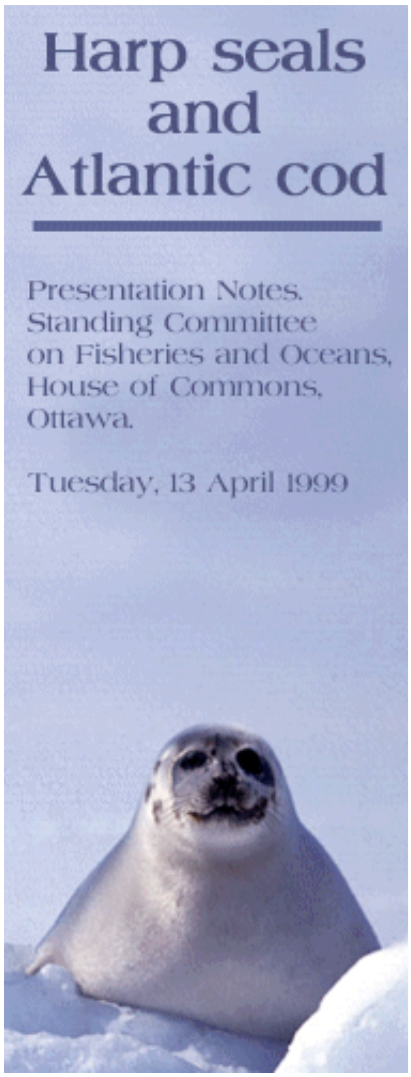
Harp seals and Atlantic cod



Harp seals and Atlantic Cod: *Notes for a presentation to the Standing Committee on Fisheries and Oceans, House of Commons, Ottawa.*

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Mr. Chairman

Committee Members

First, I would like to thank you for the invitation to appear before you today.

From the outset, I want to acknowledge that the issues related to seals and sealing in Canada, and the relationship between seals and fisheries, are scientifically complex and fraught with considerable uncertainty. It is out of this uncertainty that arises much of the controversy which constantly plagues discussion of these issues. I would also have to say, however, that there is far more agreement among scientists on these issues than might appear to be the case simply from following the media coverage of recent months.

In the few minutes available to me this morning, I will limit my comments to two major issues:

1. Is Canada's harp seal hunt -- which is usually depicted as a "sustainable" harvest -- consistent with the government's policy of taking a precautionary approach to the management of wild living resources? Is it achieving the government's management objective of maintaining "stable" seal populations?
2. Are calls for culling harp seals ostensibly to benefit fisheries -- particularly cod fisheries -- justified by the current scientific evidence?

You have heard much on these subjects in recent months and will no doubt hear much more this week and in the weeks to come. The information you will receive will come from a number of sources and, for this reason, I will digress for a moment to emphasize that, from a scientific perspective, not all sources of information can be considered equal. Some examples:

1. **Peer-reviewed primary scientific literature, published in independent journals:** In most areas of science, the peer-reviewed literature documents the current state of knowledge and is the main source of information. The results of the government's 1990 harp seal survey, for example, were published in the *Canadian Journal of Fisheries and Aquatic Sciences* (Stenson *et al*. 1993), and my paper: Estimating total kill of Northwest Atlantic harp seals, 1994-1998, will appear shortly in the journal *Marine Mammal Science* (Lavigne *in press*).
2. **The so-called "grey" literature:** This includes papers published by government departments and non-governmental organizations, which have not received the benefit of independent peer review and have not been accepted for publication in the primary scientific literature. They do not enjoy the same status as primary publications and, in fact, some scientific journals resist referring to such papers precisely because they have not been peer reviewed, and because of their normally restricted distribution and, hence, availability. Such papers include the results of the 1994 harp seal survey (Stenson *et al*. 1995) and the government's current management model (Shelton *et al*. 1995). These two papers were subsequently published almost *verbatim* in the Northwest Atlantic Fisheries Organization's in-house "journal" [*Scientific Council Studies*] (Stenson *et al*. 1996; Shelton *et al*. 1996), but unlike the 1990 survey results they have not appeared to date in the conventional primary scientific literature. Other examples of grey literature include technical reports produced by the International Marine Mammal Association (e.g. Wallace and Lawson 1997).

3. **Reports from meetings:** Reports from scientific meetings and workshops often provide useful reviews of topical issues. Many such meetings produce agreed reports that document the nature of the discussion and any conclusions or recommendations arising. Examples include: the reports of the ICES/NAFO Working Group on Harp and Hooded Seals (e.g. Anon. 1998, 1999) and the report of the international workshop on interactions between harp seals and fisheries, held in St. John's, Newfoundland in February 1997 (Anon. 1997).
4. **Unpublished reports:** Unpublished reports are not normally considered part of the scientific literature. They include drafts of papers that may subsequently be submitted for consideration by a scientific journal, or manuscripts that have actually been submitted and rejected. Reference to such unpublished reports is usually not permitted in the primary scientific literature. A relevant example is the Winters and Miller (1998) manuscript, which was released at a press conference by Newfoundland's Minister of Fisheries and Aquaculture in January 1999.
5. **Anecdotal reports:** Such reports, by scientists and others, are not normally considered to be part of the scientific information base. Nonetheless, such reports might raise interesting questions or hypotheses that could be examined scientifically, e.g. claims that harp seals feed on the livers of cod.

There is a tendency -- particularly in the media -- to give equal weight to claims arising from all of the above sources of information. Scientists, on the other hand, who are (or should be) sceptical by their very nature, will instinctively treat the information in the various sources above with increasing vigilance as they proceed down the list from 1 through 5.

I respectfully suggest, Mr Chair, that this convention might be a useful one for your committee to adopt when considering the scientific issues before you.

With that as background, I will return to the issues at hand:

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1. Is Canada's harp seal hunt consistent with government policy and is the government's management plan achieving its objectives?

For several years now, the government has based its management decisions largely on a computer model that suggested the harp seal population numbered 4.8 million seals in 1994 (range 3.4-5.0 million) and produced a replacement yield -- the number of animals that can be removed from the population annually without causing it to decline -- of 286,700 (range 170,000 - 300,000) (Shelton *et al.* 1995, 1996).

Based on this model, the Total Allowable Catch (TAC) was increased to 250,000 in 1996, and then to 275,000 for 1997-1999. These are the highest TACs since the introduction of quota management in 1971.

Landed catches of Canada and Greenland 1996-1998

To assess whether the objective of a sustainable hunt is being achieved, the government (Anon. 1996) and the ICES/NAFO Working Group on Harp and Hooded Seals (Anon. 1998, 1999) typically compare the reported and estimated landed catches from Canada and Greenland with the estimated replacement yield (see Table 1).

Table 1. Total Allowable Catches (TACs), and Landed Catches for Canada and Greenland, 1994-1998 (updated from Lavigne *in press*).

Year	TAC	Landed Catch (Canada)[1]	Landed Catch (Greenland)[2]	Total Landed Catch (Canada + Greenland)
1994	186,000	52,916	54,332	107,248
1995	186,000	64,794	60,207	125,001
1996	250,000	242,262	73,938	316,200
1997	275,000	264,204	45,170-75,592[3]	309,372-339,794
1998	275,000	282,070	45,170-75,592[3]	327,240-357,662
1999	275,000			

[1]Official catch statistics obtained from the Canadian Department of Fisheries and Oceans, Ottawa (see Lavigne *in press*). These figures differ slightly from those provided for the same years by the ICES/NAFO Working Group on Harp and Hooded Seals (Anon. 1998, 1999).

[2]Anon. (1999). These figures differ slightly from the landed catch statistics and estimated landed catches provided previously for the same years by Anon. (1998), and Lavigne (*in press*).

[3]Minimum and maximum catch for Greenland, 1997-1998, estimated using 95% confidence limits (df = 3) around average Greenland catch, 1993-1996, inclusive (53,046, 54,332, 60,207, 73,938, respectively; Anon. 1999). These estimates differ slightly from those in Lavigne (*in press*), which were calculated using data reported previously.

Landed catches from 1996-1998 (Table 1) exceed the entire range of the Canadian government's estimates of replacement yield (170,000-300,000). Therefore, if the government's management model were correct, the population would be declining. The management objective would not be achieved.

The reality is, however, that more seals are being killed than are reported in landed catch statistics, totalling somewhere between 400,000 and >500,000 in each of the past three years (Table 2).

Because of the way the government's harp seal model is constructed, it would be inappropriate to draw any conclusions from a comparison of total removals associated with sealing (Table 2) and the government's estimate of replacement yield (286,700). The United States has, however, developed a precautionary approach to estimating the total number of marine mammals that can be removed from a population by all means (e.g. landed catches, numbers struck and lost, incidental take in commercial fisheries). That number -- called the

Potential Biological Removal (PBR) -- will maintain the population at or above its net maximum productivity level (NMPL) -- approximately 50% of its maximum population size (or carrying capacity) (see Wade 1998).

Table 2. Estimated Total Removals from the Northwest Atlantic Harp Seal Population 1996-1998 (after Lavigne *in press*).[1]

Year	Canada[2]	Greenland [3]	Total Removals
1996	274,968-342,405	147,876	422,844-490,281
1997	296,187-370,394	90,340-151,184	386,527-521,578
1998	315,918-397,719	90,340-151,184	406,258-548,903

[1]These total removal estimates only include those associated with sealing activities in Canada and West Greenland.

[2] From Lavigne (*in press*; Table 1)

[3]Recalculated, following Lavigne (*in press*), using the revised landed catch data in Table 1.

According to a recent U.S. publication, the Potential Biological Removal for Northwest Atlantic harp seals is about 288,000 (Waring *et al.* 1998). For the present harp seal population, which is now believed to be relatively large (e.g. Winters and Miller 1998) and, possibly, at or near equilibrium (Stenson *et al.* 1999), this implies that any total removals in excess of 288,000 -- such as has occurred in each of the past three years -- would cause the present harp seal population not only to decline, but to decline to levels below 50% of its maximum size.

In each of the past three years somewhere between 100,000 and 260,000 (1.3 to 1.9 times) more harp seals have been killed than would be considered prudent under a truly precautionary approach to management (Table 3).

Table 3. Comparison of Total Removals of Northwest Atlantic harp seals (updated from Lavigne, *in press*) with the Potential Biological Removal (PBR) estimated in the recent United States stock status assessment for Northwest Atlantic harp seals (Waring *et al.* 1998).

Year	PBR	Total removals	Difference	Multiplier
1996	288,000	422,844-490,281	134,844-202,281	1.5-1.7
1997	288,000	386,527-521,578	98,527-233,578	1.3-1.8
1998	288,000	406,258-548,903	118,258-260,903	1.4-1.9

Continued hunting at current levels would, according to this analysis, cause the population eventually to become "depleted," i.e. become reduced to levels less than 1/2 of its maximum population size. In the U.S. such "depleted" populations are offered increased protection from human activities to encourage their recovery to safe levels.

I hasten to add that our own calculations (Johnston *et al*. *unpublished ms;* currently under review by a scientific journal), which more fully take into account the current scientific uncertainty related to harp seal biology, indicate that the situation may be even more dire than indicated by the existing analyses.

Conclusions:

- If the government's management model were correct, the harp seal hunts of the last three years are not achieving the government's management objective of maintaining a stable harp seal population. As a consequence, the population is likely declining.
- The government's approach to harp seal management is not consistent with its stated policy of taking a precautionary approach to the management of exploited living resources.
- If a truly precautionary approach were taken, such as that currently in use in the U.S., Canada's total allowable catch for Northwest Atlantic harp seals likely would have to be reduced from 275,000 to 100,000 or less.[1]

[1]If the PBR really were 288,000, one would first have to deduct the unregulated Greenland catch (ca 75,000), the number of animals struck and lost in the Greenland hunt (ca 75,000), the incidental take of harp seals in the lumpfish fishery of at least 25,000 (Efford 1998), and the incidental take in U.S. waters (325; Waring et al. 1998). This would leave a total kill for Canada of 112,675. Given that the total kill/landed catch ratio for the Canadian hunt is about 112-141 % (Lavigne, in press), the Canadian TAC would have to be set somewhere between 79,911 and 100,603 in order to limit Canadian removals to some 112,675 animals. This approach would not achieve Canada's objective of maintaining the current population, but it would almost certainly ensure that the population would not be reduced to dangerously low levels.

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2. Are calls for culling harp seals to benefit cod stocks and cod fisheries justified by the scientific evidence?

In a word, No.

What do we know?

- We know that harp seals do eat Atlantic cod, although 40 years of studies indicate that Atlantic cod is a minor constituent of their diet (Wallace and Lawson 1997). Media reports now indicate DFO's own estimates of harp seal consumption of northern cod were recently reduced by about 50% (Rice 1999).
- Did harp seals cause the collapse of cod stocks in the late 1980s, early 1990s? No. The scientific evidence indicates that stock collapse was caused by over-fishing (Hutchings and Myers 1994, Myers *et al*. 1996).
- Are harp seals impeding the recovery of cod stocks? Although scientists have examined this question, there is currently no evidence that harp seals are impeding the recovery of cod stocks (e.g. Anon. 1997).

Calls for culling seals to benefit fisheries are premised on the idea that seals eat fish and, therefore, common sense dictates that fewer seals will mean more fish for fishers.

But, if we take a slightly more complex view of marine ecosystems, and imagine the situation where seals eat the predators of commercially important fish, then common sense dictates that fewer seals would mean more predators and fewer commercially important fish. In such instances, a cull of seals would actually be detrimental to fishing interests.

Scientists have for years addressed the question of the effects of an increase or a decrease (such as would result from a cull) in the size of the harp seal population on fish stocks and yields from them. Here is a sampling of their conclusions:

- "The effects [of increasing or decreasing the Northwest Atlantic harp seal population ... on exploited fish and invertebrate stocks and yields from them] are unknown" (NAFO 1981).
- "The truth is we do not know what the effects of a change in seal numbers would have on commercial fisheries" (DFO Scientist, W.D. Bowen 1992).
- "It is not yet possible to predict the effects of an increase or a decrease in the size of the harp seal population on other ecosystem components, including commercially exploited fish populations, or on the yields obtained from them" (Anon. 1997).

One reason why scientists have been frustrated in their attempts to evaluate the effects of increasing or decreasing the size of a seal population on fish stocks and fisheries is actually quite simple to understand. Marine ecosystems are extremely complex (e.g. Fig. 1, from Lavigne 1996).

To quote the late Prof. Deane Renouf of Memorial University in St. John's, in a 1992 radio interview, "The message is, we do not know enough to institute a cull ... I really think that [culling harp seals], without the correct information, could be deadly."

So, at the present time, science cannot tell you whether a large cull of harp seals -- the figure of two million has been suggested by the Newfoundland Fisheries Minister -- would be beneficial or detrimental to the interests of fishers. I am reminded, however, of a point raised by Professor W. Montevecchi, Memorial University of Newfoundland, writing in 1996 (p. 8): "There is no scientific evidence that the culling of large marine predators has ever benefited a commercial fishery...."

Furthermore, I am reminded from my work on endangered Mediterranean monk seals that as long as seals and fisheries overlap, someone will want to remove seals from the system. Today, only some 500 Mediterranean monk seals exist in the Mediterranean and in the Northeast Atlantic off the coast of Northwest Africa. They are one of the most endangered of all seal species. Yet fishers in the Mediterranean still kill them because they perceive them to be competing with them for their livelihood. Clearly, no end is in sight to the repeated calls to cull harp seals (and other marine mammals) ostensibly to benefit fisheries.

But the question for scientists is whether such culls will actually achieve the desired results. Toward this end, the United Nations Environment Programme has recently drafted a protocol for evaluating proposals to cull marine mammals with a view to benefiting fisheries

(Anon. 1992, 1995). What is striking when you examine the protocol is just how much information is required to determine whether a cull of a marine mammal population is likely to achieve its objective.

In the case of harp seals and cod, we simply do not yet have the scientific information necessary to evaluate a proposal to cull harp seals. But in this regard, I am pleased to see -- in the government's 1999 seal management plan (Department of Fisheries and Oceans 1999) -- that it has acknowledged the need for more information on other cod predators besides seals, information that is essential before a proper assessment of the culling question can be made.

Overall Conclusions:

If Canada's harp seal hunt is meant to be a "sustainable harvest":

- current levels of killing are likely too high;
- the population is likely declining;
- the government's management objective is not being achieved;
- and the management approach does not meet international standards of taking a precautionary approach to the exploitation of wild living resources.
- In that sense, Canada's harp seal hunt may already satisfy the definition of a cull.

May I also remind you that the last time landed catches were, on average, as high as they have been in the past three years -- between 1950 and 1970 -- the harp seal population declined by 50% or more.

Calls for increasing the size of hunt even further (in order to benefit fisheries) are simply not justified on scientific grounds. Indeed, larger kills of harp seals could have serious consequences, both for the harp seal population and for commercially important fish stocks.

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Harp seals and Atlantic cod

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