Commercial Whaling: The Issues Reconsidered

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Commercial Whaling: The Issues Reconsidered
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Director's Foreword

Fishery researchers from Washington, South Africa, British Columbia and Iceland, representatives from Greenpeace and members of the public, met at the UBC Fisheries Centre on June 10th and 11th 1993, in order to discuss the issues surrounding the resumption of commercial whaling.

The workshop was organised by Dr Kjartan Magnusson from University of Iceland, while he was on sabbatical leave at the UBC Fisheries Centre. Other panel speakers were Catherine Stewart from Greenpeace, Tony Pitcher from the UBC-FC, and Andre Punt from Fisheries Research Institute, University of Washington, Seattle, and their edited papers are reproduced here. The second day of the workshop comprised a detailed examination of the algorithms for the Revised Management Procedure (RMP) for managing harvested whale stocks. A number of algorithms had competed in a round-robin contest designed to determine which of them best met the conservation objectives of the International Whaling Commission (IWC) at the IWC meeting in 1992. Drs Magnusson and Punt were authors of two of the competing algorithms, but not the winners, and so the final report describes the basis of the winning algorithm, submitted by Dr Justin Cooke to the IWC.

Management procedures for commercial whaling constitutes the first of a series of open workshops sponsored by the new UBC Fisheries Centre. The workshop series aims to focus on broad multidisciplinary problems in fisheries management, provides an synoptic overview of the foundations and themes of current research, and attempts to identify profitable ways forward. Edited reports of the workshops are published in Fisheries Centre Research Reports and are distributed to all participants and to selected international fisheries libraries. Further copies are available on request.

Tony J. Pitcher
Professor of Fisheries
Director, UBC Fisheries Centre
Organizer's Introduction:

Management Procedures for Commercial Whaling Workshop

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University of Iceland

The workshop was held on June 11 at the Fisheries Centre, University of British Columbia and was organized and presented by dr. Kjartan G. Magnusson, University of Iceland and dr. Andre E. Punt, University of Washington.

The Scientific Committee of the International Whaling Commission (IWC) has been developing a Revised Management Procedure (RMP) for managing baleen whale stocks since 1986 when the moratorium on commercial whaling came into effect. The procedure has been extensively tested to ensure that it permits sustainable utilization of the resource and it will be put in place to set catch quotas should the moratorium be lifted. The purpose of the workshop was to introduce and discuss the procedure, and the approach and methodology used by the IWC to develop the procedure.

The main topics for discussion were:
- The development process - philosophy and methodology
- The single stock rules of the Revised Management Procedure
- The multi stock rules of the RMP
- The methods used to select between candidate RMPs
- Details of the computer trials carried out to determine how the procedure could be implemented for specific stocks/regions.

The agenda of the workshop was as follows.

1. Background
   1.1 Status of stocks
   1.2 The Moratorium
   1.3 The Comprehensive Assessment
   1.4 Types of data available

A brief presentation of the background to the development of the RMP was given: The management objectives of the IWC, the status of some of the whale stocks on which whaling might resume, the reasons for the moratorium on commercial whaling and the Comprehensive Assessment of the state of the various stocks, problems with the previous management procedure (the New Management Procedure - NMP) etc.

The data available can be divided into two classes: That which is essential for management - historical catches and absolute abundance data, obtained by sightings surveys - and what can be used for monitoring and implementation review - in essence biological parameters of various kinds.

2. Management Procedures
   2.1 What is a management procedure?
   2.2 The New Management Procedure (NMP)
   2.3 The Revised Management Scheme (RMS)

A complete management procedure / scheme should contain the following components:
1. Catch limit algorithm
2. Multistock rules
3. Phase-out rules
4. Specification of data requirements and data standards
5. An observer program to ensure that catch limits are adhered to.

The catch limit algorithm calculates the catch limits for each area to which it might be applied. These limits might then be modified by a multistock rule in cases of uncertainty about stock identity and stock boundaries and/or by a rule for phasing out catches when a specified number of years has elapsed since the last abundance estimate.

The RMS is a complete scheme in that the input is the abundance data and historical catches and the output is the catch limit for each area. In addition there are rules at each end to guarantee a minimum standard of the input and that the output is not exceeded. The NMP on the other hand is only a catch control law. All the necessary parameters such as MSY and population size relative to carrying capacity must be estimated before it can be used.

3. Philosophy behind the development of a revised management procedure.
   3.1 Simulation testing approach
   3.2 Implementation trials
   3.3 Tuning of the procedure

The RMP is inevitably a compromise between the objectives of conservation and utilization and it should be robust to uncertainties in basic data, in stock dynamics and stock identity. A large number of computer trials were designed to simulate the management of whale stocks and test if the proposed procedures were robust to these uncertainties. In addition so-called implementation trials were required before the procedure could be implemented for a specific oceanic region. This involved the gathering of all relevant information for the stocks/regions under consideration. Usually, the major uncertainty was to do with the actual number of stocks and stock boundaries. The RMP had to be robust to these uncertainties. Simulation trials were then designed based on the gathered information and knowledge and the performance of the RMP tested for all plausible eventualities. All options were tested in case of uncertainties.

The development process could be described as a competition between five "competing" procedures, and new trials were constantly being proposed in order to make the procedures "fail". In order to be considered as a candidate RMP, a procedure had to "pass" all the trials, i.e. not drive a population to unacceptably low levels. The development process was thus an interaction between the trials (development and results) and the evolution of the procedures which were constantly being modified in order to cope with new trials. A common control program for generating data (true stock data and stochastic observations) and to calculate the relevant statistics was made available to all developers.

In order to facilitate the comparison between the proposed procedures a common set of tunings was specified. Thus each tuning was determined, i.e. the internal parameters of the procedures fixed, so as to make the average of the final stock size in a particular trial (1% MSY rate, no prior exploitation) be a specific number (60, 66, or 72% of carrying capacity). Thus the tuning of the procedures ranged from conservative
to less conservative. None of the tunings used could be called risky. The choice of the final tuning was not a scientific choice but was left to the Commission of the IWC which went for the most conservative one.

4. The Simulation Trials.
4.1 Single Stock Trials
4.2 Multistock / Implementation trials
4.3 Performance statistics

The population model used in the trials at the later stages of the development process was age and sex structured. The single stock trials which were of a generic nature, were divided into two groups: The base case trials and robustness trials. In the former the true MSY-rate of the stock was 1,4, or 7% and the depletion at the start of management was 30, 60 or 99% of carrying capacity. The latter group consisted of tests for robustness against biases in abundance data, erroneous historical catches, different stock dynamics and time varying parameters etc.

The multistock/implementation trials carried out to date are for Southern hemisphere, N. Atlantic and Northwest Pacific minke whales. The RMP was tested for robustness against different numbers of stocks, different stock boundaries, varying levels of mixing between stocks and substocks etc.

Each trial consisted of 100 (in some cases 400) stochastic simulations. The results of these simulations were then summarized in the performance statistics which were, for example risk related statistics such as median and 5'th percentile of final and lowest population size and catch related statistics such as median and 5'th and 95'th percentile of total catch, a measure of continuing catch and a measure of catch variations.

5. The Revised Management Procedure (RMP)
5.1 Background
5.1.1 The five proposed RMPs
5.1.2 Assessments
5.1.3 Data requirements and standards
5.2 The RMP - Catch limit calculations
5.3 The multi stock rules

The selection of one of the five proposed procedures took place at the annual meeting of the Scientific Committee in Reykjavik, Iceland in 1991. Although a number of approaches to objectively select a "best" procedure had been tried, in the end the choice was made on a subjective basis by considering the results of the individual trials. There was a near consensus about the choice.

The catch limit algorithm of the RMP which was developed by Justin Cooke is of a Bayesian type. It calculates internal catch limits using a catch control law and the probability distribution of the catch limit based on prior distributions of a set of parameters and on the observations. Then a certain percentile of the catch limit distribution is chosen, depending on the tuning being used. This number becomes the nominal catch limit for the area in question.

In cases where there is uncertainty about stock identity and stock boundaries - which is usually the case - this nominal catch limit can be modified by applying one of the multistock rules. The region being managed is divided into a number of small areas. The idea behind the multistock rules is to spread the catches to guard against local depletion.
The simplest rule is to apply the catch limit algorithm independently to each small area and set a catch limit for each such area. These catch limits can be further modified by applying the so-called catch capping rule. In that case the catch limit algorithm is also applied to a combination of the small areas and an overall catch limit set. If the sum of the catch limits for the individual small areas exceeds the overall quota, these limits are reduced proportionally. In the catch cascading option, the catch limit algorithm is only applied to a combination of the small areas and the overall catch limit is then divided onto the areas in proportion to their relative abundance. The catch cascading option will in general give the highest catch limit and catch capping the lowest.

6. Selecting Management Procedure variants
   6.1 Tunings
   6.2 Multistock options

   The tuning of the RMP can in theory be modified if there are convincing reasons for so doing. However, this can only be done after testing by simulation trials. The same applies to the multistock options, the choice in each particular case is based on the results of simulation trials. Thus the catch cascading option might be used in some oceanic regions and catch capping in others.

7. General discussion of approach

8. Closing of Workshop.

An extensive discussion took place during the workshop on the methodology used in developing the RMP and on the procedure. There was general agreement of the merits of the approach taken; the testing of the procedures by computer simulation and on the "competition" aspect of the process which would lead to pressure from other developers. Some reservations were raised, for example that the IWC is too closed and no peer review of the RMP had taken place. It was recommended that the history of the development and a description of the procedure as well as the trials should be published so that the procedure and the performance could be evaluated by parties outside the IWC. As regards the RMP and the other proposed procedures, some participants felt that perhaps standard and proven statistical technology for management should have been tried as well as the proposed procedures some of which were of an ad hoc nature. This would have provided a useful comparison. At least it should be described in a review of the development of the RMP why such methods weren't used.
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Whaling: Past, Present and Future

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First of all let me say quite clearly, that although I have been a member of the Icelandic delegation at the Scientific Committee of the International Whaling Commission (IWC) for a number of years, I am not here in any form of official capacity. Whatever I might say has got nothing to do with any official Icelandic policy regarding whaling.

Secondly, it is not my intention here to argue for the resumption of commercial whaling. What I will try to do is to present some of the facts about the IWC and whaling, about population numbers and the catches in recent years. The whaling issue has long been a very emotional one and both sides have sometimes made a rather selective use of the facts. I will try to put the whaling question into perspective, but will not go into the ethical aspects of whaling which will be discussed by Prof. Tony Pitcher.

Because the International Whaling Commission has been the focus of the whaling debate and has played the major role in the developments since the Second World War, I will begin by briefly discussing the IWC and its history.


The IWC was formed in 1946, mainly as an attempt to regulate the whaling in the Antarctic. It is made up of two bodies:

1. The Scientific Committee whose members are scientists sent by their governments, invited experts and representatives of various conservation organizations; and

2. The Commission which consists of the official delegates from the member countries.

The role of the Scientific Committee is to advice the Commission on the status of stocks and to recommend catch quotas but all decisions are made by the Commission which hasn’t always followed the advice of the SC. The IWC is an open organization, any country can join. Canada was a member but withdrew in 1980.

Two things about the IWC should be made clear at the beginning.

1. The IWC is only responsible for the large whales (baleen whales and the sperm whale). It has no authority over smaller whales, such as dolphins, belugas, narwhals etc. some of which are hunted in some numbers. (I might add that in fact many scientist believe that the most seriously threatened whale species, both due to direct hunting and to incidental capture in fisheries, are some species and populations of small whales). The discussion will concentrate on the baleen whales.

2. The commission makes a clear distinction between two types of whaling. Aboriginal whaling entirely for local consumption, which at present is accepted by the IWC and commercial whaling which is not.
To begin with the IWC was mostly a club of whaling nations and there was little pressure or incentive to limit the catches which were very high, especially in the Antarctic were the bulk of the catches were taken.

A few items of information in the history of Antarctic whaling.

1. In 1930/31 40,000 baleen whales caught in the Antarctic (almost exclusively by Norway and Great Britain). At that time first attempts were made at regulation because of a huge surplus of baleen oil and a corresponding drop in prices.

2. In 1939 the distribution of the Antarctic catches among the whaling nations was as follows: Norway 30%, Gt. Britain 29.2%, Japan 19.6%, Germany 13.2%, others 8.0%. In 1960 the distribution was: Japan 41%, Norway 28%, USSR 20%, Netherlands 6%, UK 5%.

3. A shift from larger to smaller whales took place as the stocks of the larger species became depleted one after the other. Blue whale catches peak in the 30's, fin whale in the 60's and sei whale in the 70's. Since 1980 the catch has been restricted to the smallest species, the minke whale.

4. The quotas until the early sixties were not set by species but were in terms of the so-called blue whale unit. One such unit was 1 blue whale, 2 fin whales, 2.5 humpback whales or 6 sei whales. There were mostly economic reasons for this quota in that one blue whale yielded approximately the same amount of baleen oil as 2 fin whales or 2.5 humpback whales etc. The post war quota was around 15,000-16,000 blue whale units and was seldom reached. This system offered no protection to depleted species like the blue whale and caused its continuing decline as other species became the mainstay of the catch.

However, in the sixties, when concern over the status of the stocks in the Antarctic grew, a group of four independent scientists were asked to evaluate the data and the models and make recommendations. As a result the blue whale unit was abandoned and catches were reduced, although not as much as scientists recommended.

As Antarctic catching declined, the proportion of non-Antarctic catches grew, particularly in the N. Pacific where catches in numbers had almost equalled those in the Antarctic in 1965 (Main whaling nations: Canada, Japan, USSR, USA. Main species: fin, sei, bryde's and sperm whales).

Catches decreased throughout the seventies as more and more nations stopped whaling for large baleen whales (Canada did so in 1967 off the West Coast and off the East Coast in 1972) and as catch limits set by the Commission were reduced. Species such as blue whales and humpback whales had been given a protected status in the 1960's, fin and sei whales in the Southern Hemisphere in 1978 and N Atlantic sperm whales in 1982.

There were however substantial problems in the application of the management procedure used by the IWC (as Dr. Andre Punt will address will address later) and more often than not disagreements arose within the Scientific Committee as to recommendations for catch quotas. This was a factor in the decision of the Commission to implement a pause in commercial whaling.
The moratorium on commercial whaling was adopted by the IWC in 1982 and came into effect in 1985/1986. The Commission agreed that this provision should be kept under review, based on the best scientific advice, and that by 1990 at the latest the Commission would undertake a comprehensive assessment of the effects of this decision on whale stocks and consider modification of this provision and the establishment of other catch limits (i.e. non-zero).

There has been some disagreement within the IWC regarding the interpretation of this wording. Some nations maintained that this meant that the moratorium was in effect until otherwise decided but others claimed that a decision on catch quotas (zero or otherwise) should have been taken in 1990. This has led to serious problems within the IWC; Iceland has already left the Commission and Japan and Norway might do so as well.

The composition of the IWC and its attitude towards whaling has changed drastically since its foundation. It began as a club of whalers but now the so-called "whaling nations" form only a tiny minority and most of the member nations are opposed to whaling as can be seen by the adoption of the moratorium on commercial whaling by a 2/3's majority in 1982 and by the repeated refusal to lift the moratorium in the past years. Some nations are categorically opposed to whaling in principle and will vote against lifting the moratorium even if scientific evidence shows that the stocks can sustain the harvest. In my mind it is therefore unlikely that the IWC will allow whaling in the near future.

Let us now look at the present day situation: what are the stock sizes of the various species (as issued by the Scientific Committee of the IWC) and what catches have been taken in recent years.

**Status of stocks and recent catches.**

Let us look at population estimates for those species and regions for which an assessment has been carried out by the IWC. It should be noted that there is no disagreement about these numbers within the Scientific Committee of the IWC.

1. Antarctic minke whales: 761,000
2. N. Atlantic minke whales (excluding Canadian east coast) 118,000
3. Northwest Pacific minke whales 25,000
4. N. Atlantic fin whales 47,000
5. Central North Atlantic sei whales 10,300
6. West N.-Atlantic Humpback whales 5,500
7. Northeast Pacific grey whales 21,000
8. Bowhead whales (Bering-Chukchi-Beaufort Sea) 7,500

It is clear from the above numbers that the claim that whales are in danger of extinction is far from true for some species; there are probably well over a million minke whales in the world today, grey whales population numbers are close to the what they were when exploitation started and so on. It is probably true that blue, fin and sei whale numbers in the Antarctic waters are still very low. However, there has been no hunting of these species in these waters since the seventies nor will there be in the near future. Same goes for humpback whales which are on the increase in many parts of the world. Right whales numbers are low, but again, no hunting has taken place for a long time and will not be resumed.

Catch statistics for 1985, the last year before
the moratorium on commercial whaling came into effect, show how much has changed since the heavy exploitation around the middle of this century. The total harvest of all species of baleen whales and sperm whales was 8377. Minke whales made up most of the catch, a total of 7168 of which 5567 were taken in the Southern Hemisphere by USSR, Japan and Brazil, 1152 in the North Atlantic by Norway, Iceland and Greenland and 449 in the Northwest Pacific by Japan and Korea. In addition, 219 fin whales were taken in the N. Atlantic, 400 sperm whales in North Pacific, 8 humpback whales by Greenland (aboriginal hunt), 38 sei whales by Iceland, 357 bryde's in the Pacific, 169 gray whales by USSR (aboriginal hunt) and 17 bowhead whales and 1 gray whale by Alaska Inuits. The catch is within 1% of the population numbers in most cases and would hardly have comprised a threat to the stocks in question.

In 1991, the sixth year of the moratorium, only aboriginal whaling and whaling by Special Permit ("scientific whaling") was still taking place. A total of 652 baleen whales were taken (no sperm whales) of which 414 were minke whales (Greenland aboriginal 116, Japan Special Permit 288 and 10 incidental catches). The remainder consist mostly of aboriginal catches: 18 fin whales in Greenland, 169 gray whales in Russia and 46 bowhead whales in Alaska.

Future of whaling.

One of the major tasks of the Scientific Committee of the IWC during the moratorium was to develop a management procedure for commercial whaling. Some members of the Scientific Committee have been working for 8 years developing and testing such a management procedure (the so-called Revised Management Procedure-RMP). This task has now been completed and the RMP is now ready to be used. However, the Commission did not adopt it at its recent meeting in Japan.

The completed RMP is in all likelihood the most tested procedure in the history of resource management. It has undergone a multitude of computer simulation tests of different sorts and has been found to be very robust to a variety of scenarios (this will be discussed by Dr. Andre Punt). In the development process, the more cautious option was chosen whenever there were situations of uncertainty, thus minimizing the danger of depleting the stock. If harvesting is regulated by this procedure, quotas will in general be very conservative, and zero for stocks which are at low levels. There is therefore a very high safety margin and in fact it could be argued that the procedure is unnecessarily cautious.

It is safe to say that many stocks of whales could easily sustain a limited harvest under strict regulation. However, judging by the present climate of opinion within the Commission it is not likely that it will set quotas in the near future. However, this will not necessarily mean an end to whaling. As we have seen, aboriginal whaling is still going on, Japan is still catching minke whales under Special Permit in the Antarctic and Norway plans to catch 296 minke whale this year. Furthermore, whaling might also commence outside the IWC. The whaling nations in the N. Atlantic, frustrated by the refusal of the IWC to even consider setting non-zero catch quotas, have set up a regional body for managing whaling. Similar developments might occur in the Northwest Pacific and possibly...
elsewhere. This process is viewed with some concern in some quarters. The IWC would in all probability cease to exist and there would be no regulatory body with overall responsibility for all whaling. Many scientist with a high level of expertise would no longer play a part in the decision making process and whaling would be regulated by various regional organizations with varying levels of competence. This would be a probably pose a greater threat to the whale stocks of the world than the very small catches which would be allowed under the RMP scheme of the IWC.
A Logical Analysis of Whaling Issues

Tony J. Pitcher
Director, Fisheries Centre, UBC

My aim in this paper is to identify and analyse those biological, economic and ethical factors associated with whaling that bring about the sharply alternative positions that compete for human attention and support. First, I examine why exploitation of whales may conflict with conservation. Secondly, I analyse the reasons why whales may be regarded as special by humans. Thirdly, I look at the impact of traditional and aboriginal whaling within this framework.

Exploitation and Conservation of Whales

Whales are exploited (indicated by the circle in Figure 1) in order for humans to eat whale meat, sell whale meat, make whale artefacts and sell whale products. Except in a few localised aboriginal communities, these activities have provided significant economic activity only during the past two centuries. But the history of decimation of the commercial whale species has shown that, without conservation, whale populations are easily destroyed. We can contrast their ecological fragility with fish: fish stocks are generally more resilient to heavy harvest pressure. Moreover high interest rates favour destruction of the resource (i.e. a policy of 'mine them out'). Both of these unfavourable comparisons with fish are based upon economic and biological fragility and derive from the reproductive and recruitment biology of whales, which proceeds too slowly to match human industrial and economic pressures.

The factors underlying a conservation strategy vary according to the overlap with exploitation. In Figure 1 we can see that if there is no overlap with exploitation the human strategy is the prohibition of whaling. If overlap exists, the human strategy is one of sustainable harvest. This option will be dealt with first.

The tactics, or instruments of the policy of sustainable harvest with adequate conservation are the subject of Professor Magnusson and Dr Punt's contribution to this workshop. Traditional management targets for whales included the Maximum Sustainable Yield (MSY) and the New Management Procedure (NMP), but these have recently been subsumed in the Revised Management Procedure (RMP). The general aim of whale stock assessment and management has always been to trade-off the costs and benefits of different harvest levels according to a selected set of quantitative criteria. The success of management is appraised according to designated metrics, and in the RMP, takes explicit account of the uncertainties in whale biology, in the marine ecosystem and in the monitoring process.
The objectives of RMP whale management are to exploit and conserve, to rebuild stocks and to selectively favour depleted species. The design and selection of appropriate targets, metrics, and uncertainties for whale stock management using the RMP has occupied a great deal of marine biologists' and mathematicians' time and energy. The recent achievement of consensus over the precise form of the RMP was remarkable, and is detailed elsewhere in this workshop report. It is worth emphasising that both whales and people are beneficiaries of this sustainable harvest policy.

**Why are Whales Special?**

When conservation without exploitation is the strategy, with the implication that all whaling must be stopped, the policy lies in the non-overlap zone at the bottom of Figure 1. Why would we find ourselves in this logical sector?

To answer this question we have to ask why whales are worthy of special consideration? Many other mammals are exploited and eaten by humans. Only a minority of humans are vegetarian and to include whales as part of some wider embargo on meat consumption is a different argument. The reason is that many non-vegetarians do not condone whale exploitation because they regard whales as a special category of animals. A far wider group of humans have no objections to exploiting and eating fish such as cod, unseen in the deep ocean.

So why are whales special enough to inhibit harvest? What are the unique or distinctive features that set whales apart? Four sets of such factors are analysed in this paper:

1. **Historic destruction of whale populations**
2. **The critical role of whales in marine ecosystems**
3. **The cruelty of capture**
4. **Whale charisma**

**Historic destruction of whale populations**

The progressive decimation of whale stocks over the past century, outlined by Dr Magnusson in this document, presents a sad episode of human greed, an immoral tale. But without insight of whale ecology, the destruction was economically inevitable once human technology was sufficient to overtake whales and hunt them down.

This special reasoning advocates restoration of whale stocks driven by guilt and reluctance to repeat the felony.

**The critical role of whales in marine ecosystems**

This argument suggests that whales engender stability of the marine ecosystem. Presumably this is founded on the belief that whales occupy a critical position in the food web such their absence or severe depletion would bring about unstable fluctuations of other species. This argument advocates the cessation of whaling and restoration of whale stocks through ecological utility.

We have to ask ourselves if there is any scientific evidence for such a pivotal role for whales? The answer has to be not much! The ecological evidence is that most harvesters like baleen whales, or top predators like many toothed whales, are kept in check by food limitation. Although reduction in their numbers can have significant effects on the species present and their distribution in an ecosystem, life goes...
on pretty much with or without them. In the case of predation on krill by baleen whales, the population dynamics of krill are far from established and the effects of whale depletion are uncertain. Competitors for krill such as penguins and some seals, have certainly increased since the baleen whales have been reduced, but predicted cascade effects as changes like this ripple down the food chain have not been spectacular or obvious as might have been expected. The scientific evidence supports the idea that whale depletion alters the relative abundance of species in the food web. However, there is no evidence whatsoever for increased instability of the system depleted of whales, so there would be no scientific basis for a belief that role of whales was in any way specially instrumental in the harmony of nature. Just as we now live in a world without dodos, passenger pigeons or 300 species of African freshwater fish, ecologists can envisage living in a world without whales with no risk of being submitted to daily disasters on this account.

More subtle arguments bear upon this question because the reversal of whale reduction may not always be desirable to some parties. Under-utilized whale food may be directly harvested by humans, although a large krill fishing industry has not developed because krill stocks do not appear to have increased despite whale depletion. But the recovery of whale stocks impacts human fishing in other ways; each year Minke whales eat as much Icelandic cod and capelin as is caught by human fishing, a major component of the Icelandic economy.

3. Cruelty of capture

This argument suggests that killing whales entails slaughter techniques that engender unacceptable levels of pain and distress to the animals concerned. For the past 80 years, most whaling has been prosecuted using explosive tipped harpoons. The objective of this technique is to render the whale unconscious rapidly while at the surface so that it does not continue to swim and sink: traditional whalers lost over half the whales harpooned through sinking.

Since much human food entails killing animals, the criterion of acceptability of the killing procedure carries an implicit comparison with other methods of human food production. This reasoning advocates the cessation of whaling through guilt and/or brutalising effects of meeting out cruel treatment.

But we have to ask ourselves how profitable it may be to attempt to establish complete consistency of ethics of human food production. These ethical standards already vary greatly among Latin, African, Oriental and Western agriculture such that there could be plethora of suggested humane harvesting options.

Time taken to become unconscious, the quality of existence including the acuteness of pain during the capture process before this point, and the consistency of operation of the technology, are criteria that would be uncontroversial when used to establish, evaluate or improve the acceptability of a harvest technique such as explosive harpooning. Social distress brought about by separation of close kin has often been mentioned in relation to whaling, but closely analogous practices occur widely in agriculture and would not be seen as preventing whaling per se by most humans.

Many aboriginal hunting methods often seem
totally at odds with any consensus of humane criteria established through the above.

4. Whale Charisma

This argument asserts that the intrinsic worth of whales precludes killing: killing is inappropriate for magnificent creatures with such charisma for humans.

It is easy to make logical comparisons that illuminate many inconsistencies surrounding such an attitude. For example, the premise that whales should be protected as beautiful large mammals is especially prevalent in North America, yet the consensus adopted by this society towards the hunting of beautiful large wild land mammals for sport is completely different, and is reflected in legislation. In this society, sport hunting even seems to take precedence over utility and food: in Canada, sport hunting is allowed yet the sale of meat from animals killed in this manner is not.

These attitudes would seem bizarre in Africa, where any waste of human food seems immoral, but limited sport hunting occurs, where conservation of wildlife is not compromised, because of large economic benefits.

In contrast, sport hunting of any mammal is increasingly socially unacceptable in large parts of Europe. With the exception of a diminishing aristocratic segment of the population, the human emotions served by hunting are not valued highly. Yet a large mammal meat industry thrives. These examples illustrate the relativity of human ethics and how they are driven by environmental and human ecology.

What whale attributes inhibit killing by humans? Whales are majestic, mighty, mysterious and intelligent animals. On all but the last of these we can provide only value-judgements of the worth of whales.

What factors enter the value-judgements? By majesty we mean that whales swim with a graceful, powerful, steadily purposeful progression. By might we subsume the feelings that whales are endowed with a sheer size and bulk that is visually stunning; humans respect and seem to need to look up to things both animate and inanimate that are of larger size. The mystery of whales may derive from humans catching evanescent glimpses of the swimming leviathan; shape and form have to be guessed.

It is indicative of the endearingly non-rational nature of human sensibility that a combination of such factors could gain widespread support sufficient for commercial whaling to be banned.

Whale Intelligence

I will examine the whale intelligence factor in more detail.

A modest criterion of intelligence might seek to preserve whales on the same grounds that dogs, horses and cats, animals given higher status as intelligent domestic pets, are generally not killed to be eaten as food. But this version of the intelligence argument does not stand up to much logical scrutiny, as most of these animal species appear uncontroversially on the menu of one society or another. Moreover, pigs, animals that are at least as intelligent as whales and more so than most domestic animals, are farmed to be killed for human food throughout large parts of the globe.
A more powerful argument is based on our reluctance to inflict destruction on a creature that, if our criterion of exceptional intelligence is met, would surely have a deep insight of its own terrible fate. Humans consider this important, in that arrangements, and sometimes legislation, covering farmed animals on the way to the slaughterhouse try to ensure that animals remain ignorant of where they are going. We humans are also psychologically uneasy about the topic, as evidenced by much humour associated with beasts on the way to the abattoir. Human executions, when rationalised by civilisation, generally attempt to minimise direct trauma in a similar way. We would argue that, if whales were intelligent enough to perceive their own destruction through whaling, we should eliminate this trauma by stopping such activities. Incidentally this argument has rarely inhibited humans from killing each other in warfare.

So what is the scientific evidence that could be used as criteria of intelligence? As criteria of intelligence I will use a general indication of self-conscious insight that may be measured by behavioural capacity, plasticity, speed and efficiency when challenged by problems. Brain structure and behaviour are therefore examined as candidate criteria.

a. Brain

The weight and size of whale brains are often said to be higher than humans and elephants, but absolute weight is misleading as it is clearly related to body bulk. Since shrews are held to be no less intelligent than large mammals, absolute brain size cannot be a reliable guide to behavioural capacity.

Relative brain weight may be a more reliable guide to intelligence. For brain weight relative to body weight, dolphins score about one third that of humans, ahead of most other mammals. There is large difference among whales as toothed whales and dolphins score highly, while baleen whales and sperm whales score close to ruminants, differences that may reflect intelligence. But there are considerable inconsistencies in using even relative brain weight among the mammals as a whole, due to different body design plans for contrasting modes of life among say, bats, shrews, pigs, primates and elephants. To support the case to save whales from being killed, we need to make such comparisons across species groups of mammals.

Brain structure may be a better comparative guide to intelligence than crude measures of bulk. Only dolphins score close to humans on thickness of the forebrain cerebral cortex and cortical folding, but in this is thought to be related to the complexity of analysis of whale sonar. Moreover, the fundamental cortical design of whales reflects an ancient mammal pattern from 70 million BP that predates the emergence of modern land mammals at 50 million BP. In this respect, whales do not have the layered cross-connections of the advanced mammal groups that are indicative of high analytical skills.

b. Behavioural learning ability

The learning ability of whales could be taken as a criterion of intelligence sufficient for our cause if it is significantly better than the average mammal.

Many mammals and birds can learn context-specific tasks better than humans, but generalised insight learning is usually considered to be confined to primates (and a few birds). Dolphins in captivity can
certainly achieve scores in the same league as primates, but this does not apply to baleen whales.

But in the last resort, fast, effective and adaptive context-specific learning appropriate for a particular species niche and mode of life may often be difficult in practice to distinguish from generalisation ability. Another species may be able to perform equally impressive tasks in the right context. Hence cross-species comparisons of learning ability are no longer considered to be especially revealing by comparative psychologists, except across very broad taxonomic categories.

The key to intelligence congruent with human ability is often said to be communication. Indeed complex humpback whale song has been adopted as an acoustic symbol of the mystery and specialness of whales. But social communication in the form of signals and courtship song occurs even at lowly levels of organisation throughout the animal kingdom, so this criterion cannot stand up to close scrutiny. Another aspect of whale sonar, echolocation, is equally well developed among bats.

The use of an arbitrary language to convey messages is often claimed as the essentially human aspect of communication, and if whales could be shown to share this ability, they would hold uncontested esteem sufficient to argue for sanctuary from harvest. Language can ask and answer six types of questions: what?; where?; who?; when?; how?; why? Evidence from captive experiments suggests that communicating dolphins seem to be able to deal with the first three, or possibly four, of these questions. This is better performance than most captive primates (and parrots) that have been taught to cope with communication questions 1 to 3. However, there is no evidence that dolphin sonar conveys insight of how and why questions, a level of conceptual analysis in language that would be essential were we to unequivocally make case for the uniqueness of whales among other mammals.

My conclusion is that an uncontestably human level of intelligence is not logically a criterion on which to base a policy of preserving whales.

**Traditional and Aboriginal Whaling**

Finally I will turn to traditional and aboriginal whaling, activities that receive widespread support from the public and from IWC policy. If whales are to be regarded as special, it is important that the same criterion also justifies exploitation by these two types of traditional whaling. In Figure 1, traditional whaling falls into the overlap zone between exploitation and conservation, and is not incompatible with the restoration of whale stocks.

**Aboriginal whaling**

Aboriginal whaling is characterised by preservation of distinctive, ancient, native cultural integrity, usually distinct from other local populations of European or migrant-settler descent. It was originally driven by subsistence and survival in a sub-polar environment that is unremittingly harsh for humans. For example, before trade with Europeans, many Alaskan Inuit communities would not have overwintered without preserved whale meat and whale products. This is why whales became integral to their culture.
Nowadays whaling directly for food is rarely important, except as means of minimising food purchase costs or to reduce dependency on remote governments. Whaling is often driven by cultural and political factors. Young members of native tribes may be trained in whaling as part of their cultural heritage.

But the acceptability of aboriginal hunting is based on food: at least formerly, such hunting was essential for human survival. Respect for aboriginal culture expressed through political instruments generally sanctions the killing of whales, often by means that would be unacceptably cruel in commercial whaling. Historically, Inuit slowly harpooned whales to death over 3 to 4 days of dogged pursuit.

Aboriginal whaling by traditional means was so difficult and hazardous of human life that it likely made no significant impact on natural stocks. Invariably these days, aboriginal whaling quotas are strict in the interests of conservation, but one may envisage a world with restored whale stocks where such quota restrictions will not be supportable on conservation grounds.

**Traditional whaling**

Traditional whaling may be defined as a history of exploitation of whales by coastal people, who are ethnically identical with the general population. Unlike aboriginal whaling, the whale meat and products may not only be used locally but are sold and exported from the region. The argument supports exploitation through preserving their traditional means of earning a living. In the IWC forum such traditional coastal whaling communities in Japan and Scandinavia have been distinguished from aboriginal whaling in Alaska, Siberia and Greenland.

We have to ask a number of questions to clarify the logic behind this decision. How long may it take for a tradition of whaling to become established? Is the answer influenced by the economic status of the community involved such that rich coastal whalers are less supportable than whaling in a poor region with few other economic opportunities?

In Figure 1 we can see that traditional whaling overlaps with a restoration policy. As with aboriginal whaling, whale stocks rebuilt by the current low levels of exploitation raise questions that will have to be faced in the next century. For example, what future has traditional New England Boston whaling, a traditional cultural and economic activity that goes back at least as far as many of the other whaling communities?

This paper has sought to examine the logical issues behind the exploitation, conservation and restoration of the whales of the oceans. My conclusion is that the most consistent logical position to support is that of rational and humane exploitation aimed at the rebuilding of whale stocks in our oceans. Nevertheless, one can be so charmed by the sheer charisma of these wonderful beasts that it is easy to find support for a no-whaling policy.
Overview of the Revised Management Procedure

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The work undertaken by the Management Procedures Sub-Committee of the International Whaling Commission in recent years (e.g. IWC 1988, 1989, 1992a, 1993a, 1994a) has been focused on specifying a set of rules (or a management procedure) for managing baleen whale populations on their feeding grounds (IWC 1994b; Kirkwood 1991). The revised management procedure (RMP) forms part of the revised management scheme (RMS), which comprises not only rules to specify catch limits but also guidelines related to conducting surveys, data standards, and a monitoring system (Young 1993).

The RMP consists of two components. The first is a set of rules to specify catch limits for an area if there is some certainty that there is only one biological stock in the area, or if there are multiple stocks in the area that catching operations will not harvest them in proportions substantially different to their proportions in the area (the single-stock rules). The second set of rules is used to deal with the cases in which there are multiple stocks within an area but catching operations are unlikely to harvest them in proportion to their abundance in the area (the multi-stock rules). Most management procedures used in fisheries management (e.g. Punt 1992; Butterworth and Bergh 1993) consist of single-stock rules only, and ignore the consequences of the possibility of multiple stocks. Ignoring multi-stock effects and basing management decisions on the assumption of a single stock can, in some instances, lead to unintended overexploitation of some of the stocks in the management area. The RMP is designed to achieve an acceptable trade-off between three conflicting management objectives. These objectives are based on the set initially identified by a Joint Working Group of the Scientific and Technical Committees in 1981 (Kirkwood 1991). The first is that "there be an acceptable risk that a stock not be depleted (at a certain level of probability) below some chosen level (e.g. some fraction of its carrying capacity), so that the risk of extinction of the stock is not seriously increased by exploitation". Although no agreement could be reached on the matter within the Commission, most delegations felt that this objective should be given the highest priority (Kirkwood 1991). When specifying this objective, the Commission did not provide an operational definition for "acceptable risk" and "chosen level". However, recent practice within the IWC Scientific Committee had led to the chosen level being taken to be 54% of the population's carrying capacity (see, for example, IWC 1994a). The second objective relates to the stability of catch limits as the viability of an industry depends on stable catches. The final objective relates

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to the size of the catch, which should be maximised. The Commission has emphasized the need for high long-term sustainable (or "continuing") catches rather than high catches over any particular time period. Prior to 1986, when the moratorium on commercial whaling came into effect, catch limits for whale stocks were based (to the extent which proved possible) on applications of the New Management Procedure (NMP). The NMP involves classifying a stock into one of three categories. These categories are:

a) Protection Stock - a stock which is below 90% of the level at which MSY is achieved (MSYL) - for the conventional MSYL of 60% of carrying capacity, the "Protection Level" occurs at 54% of this level,

b) Initial Management Stock - a stock which is more than 20% above MSYL, and

c) Sustained Management Stock - a stock which is either between 0.9 MSYL and 1.2 MSYL, or which has remained at a stable level for a considerable length of time under a regime of approximately constant catches (unless there is positive evidence that it should be classified otherwise).

Once a stock is classified on this basis, the catch limit as a function of current population size, MSY and MSYL is provided by the NMP catch control law (Figure 1).

The NMP is incomplete because it does not include rules to calculate values for MSYL, MSY and current population size. This led to considerable problems when attempts were made to implement the NMP (Kirkwood 1991), and at the time the moratorium was implemented, some 15 stocks could not be classified under the NMP. A further problem with the NMP is that it does not includes specifications for the data which are to be used when calculating model parameters, nor how uncertainty should be taken into account. In addition, the NMP has no way to deal with the problems associated with uncertainty related to stock- identity. Simulation studies (e.g. de la Mare 1984, 1986) have shown that even if rules are added to the NMP to enable estimation of the quantities needed to apply it, the NMP can, in some instances, perform very poorly in terms of resource conservation.

The approach used by the Management Procedures Sub- Committee of the IWC Scientific Committee to compare the performance of alternative candidate management procedures is Monte Carlo simulation. This approach involves developing a number of alternative mathematical models of whale populations and using each candidate management procedure to manage these simulated populations for a period of 100 years. This approach has been used in fisheries for the same purpose (e.g. Hilborn 1979). The reasons for basing the evaluation of the performance of management procedures on simulation results is that, if a candidate procedure performs poorly, this will not affect a real resource as would be the case if the procedure was applied to a real whale population. Furthermore, because the whale population is modelled using a computer, it is straightforward to determine the consequences of management actions. If a management procedure were applied to a real whale stock it would never be possible to determine the consequences on the population exactly.
The first phase of the development process involved the construction of a management procedure for application in situations in which stock identity is not uncertain. A series of meetings (IWC 1988, 1989, 1992a, 1992b) were held to develop testing protocols and to examine the performance of candidate management procedures. Five procedures were considered (Cooke 1989; de la Mare 1989; Magnusson and Steffanson 1989; Punt and Butterworth 1989; Sakuramoto and Tanaka 1989), and the one developed by Justin Cooke was selected by the Scientific Committee (IWC 1992c) and subsequently adopted by the Commission at its 1991 meeting (IWC 1992d). This procedure is now referred to as the "core procedure" or "catch limit algorithm".

The core procedure is based on a Bayesian estimation procedure which deliberately downweights the abundance information relative to the assumed priors (IWC 1994b). It makes use of two data sources only: the historic catch information and the estimates of abundance from sightings surveys. Information on catch per unit of effort and trends in biological parameters are not explicitly used by the procedure. It sets the catch limit equal to the 42.3%ile of the posterior distribution for the catch limit so that, when the data are poor or uninformative, the catch limit can be quite a bit smaller than the "best estimate" (see Young 1993 for details). The procedure includes rules to deal with unbalanced sex ratios and situations in which surveys are not conducted as regularly as anticipated by the procedure.

The rules used to handle multiple-stock issues are based firstly on dividing the region to be managed into a number of "small areas" which satisfy the criterion that either only one biological stock is found in the area, or if there are multiple stocks in the area that catching operations will not harvest them in proportions substantially different to their proportions in the area. Catch limits are then set for each of these small areas separately (IWC 1994b).

The performance of the management procedure was examined for a very wide range of sizes at the start of management. These tests showed that, if a population is initially at a very small fraction of its carrying capacity (5% was considered), the core procedure sets zero catch limits for the entire 100 year management period with very high probability. Potential problems including imprecise abundance estimates, biased abundance estimates, and underreported historical catches, amongst many others (see IWC 1992a for details) were examined during the testing process.

For each species / region to which the management procedure could be applied, application-specific computer simulations are conducted to ensure that the procedure performs adequately for that species / region. This testing process involves the Scientific Committee specifying plausible hypotheses regarding the number of stocks which may feed in the region and how they mix, and can take up to five years to complete. To date, species / region-specific simulation tests have been conducted for the Southern Hemisphere minke whales (IWC 1993b, 1994a) and the North Atlantic minke whales (IWC 1993b, 1994a). The Scientific Committee is currently developing simulation trials for the North Pacific minke whales (IWC 1994c).
A question which often arises is how successful the RMS will be. Compared to other management procedures for marine fish species, the RMP is the most thoroughly researched and intensively tested. The number of tests conducted to assess robustness is the highest for any fisheries management procedure in the world. The hypotheses considered during the testing process included any considered to be plausible, and some which were almost certainly implausible. The variant of the core procedure adopted by the Commission (IWC 1992d) was the most conservative of those presented to it by the Scientific Committee, and is almost certainly the most conservative management procedure designed for a marine resource to date - the initial catch limit for an unexploited resource is roughly 0.5% of the estimate of carrying capacity if surveys with the precision typical of those conducted in the Antarctic are used to obtain the first abundance estimate (Young 1993). The RMP has been shown to set very low catch limits for "worst case scenarios" such as a population which is initially depleted to 30% of its carrying capacity and for which the productivity is equal to the lowest value considered plausible. The RMP has been designed to set low catch limits for "worst case scenarios", so if the population to which it is to be applied does not conform to the specifications of the "worst case scenario", underutilization of the resource will occur.

References


NMP CATCH CONTROL LAW

\[ \text{MSYR} = \frac{\text{MSY}}{\text{MSYL}} \]

Figure 1. The NMP catch control law
The Resumption of Whaling Question: The Greenpeace Perspective

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(tape transcribed by Gail Langton, FC Secretary, edited by Dr. Tony Pitcher)

Today I want to run through some of Greenpeace's ongoing objections to the possible resumption of commercial whaling. As Dr. Magnusson noted, Canada is not a member of the IWC and because Greenpeace is an international organization with limited resources we place our full-time whale campaigners where we really need them. Nevertheless, we do campaign on these ecology issues in Vancouver and provide backup for the whale campaign in Canada during the IWC meeting.

The question of how many whales there are is one that comes up for discussion every year at IWC meetings. The reliability and accuracy of the science is an issue that Greenpeace always feels very uncomfortable with, despite the methodology that has been developed and refined over many years. For instance, it seems indisputable that North Atlantic Minkes are below 54% of the original stock. The Scientific committee at the 1993 meeting established a best estimate of 45% of the original stock size. Norway disagreed with that figure, but could not convince the remaining members of the committee that the estimates were wrong. But, how are these estimates arrived at? This past year Norway operated 6 to 8 boats for one month, or 50 to 60 vessel days of observations. The ocean is divided into quadrants along transecting lines with a sight arranged on either side of the ship of perhaps a mile and a half. There are corrections factored into the sighting data so that whales that may have been missed or whales that were underwater are added to the total number of sightings. There are no corrections, however, for the fact that Minke whales are known to be attracted to vessel traffic and therefore the observer boats would tend to overestimate Minke numbers. Moreover, one Canadian scientist who was recently interviewed during the IWC meeting was talking about the possibility of seeing two whales in each quadrant and in actual fact seeing the same two whales again. Such double counting and whale attraction means that we think estimation of whale numbers is at best an unreliable science. So the numbers cited by Dr. Magnusson has been citing are in dispute by scientists all over the world, as well as by Greenpeace. We think that this unreliability is another reason to take a precautionary approach to the potential of renewing commercial whaling.

Catch records are not all that they should be. For example, inspectors have reported that in Norway there have often been incidents where two small Minke whales were caught and reported as one. Moreover, Fin whales may be passed off as Minkes. Recently available Russian records reveal a huge degree of under- and mis-reporting of whale catches during the 1960s and 70s.

Greenpeace does have some concerns about the final version of the Revised Management Procedure (RMP) as it now exists. The procedure fails to respect one of the most fundamental principles agreed by the IWC in 1975, in 1991, and again in 1992, that whaling would only be allowed in stocks
that are determined to be above 54% of the unexploited, and this has been confirmed by the Scientific committee in March 1992. The way in which the RMP is currently constructed indicates that it would allow whaling on stocks that are not recovered to that level. We think that whales are better protected under the former New Management Procedure, although it has been substantially discredited scientifically.

Another fundamental problem is that the Revised Management Procedure being proposed is blind to the sex ratio of catches. This is especially relevant in the case of Norway. Norway's whaling has shifted further and further north over time, and in higher latitudes females tend to predominate in the catch. Such selective harvest of females has likely damaged the ability of the population to recover.

It is Greenpeace's and other groups' opinion that testing of the RMP model has been insufficient and that there has not been enough effort to factor in environmental change and continued deterioration of ocean environments. We also feel that the catch capping option which now exists in the Revised Management Procedure should be made mandatory and catch cascading should be disallowed. (Catch cascading is taking a given area, dividing it up into quadrants, estimating the number of whales in each sub-area to give the total population.) Catch capping takes these sub-totals, but then also factors in an estimate for the overall area and the variables inherent in travelling stocks.

On subsistence whaling, there is some confusion whether Greenpeace supports aboriginal whaling or subsistence whaling. It does not, but our position is neither that we do not oppose it. We do have a lot of debates within the IWC committee meetings about what constitutes traditional whaling.

For instance, up until the time of the moratorium, Japan identified its coastal whaling as commercial whaling. We think that the label was correct: it was in fact commercial whaling. Now Japan is bemoaning the devastation to the economies of so-called traditional whaling villages and communities. In a highly modernized first world society like Japan we think that a potential exists for developing other economic bases to support those villages. So Greenpeace would question whether the whaling in those villages was ever traditional in any sense of the word. To our mind 'traditional' means locally caught whales consumed in the local community in which they were caught. In traditional societies, there may be some bartering or gifts of whale meat between villages, but it is primarily for the use and sustenance of the community that is doing the catching. But even now in the face of increasing and world-wide opposition to commercial whaling, Japan's coastal whaling quota requests still involve money. They involve the meat entering the market place. Certain villages have been in whaling for most of this century, but the villagers have not been eating a very large percentage of the meat. In fact most of the whales were landed hundreds of miles north of those villages and were sold in a straight market exchange for cash. We do not regard this as a definition of subsistence whaling. In the villages of Owachiki and Okawa, whaling only started this century. People do eat whale meat in those villages, but a substantial percentage of the catch is sold outside of the villages. The practice is a new one. It is not a traditional practice for those villages, unless you define
tradition in terms of very short time frame.

Furthermore, Norway claims that their small scale coastal whaling is providing meat for isolated villages and that none of the product is destined for export, but we feel that those claims are invalid. In fact, in 1993 the Japanese negotiated for the purchase of Norweigian whale meat from the year's hunt.

On the issue of humane killing I would like to make it clear that Greenpeace is not an animal rights organization, despite the fact that most of the campaigners who work on whale issues certainly have a respect for the intelligence, communicative skills and family groupings of whales. But that is not what motivates our campaigns. It is not just that the are really pretty and neat and should be preserved. I think that the analysis that has been conducted over the years is much deeper than that. Since the issue of humane killing methods is one that is discussed frequently, especially by the media in the context of whaling, I would like to touch on a few relevant issues. I don't think that we can draw comparisons, as Japan and other countries have tended to do, between the killing of land animals and the killing of whales. We are dealing with in one case a fairly reliable footing for both the hunter and the hunted. In the case of whaling, certainly a pitching, rolling deck and partially submerged moving target often leads to an extended period before death occurs in the whale. Moreover, there were repeated failures in Norway's explosive harpoons in 1992, despite the fact that Norway tends to have inspectors on board. Numerous complaints were registered by other nations and concerns were expressed by animal rights groups around the world about unreliable technology. Norway has now said that they have fixed those failures, but it remains to be seen if this is true.

The fundamental issue that concerns Greenpeace profoundly, and is one of the strongest arguments for keeping the whaling moratorium in place until we have far more information, is the state of the oceans themselves and the potential for the impact of ocean degradation on whale species. Reports from the United Nations Environment Program indicate that ozone depletion, leading to increased ultraviolet radiation, is depleting phytoplankton, particularly in the Antarctic and the Northern Hemisphere. This is the basis of the marine food chain and humans have now altered it in a very severe way.

In addition, we know that high levels of radioactive waste in the Arctic ocean derive from Russian dumping. We also know that Britain is installing another plutonium processing plant: it may increase the dumping of radioactive waste into the North Sea by at least 10 times. We also see increasing algal blooms poisoning and suffocating fish as a result of nutrient runoff from agribusiness industries. Minke whale blubber in Norway has been tested for PCB residues and was unsafe for the commercial market. All these changes ultimately impact the balance of nature in the oceans.

Greenpeace feels that we humans are having such a profound impact on ocean ecosystems that we must take a precautionary approach to the reinstatement of whale quotas. Over the years we have witnessed the attempts to build an industry on the backs of whales stocks that have failed repeatedly and failed disastrously. The commercial requirements of running a profitable and expanding business are fundamentally in contradiction
with the basic conservation needs of depleted, slowly renewing species like whales. We do not know enough about the status of whales to take the risk, and the history of whaling has consistently been that it is almost impossible to control. Can whale populations be harvested sustainably? As human beings we assume that we know how to manage ocean ecosystems but what we have to learn to manage is ourselves and our human impacts. Until we can demonstrate that we are capable of this, and up until now I do not think our track record is good, then we ought to take the most precautionary approach possible and not allow the resumption of commercial whaling.
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