standardized (4)	Proposal, Ferretti *et al.*, (2008)
Northwest Atlantic	Landings	Recent catches are 4% of historical highs	Average catch 2004–2008 vs. average catch 1961–1965	Northwest Atlantic fishery	Catch data (2)	Proposal; numbers from Gibson and Campana 2005
	Stock biomass	Current stock is 32% of the size in 1961	Surplus production model	Northwest Atlantic	Catch per unit of effort standardized (4)	Proposal, SCRS (2009)
	Total numbers	Current population size is 22% to 27% of its size in 1961	Age structured model	Northwest Atlantic	Catch per unit of effort standardized (4)	Proposal, SCRS (2009)
	Numbers of mature females	Current numbers is 12–16% of numbers in 1961	Age structured model	Northwest Atlantic	Catch per unit of effort standardized (4)	Proposal, SCRS (2009)

Table 2 (cont.)

Area	Index	Trend	Basis	Coverage	Reliability	Source
Southern hemisphere	Stock biomass	Current stock biomass about 18 – 39% of the unexploited stock size	Surplus production model	Southwest Atlantic	Catch per unit of effort of Uruguayan fleet (3)	Proposal, SCRS (2009)
	Spawning stock biomass	Current SSB is 18% of unexploited SSB	Catch free, age structured production model	Southwest Atlantic	Catch per unit of effort of Uruguayan fleet (3)	Proposal, SCRS (2009)
	Longline cpue	Declining trend since 1982	Inspection	Uruguay, Southwest Atlantic	Catch per unit of effort of Uruguayan fleet (3)	Proposal, SCRS (2009)
	Landings	Decline of 75% between 1998 and 2006.	Inspection	New Zealand	Landings (2)	Proposal, Ministry of Fisheries New Zealand
	Longline cpue	Decline to ca. 30% between 1992 and 2005	Inspection	New Zealand	Unstandardized cpue (3)	Proposal, Ministry of Fisheries New Zealand
	Longline cpue	No trend between 1992 and 2007	Inspection	Japan, southern bluefin area.	Standardized cpue (4)	Matsunaga (2009)

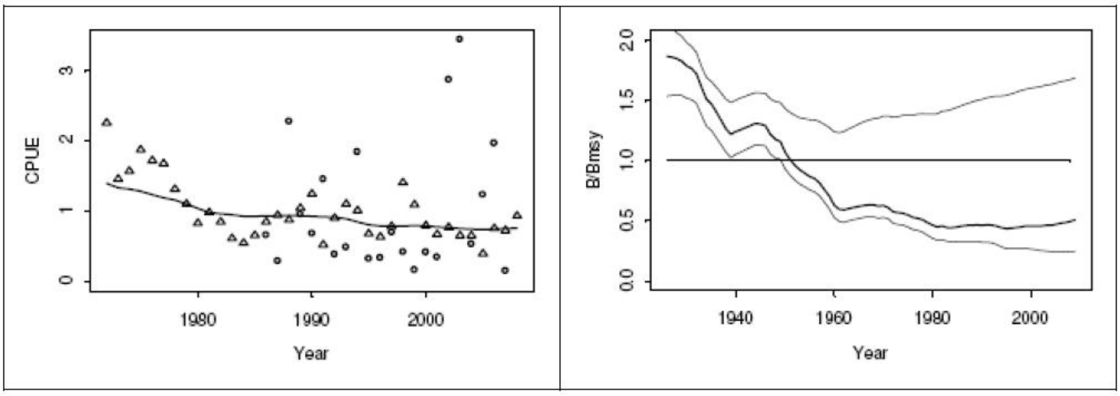

Figure 1. Results of a Bayesian surplus production model of the Northeast Atlantic porbeagle stock. Left: French and Spanish CPUE and fitted biomass trend. Right: biomass (B) relative to biomass at MSY (B_{msy}). (Source: SCRS, 2009).

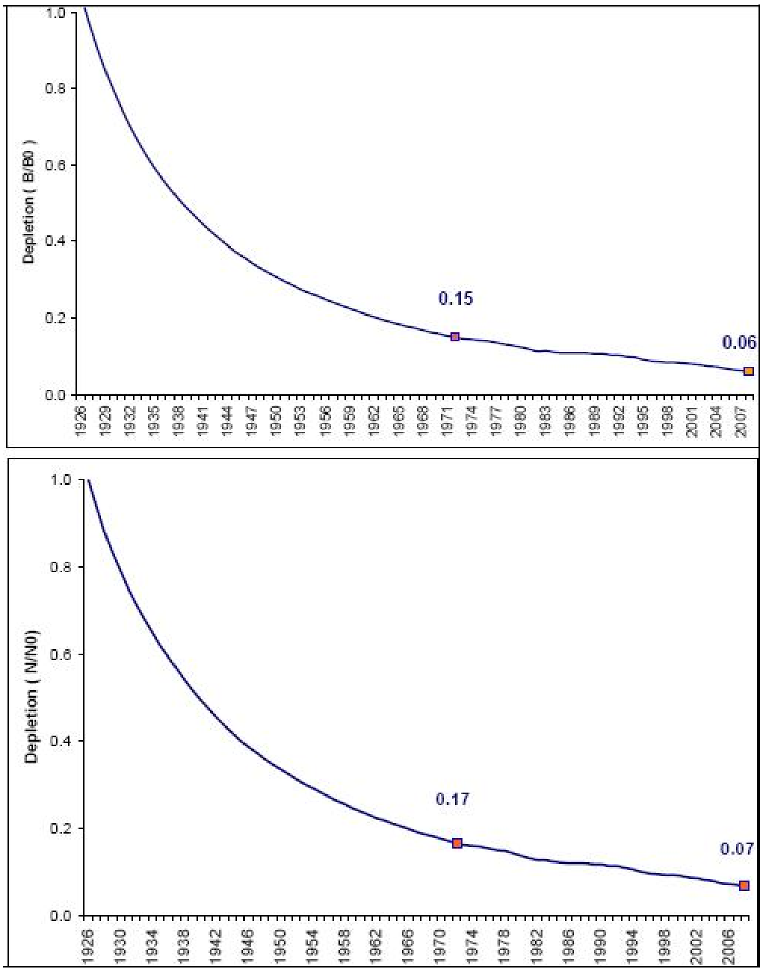

Figure 2. Depletion in total biomass (upper panel) and numbers (lower panel) for the age-structed production model assuming virgin conditions in 1926 for Northeast Atlantic porbeagle shark. The dots indicated on the line correspond to depletion at the beginning of the modern period (1972) and current depletion (2008). (Source: SCRS, 2009).

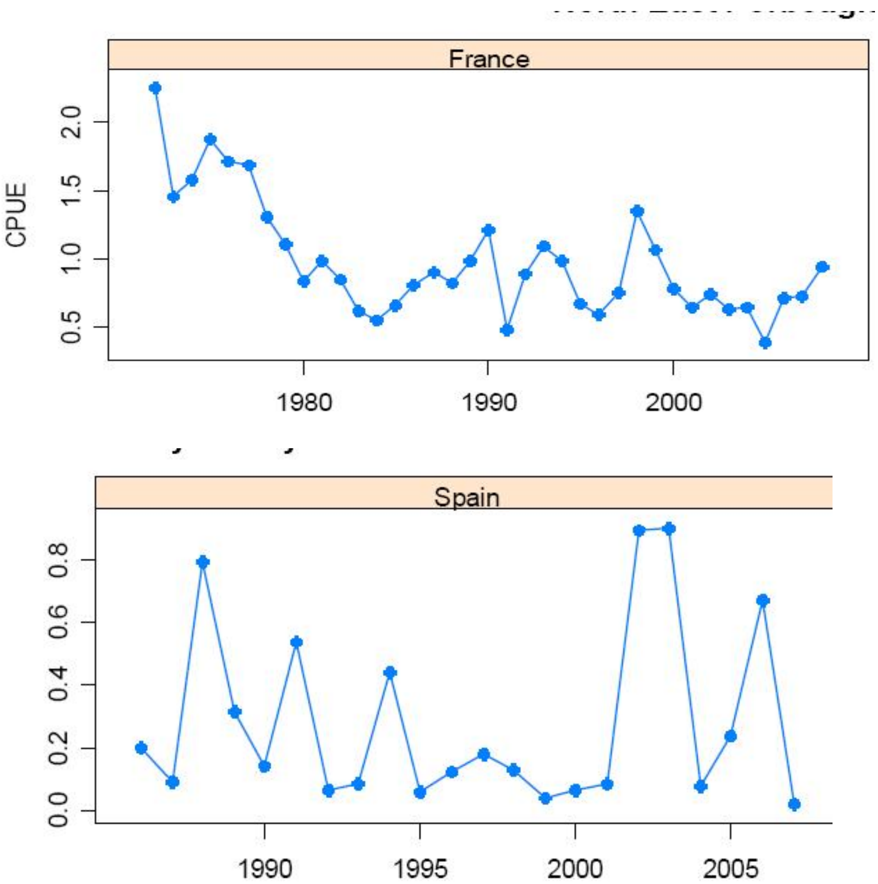

Figure 3. French and Spanish porbeagle CPUE from longline fisheries in the Northeast Atlantic (SCRS, 2009).

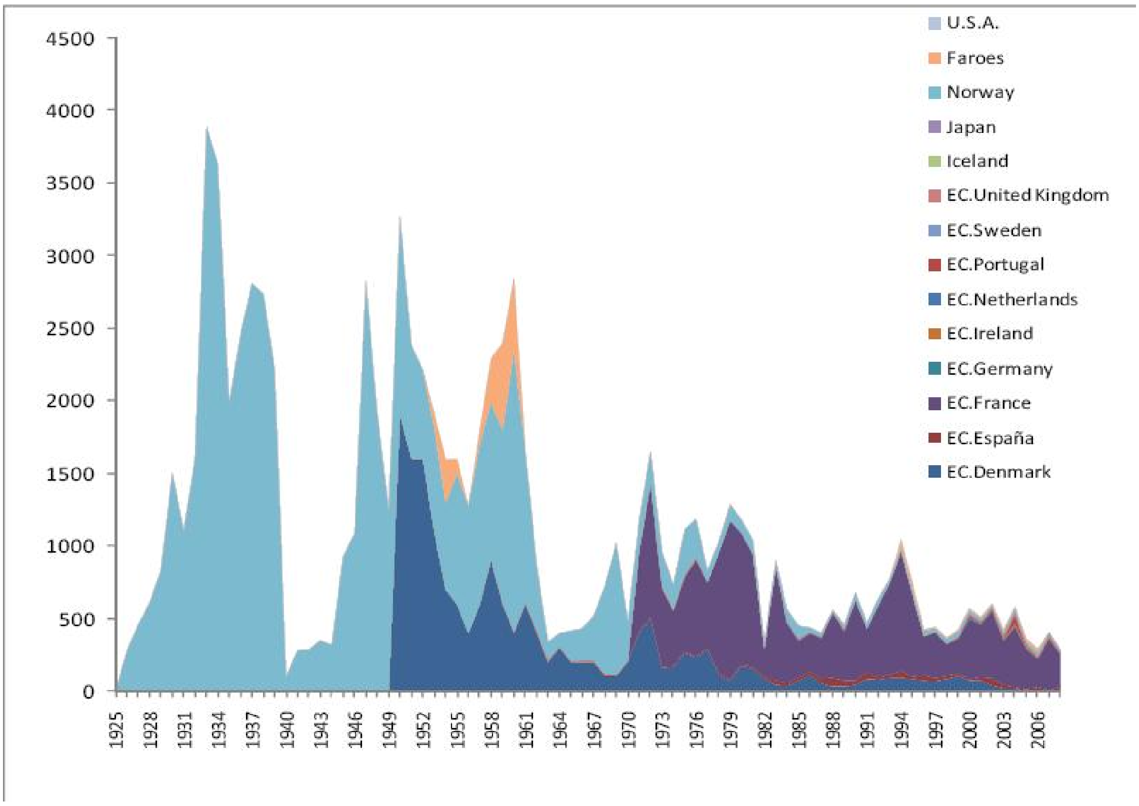

Figure 4. Catch of porbeagle sharks from the northeastern Atlantic by country used in the assessment undertaken by SRCS (2009).

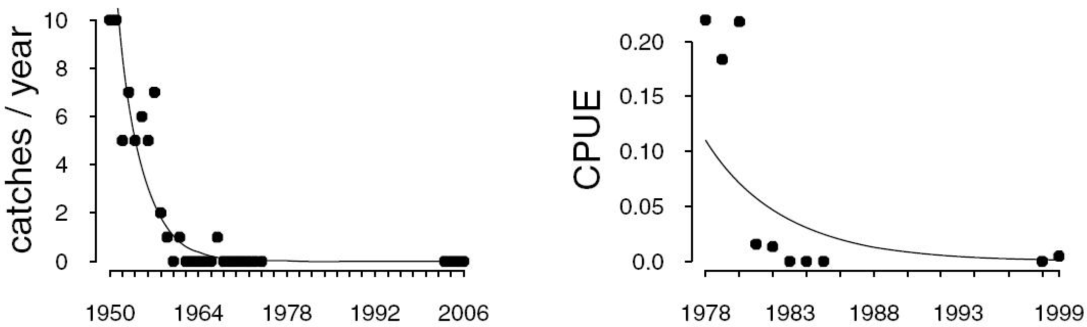

Figure 5. Trends in lamnid shark standardized annual catches in tuna traps in the Ligurian Sea (left) and in catch per unit effort (CPUE, sharks landed per 1000 hooks) for the Ionian sea (Ferretti *et al*., 2008).

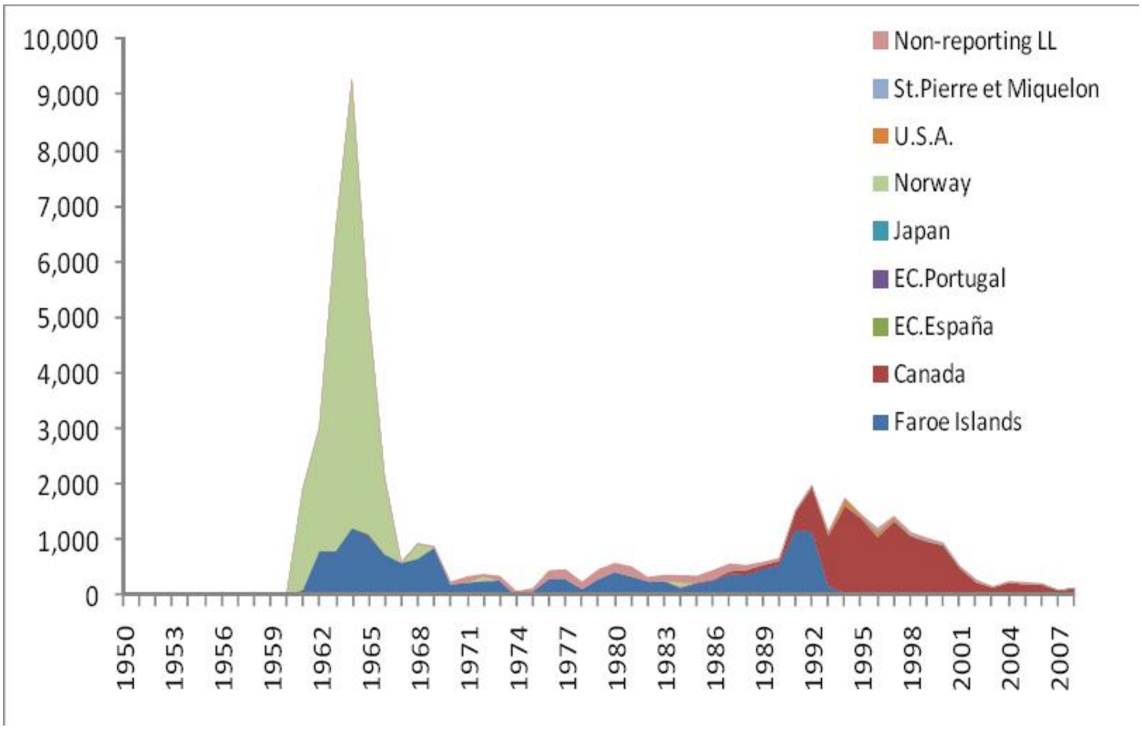

Figure 6. Catch of porbeagle sharks from the northwestern Atlantic by country used in the assessment undertaken by SRCS (2009).

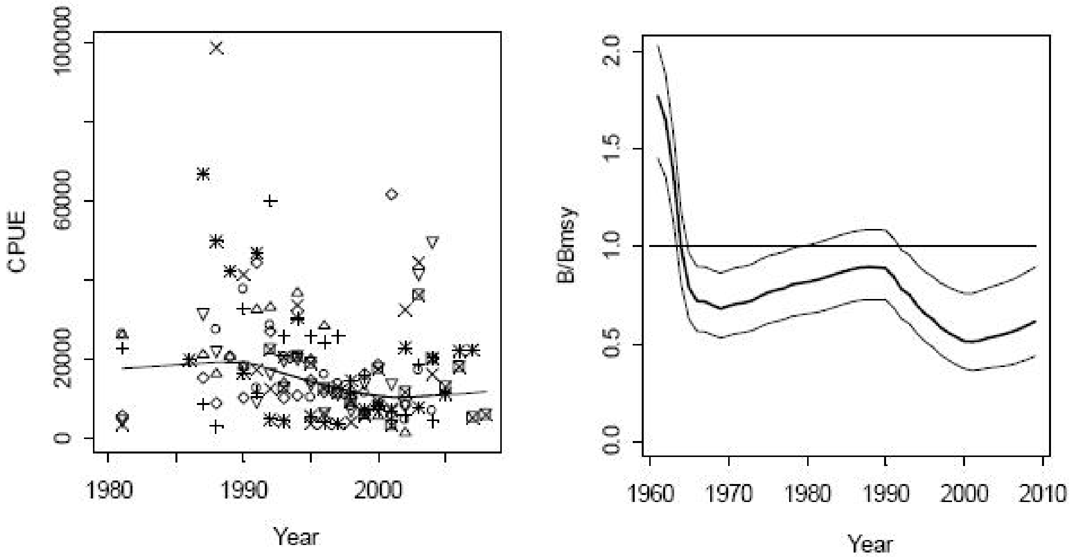

Figure 7. Results of a Bayesian Surplus Production model of the Northwest Atlantic porbeagle stock. Left: Canadian, US and Spanish CPUE and fitted biomass trend. Right: biomass (B) relative to biomass at MSY (B_{MSY}) (Source: SCRS, 2009).

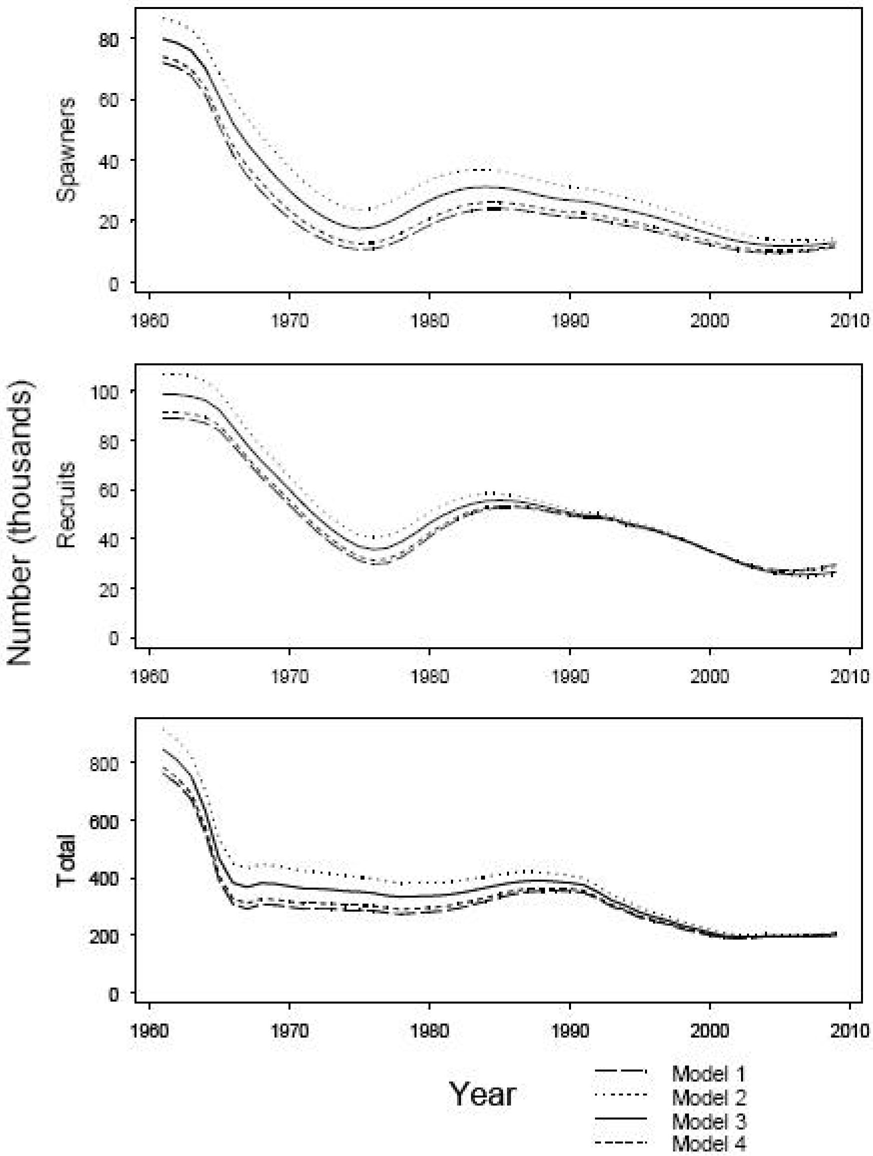

Figure 8. Estimated numbers of mature females (top), age-1 recruits (centre) and total number of *Lamna nasus* in Canadian waters, 1961–2008. (Source: Campana and Gibson, 2008).

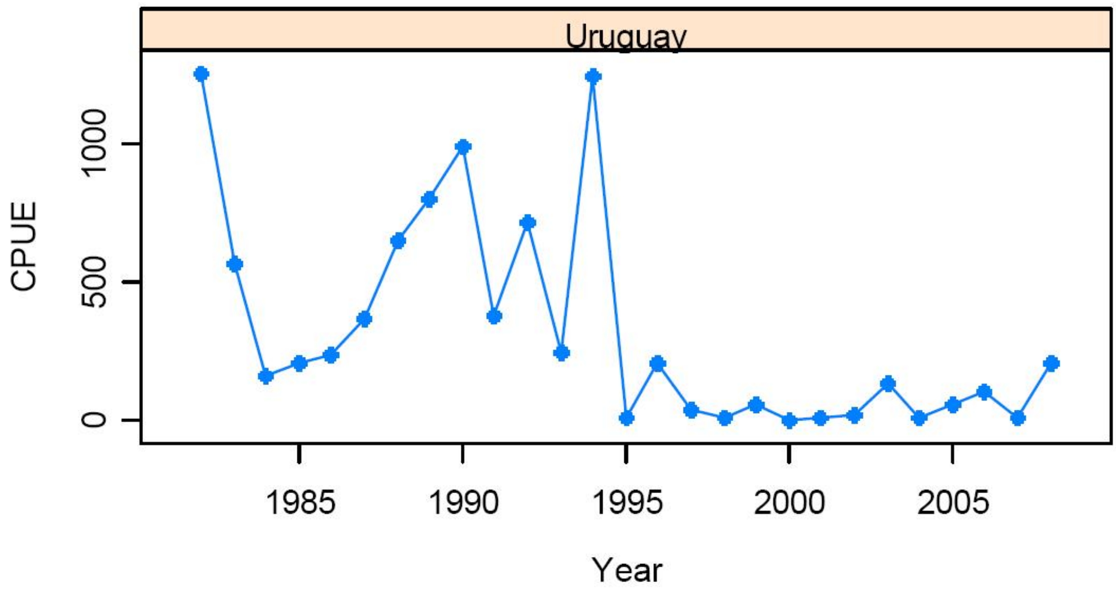

Figure 9. Uruguay porbeagle CPUE from longline fisheries in the Southwest Atlantic (SCRS, 2009).

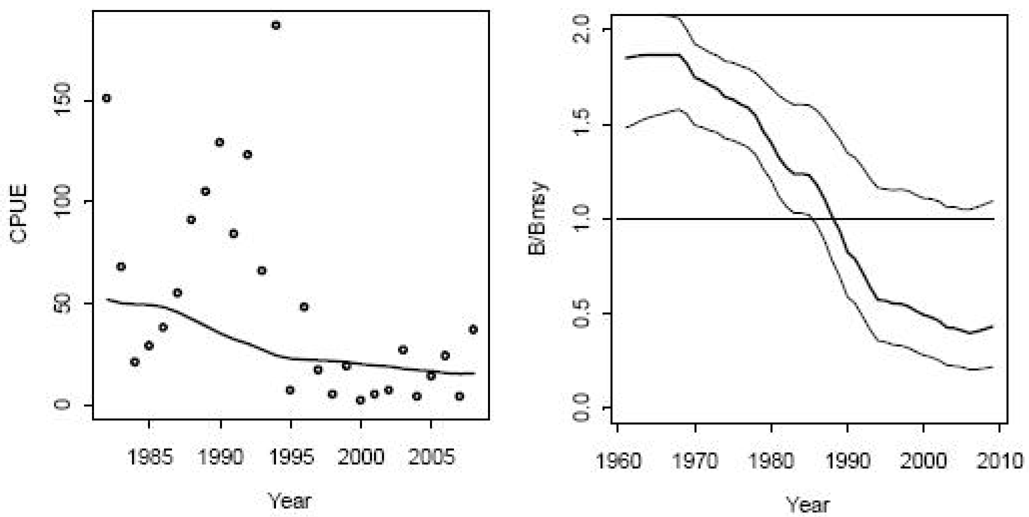

Figure 10. Results of a Bayesian Surplus Production model of the Southwest Atlantic porbeagle stock, assuming that catches are proportional to effort. Left:Uruguayan CPUE and fitted biomass trend. Right: biomass (B) relative to biomass at MSY (Bmsy) (Source: SCRS, 2009).

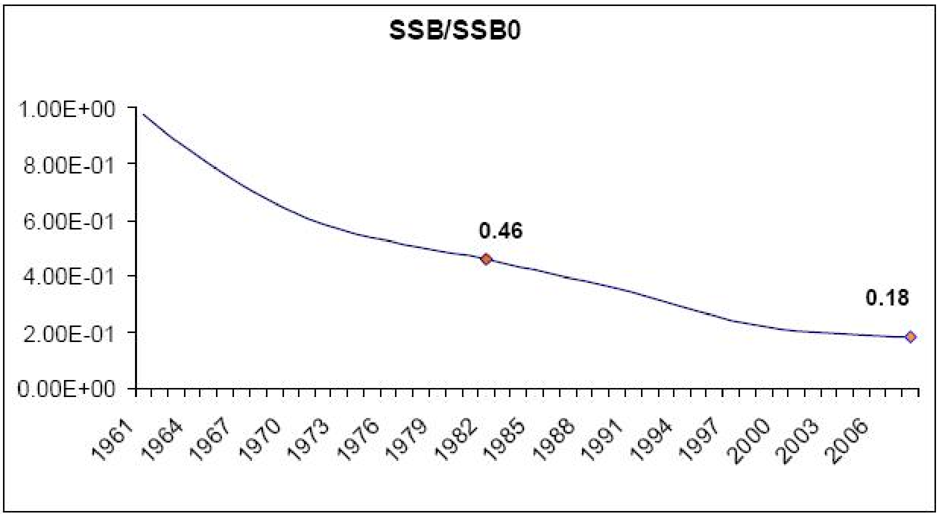

Figure 11. Relative spawning stock biomass (SSB) trend for the catch-free age structured production model assuming virgin conditions in 1961 for Southwest Atlantic porbeagle shark. Dots indicate the depletion at the beginning of the modern period (1982) and current depletion (2008) (SCRS, 2009).

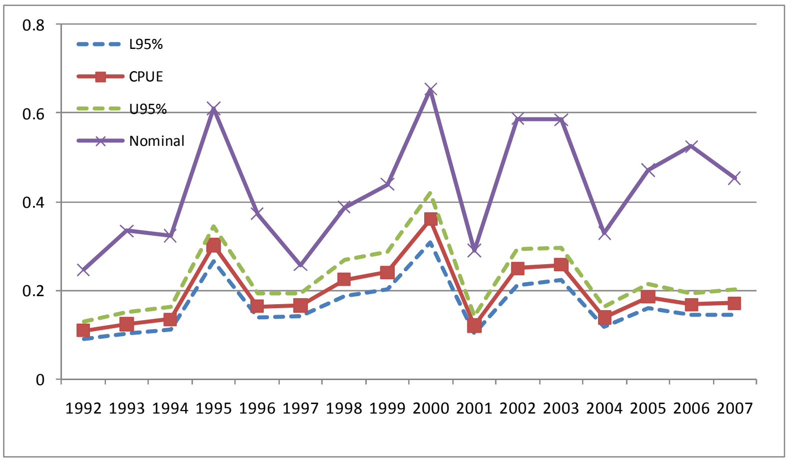

Figure 12. Trend of standardized CPUE and 95% CI and nominal (unstandardized) CPUE for porbeagle using Japanese observer data (Source: Matsunaga, 2009).

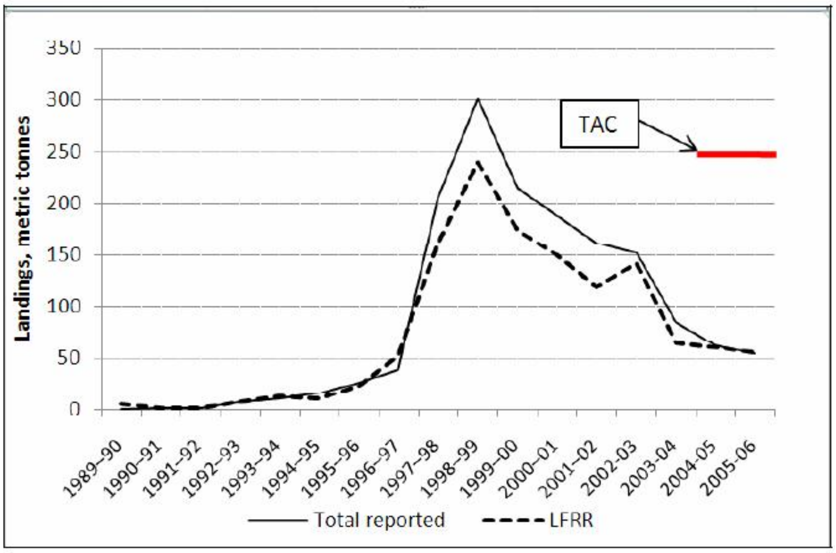

Figure 13. New Zealand commercial landings of porbeagle sharks reported by fishers and processors, 1989/90 to 2004/05. (Source: proposal).

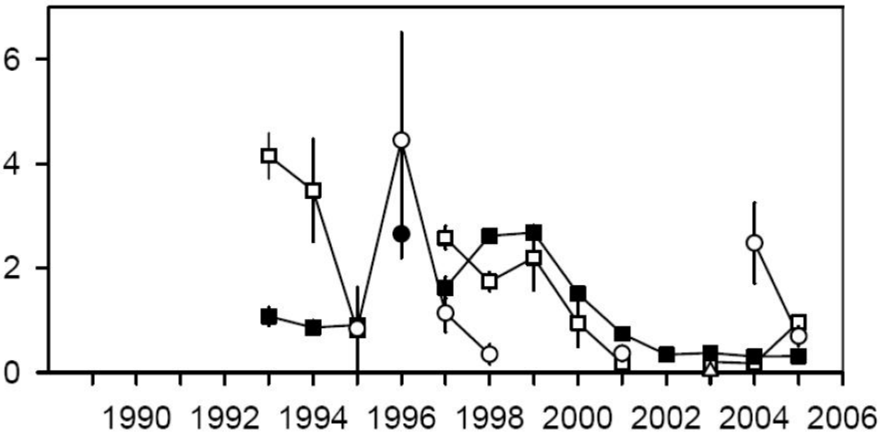

Figure 14. Unstandardized CPUE indices (number of *Lamna nasus* per 1000 hooks) for various New Zealand tuna longline fishery based on observer reports. (Source: proposal).

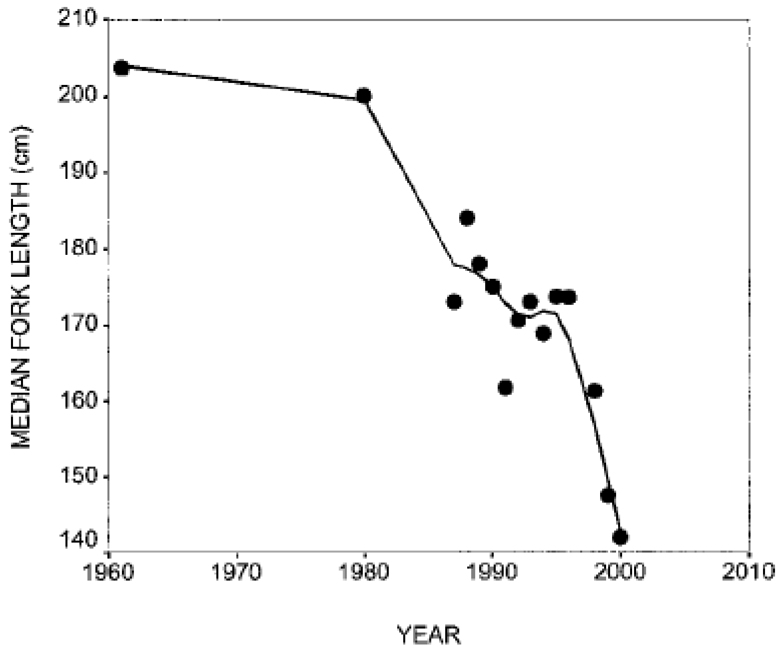

Figure 15. Change in median fork length of Porbeagle in commercial catch in September-November on mating grounds off southern Newfoundland. A LOESS smoothing line is fitted to the data. (Source: Campana *et al.*, 2001).