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CHAPTER 7

SUSTAINABLE USE OF OCEANIC WILDLIFE: WHAT LESSONS CAN BE LEARNED FROM COMMERCIAL WHALING?

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The history of commercial whaling is a widely cited example of the failure to manage the use of renewable natural resources sustainably. For centuries, one whale population after another has been brought to the verge of extinction, while technological and market developments have enabled the industry to expand to new whaling grounds and new species. Industrial whaling in the 20th century severely depleted the vast whale populations of the Southern Ocean. *The International Convention for the Regulation of Whaling*, which was concluded in 1946, established an International Whaling Commission (IWC) whose objectives were to manage whaling so as to preserve whale stocks for future generations without ignoring the current interests of those involved in the utilization of whales. For its first quarter-century the IWC merely presided over the decline of whale stocks, but after most of its members had abandoned whaling, the Commission adopted increasingly strict measures to conserve whale stocks, culminating in a moratorium on commercial whaling that took effect from 1986 and the creation of a Southern Ocean Sanctuary in 1994.

Despite being nominally prohibited by the IWC, whaling for essentially commercial purposes has expanded from a low of 326 whales in 1989 to approximately 1,500 whales expected to be caught in 2005 (not counting whales caught by indigenous peoples, nor by-catches in fishing operations). The current IWC membership of 66 countries (on 3 October 2005) is almost evenly divided between countries advocating protection of whales and

those advocating their exploitation. The IWC takes decisions either by consensus or on a one-country-one-vote basis, although the adoption of binding regulations on whaling requires a three-quarters majority.

During the moratorium period the IWC has been developing procedures, which are quite advanced by fishery management standards, aimed at ensuring that any whaling that occurs does not pose a risk to whale populations. However, it has been unable to implement these in the face of resistance both from whaling countries, who oppose international control of their operations, and from non-whaling countries, who are concerned that a re-introduction of international control of whaling would be interpreted as an endorsement of the practice, and would put them in a position of joint responsibility for an activity from which they derive no benefits.

In this chapter we summarize the past and recent history of the exploitation of whales, the international attempts to manage it, and the scientific work that has been undertaken to develop more reliable approaches to the management of whaling. We identify some reasons why it has proven difficult to apply the conventional paradigm of sustainable consumptive use¹ to whales. A central conclusion is that the kind of management regime required to ensure the biological sustainability of exploitation appears not to be politically sustainable. This underscores the importance of pursuing other approaches to conservation that depart from the conventional sustainable consumptive use paradigm.

HISTORY OF COMMERCIAL WHALING AND THE ATTEMPTS TO MANAGE IT

There are many accounts of the history of whaling that document the sequential over-exploitation of whale populations, through more than three centuries of whaling.^{2,3,4} One species of whale after another was hunted until it became too rare to support continued exploitation or in some cases was actually extirpated (Figure 7–1). As each stock was depleted, whalers moved on to exploit new stocks further afield, or developed new technology to gain access to previously uncatchable species.

The era of unrestricted whaling

Basque whalers had virtually exterminated northern right whales (*Eubalaena glacialis*) in the eastern North Atlantic by the end of 15th century when they ventured west to seek new quarry. In the 16th and 17th centuries Basque, Dutch, British and other whalers all but exterminated the right and bowhead (*Balaena mysticetus*) whales throughout the North Atlantic and eastern Arctic. The Atlantic gray whale (*Eschrichtius robustus*) is thought to have been exterminated by whalers by the early 18th century.⁵ Later in the 18th century, whalers spread to the Southern Hemisphere where they severely depleted the southern right whales.

In the 19th century, American whalers learnt to catch sperm whales (*Physeter macrocephalus*). After depleting stocks in the Northwest Atlantic they moved to the Southern Hemisphere and thence to the North Pacific, opening up contact with the previously isolated Japan in the 1860s. Right, gray and bowhead whales in the North Pacific and Bering Sea were hunted to commercial extinction. Although sperm whales had become noticeably scarcer by the mid-19th century, the discovery of petrole-

um as a luminant reduced the demand for sperm whale oil and this hunt ceased on economic grounds around 1870 before the populations were dangerously reduced. Sperm whaling was revived in the 20th century when industrial uses for sperm whale oil were found, leading to a further wave of depletion.⁶

In the early 20th century the focus of whaling shifted to the Southern Ocean where, following the exploitation of right and humpback whales (*Megaptera novaeangliae*), the other large baleen whales were sequentially exploited in order of size – first blue (*Balaenoptera musculus*), then fin (*Balaenoptera physalus*), then sei (*Balaenoptera borealis*) and finally, minke whales (*Balaenoptera acutorostrata* and *Balaenoptera bonaerensis*).⁷ In the 1930 season alone, over 30,000 blue whales were killed. By comparison the total number of blue whales in the Antarctic today is still only 1,000-2,000 despite over 30 years of protection.⁸

First attempts at international regulation of whaling

Attempts to regulate whaling internationally began in the 1930s under the League of Nations but these were abandoned with the advent of World War II, which gave a few years of relative respite to the whales. A new initiative was started after the war, resulting in the *International Convention on the Regulation of Whaling* (ICRW), signed in 1946. This established the International Whaling Commission (IWC) that focused on the regulation of whaling in the Antarctic, which was pursued mainly by British, Norwegian, Dutch, Japanese and Soviet expeditions. Catch levels rapidly returned to levels far above anything the stocks could sustain. By the mid-1950s, blue and humpback whales had become scarce and fin whales were suspected to be declining. But little serious effort was made to rein in catches. No country seemed willing to accept major cutbacks in their catches because

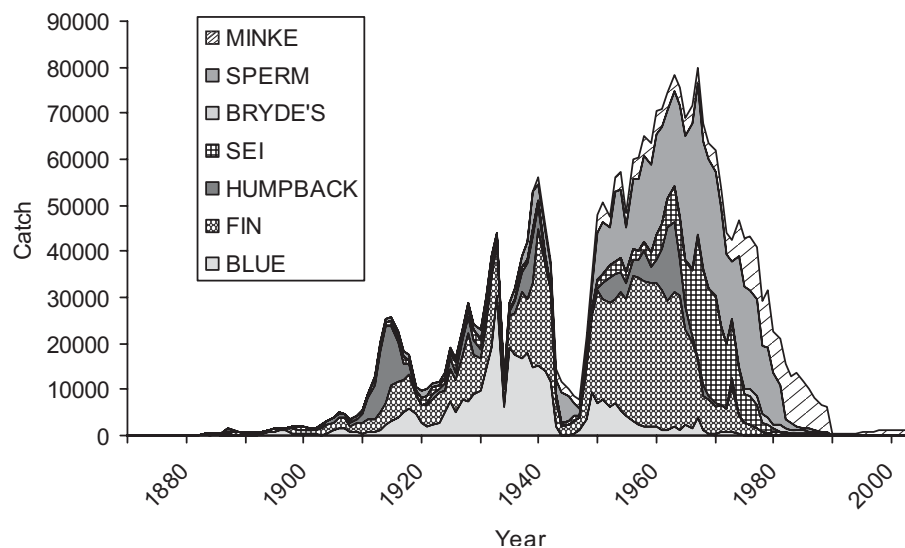


Figure 7–1. Modern Whaling, 1870–2000. The history of modern whaling catches shows that as each species in turn became scarce, attention shifted to the next until it too was depleted.

it would have meant writing-off much of their investment in catching equipment. The Commission set an overall limit on the catch of baleen whales in the Antarctic, but it was far too high and wasn't even divided by species.

A trend was already evident that has been widespread throughout fishery management and indeed environmental management in general. While the failure to take management action was mainly based on the rational self-interest of the participants, it was rare for them to admit this openly. Instead, opponents of catch limit reductions disputed the scientific evidence for the need for reductions. Disputes, which were really about objectives and intentions, were waged as if they were disputes about the facts.

Although the Commission had a Scientific Committee to advise on the state of the whale stocks, even the Commission accepted that its own Scientific Committee was too politicized to provide any objective advice. It often couldn't reach consensus, which was used by the Commission as an excuse for inaction. Although the more honest scientists recognized that catches were greatly exceeding the levels that the stocks could sustain, they could not provide unequivocal advice on how much the catches needed to be reduced.

Eventually, in 1961, the Commission appointed a special Committee of Three Scientists (later four) to produce an independent report.⁹ The group confirmed that the blue whale was depleted to such a small fraction of its original abundance that it should be given complete protection for at least 50 years, and that humpbacks should also be completely protected. It estimated that the catches of fin whales would need to be reduced by about two-thirds to be biologically sustainable. Catches of sei whales, which had been expanding as other species became scarce, needed to be held in check until more data were available. At around this time, most countries withdrew from the industry such that by the end of the 1960s only Japan and the USSR were still catching whales in the Antarctic. By that time sperm and sei whales were the main species being caught. From the late 1970s the small minke whale, previously ignored by whalers, became the main target. This is an example of the industry staying one step ahead of efforts to regulate it: the Committee of Three was told to focus on fin and blue whales, but at exactly that time the industry began to exploit sei whales, in lower latitudes.

In short, the whaling industry took care of itself rather than the populations of whales that it needed to continue in the long term. Many authors cite Colin Clark¹⁰ who, in 1973, examined the concept of profit maximization for those exploiting wild living resources. He explained why the most profitable option for those exploiting most *K*-selected species (those with slow population growth rates such as whales), where the sustainable yield is low, was

simply to "mine" the species to commercial extinction. The simple logic was that the money earned would grow faster in the bank than the species could reproduce.

The multi-species nature of Antarctic whaling exacerbated the situation for the more valuable and vulnerable species such as the blue whales. Even after blue whales had become too scarce to be worth hunting in their own right (i.e. were commercially extinct in Clark's sense) they were nevertheless still taken opportunistically in operations directed primarily at other species. True blue whales (not counting the so-called pygmy blue whales *Balaenoptera musculus brevicauda*) are estimated to have numbered around 250,000 in the Southern Ocean at the start of the 20th century, and appear to have been reduced to only a few hundred by the beginning of the 1970s when legal protection was finally enforced, although there is some evidence of limited increases since then.¹¹

After the collapse of the Soviet Union, it emerged that the Antarctic whaling situation had been even worse than appreciated at the time. Through the 1950s and 1960s, whaling fleets of the USSR had secretly killed large numbers of protected species, including right whales which had been legally protected since 1935, and systematically falsified the catch data that were provided to the international community.¹² The fraud continued until a scheme for the international exchange of observers on factory ships came into effect in 1972.

The preamble to the 1946 Convention implicitly recognized some basic notions of the theory of population management in that it talked about stocks being able to sustain exploitation and about the optimum level of whale stocks, but the Convention lacked a strategy for putting such notions into practice. The Convention referred to the goal of achieving the optimal level of whale stocks as rapidly as possible, but qualified it with the proviso "without causing widespread economic and nutritional distress". During the 1950s and 1960s, the economic hardship provision was used to reject any measure that would have reduced the return on investments in whaling ships. Much needed conservation measures were delayed until after severe damage had been done to whale populations.

In the event, when Antarctic whaling finally collapsed, no "widespread economic and nutritional distress" came to pass. Food production in the affected countries was already back to normal following the disruptions of World War II, and those employed in the industry had little trouble finding other jobs, because their countries were enjoying a period of rapid economic expansion and full employment.⁴

Much of the whaling industry itself saw the writing on the wall and took the steps they deemed necessary to secure their businesses. However, these did not involve

conservation. One such company was Scottish-based Christian Salvesen, which became the largest whaling company in the world. Gerald Elliot, who retired as its Chairman in 1988 wrote of the preparations that his company made to leave whaling: “Our company went on from whaling into many new activities, most of them away from the sea”.¹³ “In the thirty years that have passed since the end of our whaling, Salvesen has grown steadily and continues to flourish as a public company, though in areas far removed from our original trades”. Salvesen is now a large Europe-wide distribution company that would appear to have achieved economic sustainability.

Management based on the science of sustainable use

From the late 1960s the growing global consciousness of the need to safeguard humankind’s finite environment directed public attention to the whaling issue, a prime example of the wrong relationship between people and their environment. This led to a resolution at the first UN Conference on the Human Environment in 1972 calling for a 10-year moratorium on commercial whaling, to allow time both for research into the state of whale stocks and for stocks to recover. However, the UN resolution deferred to the IWC to implement this demand. Although some of those IWC members who had recently withdrawn from commercial whaling, such as the UK and USA, supported the call, the Commission did not adopt it. Instead, it adopted in 1974 an Australian amendment to the moratorium proposal, whereby it would only apply to those populations of whales which had been depleted below the levels providing the Maximum Sustainable Yield (MSY). Other populations could continue to be exploited subject to catch limits based on estimates of the MSY. The new policy came to be known as the New Management Procedure (NMP) and came into effect in 1976. With the NMP came at last the agreement to set catch limits separately by species and stocks, and also for all regions, not just the Antarctic.

The NMP was the first systematic attempt to put the management of whaling on a sustainable footing, and was for its time an advanced approach to resource management.

The basic idea behind the NMP, and indeed much of the theory of sustainable use in general, is that a natural population, left to its own devices, will neither expand without limit nor disappear, but hover around a level which the environment can support, where births and natural deaths will balance on average (Figure 7–2).¹⁴ This level is the carrying capacity of the environment for the population, usually denoted by the letter *K*. A population below this level will, other things being equal, tend to increase back towards that level while a population above that level will on average tend to decrease. The maximum net excess of births over deaths will occur at

intermediate population levels. If this net annual increment is taken as offtake then the population should stabilize at this level and the exploitation will be sustainable.

The idea of the NMP is to move whale populations into the range where the net annual increment is greatest, or keep them there. Under the NMP, which is still nominally in force, whale populations were classified into three categories:

- *Protection Stocks* (PS): whale stocks estimated to be more than 10% below MSY level, are accorded complete protection;
- *Sustained Management Stocks* (SMS): whale stocks estimated to be between 10% below and 20% above MSY level – catches are limited to 90% of MSY level;
- *Initial Management Stocks* (IMS): whale stocks subject to little past exploitation estimated to be more than 20% above MSY level. These may be brought down to the MSY level by temporarily unsustainable catches.

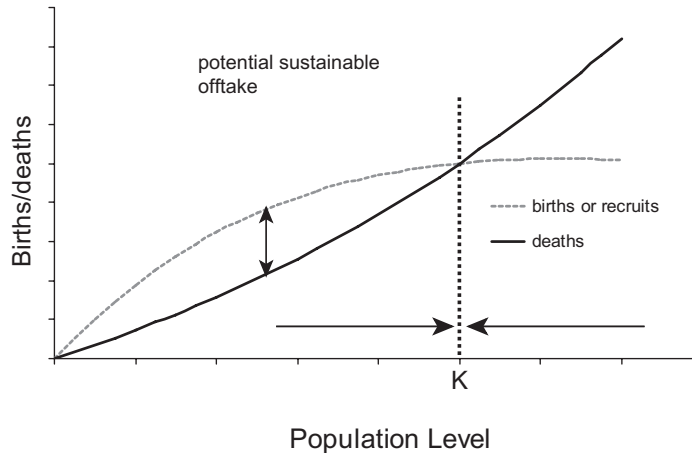
By convention the IWC Scientific Committee took the optimal level for baleen whale populations (often referred to as MSYL) to be 60% of *K*, and assumed that the pre-whaling abundance corresponded to *K*. A potential complicating factor, ignored in the NMP, is that the carrying capacity of the environment may fluctuate in an unpredictable manner due to natural ecological variability. By amendment to the original NMP it was provided that exploitation of previously unexploited whale stocks should not commence until a satisfactory estimate of the size of the population was available. This was perhaps the first provision of the IWC that could be described as precautionary in the modern sense.

Although the new procedure led, as intended, to the protection of those stocks which were obviously severely depleted, it proved hard in practice to determine levels of sustainable catch for the other populations, due to a lack of data and knowledge on whale populations. The Scientific Committee of the IWC, charged with determining the requisite catch levels, had to rely largely on guesswork or on supposedly scientific methods that did not stand up to critical scrutiny. In most cases, the data did not exist to determine the size of a population relative to its MSY level, nor what the MSY would be. Furthermore, the NMP did not provide much incentive to collect the required data. Indeed, it contained an escape clause which permitted catches to continue at current levels in the absence of positive evidence to the contrary.

The moratorium

As the difficulties in applying the NMP became increasingly apparent, attention turned to complementary approaches to conservation, including regional sanctuaries.

Figure 7–2. Theory of Sustainable Offtake. A natural population above the carrying capacity level K will tend to decrease towards K (deaths exceed births), while a population below K will tend to increase towards K in the absence of exploitation (births exceed deaths). At population levels intermediate between zero and K , the excess of births over deaths can in theory be taken as sustainable offtake.



At the initiative of the Seychelles, the IWC in 1979 designated the Indian Ocean north of 55°S as a whale sanctuary in which whaling was prohibited. Also in 1979, the IWC banned the operation of factory ship whaling, except for minke whales.¹⁵ In 1981, a moratorium on the killing of sperm whales was adopted by the IWC, but it excluded the western North Pacific, the most important sperm whaling area in both historical and recent times.

In 1982, the Commission adopted an indefinite moratorium on commercial whaling to take effect from 1986 onwards. The moratorium specified that all catch limits for commercial whaling would be zero until the decision was reviewed, by 1990 at the latest, when alternative catch limits could be considered. When the moratorium came into effect in 1986, the IWC embarked on a “comprehensive assessment” of the state of the world’s whale stocks and the development of a Revised Management Procedure (RMP) (discussed further below), that would overcome the deficiencies of the NMP.

The moratorium did not apply to whaling by indigenous peoples for which the IWC has special provisions. Whaling by or for indigenous peoples in Alaska, Russia and Greenland continues under this provision.

The *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES) supported the IWC decision by banning the international commercial trade in whale products (from species that were not already protected) from 1986 onwards, through the inclusion of the affected species on its Appendix I.

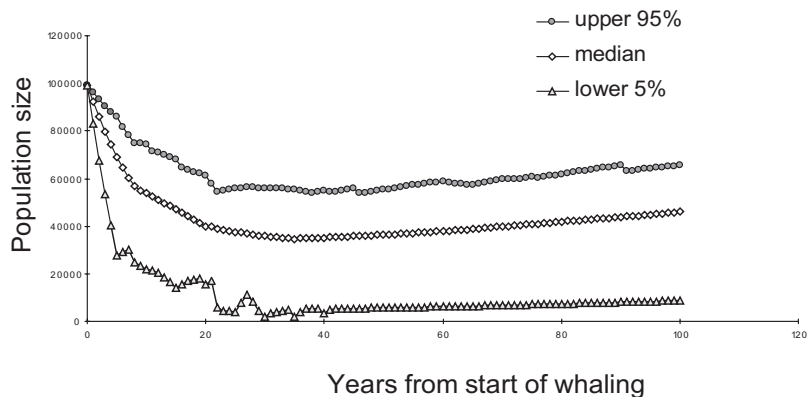
The moratorium decision was controversial and several countries lodged formal objections that exempted them from it: Japan, Norway, the then USSR, and Peru. A main argument raised against the moratorium decision was that it ignored the differences in status between whale stocks and was therefore not scientifically justified.

In the event, whaling nations Brazil, Spain and South Korea and Peru (despite its initial objection) accepted the decision and phased out their whaling operations. Brazil adopted a national policy of exclusively non-lethal utilization of whale resources, such as tourism and research. The non-lethal policy has been backed up by the designation of specially protected areas for southern right whales, the most prized species in Brazilian waters, and the Brazilian President has recently appealed for international backing for their policy in the form of support for the South Atlantic Whale Sanctuary proposed by Brazil and Argentina to the IWC. Brazil has taken a range of further measures to protect whales such as banning seismic surveys on the Abrolhos Bank.¹⁶

The USSR lodged an objection to the moratorium decision but subsequently ceased whaling, although the Russian Federation inherited this objection and hence the right to conduct commercial whaling. Norway objected to the moratorium decision, but suspended commercial whaling in 1987. It resumed whaling again in 1992 and, since 1994, has managed its whaling using successively modified versions of the RMP, to allow steadily increasing catches, as explained in more detail below.

Japan withdrew its objection to the moratorium decision in 1987, but then embarked on a program of “scientific whaling” on minke whales in the Antarctic, making use of a clause in the whaling Convention that exempts catches for “scientific purposes” from all regulations. Since 1994, Japan has also conducted scientific whaling in the North Pacific. In addition to minke whales, this operation also takes, since 2000, sperm whales and Bryde’s whales (*Balaenoptera edeni*),¹⁷ and, since 2002, sei whales. The number of whales caught has been increasing year by year and is now on a scale comparable with ordinary commercial whaling. The Commission has on several occasions recommended by majority vote that such use of the

Figure 7–3. Simulation of a whale population, catches set to NMP rules. 100 computer simulations were conducted of the application of the New Management Procedure (adopted in 1975 and nominally still in force) to an hypothetical whale population. The figure shows the median, 5th lowest and 5th highest outcomes from 100 runs. While the population trend is satisfactory on average, the span of possible outcomes is very wide, with the population driven to near-extinction in “unlucky” cases. The NMP is, therefore, not a safe management procedure, even in theory.



scientific whaling exemption be discontinued, but these exhortations have not been heeded.

Iceland did not object to the moratorium decision but initially pursued a scientific whaling program until 1990. It then ceased whaling, and withdrew from the IWC in 1992 in protest at the Commission’s failure to end the moratorium. In a legally controversial move, Iceland rejoined the IWC in 2002 with a reservation on the moratorium. Iceland resumed whaling in 2003 under the scientific whaling provision, without invoking its reservation, whose validity is not recognized by many parties.¹⁸

Because the moratorium was conceived as a temporary measure, the IWC continued to consider other conservation measures and, in 1994, it designated most of the waters south of 40°S as the Southern Ocean Sanctuary which is to remain in effect indefinitely, subject to review at 10-year intervals. This measure effectively establishes a long-term moratorium in a region which had been the major whaling ground of the 20th century. Recent proposals for adjoining sanctuaries in the South Pacific and South Atlantic have failed to attract the three-quarter majorities required for adoption.¹⁹

THE REVISED MANAGEMENT PROCEDURE

Some pioneering work in the mid-1980s by William de la Mare,²⁰ showed that to some extent it is possible to simulate the operations of a management procedure such as the NMP on a computer. However, one can only simulate a highly idealized picture of the whale stocks and the management procedure, but if the simulations show that even under idealized circumstances a management procedure is not likely to behave as intended, then clearly there is something wrong with it. The NMP itself was not a fully specified procedure, since it did not specify exactly how catch limits were to be calculated, but the Scientific Committee had developed some *ad hoc* rules of thumb to implement it. Figure 7–3 shows some example simulations of the Committee’s method of implementation of

the New Management Procedure (NMP).

This figure shows the range of outcomes of 100 replicates in a typical, highly simplified scenario. The reason for running 100 replicates is that the management process is inevitably subject to random, unpredictable factors, such that no two simulations of a given scenario will yield the same result, not least because the data (including surveys of whales in the ocean) on which management decisions are based are subject to random sampling error. The range of trajectories of population size over an 100-year period are shown. The results show that there is a high risk of the whale population being severely depleted. Not shown on this figure are the catch limits under the NMP, which would be liable to fluctuate wildly, such that the procedure would be effectively unworkable in practice. It should be emphasized that this is a highly idealized scenario in which all the assumptions of the NMP are met. In more difficult, and possibly more realistic scenarios, such as where the whale population does unexpected things, performance of the management procedure could only be worse still.

The scientific demonstration of the inadequacy of the NMP led the Commission to approve the development of a Revised Management Procedure (RMP) that should overcome the deficiencies of the NMP.²¹ The finding also provided a retrospective justification of the 1982 moratorium decision. Even though not all whale stocks were necessarily overexploited, a blanket moratorium could be considered a rational management measure in a situation where the management procedure itself was deficient, and thus placed all stocks at potential risk. When the moratorium came up for its scheduled review in 1990, this argument was accepted by the Commission, but only just. Whaling countries argued that the moratorium had run its course and proposed non-zero catch limits. Others argued that the moratorium should remain in place until a revised procedure was ready. By a majority of only 2 votes, the latter view prevailed.

The Commission specified in 1989 three objectives for the RMP:

- Stability of catch limits (to permit the orderly development of the whaling industry).
- Acceptably low risk that the stock (= population) is not depleted below a specified level (so that the risk of extinction of any stock is minimal).²²
- Making possible the highest continuing yield from the stock.

The IWC Scientific Committee considered that the RMP should be a fully-specified procedure, that is amenable to the kind of simulation testing developed by de la Mare. Furthermore it should work directly with data that could actually be obtained in practice, instead of requiring guesses of unobservable quantities such as MSY.

Following an iterative process of testing and development, the Committee was in 1992 able to recommend a procedure that achieved a reasonable balance between the above objectives.²³ The Commission accepted the procedure in principle as the basis for the management of any future commercial whaling that might be authorized.

REVISED MANAGEMENT SCHEME

The RMP is merely a rule for specifying catch limits, and the Commission decided that it should be embedded in a more comprehensive management framework, called the Revised Management Scheme (RMS), which was to include additional elements such as arrangements for inspection and enforcement.

The need for inspection arrangements has been underscored not only by the extensive falsification of catch records by the former USSR (see above) but also by more recent revelations including the falsification of Japanese coastal whaling catch figures in the 1980s. For example, Kondi reports 1157 Bryde's whales killed by Japan in 1986-87 as compared to the official figure of 634.²⁴

Negotiations on the RMS have continued since 1995, at varying levels of intensity, within the IWC itself and in various working groups that it has appointed. By October 2005, little progress towards its adoption has been made. A proposal to adopt the RMS that was put to the vote in the Commission in 2002 failed to achieve a majority, receiving votes against, from both supporters and opponents of whaling.²⁵ Supporters of whaling see the RMS as an overly restrictive scheme, while countries opposing whaling are concerned that its adoption would amount to international endorsement of whaling, for which they would be held jointly responsible. Both sides appear to see the current arrangements, whereby commercial whaling continues in practice without international endorsement, as preferable to having an international management scheme in place.

In the meantime, commercial whaling, under objections to the moratorium and through extensive use of the "scientific purposes" exemption, has continued to expand, outside international regulation, from a low of 328 minke whales in 1991 to a projected catch of around 1,500 minke, sei, sperm and Bryde's whales in 2005, with plans further to increase the number and species composition of "scientific catches" in the near future.

However, the non-adoption of the RMS does not mean that the key players are necessarily content with the *status quo*. Japan has over the last 20 years run an ongoing project to recruit new parties into the IWC, typically small island states and poorer countries, to support its policy. For example, Mauritania, which attended its first meeting of the IWC in 2004, cast 10 votes, all of which were identical with those of Japan. St Kitts and Nevis voted with Japan on 71 out of 72 votes between 1998 and 2003. Japan continues to recruit new members, the latest being Mali in August 2004 and Kiribati in December 2004, and its representatives have expressed optimism that they will soon achieve a majority in the Commission for their position.²⁶ What Japan calls its "vote consolidation program"²⁷ has been criticized by non-governmental observers as vote-buying.²⁸ Though concerns regarding vote-buying have arisen in many fora, this is perhaps the only example of a twenty-year campaign by one country, seeking to buy an entire convention.²⁹ The Commission addressed the vote-buying issue obliquely at its 2001 meeting, noting the importance of transparency in the Commission's affairs and the right of members to exercise their votes free of coercion,³⁰ but did not take specific action.

As of the 2005 IWC meeting, the Commission of 66 members is about evenly divided between proponents and opponents of commercial whaling and new members are joining on both sides. It is, therefore, hard to predict what direction the body will take. In the event of proponents of whaling gaining the upper hand, the most likely action of the Commission would be to issue some form of international endorsement or approval of ongoing nationally-managed whaling activities, rather than to reintroduce international management of whaling (which would require a three-quarters majority).

CONCEPTS OF SUSTAINABILITY

The history of whaling, and the attempts to manage it, provide potentially useful lessons relevant to the issue of sustainable exploitation of living resources in general.

Elsewhere in this book, Sidney Holt³¹ has indicated that there are many definitions of sustainability, including the definition in the World Conservation Strategy³² produced jointly by IUCN (now the World Conservation Union), UNEP (United Nations Environment

Programme), and WWF (now the World Wide Fund for Nature) that, “if an activity is sustainable, for all practical purposes it can continue indefinitely”. However, this definition does not provide guidance as to how to achieve sustainability in practice, nor how to determine whether or not a particular use is indeed sustainable. It is also unclear whether it refers only to biological sustainability, or also to ecological, economic, technical or political sustainability, or to the combination of all these aspects.³³

The conventional sustainable use paradigm is that wild living resources, including whales, can be harvested sustainably provided that the exploitation is appropriately managed.

This concept of sustainability was critically scrutinized in a short paper in *Science* in 1993.³⁴ Like Colin Clark (see above), Ludwig and co-authors believe that exploitation of resources is largely driven by economic factors (the more valuable the resource, the more likely the over-exploitation). The paper attacks “sustainability” as a concept that can rarely be applied in practice, and proposes that in general it is more appropriate to think of resources managing humans than *vice versa*. The larger and more immediate the prospects for gain, the greater the pressure for unlimited exploitation. When the resource has been over-exploited, governments tend to subsidize continued exploitation as substantial investment and many jobs are often at risk. Large levels of variability (in both the distribution of the resource and the pattern of its exploitation) tend to mask problems. Scientific uncertainty is identified as one reason for lack of action to limit exploitation, however, the authors cite instances where, despite scientific certainty, unsustainable practices continued.

The paper concludes with some principles of effective management (the two-page paper itself does not use the history of whaling as an example but mentions instead the exploitation of fish stocks and forests). These principles are as follows:

- Include human motivation and responses as part of the system to be studied.
- Act before scientific consensus is achieved – often calls for more research are simply delaying tactics.
- Rely on scientists to recognize problems but not to remedy them – and be aware that scientists and their judgments are subject to political pressure.
- Distrust claims of sustainability.
- Confront uncertainty. There is an illusion that science can provide all the answers.

However, it is possible to make rational decisions while taking uncertainty into account, by constructing a variety of plausible hypotheses, considering a variety of strategies,

favoring actions that are reversible, monitoring results and modifying actions accordingly and erring on the side of precaution.

SCIENTIFIC LESSONS FROM THE DEVELOPMENT OF THE REVISED MANAGEMENT PROCEDURE

We have already seen how, left to itself, the exploitation of whales has been almost universally biologically unsustainable. The example of Salvesen shows that a corporation can achieve economic sustainability based on biologically unsustainable activities, provided that it is sufficiently flexible and adaptive. Capital accumulation obtained from the profitable destruction of a resource then leads to continuity of another activity by the same corporation.³⁵

Although the specified objectives of the Revised Management Procedure did not include biological sustainability *per se*, they are quite closely related to concepts of sustainability: low risk of depletion; stable catches; and highest continuing yield.

The experience gained from the IWC’s process of developing and trying to implement a Revised Management Procedure echoes some of the problems identified by Ludwig *et al.* with respect to the sustainability concept. There follow some of the key points to emerge from this exercise.^{36,37}

Good intentions are not enough

As noted above, the NMP was designed to ensure biologically sustainable exploitation, but when it was subjected to simulation testing, it was found to have a low probability of providing sustainability in practice. Likewise, the early versions of candidates for a Revised Management Procedure were found to provide poor performance in the first round of simulation tests, forcing the developers to modify them substantially.

This experience confirms the wisdom of Ludwig *et al.*’s advice to “distrust claims of sustainability”. It is not sufficient that a management approach merely be *intended* or *designed* to be sustainable. Evidence is needed that it would actually perform as expected.

Reaction is not enough: pro-action is needed

Candidate management procedures for whaling that relied on detecting negative trends in populations before limiting catches, did not perform well in tests. Depending how they were tuned, they either tended to act too late, and ran a high risk of severely depleting populations before a decline was detected; or they were too sensitive, responding too readily to “false alarms”. In neither case was biological sustainability achieved.

The only procedures that performed reasonably satisfactorily in simple tests were those that required direct estimation of the size of the population to be exploited, and which set the allowed catch limit to a sufficiently small fraction of the abundance estimate, such that rapid depletion of the resource could not occur, even after allowing for some error in estimation.

This experience is consistent with Ludwig *et al.*'s advice to "act before scientific consensus is achieved", which could be phrased more strongly generally as "act before the need is evident".

Other than by setting a trivially low catch limit, it is not possible to provide an advance guarantee of long-term biological sustainability, but it is possible to set a catch limit low enough to ensure that a stock will not be impacted by exploitation too fast to allow time for remedial action. Extensive simulation testing during RMP development showed that "low enough" means typically less than 1% of the estimated population size. Thus a safe catch limit is not much greater than what many would regard as a "trivially" small one.

History matters: the need for a reference point

A further result to emerge from the RMP development process was that it is quite difficult to meet the management objectives without taking past catches into account in some way. This provides an implicit reference point. When a population is small compared with past catches, it can be considered depleted and protective action should be taken. If one is allowed to forget the past, and focus on maintaining populations at their current levels, then it is hard to prevent a slow but sure drift towards extinction. This is an example of the "shifting baseline" problem of fisheries noted by Daniel Pauly.³⁸ Biological sustainability requires some form of reference point such that populations below this level are restored.

This finding justifies the ongoing effort by the IWC Secretariat to reconstruct from various original sources, the approximate catches actually taken by Soviet era whaling fleets during the 1950s and 1960s, whose reports filed at the time were largely fabricated.

Incentives to collect data

The precision of an estimate of the number of whales in an ocean is directly related to the amount of survey effort expended to obtain it. The more time spent counting the animals, the closer will the estimate be to the true number, on average. The RMP takes this into account in setting the allowable catch limit: the less precise the estimate, the lower the allowed catch, such that the risk of depletion is held to an approximately constant, low level regardless of the amount of data. In the absence of any

data, the catch limit is zero. This places a positive value on data and is one way of implementing a precautionary approach. This is in contrast to traditional fishery management approaches where restrictions are only imposed when there are sufficient data to justify them.

This is one aspect of Ludwig *et al.*'s point about the need to include human motivation in the system being studied: relevant data will not be submitted³⁹ unless there is a pay-off for doing so.

Whale populations cannot be managed

A more subtle but significant result to emerge from the process of developing the RMP is that it is not actually possible to "manage" populations of whales, in the sense of holding them at some desired level. Attempts to do so run a high risk of depleting the population far more severely than intended.

A natural population fluctuates in unpredictable ways. When exploitation is limited to the levels found to be safe, the result is that the dynamics of the population under exploitation are not expected to be appreciably different from those of an unexploited population. Setting the exploitation high enough to substantially impact the population engenders a high risk of serious accidental overexploitation.

Figure 7-4 shows an hypothetical whale population which is either (i) protected; or (ii) subject to a safe level of exploitation; or (iii) subject to an unsafe level of exploitation. The safely exploited population tracks the unexploited population quite closely. A conclusion is that we can at best manage *whaling* so as to limit its impact on whale populations, but we cannot manage the *populations* themselves.

The Maximum Sustainable Yield is not sustainable

Although this finding sounds like a contradiction, it reflects an important truth. While it is possible to identify a safe level of catch, it is hard to identify a *maximum* safe level of catch. An attempt to extract the *maximum* sustainable yield from a stock, as opposed to merely a sustainable yield, runs a high risk of excessive depletion of the stock such that the catch will not be sustained.

How much risk of depletion to accept is partly a value-judgment. The Scientific Committee, somewhat arbitrarily, put forward three different "tunings" of the RMP with different risk levels.⁴⁰ These were labeled the 0.60, 0.66, and 0.72 tunings based on the expected depletion of an hypothetical whale stock in a specific reference scenario. The Commission endorsed the 0.72 tuning level which gave the lowest risk level, and hence the lowest allowable catches.

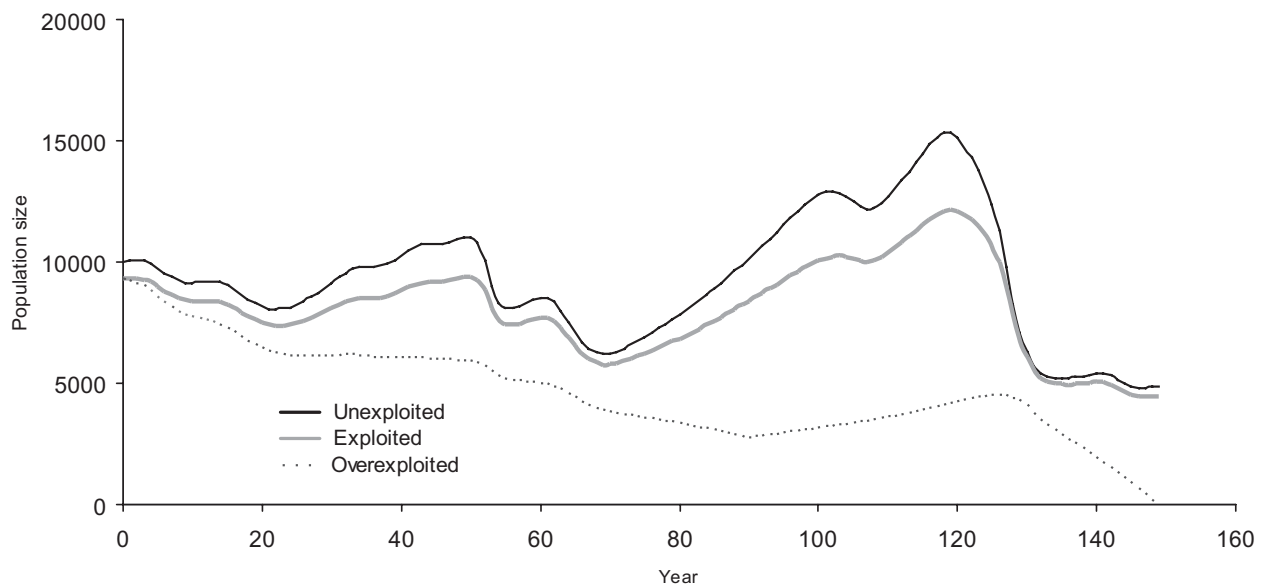


Figure 7-4. Managing populations? A natural population will fluctuate in unpredictable ways (upper curve). A low, safe level of exploitation will reduce the population slightly but leave it subject to much the same level of fluctuation. A level of exploitation high enough to substantially impact the population has a high risk of being unsustainable and driving the population towards extinction (lower curve). It has not proven possible to devise management procedures that hold a population at some desired, stable level.

IMPLEMENTATION OF THE RMP: THE NORWEGIAN EXPERIENCE

The RMP has not been adopted internationally, and Norway is the only country so far to apply a version of it to the management of whaling. Norway filed a formal objection to the moratorium on commercial whaling, so is not bound by that decision.

During 1996-2000 Norwegian fishery authorities set national catch limits for minke whaling calculated from the RMP with the IWC's approved tuning of 0.72. From 2001, the catch limit would have been reduced under RMP rules had the 0.72 tuning been retained. This was because the procedure called for a reduction to compensate for the unduly high proportion of females in the 1996-2000 catch. The Norwegian authorities avoided a catch limit reduction by changing to the 0.66 tuning from the 2001 season. In 2003, a further catch limit reduction was implied by the RMP rules because of a new, lower abundance estimate. This catch limit reduction was avoided by switching the tuning to 0.62 (Figure 7-5).

In 2004, the Norwegian Parliament adopted a policy on marine mammals which proposed a substantial rise in minke whale catches, motivated by the reasoning that reducing the numbers of whales would benefit fisheries for prey species.⁴¹ The government set the catch limit for 2005 at 797 whales, obtained by applying the RMP with the 0.60 tuning. This tuning is the lower end of the range

recommended by the IWC Scientific Committee. The Norwegian delegation to the IWC announced that Norwegian scientists would be tabling a radical revision of the RMP in the near future that would allow yet higher catches.

Arguably, each version of the RMP with a given tuning represents a biologically sustainable management procedure, albeit with different risk levels. However, the safety of each tuning level has been tested by simulating it for 100 years assuming that the management procedure would not be changed. The process actually followed by the Norwegian authorities has been to adjust the tuning level to maintain or increase catches whenever the RMP itself called for a decrease. To the extent that the tuning level is only changed in one direction, *this* process cannot be sustainable: there will come a point where the tuning cannot be adjusted any further without abandoning the goal of sustainability.

The Norwegian parliamentary resolution states that sustainable management of minke whale populations may soon be abandoned in favor of a deliberate policy to reduce the populations in order to reduce the amount of commercially valuable fish they consume.

When and whether the management objective is changed from sustainable use to population culling may depend on how much longer the desired catch level can be justified on sustainable use grounds. The desired catch level itself probably depends on market conditions. The

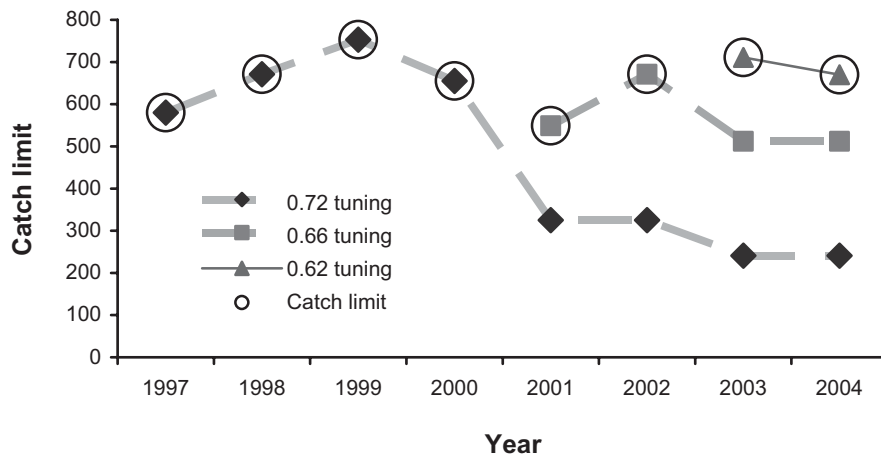


Figure 7-5. Norwegian whaling catch limits. From 1997-2000 Norway set catch limits for whaling using the Revised Management Procedure (RMP) with the IWC's adopted tuning level of 0.72. From 2001 the RMP rules indicated a reduction in the catch limit (lower curve), but Norway changed the tuning to 0.66 to maintain catch levels (middle curve). In 2003 a further cutback was indicated, which Norway avoided by changing the tuning to 0.62.

government's stated policy is to try to boost domestic demand for whale products, and at the same time to try to re-establish export markets, especially in Japan. The government of Japan is not currently permitting the import of Norwegian whale products.

The example of Norway's implementation of the RMP illustrates two points:

- Even the best designed procedure for sustainable management can be implemented in unsustainable ways that the developers of the procedure did not expect; and
- Instead of the management procedure determining the catch level, the reverse process occurs: the desired catch level determines the choice of management procedure.

BIOLOGICAL VERSUS POLITICAL SUSTAINABILITY

The Revised Management Scheme, in which the RMP was to be embedded, has at the time of writing not been adopted into force by the IWC despite over 10 years of negotiations. Until this is done, the IWC is effectively unable to actively manage commercial whaling. Issues of disagreement include, *inter alia*, arrangements for observation and inspection of whaling operations. These would not in principle be a difficult issue to resolve, because in the meantime the placement of observers has become normal practice in many other international fishery management organizations. The failure to reach agreement is, therefore, due primarily to the lack of an incentive to do so.

Whaling countries see the RMS as unduly restrictive and can take more whales under current arrangements. Without an agreed RMS, non-whaling countries can take

a position of disapproval of commercial whaling, while leaving responsibility for its management to the minority of countries which conduct it. In view of the general obligation under international law on states to co-operate in the conservation and management of cetaceans, countries are reluctant to be seen explicitly to abandon the notion of international management of whaling, and hence negotiations have continued despite the lack of progress.

The RMS concept fails to satisfy the first key principle enunciated by Ludwig *et al.*, which is to include human motivation in the system to be studied. The standard sustainable use paradigm often assumes the existence of an altruistic management authority, which will take the decisions needed to ensure sustainability. In the case of whaling, this idealized manager does not exist.

The history of whaling management shows that in the time when the IWC was dominated by whaling interests, they acted in their own interests to maximize returns at the expense of biological sustainability. When the IWC became dominated by countries without whaling interests, it adopted increasingly protective measures, but these members have little interest in implementing international regulation for the whaling that does occur. This is rational to the extent that there is no incentive for a government to take joint responsibility for managing an activity from which it derives no benefit itself.

While the current lack of consensus within the IWC may represent rational behavior of those involved, it appears not to be a politically sustainable situation, given the vote-buying phenomenon noted above.

The whaling experience suggests that the kind of management required to ensure biological sustainability may not be politically sustainable. This finding calls the conventional paradigm of managed sustainable use into question. It does not rule out the possibility that specific cases

of exploitation can be fortuitously sustainable, simply because the demand for the products happens not to exceed the productive capacity of the resource.

In view of the problems with implementing the sustainable use concept for whaling, players on both sides of the debate have been seeking alternative bases for action.

FROM SUSTAINABLE USE TO CULLING – A NEW JUSTIFICATION FOR INCREASING CATCHES

The Governments of Japan, Norway and Iceland are all vigorously promoting the idea that whales and other marine mammals need to be culled in order to protect fisheries resources.⁴² This argument is being pushed partly in order to justify greater catches through culling than would be permitted under a sustainable management regime⁴³ such as the RMP. If the objective is to deliberately reduce the size of the population in order to decrease the alleged competition, there is an opportunity for higher catches that need not be sustainable.

A number of brochures that have been prepared by the Government of Japan are intended to justify this notion. Press releases are also regularly issued on the subject. In the words of Joji Morishita from the Fisheries Agency of Japan, “This is direct competition with fisheries to feed humans”.⁴⁴ Then alternate Japanese IWC Commissioner Masayuki Komatsu and his co-author are more strident, “excessive protection of whales is evil, it gives adverse effects to the marine ecosystem as a whole”.⁴⁵

The issue of competition between whales and fisheries is frequently cited by the representatives of countries that have been brought into the IWC in the context of Japan’s vote consolidation program. It provides an ostensible rationale for their support for whaling in the IWC, despite their countries having no direct interest in whaling. However, some of these countries are located in areas where there is little or no overlap between species targeted by commercial fisheries and the diet of whale species that are potential targets for whaling.⁴⁶

The 2004 Norwegian White Paper explains the need to kill whales in order to benefit fisheries,⁴⁷ and the main justification for both Iceland and Japan’s “scientific whaling” is to determine the impacts of whales on commercially important fish.

It is not a simple matter to determine what net benefit would actually accrue to fisheries from the reduction of cetacean populations, nor even whether the net effect would be positive or negative in each case.⁴⁸ When the IWC examined this issue in a scientific workshop it recognized the complexity of marine ecosystems and stated that, “...there is currently no system for which we have suitable data or modeling approaches to be able to provide reliable quantitative management advice on the impact of

cetaceans on fisheries or fisheries on cetaceans”.⁴⁹ Whether our understanding can improve significantly in the foreseeable future is not yet clear. The use of ecosystem arguments for justifying the culling of whales is likely to generate considerable controversy at both the scientific and the political level.

CONSERVATION-ORIENTED MANAGEMENT

The history of whaling shows that once unsustainable exploitation is occurring, it can be hard to rein it in to biologically sustainable levels. This suggests that it is better to pre-empt the development of dependencies on consumptive exploitation altogether. One way to achieve this is to lock in consensuses for the non-exploitation of cetaceans where these exist.

The sustainable use paradigm is not the only basis for measures to protect whale populations from exploitation, and more protective measures are permitted under international law.⁵⁰

For example, a relatively new agreement, ACCOBAMS (Agreement on the Conservation of Cetaceans in the Black and Mediterranean Seas) came into force in 2001 under the Convention on the Conservation of Migratory Species.⁵¹ It requires parties to co-operate in the conservation of cetaceans in the Black and Mediterranean seas and to prohibit the deliberate exploitation of cetaceans in this area. Until the 1980s, small cetaceans in the Black Sea were subject to heavy exploitation including directed purse-seine catches that depleted them. However, no direct exploitation of cetaceans was occurring when ACCOBAMS was negotiated, and although not all range states have adhered as yet, the Agreement provides a way of entrenching the current consensus for no exploitation. In regions where some countries are currently involved in exploitation, such a consensus is much harder to achieve.

The Southern Ocean Sanctuary, adopted by the IWC in 1994, is an international area, outside exclusive economic zones (EEZs) except those of a few states that are strongly supportive of the sanctuary. When it came up for review in 2004, the IWC Scientific Committee recognized that the sanctuary concept in the Southern Ocean needed to be developed further to provide for long-term protection for whales beyond the simple prohibition of direct exploitation. Nevertheless, this collective decision by the international community not to exploit the whales in these waters appears to have been widely accepted as legitimate, even in the absence of complete consensus, and is one of the few decisions of the IWC that has become widely known outside the organization.⁵²

Currently, Japan, the only country to have voted against the establishment of the Sanctuary, is also the only country pursuing whaling there, and no other countries

have a concrete current interest in joining in. The Sanctuary may help to entrench the current near-consensus on protection of whales in this region. This could become important in the future, if some whale populations exhibit a substantial recovery and tempt a resumption of the 20th century-style exploitation of whales in the area.

Likewise, the Indian Ocean Sanctuary, established for a limited period in 1979 and made indefinite in 1992, obtained legitimacy through a broad consensus of support amongst Indian Ocean states, and has contributed to ensuring that substantial exploitation of large whales in this region was ended and has not been resumed. Even though the maintenance of an active interest in the Sanctuary by the bordering states has proved harder than anticipated, the Sanctuary has resulted in substantial research activities in this region where the cetacean fauna was previously very poorly known.⁵³

Political support for policies of no consumptive use is more likely to be achieved where demonstrable benefits from non-consumptive uses are obtained such that whales have an economic and political value other than as an exploitable resource. Several Southern Hemisphere countries including Brazil, South Africa, Australia and New Zealand have adopted national policies of strictly non-lethal use of cetacean resources, including whale-watching. Whale watching is a rapidly expanding branch of the tourism industry with an estimated global value of US \$1 billion per annum growing at approximately 12% per year.⁵⁴ Ensuring that non-consumptive uses of whales are managed so as to make a positive net contribution to whale conservation, will be one of the challenges to be met in the coming years.

Although the term whale-watching normally refers to the *in situ* form, *ex situ* enjoyment of whales through films, books and other media may be the larger industry in terms of global turnover. Conducted responsibly, *ex situ* whale watching potentially represents the form of use that involves the least disturbance to whales and to the environment generally. The challenge is to ensure that the benefits from these uses of whales feed back at least in part to support for whale conservation.

It is not necessarily valid to regard consumptive and non-consumptive uses of whales as alternatives, because a situation that involves a direct choice between the two types of use would rarely arise. However, the link exists to the extent that non-consumptive uses help to cement political support for policies that exclude consumptive use.

Traditional fishery management bodies, whose activities are limited largely to the regulation of exploitation, as the IWC was originally conceived, are at a disadvantage when it comes to implementing management approaches that are more conservation-oriented than the convention-

al sustainable use philosophy, because it can be hard to maintain a functional institutional machinery for the sole purpose of prohibiting an activity. There is, however, considerable precedent for international conventions and institutions to evolve to meet new challenges and responsibilities.⁵⁶

In the case of the IWC, a number of member countries, led by Mexico, launched in 2003 the so-called "Berlin Initiative".⁵⁷ The aim was to bring the organization into the 21st century by transforming it from a traditional fishery management body to a modern conservation organization with a comprehensive agenda covering all aspects of the conservation of whales including protection from environmental threats. In addition to helping to address these other threats in their own right, it was hoped that the broadening of the IWC's agenda would reduce the risk that its failure to achieve consensus on the regulation of exploitation would lead to the organization becoming dysfunctional to the detriment of whale conservation. Although it is too early to judge the success of this initiative, there will clearly be a need for a global forum to address the full range of threats to whales and to work to ensure their long-term survival.

CONCLUSIONS

Despite its poor record of conserving whales in the past, the IWC has in recent times made a serious attempt to develop a management procedure that would implement the goal of managed sustainable use to the extent possible. The resulting Revised Management Procedure is widely regarded as one of the most advanced procedures ever developed in the fishery management field.

The process of RMP development has revealed that the conventional goal of extracting the Maximum Sustainable Yield (MSY) from a population is not obtainable. Although very low levels of exploitation can be sustained, there is no clear-cut maximum level. The higher the catches, the greater the risk that they will not be biologically sustainable. Levels of catch sufficient to "manage" populations in the sense of steering them towards a target level, engender a high risk of unintended depletion. One cannot manage whale populations: at best one can manage the exploitation to limit its impact on populations. To do this it is necessary to set catch limits sufficiently low in advance that they do not have a major impact on the exploited populations, without waiting for evidence of negative trends.

The approach of scientifically-managed sustainability is only viable if there is a sufficiently strong constituency with an interest in pursuing this approach and making it work. The political experience from both the history of whaling, and from the attempts to conclude and implement a comprehensive regulatory regime for the manage-

ment of whaling, reveals that this is not the case. Internationally-managed exploitation of whales would at best be an uneasy compromise between those seeking to exploit whales and those seeking to protect them, with no-one standing to gain significantly from implementing and enforcing the kind of management required. The kind of management that is required to ensure biological sustainability is not politically sustainable.

These conclusions underline the importance of pursuing alternative approaches to whale conservation, based on avoiding the development of dependencies on consumptive exploitation. Such an approach is gradually taking shape in parts of the world, through for example the designation of the Southern Ocean Sanctuary, and regional agreements that exclude consumptive exploitation of cetaceans, such as in the Mediterranean and Black Seas.

Management approaches that are more protective than those based on conventional sustainable use criteria are explicitly permitted for marine mammals under international law, but their acceptance is still far from universal. Where a consensus for the protection of cetaceans exists, the opportunity can be used to formalize their protected status to help make the protection permanent.

Those favoring the exploitation of whales have also begun to shift their public strategy away from the conventional paradigm of sustainable use towards ecosystem-based considerations, with a particular emphasis on arguments that whales need to be culled to protect the resources which they exploit. Considerable controversy in both the scientific and political arenas can be expected in the coming years.

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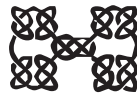
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 - ¹⁴ For a detailed discussion of the "notion" of sustainable use, see Holt, Chapter 4.
 - ¹⁵ The factory ship moratorium (Paragraph 10d in the IWC Schedule) is an important conservation provision because no country has filed a formal objection to this paragraph, so therefore all are bound by it. In addition, both the text of this paragraph and the records of the meeting (the Chairman's Report and the Verbatim Record) suggest that this measure was designed to be permanent.
 - ¹⁶ In 2004, the IWC Scientific Committee commended the Brazilian Government for this action. See IWC 2004. Report of the Scientific Committee Section 12.2.5.
 - ¹⁷ Bryde's whales were first distinguished from sei whales from catch statistics in the 1960s but it is still unclear how many different species of Bryde's whale exist. Three species have been proposed (*Nature* 426: 278-281).
 - ¹⁸ The IWC Schedule indicates in a footnote that, "Iceland's instrument of adherence to the International Convention for the Regulation of Whaling and the Protocol to the Convention deposited on 10 October 2002 states that Iceland 'adheres to the aforesaid Convention and Protocol with a reservation with respect to paragraph 10(e) of the Schedule attached to the Convention'." The manner of Iceland's accession caused a great deal of controversy, with Iceland's conditions for membership being rejected through votes at the 2000 and 2001 IWC meetings. Iceland was eventually admitted as a member at the 5th Special meeting of the IWC that was held in Cambridge in October 2002. For more detail, see the Chair's report of the 5th Special meeting in Annual Report of the International Whaling Commission, 2003, pp. 139-148.

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- ²⁸ See for example <http://www.ifaw.org/ifaw/dimages/custom/Publications/JapanVoteBuying.pdf>, or http://whales.greenpeace.org/reports/IWC_japanese_vote_buying.PDF.
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- ³³ The term "biological sustainability" is used in the case of a single species whereas ecological sustainability is used in the case of several species or an ecosystem.
- ³⁴ Ludwig, D, Hilborn, R and C Walters. 1993. Uncertainty, resource exploitation and conservation: lessons from history. *Science* 260: 17 and 36.
- ³⁵ In contrast, the imposition of an extremely precautionary regime, such as the RMP/RMS, is intended to ensure biologically sustainable use. However, the catches obtained may be too small to be economically sustainable (i.e. in which income does not cover costs plus amortisation of the capital/hardware). This is likely to be a "normal" consequence of applying a precautionary regime to already greatly depleted resources.
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- ³⁸ Pauly, D. 1995. Anecdotes and the shifting baseline syndrome of fisheries. *Trends in Ecology and Evolution* 10(10): 430.
- ³⁹ The situation prior to the RMP (and for non-RMP related matters such as humane killing) is that whaling countries have indeed been collecting data, but they have generally kept it to themselves, submitting only analyses of it that appear to support their case, not releasing the actual data. Only when the RMP came along, did the whalers in principle stand to gain from submitting the data.
- ⁴⁰ During the development of the RMP large numbers of computer simulation trials were conducted to test the performance of the procedure relative to different management objectives (listed on p.119) in a range of hypothetical scenarios each involving different assumptions about whale population dynamics and other factors. The procedure could be adjusted to place greater emphasis on the different objectives (e.g. higher catches or reduced risk of depletion) by a process known as tuning. The Commission accepted the procedure now known as the RMP, with a tuning of 0.72. This tuning refers to the adjustments made to the procedure to achieve a median final population size after one hundred years of 72% of the assumed natural population level or carrying capacity, in a specific reference scenario that was selected for the purpose of comparing different candidate management procedures.
- ⁴¹ A summary of the Norwegian White Paper (in English) can be found at <http://odin.dep.no/archiv/fidvedlegg/01/03/marin044.pdf>; the complete version of the White Paper (in Norwegian) at <http://odin.dep.no/fid/norsk/publ/stmeld/008001-040014/index-dok000-b-n-a.html>.
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- ⁵⁰ The *UN Convention on the Law of the Sea* extends a special status to cetaceans in two respects. Most cetaceans, apart from the *Phocoenidae*, are listed as “highly migratory species” in Annex A to the Convention: Article 64 obliges states to co-operate internationally for their conservation even when their catches are within their own Exclusive Economic Zone (EEZ). Articles 65 and 120 require that, with respect to all cetaceans both within EEZs and on the high seas, states shall work through the appropriate international organizations for their conservation, management and study. These articles further authorize coastal states and international organizations to prohibit, limit or regulate exploitation of cetaceans more strictly than is required under the Convention’s general prescriptions, for living resources, which is that populations be maintained or restored at levels that provide the maximum sustainable yield. These provisions have been cited as providing legal justification for IWC measures such as the moratorium and the Southern Ocean Sanctuary, although they were not explicitly invoked in either proposal.
- ⁵¹ See <http://www.accobams.mc>. In particular, Article II indicates that, “...Parties shall prohibit and take all necessary measures to eliminate, where this is not already done, any deliberate taking of cetaceans...”.
- ⁵² See, for example, the report by the U.N. Secretary-General (E/CN.17/1996/3) to the Commission for Sustainable Development’s 4th Session which cites the creation of the Southern Ocean Sanctuary by the IWC as one of five international agreements considered to be achievements in implementing Chapter 17 of Agenda 21.
- ⁵³ De Boer, M.N., Eyre, L., Jenner, K.C.S., Jenner, M-N., Keith, S.G., McCabe, K.A., Parsons, E.C.M., Rosenbaum, H.C., Rudolph, P. and Simmonds M. 2001. Cetaceans in the Indian Ocean Sanctuary: a preliminary review. Doc. IWC SC/53/O6.
- ⁵⁴ Hoyt, E. 2001. *Whale watching 2001: Worldwide tourism numbers, expenditures, and expanding socio-economic benefits*. IFAW, Yarmouth Port, MA, USA. pp. 1-158.
- ⁵⁵ For more on this and whale watching generally, see Corkeron, Chapter 11.
- ⁵⁶ Birnie, P. 1997. Are Twentieth-Century Marine Conservation Conventions Adaptable to Twenty-First Century Goals and Principles? Parts 1 and 2. *The International Journal of Marine and Coastal Law* 12(3): 307-339.
- ⁵⁷ The Berlin Initiative on strengthening the conservation agenda of the International Whaling Commission. Annual Report of the IWC 2003, pp. 58-77.



THERE ONCE WAS A BRITON CALLED HOLT
 WHOSE STUDIES GAVE WHALERS A JOLT
 HE SAID “MSY
 IS PIE IN THE SKY
 AND IF YOU DON’T BELIEVE THAT YOU’RE A DOLT”.

WILLIAM DE LA MARE 2004