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July 10, 2006

Ms. Michele Brenning  
Director General  
Canadian Wildlife Service  
Environment Canada  
Ottawa, Ontario K1A 0H3

Re: Porbeagle shark SARA listing recommendation (Canada Gazette Part I, 01 June 2006)

Dear Ms. Brenning:

I am writing to express my concern over the recommendation not to list porbeagle shark as an endangered species under Schedule 1 of the Species at Risk Act (SARA). I am an environmental economist by training, with degrees in agricultural economics and a Ph.D. in environmental policy. Prior to taking my current position as a Canada Research Chair in Ecological Economics at Memorial, I spent 4+ years as a senior economist with Department of Fisheries and Oceans (DFO) Policy Branch, Maritimes Region. While at DFO, I was the primary author of the report looking at potential socio-economic implications of listing porbeagle shark as endangered<sup>1</sup>.

In my opinion, the Minister's recommendation not to list porbeagle shark as an endangered species under SARA is inconsistent with the scientific and economic evidence presented by DFO during public consultations, in scientific documents, and in the socio-economic analysis of listing impacts. There is no legitimate economic argument for not listing porbeagle as endangered. My key points are listed; I will expand on each in more detail below.

- (1) The recommendation circumvents key ecological issues regarding porbeagle shark recovery by relying primarily on an economic rationale for not listing;
- (2) The recommendation states that bycatch fisheries will be closed by a listing decision even though this is clearly not the case under sale and trade restrictions;
- (3) The importance and costs of information collection via fishery dependent surveys has been exaggerated – necessary information can likely be collected more economically;
- (4) Directed fishing for porbeagle shark at current effort levels, in excess of that needed to achieve maximum sustainable yield, likely generates under \$50,000 annually in net benefits for Canadian society and is economically inefficient; and
- (5) The non-use economic benefits of porbeagle shark conservation to Canadian society as a whole, which could be in the range of tens of millions annually, have not been accounted for.

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<sup>1</sup> DFO, 2006a. Potential socio-economic implications of adding porbeagle shark to the List of Wildlife Species at Risk in the *Species at Risk Act* (SARA). Dartmouth, NS: DFO Policy Branch.

## Background

Large, slow-growing, long-lived marine animals such as sharks are highly susceptible to directed and bycatch fishing pressure<sup>2</sup>. Declines of an order of magnitude in population abundance may be common for vulnerable species and some sharks have been reduced to as low as 1% of historical unfished levels. In Atlantic Canadian waters, the abundance of porbeagle shark is estimated to be 12-15% of its pre-1961 unfished level according to DFO science reports<sup>3</sup>.

Porbeagle is the target species for a Canadian exploratory shark fishery and is caught as bycatch, primarily by swordfish and tuna longline fisheries<sup>4</sup>. Despite the steep decline in abundance and ongoing fishing mortality, the Minister of Environment recently recommended not listing porbeagle shark as an endangered species under SARA<sup>5</sup>. The reasons cited (p. 1488) were the loss of fisheries-dependent data useful for management and potential economic costs to some fishers and associated industries:

“...the Minister is proposing not to add the Porbeagle Shark to Schedule 1, because in the absence of a provision for the possession and sale of listed species, listing the porbeagle would eliminate the directed and bycatch fisheries and result in economic losses for some fishers and associated industries in coastal communities and loss of industry-based sources of information on the species.”

The Minister states that porbeagle shark will continue to be managed under the Fisheries Act and that DFO would work with stakeholders to “develop a conservation strategy for this species to ensure its protection and recovery” (p. 1505).

## Porbeagle Shark Population Models and Recovery Targets

Given DFO’s scientific research<sup>6</sup> and input into the COSEWIC assessment<sup>7</sup> that led to the listing recommendation, and the severity of porbeagle population decline, there appears to be no dispute that porbeagle shark abundance is currently at a level that is consistent with an endangered listing status.

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<sup>2</sup> Stevens, J.D., R. Bonfil, N.K. Dulvy, and P.A. Walker, 2000. The effects of fishing on sharks, rays, and chimaeras (chondrichthyans), and the implications for marine ecosystems. *ICES Journal of Marine Science* 57: 476–494; Myers, R.A.M. and B. Worm, 2003. Rapid worldwide depletion of predatory fish communities. *Nature* 423: 280-283; Christensen, V., S. Guenette, J.J. Heymans, C.J. Walters, R. Watson, D. Zeller and D. Pauly, 2003. Hundred-year decline of North Atlantic predatory fishes. *Fish and Fisheries* 4: 1-24; Baum, J.K. and R.A. Myers, 2004. Shifting baselines and the decline of pelagic sharks in the Gulf of Mexico. *Ecological Letters* 7: 135-145.

<sup>3</sup> DFO, 2005a. Recovery assessment report on NAFO Subareas 3-6 porbeagle shark. CSAS Science Advisory Report 2005/043; Gibson, A.J.F. and S.E. Campana, 2005. Status and recovery potential of porbeagle shark in the NE Atlantic. CSAS Research Document 2005/053.

<sup>4</sup> DFO, 2006a (p. 12).

<sup>5</sup> Department of the Environment, 2006. Order amending Schedules 1 to 3 of the Species at Risk Act. Canada Gazette Part I 140(23): 1478-1513.

<sup>6</sup> DFO, 2005a; Gibson and Campana, 2005.

<sup>7</sup> COSEWIC, 2004. COSEWIC assessment and status report on the porbeagle shark *Lamna nasus* in Canada. Committee on the Status of Endangered Wildlife in Canada.

DFO makes an assumption that the porbeagle shark population can recover based on population dynamic insights derived from porbeagle shark population models<sup>8</sup> and observations that the population abundance appears to have stabilized since 2003<sup>9</sup>. While the models are comprehensive, there are unexplained anomalies and uncertainty has not been fully incorporated into all modeling scenarios. To discern any trends in long-term population abundance given two years of field observations seems dubious.

In the models, spawning stock number (abundance) at 20% of unfished levels ( $SSN_{20\%}$ ) and at maximum sustainable yield ( $SSN_{msy}$ ) are used as reference points<sup>10</sup>.  $SSN_{20\%}$  appears to be much lower than  $SSN_{msy}$  (approximately 16,000 adult females versus 36,000 adult females under a moderate productivity assumption). As pointed out by external reviewers at the porbeagle shark recovery assessment potential meeting<sup>11</sup>,  $SSN_{20\%}$  would usually be considered to be a boundary between critical and cautious zones for fish populations (i.e., a limit reference point) while  $SSN_{msy}$  is often thought of as a boundary between cautious and healthy zones<sup>12</sup>.

Under assumptions of moderate productivity, population recovery to  $SSN_{msy}$  would not occur until 2050-2075 with low levels of fishing pressure (2% exploitation rate) and as late as the mid-2100s with exploitation rates around the current level of 4% per year. It is difficult to think of these time frames as “recovery”.

If the scientific issues regarding porbeagle shark status – slow population growth, a depleted population in the ‘critical’ zone, high uncertainty, and inherent biological vulnerability – were dealt with directly, it would be very difficult to deny the appropriateness of listing porbeagle shark as an endangered species. The rationale for avoiding this discussion and not listing porbeagle, instead, is based on the costs of listing, both in terms of financial losses for industry and the loss of information for management. As a consequence, continuing management under the Fisheries Act and with other existing regulatory mechanisms is justified.

### **Information Needs and Costs for Porbeagle Shark Management**

Part of the rationale for not listing revolves around the loss of industry-based sources of information on the species. Depending solely on the exploratory shark fishery, however, as a source of information on stock abundance also has its limitations (e.g., selectivity issues, geographically limited fishing activities). The use of alternative sources of data was not explored

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<sup>8</sup> Gibson and Campana, 2005.

<sup>9</sup> DFO, 2005b. Stock assessment report on NAFO Subareas 3 – 6 porbeagle shark. CSAS Science Advisory Report 2005/044.

<sup>10</sup> Gibson and Campana, 2005; For more discussion of reference points in the SARA context, see DFO, 2005c. A framework for developing science advice on recovery targets for aquatic species at risk in the context of the *Species at Risk Act*. CSAS Science Advisory Report 2005/054.

<sup>11</sup> DFO, 2005d. Recovery potential assessment of Atlantic porbeagle shark meeting of the Maritimes Regional Advisory Process, 22 March, 28 June and 14 July 2005. CSAS Science Advisory Report 2005/019.

<sup>12</sup> Mace, P.M., 2001. A new role for MSY in single species and ecosystem approaches to fisheries stock assessment and management. *Fish and Fisheries* 2: 2-32; Shelton, P.A., P.M. Mace, W.B. Brodie and J.-C. Mahé, 2003. A proposed more flexible framework for implementing the Precautionary Approach on NAFO stocks. NAFO SCR Doc. 03/58; DFO, 2006b. A harvest strategy compliant with the Precautionary Approach. CSAS Science Advisory Report 2006/023.

in the socio-economic report. There appears to be no inherent reason why porbeagle shark data could not be collected by the tuna and/or swordfish pelagic longline fleet, perhaps as part of their license agreements.

The costs of the surveys also seem excessive. That is, DFO is proposing to spend almost as much on population monitoring (NPV = \$822k) as the entire porbeagle landing is potentially worth (\$864k)<sup>13</sup>. This does not seem economically prudent – there is no reasonable documentation as to whether, or how, ‘back-of-the-envelope’ cost estimates have been externally reviewed.

As noted in the report, government spending is re-injected into the local economy via vessel charters thereby mitigating the overall cost of population monitoring. Chartering is likely to be more profitable than fishing for porbeagle shark, so it is quite likely that the costs to government are largely offset by the benefits to local fishing charter operators.

In summary, there appears to be no justification for the assertion that information necessary for managing porbeagle need be lost. In addition, there is no credible information about the true costs of data collection. These are likely to be much lower than stated.

### **Fisheries Impacted by Listing Porbeagle Shark as Endangered**

Another rationale given by the Minister for not listing porbeagle shark as endangered is that in the absence of a provision for the possession and sale of listed species, the directed porbeagle and bycatch fisheries that land porbeagle will be eliminated.

According to DFO management Scenario 3<sup>14</sup>, restrictions under listing would mean that “while it would not be illegal to catch porbeagle, they would have no market value... While we recognize some porbeagle mortality in other fisheries is inevitable, activities to minimize bycatch mortality would be important if porbeagle were listed...”

The wording in Gazette 1 is misleading: there has never been any indication from DFO that any fishery that lands porbeagle as bycatch – groundfish, small pelagics, or large pelagics – would be closed as a result of listing porbeagle as endangered.

### **Economic Costs of Listing Porbeagle Shark as Endangered**

Another part of the rationale for not recommending listing of porbeagle is that a listing would “result in economic losses for some fishers and associated industries in coastal communities”. There are several important points regarding costs that need to be considered, including placing porbeagle listing costs in context and more general concerns regarding maintenance of a fishery that contributes little to the Canadian economy and is economically inefficient.

As pointed out in the socio-economic report on porbeagle, the loss in producer surplus (true profitability) is the proper measure of economic loss for the fishing industry and needs to be

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<sup>13</sup> DFO, 2006a (p. 18).

<sup>14</sup> DFO, 2006a (p. 17).

considered in a societal analysis of listing costs and benefits. The NPV of listing porbeagle shark was \$865k to \$1.82 million over a 20-year time horizon.

The continual decline in porbeagle shark fishing participation (down to 7 participants in 2004) is partly due to regulatory change but also is symptomatic of the marginal profitability of the fishery. Exploratory shark fishers themselves acknowledge that the fishery cannot sustain more than about a half dozen porbeagle fishers because of the poor economics of porbeagle fishing<sup>15</sup>. Marginal profitability for directed shark fishers means that the NPV of the fishery will be at the low end of the range. That is, in current dollars, the porbeagle shark fishery is likely worth less than \$50,000 per year in producer surplus.

The recommendation not to list also cites the costs to fishers and associated communities. By DFO's own account, only one fisher was dependent on porbeagle shark in both 2003 and 2004, deriving greater than 25% of overall income from porbeagle fishing. Other fishers in the exploratory shark fishery in the Maritimes and Quebec generally hold other types of fishing licenses from which they derive most of their income. Further, only one community – Sambro, N.S. – would see any sort of impact from listing and even there, the overall impact would be a loss of 2% of gross fishing revenue.

Given the flexibility that virtually all fishers have to concentrate on other fisheries, the short-term employment and spin-off impacts of listing should be minimal. It's highly unlikely that porbeagle listing would have any quantifiable impact on regional economies.

A more general concern regarding the economic costs of listing also arises in the SARA recovery context. In terms of a standard static fishery bioeconomic model, it is well known that maximum economic yield (MEY) occurs at a lower level of exploitation than maximum sustainable yield (MSY)<sup>16</sup>. In other words, fishing at an effort level to maintain MSY is still too high to derive maximum economic benefits for society.

In the case of porbeagle, exploitation rates were certainly such that recruitment overfishing occurred in the past. Even with current reductions in porbeagle mortality, we are at best approaching an effort level that might be consistent with maintaining MSY (although it could take a century to rebuild abundance and biomass to MSY levels if fishing continues at current rates). From an economic perspective, fishing effort should be more conservative still. While the exact level of effort is dependent on market prices, interest rates and uncertainty in a dynamic environment, a reasonable level might be in the range of 75% of the effort needed to maintain  $SSN_{msy}$ . Besides being a proxy for MEY, this level of effort has been shown to result in harvest levels in the range of 94-98% of MSY while maintaining biomass at 125-131% of MSY biomass over wide ranges of life history characteristics<sup>17</sup>.

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<sup>15</sup> DFO, 2006a (p. 12).

<sup>16</sup> See for example Eggert, H., 1998. Bioeconomic analysis and management: the case of fisheries. *Environmental and Resource Economics* 11: 399-411.

<sup>17</sup> Restrepo, V.R., G.C. Thompson, P.M. Mace, W.L. Gabriel, L.L. Low, A.D. MacCall, R.D. Methot, J.E. Powers, B.L. Taylor, P.R. Wade and J.F. Witzig, 1998. Technical guidance on the use of precautionary approaches to implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act. NOAA Technical Memorandum NMFS-F/SPO 31.

From a narrow economic perspective focusing strictly on the value of extracting porbeagle shark in a commercial fishery, there is a strong argument to be made for reducing current porbeagle fishing mortality as low as possible in the short-term in order to build up biomass and abundance to such a point that a conservative MEY-based fishing strategy could be implemented in the future. Maintaining a marginally profitable, small directed fishery in perpetuity drastically slows recovery and limits the opportunities for regaining a healthy, profitable fishery in the future.

### **Economic Benefits of Listing Porbeagle Shark as Endangered**

When examining Canadian regulatory or policy change, both the costs and benefits of change should be considered<sup>18</sup>. From an economic perspective, that means that changes in both producer and consumer surplus should be tallied<sup>19</sup> (i.e., the costs to producers should be compared to the benefits derived by Canadian citizens). Benefits of conservation to society as a whole may include option values and non-use values, the value – reflected by willingness to pay – that Canadians hold for preserving species for current and future generations. While generally recognized in the current Order<sup>20</sup>, quantitative estimates of consumer surplus were not available for porbeagle shark at the time the socio-economic report was prepared<sup>21</sup>.

A national DFO study on non-use values for six Atlantic Canadian aquatic species at risk, including porbeagle shark, was conducted in March 2006 and preliminary (not yet peer-reviewed) results have been presented at a number of public seminars and conferences<sup>22</sup>.

While porbeagle was generally a low priority species for many respondents in the national sample (n=2,199 surveys used in analysis), for one group comprising 36.5% of overall respondents, porbeagle was a moderate conservation priority. People in this group tended to be younger than average, more likely to be from Central Canada, and held strong views about potential threats to aquatic species at risk such as sharks, turtles and whales. Using results from the statistical analysis, it is possible to calculate the mean willingness to pay (WTP) of porbeagle-oriented conservation programs: average WTP from the preliminary analysis was \$6.39 per year per household for porbeagle shark. As there are approximately 11.56 million

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<sup>18</sup> Treasury Board Secretariat, 1995. *RIAS Writer's Guide*; Treasury Board Secretariat, 1998. *Benefit-Cost Analysis Guide*.

<sup>19</sup> See for example, Environmental Protection Agency, 2000. *Guidelines for Preparing Economic Analyses*; Environmental Protection Agency, 2002. *A framework for the economic assessments of ecological benefits*; NOAA, 2000. *Guidelines for Economic Analysis of Fishery Management Actions*; Rudd, M.A., H. Folmer and G.C.van Kooten, 2002. Economic evaluation of recreational fishery policies. Pages 35-52 in *Evaluating Recreational Fisheries: an Ecological, Economic and Social Balance Sheet* (T.J. Pitcher and C. Hollingworth, editors). Blackwell Science; Van Kooten, G.C. and E.H. Bulte, 2000. *The Economics of Nature*. Blackwell Scientific; Weimer, D.L. and A.R. Vining, 1998. *Policy Analysis: Concepts and Practices*. Prentice-Hall

<sup>20</sup> Department of the Environment, 2006 (p. 1493).

<sup>21</sup> DFO, 2006a (p. 8)

<sup>22</sup> Rudd, M.A., 2006. Non-use economic values of aquatic species at risk in Canada: preliminary results. Bedford Institute of Oceanography, Dartmouth, May 06; Rudd, M.A. and A. McPherson, 2006. Non-use economic values of Canadian aquatic species at risk: preliminary results from a national internet survey. *American Institute of Biological Sciences Annual Meeting*, Washington, D.C., May 06; Rudd, M.A., 2006. Assessing the non-use economic values of six endangered aquatic species in Canada. *Society for Conservation Biology Annual Meeting*, San Jose, California, June 06; Rudd, M.A., 2006. Assessing the non-use economic values of six endangered aquatic species in Canada. *Valuing Nature: Stewardship & Conservation in Canada*, Corner Brook NL, July 06.

households in Canada, per household WTP of \$6.39 for 36.5% of households implies an annual aggregate non-use economic benefits of \$27.0 million per year arising from porbeagle shark conservation efforts.

Survey respondents were also asked to identify any five aquatic species that they thought should be the top conservation spending priorities for the Government of Canada. A total of 206 respondents (9.4% of the sample) thought that porbeagle shark should be one of the top five conservation priorities.

When comparing the non-use economic benefits of porbeagle shark conservation (i.e., tens of millions per year) versus the economic costs to the fishing industry (i.e., under \$50,000 per year), it is clear that the economic arguments support porbeagle shark listing and conservation, not ongoing directed fishing.

## **Conclusions**

Economic arguments are often used to oppose the implementation of policies and management measures consistent with a precautionary approach to fisheries management. Economic arguments, however, are flawed if only narrow financial costs to industry are considered. Economic cost-benefit analysis of conservation initiatives should account for the full spectrum of economic costs and benefits to all stakeholders, including Canadian society as a whole.

In the case of porbeagle shark, a full and balanced accounting of costs and benefits to fisheries, Canadian society as a whole, and to future generations of Canadians clearly points to the fact that listing under SARA should provide net economic benefits to Canada at a very low cost.

I very much hope that the Minister will re-consider the recommendation to not list porbeagle as an endangered species under SARA. The porbeagle shark is clearly in need of protection given its current population abundance and there are no legitimate social or economic arguments for not listing porbeagle shark as endangered.

If you have any questions about any of the points I have raised, I would be more than happy to address them at any time.

Sincerely,

A handwritten signature in black ink that reads "Murray Rudd". The signature is written in a cursive, slightly slanted style.

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