A review of live-capture and captivity of marine mammals in Canada

Prepared for:

The Department of Fisheries and Oceans, Ottawa.

By:

Jon Lien

31 March 1999

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Executive summary:

The Canadian public cares deeply about marine mammals and how well they are cared for in the wild by managers, and their welfare in captivity. The have become a symbol of mans' abuse of nature, of the health of the ocean ecosystem and a frontier for exploring the relationship between humans, animals and nature. As a practical matter the Department of Fisheries and Oceans (DFO) cannot manage marine mammals as it does fish because of this public interest and concern.

This report examines the practice of live-capture and captive maintenance of marine mammals in Canada. Many marine mammals are incidentally live-captured in fishing gear, some are captured quite commonly for clinical treatment when they are sick or injured, a few are deliberately captured for brief periods for scientific work. Very few marine mammals are captured and maintained in captivity in Canada.

Assisting marine mammals incidentally caught in fishing gear, or those that need medical help is not controversial. Such assistance is a management practice which DFO must support. For most species, and in most areas, short-term scientific captures of animals for tissue sampling, or to enable fitting of instrumentation, are also well-regarded. Such live-captures, particularly because of recently developed technologies, provide extremely useful scientific information and should be encouraged. The live-capture and holding of marine mammals in aquaria is a more difficult practice for some of the public. Although it appears that a majority of people in North America and Canada support it, that support is not without qualifications.

Absolute requirements by the public for maintenance of marine mammals in captivity is that both care and welfare of the captive animals is assured, and that there are educational and scientific benefits which result from keeping such animals. Scientific benefits of research on captive marine mammals are well recognized by marine mammalogists and much of the public. However, educational benefits from the publics' exposure to captive marine mammals are more difficult to demonstrate; lacking is a body of independent empirical studies which shows its impact. Thus, such benefits are questioned by some. More troubling is the fact that there is not adequate authority presently in Canada to regulate the quality of care which animals receive in captivity.

In the past DFO has attempted to assure adequate captive care through it's moral authority but it in fact lacks an enforcement capability for standards.

It is concluded that until the deficits which exist in the practice and regulation of captive maintenance, there should be a moratorium on captive maintenance of marine mammals in Canada. Arrangements for animals presently held should meet recommendations in this review, but new live-captures or imports should not be permitted for the time being. This moratorium is not envisioned as permeant but will provide motivation and time for all concerned to properly respond to public concerns.

To develop adequate regulations on live-captures additions are proposed to Marine Mammal Regulations under the Fisheries Act. These include authorizations for incidental entrapment assistance, clinical interventions, permits for scientific live-captures, and for export or importation of animals for breeding purposes. Permits for educational and scientific captivity would be required for live-captures or importation of marine mammals in Canada, and holding permits issued on an annual basis would be required for captive maintenance.

To assist in developing a body of information on the educational impact of exposure to captive marine mammals it is recommended that DFO encourage study to evaluate and optimize aquarium education programmes. Canada can provide world-wide leadership in this area.

Draft standards for captive maintenance of marine mammals are presented. To ensure that standards are met an assessment procedure is recommended which enlists the Canadian Council on Animal Care to oversee compliance to care and welfare standards in all facilities, and an Education Experts Advisory Committee to advise and assess educational programmes in each facility holding marine mammals. These arrangements bring transparency, independence and accountability to assessments of captive maintenance facilities and should alleviate many of the public's concerns for the animals and about the practice of keeping them.

Additional recommendations are made regarding alternative exposures to marine mammals, such as whale watching, and its regulation; permit application reviews, and the support required for leadership by DFO regarding marine mammal management.

Introduction:

The Department of Fisheries and Oceans (DFO, or the Department) asked for a review of the marine mammal live-capture programme in Canada to provide recommendations respecting its relevance to DFO's role in marine mammal management. Views on marine mammal management, public interest in this group of animals, DFO's mandate for ocean management, and technology for the study of wild marine mammals have developed rapidly in the last few years. In light of these changes, DFO wished to re-evaluate the role the live-capture and the holding of marine mammals in captivity in its management activities. Of greatest interest were live-captures which resulted in long-term captivity, particularly of whales. The direction which was given for the review was that the Minister's goal was for Canada to provide real leadership in this area; this position is stated in the Oceans Act of 1996. "Parliament wishes to reaffirm Canada's role as a world leader in oceans and marine resource management." There were no additional constraints on my review, except time; I only had three months in which to complete the study.

The terms of reference provided for the review asked for specific recommendations to the Department on the following points:

- the potential benefits of live-capture as a fishery for Canadians;
- the potential benefits of live-capture to the science and management of marine mammals in the wild;
- the potential benefits of research findings on captive animals as compared to those on wild animals;
- the standards for captive marine mammals in Canada and the welfare of the captive animals maintained under these standards;
- the views of interest groups regarding live capture;
- standards required for research use, public education to increase public support for conservation and management, and display and entertainment.

In addition, I have included several other areas in which to provide recommendations:

- the relationship of marine mammals to DFO's mandate;

- educational and awareness benefits of captive marine mammals;
- the comparative educational value of alternative exposure to marine mammals, specifically whale watching;
- the contribution of marine mammals to the attractiveness and viability of aquaria programmes.
- specific changes which are required for live-capture permits and the retention of marine mammals in Canada.

Live-captures of marine mammals in Canada occur frequently incidentally to fishing operations and, at present, are also permitted in deliberate captures for clinical treatment, research, or education. Many of these captures are very short-term; live-captures that result in long-term captivity have been infrequent. I have included consideration of all these live-captures within the scope of this review. In addition to cetaceans, I have also included seals and otters within the purview of the review.

History of live-capture and captivity:

The live-capture of cetaceans is a relatively recent phenomena in Canada and other parts of the world with most occurring in the last 50 years. A total of eight species of cetaceans have been live-captured and/or captive in Canada including orca *(Orcinus orca)*, beluga *(Delphinapterus leucas)*, narwhal *(Monodon monoceros)*, harbour porpoise (*Phocoena phocoena)*, white-beaked dolphin *(Lagenorhynchus albirostris)*, Pacific white-sided dolphins *(Lagenorhynchus obliquidens)*, Dall's porpoise *(Phocoenoides dalli)* and bottlenose dolphins *(Tursiops truncatus)* (Baird 1992). Most captures have been of beluga or orca.

The capture programme for orca began in west coast Canadian waters in 1964 (Newman and McGeer 1966), and expanded quickly (Bigg and Wolman 1975; Reeves and Leatherwood 1984, Hoyt 1992). A total of 25 orca were collected in Canada off the British Columbia coast (Hoyt 1992). Others were captured in northwestern U.S. waters (Asper and Cornell 1977). Still other orca have been imported from Iceland.

Beluga were first live-captured in the St. Lawrence River in fairly small numbers. Between the 1800s and 1965, when the last capture occurred, some 30 animals were

taken (Reeves and Leatherwood 1984). The first belugas known to be held captive in Canada in 1967 came from an incidental capture in Alaska. They were held at the Vancouver Aquarium for 9 and 13 years respectively (Cowan 1992).

Initially DFO developed a live-capture programme for belugas in 1967 to "promote public understanding and support for the management and conservation of Arctic cetaceans through education and public awareness". A total of 68 beluga have been captured in the Churchill River estuary area from 1967-1992.

Beluga whale captures for export from Canada were banned in 1992; there has been a ban on all captures of killer whales since 1975 (Cowan 1992). Permits were given for the live-capture of ice-entrapped white-beaked dolphins in 1983 for display in Mystic Aquarium (Buck and Spottee 1986). There were efforts to capture narwhal as late as 1987 (Goodman 1988). There has been no live-capture of cetaceans for captive maintenance in Canada since 1992 (Cowan 1992).

Other short-term captures of cetaceans may have occurred for scientific or clinical reasons but records are difficult to obtain. Short-term live-captures in which whales or seals were fitted with telemetry and released shortly after in the same location have continued since that time (Richard *et al.* 1998; Heide-Jorgensen *et al.* 1998; Richard *et al.* 1997; Stenson *et al.* 1998). Seal and otter live-captures also have been permitted with some animals maintained in captivity, but these records are difficult to find. At present records of applications for live-captures of marine mammals and results of live-capture efforts are difficult to obtain from Regional DFO offices, or from DFO in Ottawa. There does not appear to be a systematic inventory of permit applications, their disposal, or results of any captures which were made. There is one exception to this; belugas live-captured for captive maintenance have been carefully followed (Moshenko 1992; 1999).

Inventory of marine mammals in captivity in Canada:

There are a total of 13 facilities that presently, at least part-time, hold captive marine mammals in Canada. In total 24 sea lions, 36 seals, 3 otters and 17 whales are maintained in captivity. Listing of facilities and animals held is presented in Table 1.

Table 1: An inventory of marine mammals maintained in captivity in Canada.

Facility	Species	n/sex	Source
Valley Zoo Edmonton, Alberta	Calif. sea lions	3 females	2 captured in Peru 19 yrs old born in captivity; 8.5 yrs.old.
Canada's Wonderland Niagra Falls, Ontario	Calif. sea lions	?	Rented seasonally from Marine Animal Prod., Biloxi, Miss.
Grandby Zoo Grandby Que.	grey seal	1 male 2 female	1 born here; 1 from Guelph U; 1 from Marineland.
Huntsman Marine Science St. Andrew's, N.B.	(Animals are received from Shippagan Aquarium and maintained there during summer months.)		
Marineland Niagra Falls, Ontario	orca bottlenose dolphin grey seal hbr. seal Calif. sea lion	7 1 2 1 16	No additional information received.
Zoo de Saint-Felicien	grey seal	1 male 1 female	Born in captivity in 1986 Born in captivity in 1984

Table 1: (continued)

Bioparc de la Gaspesie Bonaventure, Quebec	**hbr.seal**	**1 male**	**Born in captivity, 2 yrs old.**
		1 female	Born in P.E.I., 15 yr old
		1 female	Born in captivity, 5 yrs.old.
		1 female	Born in captivity, 1 year old.
Ocean Sciences Centre St. John's, Nfld.	harp seal	1 male	In captivity for 10 years
		l male	Born in captivity
		l female	In captivity for 10 years
	hbr.seal	l male	In captivity for 10+
Provincial Wildlife Park Subernacadie, N.S. Dalhousie U.	hbr. seal	2	l born in park 20 yrs.ago; l obtained from in 1998.
Quebec City Aquarium Quebec City, Quebec	hbr.seal	l female	Caught wild in 1969 birthed 15 pups at aquarium
		6 females	Born 1990;1991;1996; 1998
	hood seal	l male	Captured 1983
		l female	Transfer from Biodome in 1994.
	grey seal	2 females	Captive born 1984;1985.
Shippigan Aquarium and Marine Ctr., Shippigan, N.S.	hbr.seal	l female	25 yrs old,
		l male	15 yrs old, captured 1984
		l female	born at aquarium in 1996
		l female	born at aquarium in 1998

Table 1 (continued)

Vancouver Public Aquarium Vancouver, B.C.	orca	1 female	23 yr +, captured in Iceland
	beluga	1 male	Captured in Churchill
		3 females	Captured in Churchill 11, 15, 28 yrs. old
		1 female	Born at VA, 3 yrs old
	Pacific wt.-sided sea otter	1 female	Captured in Calif. 33 yrs. old
		2 males	Captive born, 9 & 16 yr.
		1 female	Captured Valdez Alaska, 10 yrs. old
	Steller sea lion	3 males	Captured in Scott Is 5, 1, 1 yrs. old
		2 females	Captured in Scott Is.: Both 1 yr old.
	hbr. seal	2 females	Clinical captures in B.C.; 1 & 2 yr. old.
		1 male	1 yr. old
West Edmonton Mall Edmonton, Alberta	Bottlenose dolphin	2 males 2 females	Wild captured; Obtained from Dolphin Research Ctr. in Florida in 1985.

There are 116 facilities in the United States that maintain marine mammals; these contain some 1,429 animals (APHIS 1999). Of this number only 443 are cetaceans, 812 are pinnipeds, 29 sirenians, 21 mustlids and 111 are polar bears. The Atlantic bottlenose dolphin, harbour seals (*Phoca vitulina)*, California sea lions (*Zalophus*

californianus) and polar bears (Ursus maritimus) are the predominate varieties and account for 74% of the total captive marine mammal population (APHIS 1999).

It is important to keep the extent of captive maintenance of marine mammals and the number of animals actually involved in perspective.

Incidental live-captures of marine mammals in fishing gear:

By far the vast majorities of live-captures of marine mammals in Canada occur incidentally to fishing operations; these number in the thousands each year. Such incidental live-captures of marine mammals occur world-wide and are often the major anthropogenic mortality factor in many populations.

In the eastern tropical Pacific it is estimated that some six million dolphins have been captured and killed in the tuna purse seine fishery (Hofman 1990; Joseph 1994). Such captures have been reduced, but as late as 1992 still totalled 15,539 dolphins per year (Joseph 1994). Some 15,000 Dall's Porpoise were taken from the north Pacific in the salmon drift-net fishery (Hofman 1990). California set net fisheries between the mid-1980's and 1994 caught 2,000-4,000 California sea lions per year and harbour seals at a rate between 500-2,000 per year. Harbour porpoise populations were estimated to be reduced by one-half by such incidental catches (Barlow *et. al. 1994)*. Atlantic fisheries similarly have high levels of incidental captures (Waring *et al. 1990*). Perrin *et al.*(1994) provide an excellent summary of the extent of the live-capture of cetaceans world-wide in passive fishing gear. Incidental captures of smaller cetaceans especially is clearly the greatest threat they presently face.

In Canada, large baleen whales and a variety of dolphin and porpoise species are captured; incidental captures of harp (*phoca groenlandia)* and harbour seals are extremely common. In the British Columbia driftnet fishery for salmon, harbour porpoise, Dall's porpoise, Pacific white-sided dolphins, killer whales, gray whales (*Eschrichtius robustus)* and humpback whales (*Megaptera novaeangliae)* are caught (Barlow *et al.* 1994). Baird *et al. (1990)* has estimated that estimate that some ll gray whales are caught each year in British Columbia. Incidental captures of marine mammals occur as well in Arctic waters of Canada (Lien, MUN, pers. observation). In the Atlantic, Lien (1994) documented that about 80 large whales were incidentally

caught on average each year between 1979-1990. The capture of harbour porpoise and harp seals in fixed net fisheries in Newfoundland and Labrador is exceptionally high, numbering in the thousands each year (Lien *et al.* 1994). Fontaine *et al.* (1994) estimate that some 1,900 harbour porpoises a year are incidentally caught in Quebec waters of the Gulf of St. Lawrence. Additional catches of harbour porpoise occur in the Bay of Fundy (Gaskin 1994; Tripple *et al.* 1996; Richter 1998).

The magnitude of incidental live-capture in fishing gear is a far greater problem for wild populations of marine mammals than is the deliberate live-captures which occur for scientific study, or for animals that are removed from the wild and maintained in captivity. While deliberate live-captures would be extremely unlikely to even minimally impact wild populations, the incidental live-capture of marine mammals is significant both for welfare and conservation reasons.

Some sort of numerical weighting must be used in the management of wildlife by responsible agencies. The deliberate live-capture and live-capture for captive maintenance of marine mammals is a tiny fraction of all live-captures which occur. Incidental captures of marine mammals in fishing gear in some cases represent serious threats to the conservation of wild populations. Typically all of these seriously impact on the welfare of individuals involved. The magnitude of concern and importance the public places on deliberate live-captures and captive maintenance of marine mammals is far out of scale to any conservation or welfare impact of the practice. I believe that comes from repeated, close exposure to captives, knowing captive animals personally and as individuals, and resulting concern for the welfare of known individuals.

Methodology for this review:

Public Views: To solicit public views on live-capture and captivity notices were placed on electronic bulletin boards, including MARMAM, Scuttlebutt (National Marine Education Association), and AQUARIA. Letters were sent to individuals in Canada who had professional or personal interests in the issue (N = 42), interested groups (N=32), and to aquaria directors throughout North America (N=21). DFO agreed that I could solicit the opinions of some of their scientists and managers who either used live-captures of marine mammals in their research, or managed applications

for such activities. Samples of these letters are provided in Appendix I (Vol. 1). Lists of individuals and groups contacted are provided in Appendix II (Vol. 1).

In contacting individuals and groups an invitation was extended to provide a brief which could be included in the Appendix to this report. Each was requested to provide specific permission for including the brief in the report. Initial contacts with individuals and groups were often followed up with further discussions. Briefs submitted are provided in the Appendix III (Vol. 1-5).

An interview was held with several national newspapers to indicate the review was underway and to indicate interest in considering public comment on issues involved in live-capture and captivity of marine mammals.

With many individuals I followed up on initial contacts which occurred by e-mail with discussions regarding their views, or to solicit additional information. The electronic discussions in quite a number of instances helped me better understand concerns and values, and how individuals holding them evaluated the captive animal's situation, or individuals that held other opinions.

Consultations were arranged in Ottawa (22-26 January), Winnipeg (1-3 February) and Vancouver (4-l0 February), Niagra Falls (Feb 25-26), Toronto (February 27) and again in Ottawa (March 1-3) to meet with interested individuals and groups. Much of the time in these consultations was spent with individuals who were of particular importance in evaluating live-capture issues and reviewing recommendations.

DFO: DFO provided its in-house records and information on live-capture of marine mammals. Previous contract reports were provided (Baird 1992) as were previous reviews (Cowan 1992) (Appendix IV; Vol. 6). Additional information as a result of discussions on live-capture held by the Advisory Committee on Marine Mammals was solicited from Ian McTaggert Cowan (ex-Chair) and Dan Goodman (ex. DFO Marine Mammal Advisor). To further understand previous practices for live-capture of belugas, interviews were held with Robert Moshenko who managed the live-capture programme for DFO-Central and Arctic Region before his retirement.

Live-capture in other countries: To determine practices and standards in other countries, particularly the U.S., phone discussions were held with John Twiss and Bob Hoffman of the U.S. Marine Mammal Commission, Kevin Chu and Art Jeffers of NOAAs National Marine Fisheries Service, Terri Rowles of the Plant and Animal Health Inspection Service of the U.S. Department of Agriculture. Michael Woodford provided information on the I.U.C.N. policy on live-capture. Cam Elliott discussed the Province of Manitoba's policies on facility standards for receipt of live-captured polar bears. Margaret Kilinoska and Peter Barrett provided documents and helpful discussion regarding reviews and policies in the England; Neil Gribble assisted me with the Australian reviews. I have included reports, briefs or proceedings of interest in Appendix V-VI (Vol. 7-9).

Regulations and standards for captivity in Canada: Discussions were held with the Canadian Council on Animal Care, the Department of Agriculture Health of Animals group, the Department of Justice, Environment Canada, and provincial authorities. The Welfare Committee of the Canadian Veterinary Medicine Association (CVMA) provided assistance in developing draft standards for captive maintenance based on standards from CAZPA (CAZPA 1995) and USDA marine mammal regulations (APHIS 1992; 1999).

Literature searches: Searches of current contents were made on Unicorn using live-capture of marine mammals, marine mammal captivity, captive cetaceans, captive whales, captive seals, captive pinnipeds. Searches were also made on informal education, values education, animal rights, animal welfare, educational evaluation and the like. Searches for relevant literature were also made using the Internet database of Aquatic Sciences and Fisheries Abstracts, ERIC, Biological Abstracts, Psychological Abstracts. In addition, contacts with individuals and groups solicited relevant reports in grey literature, or unpublished studies that were relevant. A bibliography of literature consulted during the review is presented. Although I consulted the listed publications I have not used them all, or uniformly, in finally forming my ideas. At the end of my study I was left with the unpalatable feeling that the wisdom required for this review had not adequately been yet expressed in published words, or existed only in grey literature which eluded me.

The Fisheries and Oceans Mandate:

The Department of Fisheries and Oceans has the vision of being a world leader in oceans and aquatic resources management. It "is responsible for policies and programmes in support of Canada's economic, ecological and scientific interests in the ocean...; for the conservation and sustainable utilization of Canada's fisheries resources...; and for safe, effective and environmentally sound marine services responsive to the needs of Canadians..." (DFO 1998). "Canada promotes the understanding of oceans, ocean processes, marine resources and marine ecosystems to foster sustainable development". Further, it "recognizes that the oceans and their resources offer significant opportunities for economic diversification " (The Oceans Act 1996). In meeting this mandate the Department gathers, analyses and coordinates information, provides communications to the marine community and the public at large, develops integrated management plans, and manages and protects ocean resources. To achieve these goals Canada's citizens will need to understand, appreciate and accept the environmental value of the marine environment, and support DFO's actions in managing it. DFO's mandate is fullfilled by gaining support for its activities, and compliance with necessary regulations. A major strategy is to "enlist ocean stakeholders to assist in the Department's programmes and increase their responsibility and accountability"(DFO 1997).

DFO manages people, not fish or oceans. An aware public, that cares about oceans and their inhabitants, and is knowledgable about requirements to conserve and protect them is, therefore, a critical component of the management process. The public must understand the need for management initiatives and, ultimately, support them.

Marine mammals are of passionate interest to much of the Canadian public who care deeply about their conservation and welfare. They have become a symbol of mans' abuse of nature, of the health of the ocean ecosystem and a frontier for exploring the relationship between humans, animals and nature. Their existence in a landscape being exploited and rapidly changed by humans is seen as the epoic challenge of modern conservation (Lien 1992). This group of animals provides DFO with a natural point of contact with most of the Canadian public.

The popularity of marine mammals means DFO cannot manage marine mammals as it does fish. The public strongly supports scientific and management programmes for all marine mammal species, including those designated as "non-commercial" species. They want their passion for the animals expressed in government action and high quality management. There are no alternative management or regulatory agencies that can fill this mandate. The Department should in its policies and programmes recognize this basic reality. The reputation of DFO with the Canadian public will depend more on their activities with this groups of animals than all others. Marine mammals represent an unequalled opportunity for DFO to communicate with the Canadian public, whether the Department wants it, or not. Marine mammal popularity is both a responsibility and an opportunity for the Department.

Attitudes toward wildlife and animal use:

Views toward the live-capture and captive maintenance of marine mammals are an intensely focussed example of an evolving general attitude toward wildlife.

Croke (1997) in her study of zoos concludes "The zoo is not a window on nature but rather a prism that bends the light according to the culture it is set in." While cultures have frequently felt that humans are inexorably linked with other creatures by common consciousness or spiritual ties, cultures have still used these species as symbols, as teachers, for food, clothing or work . The concept that all life is sacred did not necessarily inhibit usage, but controlled the respect with which it was conducted (McLuhan 1994). Respect and care for animals does not typically mean that we don't use them for our own purposes. While our right to such use may be questioned, our need is not. These needs change with the times.

The dominant commercial urban culture that now envelopes the globe views the natural world as resource. In North America this commercial value of wildlife is generally recognized and many place it in a marketplace category (ecotourism, wildlife related consumption). But the very distance of modern humans from nature appears to have created a separation anxiety which is in the process of resolving itself with markedly changed attitudes (Singer 1975; Wilson 1984; Kellert 1996). Our culture has many kinds of values including moral, religious, aesthetic, political, legal, scientific,

educational, social, historical, etc. Wildlife, properly valued, uses all these domains of value; it is impossible to adequately value it if one insists that wildlife values must be restricted to only particular category (Rolston 1994). An emerging property of animals in the modern world is that they are valued in many ways.

Marine mammals, in particular, have been at the frontier of emerging wildlife valuation in the developed world. Ellis (1991) describes whales as myths and deities that became commodities, and now, once again, have become myths. "Consolidating all its various species into a single symbol, we have now elevated one animal to near-devine status. The people who accomplished this elevation did it unwittingly, not with the idea of creating a new mythology but for rather practical reasons. In the new religion of environmental conservation we have elected the whale as our flag-bearer, the symbol of everything that is wrong - or right - with our planet" (Ellis 1991).

Attitudes toward animals, and marine mammals specifically, are complex however. Kellert (1984; 1996) examined American attitudes toward wildlife and established a topology of complex traits. Attitudes toward animals and the environment include clusters of beliefs which Kellert identifies as: naturalistic, ecological, humanistic, moralistic, scientific, aesthetic, utilitarian, doministic, and negative views (Kellert 1984). While it is common to label individuals on single, stereotyped dimensions as conservationists, scientists or consumers in relation to wildlife, Kellert's topology, at the very least, makes us aware of the diversity of values and attitudes possible toward animals.

Use, and the welfare of animals:

Wildlife generally is of great importance to North Americans. Environment Canada has been conducting survey studies on the importance of wildlife to Canadians since 1981 (Fillion *et al.* 1985; Fillion *et al.* 1993; F.L.Fillion pers. comm. 1999). These studies have consistently shown a very high level of wildlife-related activities in Canada with 85-90% of the population involved. Non-consumptive wildlife activities are three times as common as consumptive interactions and have been steadily increasing through the 1980's and 1990's. Watching wildlife in zoos and aquaria has been an increasing part of this trend.

Canadians (86%) are very concerned that abundant wildlife is protected and that declining or endangered wildlife is preserved (83%). They are willing to pay extra for products (60%) if it protects animals and habitat. Many called on government to pursue proactive policies which increase conservation efforts and environmental legislation, and foster environmental education both for schools and society at large (Fillion *et al.* 1993). There are important cultural differences however even across Canada and these are seen clearly in wildlife activities. In 1991 British Columbia recorded the highest rate of participation in non-consumptive wildlife activities; Atlantic Provinces had the lowest participation rate (Fillion *et al.*1993).

North Americans are not just interested in wildlife and conserving them; they are increasingly concerned about the treatment and use of animals. In 1989 a survey of American adults showed that the public is significantly more sensitive about the use of relatively small numbers of animals used in research than they are about killing much larger numbers of animals for food (Animal Policy Report 1995). In the U.S. about 15-20% of the public would like to see all animal use in research and testing stopped. At the same time 85% of Americans believe its is acceptable to kill animals for food. In the same survey 66% of the public believed it was acceptable to capture animals for zoos and aquaria and 63% supported animal performances. But 74% of Americans were strongly concerned about how zoos, aquariums, and animal parks treat their captive animals (Roper 1992). Even children share these attitudes.

Support for research on animals is complex; only 11-12% oppose use of animals in cancer research, but 60% oppose their use in cosmetics research (Animal Policy Report 1995). It is important to note that views in this area have been changing rapidly. When asked in 1988 if research on dogs and chimpanzees which causes pain should be allowed, 63% agreed/strongly agreed, in 1988 53% agreed/strongly agreed, in 1990 50% agreed/strongly agreed and in 1993 53% agreed/strongly agreed (Animal Policy Report 1995). A more recent review of use of animals in medical research perhaps indicates more changes are to come (Barnard and Kaufman 1997). Shifts in the publics' views toward specific uses of animals follows larger trends in views toward animals generally and our relationship with them (Carson 1972; Hoage 1989; Bostock 1993; Norton *et al.* 1994, Croke 1997; Honey 1999). An excellent recent review of these changes is that of Lauerman (1999).

Animal welfare concerns applied to research using wild, non-domesticated, animals generally limit legitimate research to studies which contribute directly to conservation and welfare of the species, or related species (Mayer 1998). But often, as basic research questions end providing the most important scientific answers and applications, this requirement must be cautiously interpreted. Some, such as Mayer (1998) and Barnard & Kaufman (1997) argue that information gained from captive wild animals is typically misleading, unnecessary or unhelpful. The balance of scientific and informed opinion evaluates such research as necessary and useful, but supports careful controls and standards on all captive animal research. (Anon. 1984; 1995).

Publication of Singer's (1975) book on animal rights is often cited as the time animal welfare emerged into public consciousness. Singer pointed out that we have good reason to believe animals have memory, sensitivity and emotions, but rights for humans are not granted based on traits such as intelligence or ability to function. Rather, human rights are granted to all equally to optimize individual welfare. Consequently animals, like humans, have the right to maximize their welfare. A parliamentary sub-committee in New Zealand is currently debating legislation which would, for the first time, confer some basic legal rights on chimpanzees and other great apes (Chandler 1999)."You can't say that animals are different enough from people so that it's acceptable to experiment on them, but enough like people so that the results of experiments are valid" (Zupko in Lauerman 1999).

Debates on the use of animals in science have raged for the past several decades. Public concern has continued to grow (Jasper & Nelkin 1992). The current legislation to insure animal welfare under review by the Canadian Department of Justice has received an overwhelming response from the public supporting stronger legislation (Anderssen 1999).

A clear consensus is that if animals are used they must be treated optimally. "All of us recognize that, whether we're doing research on animals or not, we recognize that this is something that is not optimal. If society didn't feel that we needed the information, we wouldn't do research on animals. But society feels we do, and so do scientists. There's a tension between our concern about causing pain and distress, and killing animals, and our need for new knowledge. We're engaged in encouraging people to make animal welfare a higher priority without compromising their ability to

gather information. We contact animal care and use committees and ask them to work with us to identify techniques that cause pain and distress and figure out ways to eliminate that in research" (Rowen in Lauerman 1999). Use of animals entails the responsibility to insure their welfare and minimize all costs to the animal, in so far as possible. Some uses may not deemed acceptable by society.

Animal welfare: Much attention has been given to the task of providing adequate facilities and care for captive marine mammals. Proper husbandry of all captive and domestic animals has come to include all requirements for the animals welfare. Animal welfare is described as (Olfert *et al.* 1993):

- "an animal's state as regards its attempts to cope with its environment (Broom 1988);
- maintaining appropriate standards of accommodation, feeding and general care, the prevention and treatment of disease (Blood and Studdert 1988);
- all aspects of animal well-being, including proper housing, management, nutrition, disease prevention and treatment, responsible care, humane handling, and when necessary humane euthanasia (AVMA 1990);
- both the physical and psychological well-being of animals (Fraser 1989);
- a state or condition of physical and psychological harmony between the organism and its surroundings (Hurnik 1988);
- the absence of stress (RSPCA 1992);
- dignity-according to animals the natural dignity which is due them as living sentient creatures (Hollands 1980)."

Any recent conception of the welfare of captive marine mammals includes the requirements of freedom from stress, considerations of pool acoustics, recognition of the animal's typical social conditions and inclusion of elements of the animal's natural environment into its maintenance. It is difficult to assure this with any agreed upon set of minimum standards; once set, standards become the norm. Standards are limited by understanding of the animals needs and by lack of information. Limitations in the development of technology and techniques also inhibit the practical implementation of welfare standards. Clinical disciplines have adopted the "best care practice" standards to overcome this. Use of a best practices as judged by relevant experts as a standard incorporates new information and developments regarding welfare into animal

husbandry applications in a timely manner and avoids the difficulty where minimum standards become the rule (J. Wong, CCAC, pers.com.).

Complaints of inadequate welfare for captive marine mammals have been reasonably common. Part, but not all, of this concern has been fueled by mortality in early captives. Klinowska and Brown (1986) note that stereotyped behaviour in captive dolphins is common (Pilleri 1983). This is abnormal behaviour typically interpreted as the result of stress and boredom (Hediger 1950; 1958; Fox 1968). Almost all instances of early captive maintenance efforts isolated animals; most captive facilities still do not permit adequate social housing (Cowan 1992; Hoyt 1992). And almost all facilities cannot incorporate natural elements within pool facilities. Efforts to provide environmental diversity for captive marine mammals by enrichment techniques is really just beginning. All of these commonly referenced problems cause concern about the welfare of captive marine mammals.

Attitudes toward marine mammals and their use:

There are primarily anecdotal descriptions of human attitudes and attachments to marine mammals but surveys also often find whales and seals are the most favoured wildlife (Walter and Lien 1985). Whales are perceived as intelligent, highly social and "like us". They are the favourite animal group of North Americans (Lien and Walter 1985; Lien and Atkinson 1988). Seals are cute, and not far behind (Walters and Lien 1985; Henke 1985).

Tilt (1986) conducted a survey (n =310) of knowledge and attitudes in relation to whale watching in California which included perceptual, attitude and knowledge statements. Generally individuals were well informed on the impact of whaling on the gray whale but did less well on biology of the animals. Whale watchers (70%) typically had visited marine parks or oceanariums one or more times. Participants in the survey were strongly opposed to whaling (74%) but supported captivity of whales for research and education. Eighty-six percent judged that seeing a whale in the wild was one of their greatest outdoor experiences; 88% wanted to touch a whale. Interest in the animals and seeing them may be accompanied with activism; 59% of the whale watchers surveyed indicated that they were willing to devote time to whale protection

activities. Tilt's (1986) findings on attitudes resulting from whale watching are presented in Table 2.

Scoring of whale watchers varied on Kellert's (1984) attitude topology. Most individuals scored in naturalistic (76%), moralistic (63%), scientific (38%), humanistic (31%) or utilitarian (30%) attitudinal categories. About 80% of individuals that participated in whale watching believed it had minimal effects on the animal.

Table 2: Responses to value statements about the whale watching experience (Tilt 1986).

Statement	% strongly/moderately agree
Whale watching is one of the most fantastic wildlife experience that I have ever had.	75
Seeing whales on a whale watch convinced me that they are beautiful and graceful creatures.	88
The experience of actually seeing whales in the wild greatly increased my support and commitment to the cause of whale conservation.	83

In 1989 DFO contracted Angus Reid Associates, Inc. to conduct a survey of Canadian public opinion (n =1500) on live-capture of white whales. Findings of this report are summarized in Table 3. People supported maintenance of cetaceans in captivity and found this contact with the animals interesting and educational.

Table 3: Results of the 1989 Angus Reid survey of Canadian public opinion on live-capture of white whales.

Statement	**% strongly/moderately positive(range/province)**
Visited a marine park.	67 (49-94)
Visit to aquaria was 'educational'.	80 (74-89)
The visit was interesting.	93 (90-96)
The visit was exciting.	81
Support for live-capture for educational viewing.	71
Support for live-capture for research.	75

A similar survey was conducted of 1,200 Canadians in 1992 by Decima Research. These results are presented in Table 4. Results indicated that 71% of Canadians have visited a marine park or public aquarium. People supported keeping white whales in captivity, but not orca. They felt that standards should govern captive care of the animals and that the government was most likely responsible for these.

Results in the Decima (1992) survey reflect the importance of individual differences in views toward the animals and their use. British Columbians are much more likely to have visited an aquarium, as are wealthier and better educated individuals. Generally, support for keeping whales in captivity was similar to the Roper (1999) poll.

In August, 1991 the Vancouver Aquarium surveyed randomly selected individuals from the general public (n = 400), 200 visitors to the aquarium (n = 200) and 100 aquarium members (n = 100). Overall 70% supported the presence of killer

whales and other cetaceans at the aquarium; support was higher among visitors (88%) and members (91%) (VA 1992).

Table 4: Decima Research (1992) on Canadian public opinion on marine parks and the capture and holding of whales for entertainment, public viewing and research.

Statement	% agree
Visit to marine park was interesting.	96
Visit to marine park was educational.	83
Visit to marine park was exciting.	59
Support keeping beluga whales in captivity for education.	72
Support keeping beluga whales in captivity for research.	78
Support keeping beluga whales in captivity for public viewing.	61
Support keeping orca in captivity for public viewing.	39
There should be standards governing holding and care of whales.	95
The government should be responsible for standards.	48

B.C. residents (49%) reported that the main priority of the Vancouver Aquarium was education; others (33%) felt it was recreation in the 1991 survey. But these percentages were reversed less than one year later in 1992. About half of the individuals surveyed in 1992 believed that cetaceans had shorter life spans in captivity and only a narrow majority (53%) still favoured the keeping of cetaceans in captivity. This was a drop from previous survey results in 1991 when 61% of the public supported

captivity of whales (VA 1992a, 1992b;1992c; 1996; Poyser 1992). In the intervening period the Aquarium had lost a newborn orca calf. In general support for captivity of whales in British Columbia was lower than that in the rest of the country

In 1996 the Vancouver Aquarium commissioned MarkTrend to survey 803 individuals; 47% of those interviewed felt killer whales were the most important aquarium residents; 20% mentioned beluga whales. The Aquarium estimated that if orca were removed from the Aquarium they would have a loss of 18% in visitor attendance; if both orca and beluga were removed the drop would be 28% (VA 1996).

Kellert (1991) conducted surveys of Canadian perceptions of marine mammal conservation and management. A summary of the findings of this survey are found in Table 5. The Canadian public was very protective of marine mammals generally. Highly significant differences were found between the public and views held by sealers and fishers.

Sea World commissioned the Roper Organization in 1992 to survey public attitudes toward aquariums, animal theme parks and zoos (Roper 1992). A total of 1,987 interviews of a nationally representative cross-sectional sample of adults were surveyed. Forty percent of Americans say they have visited an aquarium, animal theme park or zoo in the past year. Those interviewed (80%) were very protective toward animals and were concerned about wildlife. Nearly three-quarters are concerned about the way that animals are treated in captive facilities. Aquariums and oceanariums are seen as important facilities in which to learn about animals and develop concern for wildlife(76%). Aquaria are also seen as useful as clinical facilities for injured or sick wild marine mammals (88%), and as breeding centres for endangered wildlife (85%). The staff of captivity facilities are viewed as genuinely caring for the animals and knowledgable about their care (Roper 1992). Roper (1995) polls conducted later report similar findings.

A survey in 1998 interviewed people as they left four aquaria that exhibited marine mammals (Roper-Starch 1998). In this survey, 97% of people indicated that live captive marine mammals effected their appreciation and knowledge of the animals. Ninety-six percent believe that seeing live animals was the best way to understand and learn about them. Seeing marine mammals in captivity (27%) was a more favoured way

of encountering the animals compared to seeing the animals in the wild (15%). Thirty-eight percent of people believed that TV, books, videos or preserved animals displays were the most valuable educational tools. The survey found that 33% of visitors would take some form of environmental action as a result of their aquarium visit. Reports on what was learned as a result of the visit is presented in Table 6.

Table 5: Findings in a study of Canadian perceptions of marine mammal conservation and management (Kellert 1991). Survey results presented are for the general public.

Statement	% strongly/moderately agree
I may never see a whale/seal, but it is important to know they exist in the north Atlantic.	94
I'm proud to live in a country that restored whales and seals to previous abundance.	92
I'm opposed to capturing marine mammals for aquariums or zoos unless no harm is done and this results in measurable educational benefits.	79
The Atlantic seal hunt should be allowed if no other employment opportunities for fishers during the season of the hunt.	49
I approve of the harvesting of seals for:	
meat	64
fur	39
net damage	43
improve economy	66
native culture	73
I oppose whale hunting under any circumstance.	64
I would be far more likely to visit Nfld./Lab. if I knew I could see seals or whales.	57

Table 6: Findings of a 1998 survey of people following visits to aquaria that kept marine mammals (Roper Starch 1998).

What visitors said they learned about:	Percentage
Marine mammal behaviour	86
What marine mammals eat	83
The marine mammal's natural habitat	81
Marine mammal anatomy	78
Dangers facing marine mammals in the wild	73
The impact of pollution on marine mammals	71
Ways that you can help wild marine mammals and/or their habitats	65
Research concerning marine mammals	63
Medical treatments of injured or sick marine mammals	54

The reality of public feelings about captive maintenance of marine mammals is that people are voting with their feet. Percentages of the general public n North America visitation that have visited an aquaria are extremely high. Additionally, these visits are a direct outcome of the display of marine mammals, especially cetaceans. The Vancouver Aquarium has, based on surveys, determined that their visitations would decrease by 28% if the aquarium held no cetaceans (VA 1996). The difference cetaceans make to aquarium programmes is perhaps illustrated by the economic circumstances of three Canadian facilities: the Vancouver Aquarium is a non-profit

institution that successfully fills its own operating budget; Marineland is a profitable private venture. Both of these facilities include whales in their programmes. The Montreal Biodome is a public institution that requires substantial yearly contributions from government; it does not keep whales.

Public attitudes toward captivity:

Initial captures of marine mammals were cruel and poorly controlled (Baird 1992; Hoyt 1990; Reeves and Mitchell 1984; Reeves and Leatherwood 1984; Newman and McGeer 1966; Newman 1994) and without clear scientific or educational objectives. As experience was gained in both capture techniques (Jack Orr, DFO, personal communication; G. Ellis, DFO, personal communication) and captivity (Cowan 1992), procedures became more humane and were designed to cause less stress on animals captured and their home groups. Because of extensive telemetry monitoring following capture and release, it is known that capture *per se* does not appear to impact the animals later behaviour in the wild, or that of its social group.

The era in which captive display of whales and dolphins became popular, discoveries of their trainability in captivity were made, and substantial numbers of the public were exposed to captive animals came during the same time that the public in North America recognized that wild cetaceans had been depleted by whaling and had been seriously abused by human practices (Cowan 1992). The Advisory Committee on Marine Mammals (Cowan 1992) in the last review of live-capture in Canada concluded that "there is no doubt that public appreciation of the lives of whales in general increased many fold through their contact with living whales in an aquarium setting. Then too the research opportunities the aquarium cetaceans presented to animal scientists were quickly seized upon.... These early captives played a major role in the growing cult of the whale that led directly to important changes in the commercial killing of whales world-wide and, in 1982, resulted in the adoption of a ten year moratorium on the commercial killing of the 'great' whales." (Cowan 1992).

Information and stories on wild whales (Lilly 1978; McIntyre 1974) and studies of captive animals (Lilly 1978; O'Barry 1989) began to emphasize the animals sensitivities, consciousness and their emotional and intellectual lives. Campaigns by

Non-governmental organizations (NGOs) regarding marine mammals gradually developed mixed messages of conservation, rights and welfare (Henke 1985; Herscovici 1985; Dale 1996). Ellis (1991; 1994) has described how whales initially were mythologised as sea monsters dwelling on the frontier of knowledge, objects of intense interest and speculation. Then, as information grew, they became objects of more realistic curiosity and study, only to remerge in modern mythology as charismatic megafauna again inhabiting a frontier of explorations into animal consciousness, and human relations with animals, and nature.

Early public display of captive marine mammals, especially whales, may have been an important event in popularizing marine mammals. Interest in marine mammals, especially cetaceans, extends far beyond the importance of this group of animals in the ocean ecosystem, or in present management concerns. These are totem species who now hold symbolic significance for the public.

Views of the value and acceptability of maintaining whales in captivity have changed for some since the time of the last Canadian review of live-capture (Cowan 1992; VA 1996). The Australian Senate Select Committee that investigated captivity of cetaceans exhibited such a change of heart. They acknowledged "the past contribution made by oceanaria in raising awareness and advancing knowledge about cetacea" but concluded that "cetacea in captivity have suffered stress, behavioural abnormalities, high mortalities, decreased longevity and breeding problems" and were "of the opinion that cetacea generally have paid a high price for the dubious advantages of captivity" (Anon. 1985). Others have similarly changed their views on the costs and benefits of captive maintenance (Spong 1991; O'Barry 1989; Obee 1992).

Attitudes today remain diverse. Captive maintenance of marine mammals, especially cetaceans, is a controversial, emotional topic. There are data relevant to evaluating the costs and benefits of captivity, but for many, views on captivity are based in deeply-held values and views of animals where empirical outcomes are fundamentally irrelevant. One must accept and respect such values. However, it is not appropriate to base policy on views and values of only one segment of the public or another. Policy must be sensitive to the range of such views and their implications. But public policy decisions regarding the acceptability of live-capture and captive

maintenance of marine mammals must be based on empirical assessments of the costs and benefits of such activities.

Some NGO's represent individuals believe that captivity is morally and ethically wrong (eg No Whales in Captivity). Although they may use empirical arguments at times, no information on the benefits or costs of captivity are really relevant. Other groups believe that maintenance of captive marine mammals is wrong because of the commercial motivation behind it (IFAW) or that the performance and entertainment use of animals is inappropriate (Davis 1997). Other groups judge captivity on the cost and benefits such a practice involves. Hence, some reject captivity for certain species, such as orca or practices such as performances. Some judge it on lack of demonstrated educational (HSUS) or scientific (WDCS) benefits. Some believe that costs outweigh benefits. Others that benefits outweigh costs.

In conducting this review, good people presented me with views and values which were fundamentally opposed to those of other equally good folks. My personal opinions aside, decisions in this review will be based on costs and benefits of live-capture and captive maintenance, and on the risks the practices pose for the animals and their populations.

Mortality of marine mammals in captivity:

Early efforts at maintaining marine mammals, particularly cetaceans, in captivity were frequently unsuccessful and typically, because of improper facilities and little understanding of their needs, resulted in high mortality. Captive maintenance concerns were largely limited to keeping the animals alive. Although mortality rates themselves are not an sufficient indicator of the welfare of the animal, they represent a sort of bottom line on welfare; if mortality is too high it indicates something is wrong with the conditions in which the animal is housed, or its care (Klinowska and Brown 1996).

Many early efforts presented data by totalling the number of marine mammals of a given species taken into captivity to the numbers which remain alive. Such presentations are on first exposure quite shocking but are biassed in that they fail to include the importance of lapsed time. (I suspect that similar statistics on the total

numbers of people once involved in welfare groups, DFO or the aquarium industry who are still alive today might be shocking as well.) Other summaries presented average longevities in captive animals but failed to consider captives that remained alive. Still others failed to consider age specific mortality or excluded recent captives or young animals from survivorship estimates. Mortality reports by interested NGO and industry groups often still include such flawed mortality summaries in their presentations.

The best current source of data which allows analysis of captivity mortality is the Marine Mammal Inventory Reports (MMIR) maintained by the National Marine Fisheries Service. Under requirements of the U.S. Marine Mammal Protection Act of 1972, facilities holding marine mammals were required to provide annual reports on animals held, and their status. There are omissions in the MMIR, such as neonatal and post-partum deaths (Temte 1993) but, as time has passed, it provides the best data base for mortality information. There are a few additional records from other sources (eg. Reeves *et al.* 1994).

The method which most researchers (DeMaster and Devenak 1988; Small and DeMaster 1995; Woodly *et al.* 1997; Steuer 1989) who have examined captive survivorship have used estimates mean annual survivorship (ASR). ASRs are calculated by:

$$ASR = [\ 1 - (\text{total \# deaths})/(\text{total \# days survived})]\ 365.25$$

Calculation of ASRs are typically limited to a few captive species on which adequate numbers of records are available. These include: bottlenose dolphins (Woodley *et al.* 1997; Small and DeMaster 1995; DeMaster and Drevenak 1988; Klinowska and Brown 1996); beluga (Small and DeMaster 1995; Moshenko 1999); orca (Small and DeMaster 1995; Woodley *et al.* 1997); California sea lions (Small and DeMaster 1995); Stellar sea lions (*Eumetopias jubatuss)* (Small and DeMaster 1995); false killer whale (*Pseudorca crassidens*) (Steuer 1989). In all cases numbers of animals are limited so that statistical power of comparisons is low. Additionally, as more and more animals are born in captivity, there may be important differences in mortality rates between captive-born and wild-caught animals. An additional complication is the absence of, or problems in determining ASRs for wild populations. Such uncertainties in the data provide manoeuvring room for the different persuasions

about the welfare of captive cetaceans to make a variety of claims regarding captive mortality.

ASRs have been increasing over the last five year period (1988-92) for bottlenose dolphins and California sea lions but there are significant differences among institutions (Small and DeMaster 1995). This increase would indicate that captive care of these species has improved over time. Consistently, non-calves do better than calves and, for some species, captive-born animals do better than do wild-caught animals. Non-calf bottlenose dolphins (Small and DeMaster 1995; Woodley *et al.* 1997) and orca (Richter 1988; Small and DeMaster 1995; Woodley *et al.* 1997) survived at lower rates than wild populations. Richter (1988) reports no increase in survival of orca over time; Bain (1988) finds some improvement in more recent data for orca. Baird (1992) reports a survival rate of captive non-calf orca that is most likely equal to, or higher, than for wild animals. Variations in these estimates reflect the use of larger or smaller data bases, and assumptions made by authors regarding what data to include or exclude.

Survival of non-pup Stellar sea lions in captivity exceeded survival in the wild (Small and DeMaster 1995). ASRs for captive false killer whales are substantially lower than for wild populations (Steuer 1989). Captive survival rates for belugas are about equal to or higher than for wild populations (DeMaster and Drevenak 1988; Moshenko 1999).

Mortality estimates that make comparisons between captive and wild populations do not, however, sufficiently account for the impact of captive marine mammal deaths. Aquarium cetaceans especially are known by name, as individuals by the public. A death has the impact similar to the death of a personal acquaintance, a friend, a hero. The deaths of young calves are somewhat similar - an acquaintance losing a baby. Even if mortality estimates for captive populations of marine mammals equal or surpass those in wild populations, that data will be largely irrelevant to a public who views the loss in personal terms.

Previous reviews of live capture and captivity in Canada:

There are four sources which have previously reviewed aspects of live-capture and captivity of marine mammals in Canada (Baird 1992; Cowan 1992; Klinowska 1995; and Moshenko 1992; 1999). These are presented in Appendix IV (Vol. 6).

Baird (1992): Baird's (1992) review was contracted by the Advisory Committee on Marine Mammals. The report is directed only at cetaceans and deals only with those live-captures that result in maintaining the captured animals in captivity. It reviews the history of cetacean live-captures and presents an inventory of animals maintained in Canadian aquaria at the time. Captivity mortality, care and facility standards and captive use of the animals are examined. Baird (1992) concludes that "typically DFO has been able to regulate factors relevant to maintenance of cetaceans in aquaria in Canada through the capture permit process". Those facilities which hold animals not captured in Canada were not regulated through DFO. However, since importation into Canada requires CITES permits issued by DFO; Baird reckons that regulation could occur through conditions placed on these permits. Regulation of captive marine mammals originating elsewhere, but already held in Canada "would have to be through other measures" (Baird 1992).

The report does not make recommendations but Baird (1992) identified the dilemma faced by DFO. While they have legislative authority to control removals from wild populations, conditions placed on live-capture permits are essentially unenforceable by DFO. This means that DFO is responsible for initiating a process over which they may have some "moral authority" but essentially have no control. The situation allows holding of marine mammals in Canada without any enforcement authority for standards, except perhaps for local or provincial cruelty legislation.

Advisory Committee on Marine Mammals: In their review (Cowan 1992) the Advisory Committee on Marine Mammals attempted to deal with DFO's dilemma. It recognized that some care standards were deficient and all facilities were deficient for orca, although they typically were based on U.S. levels. It, however, re-affirmed it's belief that captive animals were an acceptable and useful way of introducing large numbers of people to marine mammals.

The Advisory Committee concluded that existing legislation (Marine Mammal Regulations of 1982 under the Fisheries Act) gave DFO adequate control over live-capture. Further, the Advisory Committee believed that the import and export of animals could be controlled under the Wild Animal Plant Protection Act (WAPITRA), finally passed in 1996), through conditions placed on these permits. This act implements the CITES Convention in Canada. The act requires transportation standards to comply with those of IATA Live Animal Regulations (1995). However, it excludes all animals bred in captivity or which are part of a captive breeding programme, and it may not be used to infringe on Aboriginal rights to traditional trade and barter in wild animals. Enforcement of the act is through officers designated by the Minister who have powers to detain shipments, conduct inspections and remove animals.

The Advisory Committee (Cowan 1992) recommended that the Canadian Association of Zoological Parks and Aquaria (CAZPA) use their accreditation process as a means to insure compliance with live-capture permit conditions and to achieve appropriate standards for facilities and care of marine mammals in captivity. CAZPA is a professional association and has an inspection and accreditation process, but its membership is voluntary. To circumvent this problem the Advisory Committee recommended that any facilities applying for live-capture permits must be members of CAZPA. It was also recommended that DFO work with CAZPA to develop and adopt standards for captive marine mammals which would be incorporated into the accreditation process. The Committee recommended independent reviews of facilities and operations. A final recommendation of the 1992 review (Cowan 1992) was that, should satisfactory standards and compliance mechanisms not be adopted by the aquarium industry, DFO should examine the options to impose such standards. Their report did not attempt to deal with marine mammals already held captive in Canada.

A process of application and conditions for live-capture permit review were developed by the Advisory Committee. Additional recommendation were made regarding the improvement of education and breeding programmes. Problems in the captive maintenance of orca were acknowledged, as were facility deficits. The Advisory Committee recommended continuance of the ban on orca live-captures and discouraged further captive breeding or importation.

Klinowska: The review by Klinowska (1995) was an examination of the 1994 Draft of Standards for Cetaceans proposed by CAZPA (1995). Klinowska does not feel CAZPA (1995) proposed adequate verification of compliance to standards and took exception to many specifics. When facilities are found below standard she proposed that a grace period of five years was adequate to plan and rebuild facilities which corrected deficits.

Moshenko: Robert Moshenko managed the beluga live-capture programme for DFO from 1968-1992 and has reviewed survival of the animals in captivity from 1968-1998 (Moshenko 1999). At the time this review was submitted Moshenko's (1999) report was in draft form only and cannot be included in the Appendix. His 1992 review is included in Appendix VIII (Vol. 8).

There were a total of 68 beluga whales live-captured for captive maintenance in the Churchill River estuary area of western Hudson Bay from 1967-1992. Richard *et al.* (1990) has surveyed this population of approximately 23,000 animals and has confirmed through telemetry studies that the entire range of this population was well surveyed (P. Richard, DFO, pers. com.). Hence, there has been no impact of these removals from the population. Conditions on live-capture permits were on size (females from 245-290 cm; males from 245-395 cm) so removals were from weaned to reproductively immature animals. Hence, captured animals ranged from 3-6 years old.

Survival records in captivity were reviewed for 13 years. Of 68 animals captured since 1967 only 30 remain alive today (44%). Of 35 live-captured since 1984 24 (69%) are still alive. One animal has been in captivity 25 years; 20 have been captive for more than 15 years (Moshenko 1999). A more realistic picture of survival in shown in the ASRs.

DeMasters and Drevenak (1988) calculated an ASR in captivity of 0.94 based on 48 belugas; this would predict a life expectancy of 16 years. They found no difference in ASRs between 1975-79 and 1980-84. Richter (1988) similarly also reported that survival rates did not differ between 1975-79 and 1980-84. Small and DeMasters (1995) found ASRs from 0.94-0.95. Moshenko (1999) calculated an ASR of 0.94 as well and also found no differences in survival between 1975-79 and 1980-84, between sexes or between aquaria. Woodly *et al.* (1997) have noted difficulties in

determining beluga survival rates in wild populations. These have ranged from 0.71 for calves to 0.91 for non-calves. Sergeant (1973) estimated a first year survival ASR of 0.82. Moshenko (1999) concludes that "survival in captivity may be better than, or equal to, survival in the wild".

There have been a total of 20 beluga calves born in captivity from the Canadian-captured animals between 1972-1998 (Moshenko 1999). Six of these calves survived less than 4 days; some died within minutes of birth. Three more died within months of birth. For births since 1991, 6 out of 15 captive-born young are still alive. ASRs have not been calculated because of the small number of animals known. The eight aquaria in North America that hold Canadian beluga are involved in breeding loan exchanges (Moshenko 1999) but details of these are not specified.

Legislation and regulations in Canada:

Captures of cetaceans in Canada have been permitted under several regulatory authorities. Early beluga captures were regulated under the Beluga Protection Regulations of 1962. Permits for orca captures could be authorized under the British Columbia Fishery Regulations. Prior to 1982 British Columbia regulated cetaceans held in captivity under the Wildlife Act (Baird 1992). The Narwhal Protection Regulations of 1971 could authorize live-captures of that species.

Authority for controlling removal of ocean animals occurs under the Fisheries Act. General Regulations under this act were last revised in 1998. Cetacean Protection Regulations under the Fisheries Act were developed in 1982 and gave DFO enforcement authority over live-captures. Marine Mammal Protection Regulations were last revised in 1993. Under the regulations of 1993, DFO has authority to issue live-capture permits.

Typically, DFO has attached a series of conditions to live-capture permits. However, once the capture occurs the animal essentially becomes private property and it is clear that DFO does not have enforcement authority for animals maintained in captivity. In any event, DFO has developed little expertise within its own staff in captive animal facilities, or captive care.

Animal welfare is governed in Canada under Section 446 of the Criminal Code. In 1988 the Law Reform Commission of Canada proposed changes which viewed animals as sentient beings, and not merely chattel for human use (Olfert *et al.* 1993). Recently the Department of Justice solicited public comments for revising regulations under the act and had an over-whelming public response exhibiting great concerns for animal welfare (Anderssen 1999). The present act forbids imposing unnecessary suffering on animals and provides penalties for abuses. It does not provide for routine inspections of animal care or enforcement of maintenance standards.

The Health of Animals Act was revised in 1992 but pertains primarily to agricultural animals. It does contain provisions which cover the importation and export of animals which could transmit controlled diseases. It has no marine mammal regulations at present.

The CITES in Canada is embodied in legislation in Bill C-42 (1992) and is commonly referred to as the Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act (WAPPRITA). This controls import and export of marine mammals listed in Appendix II of CITES, but does not provide adequate authority for welfare and care standards for animals maintained in captivity.

There is some provincial legislation that could be relevant to captivity of marine mammals if they are used for research. In Ontario the Animals for Research Act (1970, revised 1989) controls the source of research animals and has requirements which specifies humane treatment to prevent suffering. It provides regulations for minimum care and housing standards and provides for the inspection of research facilities. Inspections under this act have not been conducted for marine mammal facilities. Veterinarians employed as inspectors have been requested by the U.S. NMFS to supervise loading of cetaceans for shipment (B. Holly, HOMAFRA, pers. comm.). A recent act in Ontario regulates indigenous animal species but does not apply to marine mammals.

In Manitoba a policy directive is used to establish conditions and procedures for the donation of polar bears, which are captured in a polar bear control area, to zoos (Manitoba Natural Resources Index Number PR 10/14/001). It does not apply to other marine mammals (C. Elliot, Manitoba Natural Resources, pers. comm.).

The 1992 review of the captivity of cetaceans (Cowan 1992) attempted to solve the legislative dilemma by suggesting that DFO require applicants for live-capture permits be members of CAZPA and that DFO and CAZPA develop maintenance standards for the keeping of marine mammals. CAZPA (1995) did develop standards for cetaceans which were approved by its membership. A copy is provided in Appendix VI. The U.S. has similarly involved the aquarium industry in the development of care and facilities standards. However, relinquishing authority for inspection and ultimately enforcement of captive maintenance standards for marine mammals was unwise.

Membership in CAZPA requires on-site inspections every five years. Deficits in facilities and/or practices receive grace periods which can be extended. Membership in CAZPA is voluntary and only some Canadian facilities now holding marine mammals belong. The inspections performed by CAZPA are not transparent and are performed by CAZPA members. They were privately described to me as too informal; some sources even described them as subject to political considerations. While it is appropriate for CAZPA professionals to assist in the development of standards, it is clear that they cannot be responsible for monitoring their implementation or enforcing them.

The Canadian Council on Animal Care (CCAC) was established in 1968 as a standing committee of the Association of Universities and Colleges of Canada (AUCC). The CCAC is funded primarily by Canada's two major granting agencies - the Medical Research Council (MRC) and the Natural Sciences and Engineering Research Council (NSERC). The CCAC oversees the care and use of animals for research and teaching and testing in all Canadian colleges and universities, and in all Federal Government science and technology programmes. It provides an independent peer review process, as veterinarians, scientists and community representatives participate in CCAC assessments. CCAC is publically accountable for the standards in institutions that are participants in its assessment programme.

The CCAC assessment programme is also available to other government and private sector institutions, on a user-pay basis. In this respect, CCAC is reviewing the universal implementation of the assessment programme within the boundaries of research, teaching, testing and production (excluding food and fibre) as defined by the CCAC Council in 1996 (C. Gauthier, CCAC, pers.com.). CCAC offers the only

practical transparent, independent, publically accountable mechanism for ensuring standards for the maintenance and care of marine mammals in captivity are adequately assessed, monitored and enforced. These qualities are a necessity to meet public expectations in this area.

Legislation and regulation in other countries:

Some jurisdictions have simply banned captive maintenance of cetaceans but allow the keeping of pinnipeds. Klinowska and Brown (1996) found there was general agreement on captive care standards for cetaceans but less on facilities. It is fairly easy to set facility standards at a level which would make keeping of captive cetaceans impractical.

Only legislative arrangements in two countries, the United States and United Kingdom will be presented here.

U.S.: Regulations of activities related to marine mammals have been rapidly developing in the U.S. since the 1960's (MMC 1995). The Marine Mammal Protection Act of 1972 created a Marine Mammal Commission (MMC) (Appendix V; Vol. 7). The act imposed a moratorium on the taking and importation of marine mammals except under specifically permitted conditions. Permits could be issued for the purposes of scientific research or public display of marine mammals. Permits for display were conditional to facilities that offered "a programme for education or conservation purposes based on professionally recognized standards". Clinical captures were also recognized as was the need to rehabilitate and release treated animals. The Commission was directed to establish programmes dealing with the rescue and rehabilitation of stranded marine mammals and to determine by consultation at what point a rehabilitated marine mammal is releasable to the wild (MMC 1995).

In 1988 amendments to the act reiterated the educational role for marine mammals in captivity and further specified that holding facilities must offer programmes which includes education or conservation. The act specifically indicated that the intention of the government was not to regulate the content of education or conservation programmes but ensure they were based on professionally recognized standards of the public display community, specifically those of the American

Association of Zoological Parks and Aquaria (AAZPA). A copy of the Marine mammal Protection Act of 1972 with commentary is provided in Appendix IV (Vol 7).

The Marine Mammal Protection Act was again amended in 1994 to clarify the authority of the various federal agencies over public display facilities. The National Marine Fisheries Service (NMFS) retained permit authority for live-captures on behalf of the National Oceanic and Atmospheric Administration (NOAA). Enforcement of welfare and care standards, as well as inspections of captive facilities, were specified under the Animal Welfare Act under authority of the Department of Agriculture. Specifications for care, transport and treatment of marine mammals under the Animal and Plant Inspection Service (APHIS), USDA (1992) are presented in Appendix IV (Vol. 8).

Recently draft revisions to marine mammal maintenance standards were produced through the Negotiated Rule-making Committee (APHIS 1999). These are included in Appendix IV (Vol. 8). Changes in the U.S. policies and regulations can be comprehensively followed in Annual Reports to Congress on their activities (1990-1999).

United Kingdom: Recent legislation and regulation of the live-capture and keeping of marine mammals in the U.K. have been guided by a study by Klinowska and Brown (1996) and the Report of the Dolphinaria Steering Group (1996). Copies of both reports are provided in Appendix VI (Vol. 9).

Klinowska and Brown (1996) limited their review to dolphins. They reported that most of the concerns regarding captivity of cetaceans was based on concerns about the animal's welfare and health. They found that neither concerns about the physical and mental welfare of the animals, or the arguments which favoured captive cetaceans, were well-founded, but they were related to specific anecdotes. They reported there are problems in keeping dolphins in captivity but that problems observed in captive cetaceans were not dissimilar to those experienced in any other type of wild-caught captive animals. Educational programmes in dolphinaria were reviewed as poor and lacking in important educational content. In examining research in captivity facilities Klinowska and Brown (1996) found that it was generally poorly supported, and

occurred primarily within veterinary fields. If research was to be optimized new, coordinated initiatives would be required.

The report reviewed welfare, facilities and care standards in 17 countries and found that there was, more or less, "international agreement on standards for buildings, the aquatic environment, food, health and hygiene.....the major area of disagreement is over minimum pool dimensions and, to a lesser extent, over subsidiary pool provisions" (Klinowska and Brown 1996).

The Dolphinaria Steering Group made recommendations on mortality rates, water treatment, legislation, welfare, education, research and breeding and set standards for captive care (DSG 1996). These recommendations were incorporated as a supplement to the Secretary of State's Standards of Modern Zoo Practice (1990) as additional standards for UK cetacean keeping under the Zoo Licensing Act of 1981. A copy of the Zoo Licensing Act and the Supplement are presented in Appendix VIII.

Additional regulation of marine mammals in the U.K. occurs through the Endangered Species (Import and Export) Act of 1976 which contains provisions of the CITES for control of wild species.

The conclusion of my relatively short survey of foreign regulation and legislation is that there are a variety of governance mechanisms which have been used to cover the live-capture and captive maintenance of marine mammals. Some regulation requirements are so severe that the keeping of marine mammals in captivity is impractical or impossible. They may, or may not be needed. At the present time the trick is to make a regulatory regime which adequately protects the animals and meets the need for assurance of proper care by the public, and yet are feasible for the manager, investigators and facilities who have to live with them. That will not be easy but it may be possible.

Research on captive marine mammals:

During whaling days, thousands of dead whales were available for study and this opportunity did result in some basic knowledge, but much information which could have accrued during the commercial carnage was simply not obtained. Similarly for many species of pinnipeds, commercial exploitation proceeded without scientific information, and without much effort to collect it. Realization that populations of marine mammals were in trouble due to over-exploitation began to prompt active scientific study. Examples of this are the harp seal hunt in Canada (Bonner 1978; Royal Commission 1996; Sergeant 1991) and large whales throughout the world (MMC 1995).

Early studies of marine mammals maintained in captivity provided basic introductions to the complex biology of the animals (Pryor and Norris 1998) and wetted the appetite of scientists for more information. "Outside the marine mammal scientific community, several misconceptions about dolphin research (or any marine mammal research) are still widely held. The lay public's perception of dolphins sometimes differs widely from that of serious students. Legitimate workers, who have plodded along seeking true things just as other scientists do, but they unavoidably work in the midst of a din of publicity and speculation that has turned the dolphin into a mythic beast, a sort of floating hobbit...". We trust we can "demonstrate that dolphin research has come a long way beyond first experiments.... the truth about cetaceans is more interesting than fanciful speculations" (Pryor and Norris 1998). The impetus in marine mammal research has shifted to work with wild populations. But, clearly, research with captive marine mammals will continue to be beneficial.

Not all agree. Mayer (1998) has recently reviewed the scientific justifications for maintaining cetaceans in captivity and concluded that "the physically restricted conditions of captivity, together with animals' behaviour being learnt in a unnatural environment, the small numbers of highly trained animals involved, and the changing genetic basis of the captive cetacean population means that the scientific basis for captive animals acting as models of wild animals is in increasing doubt. The increased sophistication of studies on free-living animals and the greater relevance of data from those studies further throws the justification for research on captive cetaceans into doubt" (Mayer 1998).

Not all reviews of captive marine mammal research potential have been so negative. The Society of Marine Mammalogy, the largest scientific association of professionals in the area, at a Biennial Meeting on the Biology of Marine Mammals passed a resolution that endorsed the appropriate use of live-captured and marine mammals maintained in captivity as useful research subjects. The Executive Board reviewed this earlier resolution at my request. They decided that they are comfortable with their previous stand (D. DeMasters, NOAA, pers. com.).

Mayer's (1998) criticisms involve several basic arguments. (1) One is that while captive research may have been valuable and even necessary at one time, the information gained from this early work was sufficient so that such work is no longer necessary or appropriate. (2) Captivity changes the basic biology of the animals such that information gained on captives may be misleading or irrelevant when applied to wild populations of marine mammals. (3) Tests are limited to the physical limitations of pools and the captive environment. (4) Research in captive settings is used a convenience but can also be conducted on wild animals. (5) Much of the information gained is applied in nature and has been directly addressed at maintenance and health issues with the captive animals themselves (Mayer 1998). Davis (1998) adds the criticism of captivity research that it often seems to be a sales and marketing ploy for corporate interests engaged in the aquarium industry. It is evident that to a certain extent each of these complaints are true. But all scientific research as a way of knowing is a human activity and, whether done in lab or field, has limitations.

At the outset it must be made clear that using science to monitor and treat the animals which are captive is, in my view, entirely appropriate. It would be stupid and cruel not to use such a tool for improving care, treatment and welfare in captivity. It also needs to be made clear that science is sometimes at its best when basic questions are asked about the nature of life; application-directed science, or goal-directed science, does not necessarily have the largest benefits. Thus, it is my understanding that research on captive animals should have potential benefits for wild populations. But this does not preclude basic scientific studies for which the immediate application to wild populations is uncertain, or research which is directed at clinical, care, maintenance and welfare of the animals in captivity, which is also appropriate. Criticisms that dismiss such alternatives as unacceptable do not either understand science or are willing to constrain its use in inappropriate ways.

Evaluating the importance of any science, however, depends on one's specific interests. Driedzic (MUN, pers. com.) argues that studies of the diving physiology of seals have been critical to understanding of breath-holding. He argues that such studies will have important implications for human health problems. The Ocean Sciences Centre which he directs has been particularly active in studying captive seals but also uses them in an interpretation programme. Trites and Rosen (UBC, pers. com.) argue for the importance of their captive metabolic studies to understand food requirements of Stellar sea lions and their declines in the wild. Some of the most important recent research involves sensory physiology and capacity which has direct application to mitigation of incidental catches of the animals in fishing gear.

St. Aubin (Mystic Aquarium, pers. com.) notes that he personally has authored over 40 scientific papers using captive animals. Further, he points out that over two decades three Canadian universities have authored over 100 scientific papers on captive marine mammals. Baird (1992) appears to show a dramatic decrease in the number of papers produced at the Vancouver Aquarium. However, a complete record of publications, theses and scientific papers shows that, in fact, research in this institution is very productive. The beluga programme of the U.S. Navey, who hold three Canadian belugas, have produced over 60 scientific publications on beluga in the last two decades (S. Ridgeway, U.S. Navey, pers. comm.).

In addition to specific research completed, daily monitoring programmes at most facilities that house captive marine mammals provide an important data base for assessing the impact of captivity itself and various life processes. The usefulness of these data will grow with time.

Institutions that maintain captive marine mammals frequently do not have research support programmes. Some are reticent to subject their valuable animals to any activity that is out of the normal routine, or which may interfere with exhibiting them. It is often difficult to harmonize demands of research with routine maintenance activities. Much more could be done by holding institutions and marine mammalogists to maximize the coordinated use of captive marine mammals. Rarely do facilities have active programmes which solicit interest from outside researchers, or provide support for them.

The suggestion provided to this review by U.S. NGOs that what research might be necessary on captive cetaceans could all be done in dedicated cetacean research facilities is not really appropiate. These do not exist in Canada and such an approach could exclude Canadian scientists or require Canadian scientists to work outside their own country.

Recent volumes (for example Nachtigall and More 1996; Leatherwood and Reeves 1990; Au 1993; Thomas and Kastelein 1990; Kastelein *et al.* 1995; Nachtigall *et al.* 1995; Read *et al.* 1997) show the importance of research on captive animals for sensory, diving and metabolic physiology, behaviour, cognition and learning, and ontogeny of behaviour. It is difficult, even with full recognition of the limitations that any research environment imposes, to dismiss the importance of this work (Norris 1991) and its potential benefits in understanding and conserving wild populations.

Captive research is far less common than that on wild individuals and populations but examples are abundant in the literature (Herman 1980; 1991; Sylvestre 1983; Watkins and Wartzok 1985; Schusterman *et al.* 1996; Geraci and Bruce-Allen 1987; Myrick *et al.* 1988; Renouf *et al.* 1990; Recchia and Tyack 1991; Cheal and Ross 1991; Drew 1993; Kastelein and Noseworthy 1994; Recchia 1994; Nelson and Lien 1994; Lien *et al.* 1995; Dalton et al. 1996; Helwig *et al.* 1996; Russell *et al.* 1997; Anderson *et al.* 1997). Such a list could be greatly expanded. The research of particular benefit provided by captive marine mammals is that which requires experimental control of conditions. This is the unique advantage of captive research which cannot be provided in the wild. It will continue to be so.

Techniques for the study of wild marine mammals:

Marine mammals are difficult to study; they typically can be observed for short periods of time and live in an environment that is hostile to terrestrially-limited humans. This makes the scientific study of this group of mammals challenging, time-consuming and expensive (Read 1998).

The development of new technologies has gone far to enhance our abilities to study marine mammals. Early reviews of scientific technology for the study of whales

(Norris 1966) could not imagine the strides which have been made. The major developments in sea-going vessels have occurred in the past few decades made the challenging ocean environment less remote and safer to work in. Aerial transportation has similarly become more useful, diverse and safer.

Developments of modern cameras that provide low-cost images have made possible the identification of individuals based on natural markings (Lien and Katona 1990) or specialized aerial surveys (Stenson *et al.* 1993; Estep *et al.* 1994). New camera technology enables greater use of aircraft for surveys of marine mammal populations. Census from high-quality photographs allows researchers to determine reliability of counts.

A wide variety of technical, biological and electronic developments have further expanded our competence to conduct wild studies. Studies not feasible only a decade ago, now are possible, even routine. Read (1998) has recently reviewed new technological approaches for the study of wild marine mammals. Risks to animals by in using many of the new techniques can be minimized by careful risk analysis (Cheneliere 1998).

There are a variety of satellite-based methods which can be used to study wild marine mammals. New satellite systems, and transfer of existing technology from military to scientific applications, have provided important new possibilities. Radiometers aboard recent NOAAS satellites provide sea surface temperatures and information on ocean fronts and ice coverage. Synthetic Aperture Radar (SAR) provides small-scale images of the earth's surface (Read 1998).

Great advances have been made in underwater technology as well. Small televisions cameras have been fitted to animals so that underwater interactions of animals with others, or their prey, can be observed (Davis *et al.* 1992; 1993). Use of the U.S. Navy's underwater listening technology (Clark 1994; 1995) have allowed monitoring of populations and the tracking of individual whales over long distances. Surface technologies, such as ground-wave radar and thermal imaging (Cuyler *et al.* 1992; Perryman and Laake 1994; Barton 1995; Duck *et al.* 1995) provide enhanced abilities to monitor marine mammal movements at the waters surface.

Some of the greatest advances in our ability to study marine mammals comes from technology that permits the monitoring of individuals. Early efforts to identify individual marine mammals (Katona *et al.* 1980) used hand- matching of the photographs of natural markings (Lien and Katona 1990). The development of computer-based matching technology (Hammond *et al.* 1990; Hiby 1995) have greatly improved alibility to quickly and efficiently provide information on matches As identified individuals catalogues grow and are maintained over time they will prove even more valuable as research tools. This is exemplified by Project YoNAH (Smith *et al. 1999).* Catalogues of identified individuals are now beginning to provide information on dynamics of populations including maturity, survival of offspring, environmental threats such as fishing gear and survivorship (Wells and Scott 1990). Use of acoustic tags provided by analysis of the animals vocalization are also available for individual identification (Clark 1994; Read 1998). Transponder chips (Thomas *et al. 1987)* also provide individual identification.

The advent of telemetry packages which can be carried by marine mammals for periods of time further enhance research competence with wild populations. Data logging devices which store information in recorders, can provide detailed records of diving, feeding and a variety of physiological and behavioural measures (Read 1995; Baird and Hanson 1996; Westgate *et al. 1995;* Read and Westgate 1997).

The genetic analysis of collected tissues can now give important information on subpopulations, relationships within a population or on relations between populations or species (Amos and Hoelzel 1991). These techniques provide important new ways for understanding wild populations (Brennin *et al.* 1997). The analysis of lipids (Iverson *et al.* 1995a; 1995b) or stable isotopes (Ostrom *et al. 1992;* Abend and Smith 1995; Todd 1998; Todd *et al.* 1998) in tissue samples can give detailed information on the feeding habits of animals and may, in hard tissues, provide a record of age (Schell *et al.* 1999). Recent work (Mackay *et al.* 1998) is attempting to determine reproductive status of biopsied animals by analysis of hormone levels in the samples.

Together these advances have considerably enriched our knowledge of wild marine mammals and, undoubtedly, will continue in the future to contribute to our understanding of their lives. Science is a cumulative way of knowing. It builds on what we have learned before. Some knowledge came from whaling and sealing studies, other

from studies on captive cetaceans. Today, largely because of social conditions and the advent of technologies which have appeared in the last several decades, most research on marine mammals is done in the wild. In the recent decades, because of the technology, knowledge of marine mammals has exploded (Whitehead 1990).

Research in the ocean environment, however, does have limitations which remain in spite of technological advances. The uncontrollable conditions largely limit researchers to studies which allow minimal experimental manipulation of either environmental or, in many cases, subject variables.

Education:

Education is usually given as a requirement which justifies maintaining marine mammals in captivity. Submissions from NGOs for this review are unanimous on this point. Polls of the general public (Roper 1992; Roper 1993) also reach this same conclusion.

Everyone has their own idea about what education is, or should be. Learning is both a verb and a noun; a process and a product (Falk *et al. 1995*). So sometimes the dialogue becomes pretty confusing. Some argue because education using captive marine mammals may not be up-to-snuff, keeping them in captivity is not justified. Others argue for an independent, conclusive study to show what people learn before proceeding with the practice. Still others argue that education is not perfect but should and can be improved. Most everyone realizes that this will take real effort. There are some spectacular planning programmes presently underway (see "Developing and promoting caring attitudes toward the natural world", Brookfield Zoo, 1999).

Education is a complicated human activity which ends in learning of various kinds. It is not likely that one can verify what people are learning as a result of exposure to captive marine mammals in any way that will be completely satisfactory to everyone, or by quick, simple-minded, one-shot surveys. There is a growing body of literature which helps clarify some of the questions which should be answered and gives indications of the educational outcomes of some programmes. But there is surprisingly little empirical data which unequivocally shows what educational efforts

with captive marine mammals actually accomplishes. A complication in measuring the impact of education is the transient and changeable nature of the dependent variable - **it is a moving target in time, culture and in individuals.**

In briefs presented for this review (See Appendix III) there were four major problems identified in teaching that occurs in facilities that display marine mammals; (1) it was absent; (2) it taught the wrong things about the animals; (3) it used inappropriate teaching technology; and (4) it lacked effectiveness. The first two complaints involve teaching objectives. The second two involve the actual educational process.

Entertainment or education: Generally, public support for maintaining marine mammals in captivity limits their use to scientific or educational purposes. It is not usually acceptable to use animals for entertainment only. While most of us will admit that we are entertained by animals we know personally, as well as wiser for knowing them, entertainment *per se* for commercial or public purposes is not seen as acceptable. Separating the two elements may help in analysing the educational benefits of exposure to marine mammals.

The classic anecdote used to illustrate that marine mammals in captivity are primarily used for entertainment is the one where a large toothbrush was used on an orca's teeth. The activity is an offensive use of animals to many. However, if teaching that some whales have teeth (and others don't) is an appropriate educational goal, and the curricula is directed toward very young children, such a gimmick may provide a good lesson. I've had adults tell me the story in sheer disgust. When I questioned some young children about the gimmick, they told me that they know whales have teeth and (in captivity at least) they need to be taken care of "just like me". For very young kids that might be a reasonable lesson.

Reactions to this one well-known show stunt illustrates the difficulty in separating the notion of entertainment from education. 'Education' is defined as the systematic development or training of the mind, capabilities or character through instruction. A dictionary typically defines 'entertainment' as " to engage the attention agreeably through a pleasant activity" (Webster 1999). Anyone faced with the

challenge of educating an audience is aware that entertainment is a critical factor in achieving one's communication or educational objectives. In formal education, such as mandatory schooling, entertainment may be somewhat minimized, although my experience in the task of keeping a university class awake through lectures, tells me it can't be too minimal. In informal education, such as programmes at museums, parks, zoos and the like, the audience is not required to participate (Edeiken 1992; Luckhurst 1998). Entertainment in such settings must be compelling and sufficient to simply secure the public's participation.

This does not necessarily mean that 'tricks' or 'shows' of performing animals are critical to successful education, or should be permitted. Education programmes with captive marine mammals must as an initial requirement be entertaining, but the quality of such programmes must be judged by the acceptability of their educational programmes (Baker 1990). The Humane Society of the U.S. has said " it is the quality of the programmes which determine whether or not substantial benefits are gained by the visiting public. The permit process, therefore, must assure that only facilities with high quality educational programmes, capable of benefiting the public through enhancing knowledge, understanding, appreciation of marine mammals and their role in their natural ecosystem, be granted permits" (NMFS 1999).

Several groups in their submissions to this review mentioned the use of shows which use captive marine mammals. Typically shows were described in negative terms because of 'unnatural' behaviours, demeaning routines or irrelevant educational goals. Others have argued for innovations in public presentations which change substantially the role of shows (Kelsey 1991). Kelsey suggests that the entertainment paradigm in which zoos and aquaria have traditionally operated is at odds with their contemporary goal of conservation education.

But the average visitor to a zoo or aquarium spends 30 second to two minutes at a typical exhibit (Bitgood *et al.* 1988; Marcellini and Jenssen 1988), sometimes much less (Lien 1990). A visitor, however, is often willing to spend 20 or 30 minutes at a show or demonstration. Shows and demonstrations are educational technology that can capture an audience for longer periods and, hence, provide an opportunity for more complicated curricula. Although some NGOs have objected to shows their complaints,

I believe, were based on the teaching objectives rather than the appropriateness of the teaching technology (eg. Davis, 1998).

Selection of educational objectives: What one needs to teach depends on what one wants the student to do, or know, at the end of the educational programme. One reason for educating people about marine mammals is simply that they are amazing forms of life. This may be expanded so that "education programmes about cetaceans must promote an improved understanding of and an appreciation for cetaceans and their ecosystems" (CAZPA 1995). "Education is an important tool that can be used to teach the public that marine mammals are resources of great aesthetic, recreational and economic significance, as well as an important part of the ecosystem" (MMC 1995). Traditionally, programmes objectives are "to educate people about a species and therefore to care about the species and its habitat" in the wild (HSUS 1995). At this abstract and vague level it is, of course, possible for everyone to make their own claims about how well captive marine mammal education programmes fulfill objectives.

From broad educational objectives intermediate objectives or sub-objectives are typically developed for designing curricula or programmes. Appreciation of a marine mammal may involve goals of appreciation for how it works or what it can do. Linking the animal to its habitat requirements may require some basic biology and behaviour, as well as information on the animals' environment. Appreciating the individual animal for itself may require knowing where it came from, it's current life situation and what lies in store for it. 'Caring' about a species may involve objectives of instilling environmental activism. Deciding if educational goals are cognitive/ informational goals or affective/attitudinal goals is critical (Eggerton 1996; Forestall 1997).

Several NGOs presented briefs to this review and argued that educational results from captive marine mammal exhibits were negative. They felt that what captive marine mammals taught was the domination of humans over animals, and that animals could be subjected to human use. Others (Davis 1998) have argued that educational objectives are carefully designed and technology of captive animal display rigorously provides curricula to meet them. However, these are based on commercial or corporate objectives which essentially have little benefit to the animals themselves or their

environment (Davis 1998). They both may be right, at least with some programmes and in some facilities.

What appears to be missing from most marine mammal education programmes is a more or less formal outline of educational goals and objectives. Without such a framework it is difficult to select appropriate teaching technologies, and impossible to evaluate effectiveness in meeting objectives (Lien 1988; 1989; 1990). Clear identification of the goals and objectives for education programmes in captive marine mammal facilities is a critical first step in credible teaching programmes. What types of learning will meet these objectives must be identified, and teaching methods to achieve them developed. A clear framework for education is required if it is to be successful and successfully evaluated.

Learning information, emotions, attitudes and values: Goals for learning may be of several different types. Some programmes simply wish to instill an awareness. Heightened awareness would presumably make the student more responsive to additional exposure to similar, or additional material. Some learning identifies cognitive goals so that mastery over certain information is required. Another goal of education can be to develop emotional sensitivity or feelings about subjects. Affective learning is the development of basic attachments that direct subsequent attention, educational focus or actions. Values education has a goal to teach fundamental attitudes and values (Knapp 1972; Lien and Walter 1985; Callicot 1991; Churchman and Marcoulides 1991; Serrell and Raphling 1993; Poole 1995; Negra 1997).

Lien (1985; 1993) has argued that different types of learning are constrained by different learning processes. He noted that learning of information can be done in most any context. Affectional learning, and the acquisition of attitudes and values, however, is socially constrained. In a review of values curricula he concludes: "When we were able to find them, evaluations indicated that curricula with both attitudinal and informational objectives were not terribly effective in building or changing attitudes. There was one exception which typically was related to positive attitude changes, however. It had little to do with the curricula *per se* but rather the teaching technique. Positive attitude change occurred when people who were loved, liked or respected presented their own attitudes and reasons why they held them. Development of

attitudes was not related to information but to the presenter, While information can be learned from social or non-social sources, attitude learning seems to occur most readily from a social source. Attitude learning occurs as children model on disclosed views of loved and respected adults or peers" (Lien 1993).

We seem to know so little about the complex human activity of learning. There is less than adequate guidance for the serious educator who works in aquaria and wishes to consider the best teaching technology for achieving various goals for their education. In this review I generally found the guidance from the education literature often based on little more than conjecture, filled with jargon, and not terribly helpful in understanding or structuring the educational process. This seems to me to be an area where there is much basic work to be done.

Informal education: Informal education is "voluntary, unstructured, unsequenced, non-assessed and un-evaluated, open-ended, learner-led, learner-centred, learner-directed with an emphasis on social intercourse and a minimal curricula base" (Hofstein and Rosenfeld 1996). Heimlich (1993) describes informal learning opportunities, including exhibits and shows, as being structured by educators, but the decision to participate is made by the individual. Visitors are not held accountable for learning outcomes and may walk away from any experience they decide not to pursue (Birney 1988).

Thus, each visitor it is said designs his or her own learning experience through choice and commitment. This could just be a great educational cop-out. Appealing to visitors from different educational, social and cultural backgrounds is a challenging but worthwhile goal (Thompson and Diem 1994; Bitgood *et al.* 1994). Designing successful informal education programmes may be best done by developing systematic links to formal educational curricula (Milson 1999; Bitgood 1989; Rennie and McClafferty 1993; Tunnicliffe 1994).

The major requirement of informal education is that it be entertaining in the sense that it captures the awareness of its intended audience. Studies of visitors confirm this requirement. Rosenfeld (1980) found that visitors most often cited entertainment or social reasons for attending zoos. But visitors also have a motivation to learn (Balling *et al.* 1981) and most investigators find that they are interested in both education and

entertainment (Hill and Knowlton 1987). Kellert's (1980) surveys showed educational benefit to children (38%), leisure (26%), personal fascination with animals (24%) and aesthetic reasons (ll%) all were important motivations of visitors to zoos.

In the 1960s and 1970s when the impact of informal learning programmes were first studied, evaluations were generally quite critical. Folks had a good time but often their interests in science, nature or art didn't increase, and they did not take much learning away from the experience. Based on such results educators in museums, zoos, galleries and aquaria became more selective in their educational technology. They began to stress guided, hands-on experiences. Curricula designers became aware of what the audiences brought with them to the educational exposure. Specific information on how education programmes using captive marine mammals work will be needed if designs and evaluation results are going to improve.

What target audiences bring with them to the educational effort:

The notion that anyone, even babies, are a *tabla rasa* when it comes to learning environments was abandoned long ago. What and how you teach depends on whom you are teaching and what they bring to the educational interaction. Thomson and Diem (1994) discuss visitor capabilities for processing information, attention spans and perceptual strengths. They classify children as tactual, auditory or visual learners. Such learning styles are easily seen when following children around in an aquarium or museum and observing their interactions with exhibits (Luckhurst 1998; Birney 1988). Dunn and Dunn (1993) discuss the importance of structuring teaching to match individual learning styles.

Existing knowledge and attitudes of participants in educational programmes are an important determinant of their outcome. Lien (1988; 1993) reports how childrens' attitudes toward animals influenced the outcome of a values/information curricula about whales and fishermen. Knowledge of whales improved in all students that used the curricula; groups that knew least at the outset improved most. Attitudes of children, based on Kellert's (1988) typology, were also influenced, but in different ways. The curricula tended to enhance whatever attitude the child already held about whales. The outcome of education is not just the impact of the curricula itself but how that curricula interacts with the learner. Cultural, social, developmental and individual differences all determine educational outcomes. Informal educational curricula does not deal with

passive human buckets into which information is poured; the human participants actively construct the educational goals and outcomes for themselves.

It is important to recognize that most of the visitors to aquaria come in groups that include children (Brookfield Zoo 1996). There is a fairly extensive literature in visitor studies that evaluates family participation (Borum *et al.* 1995; Borum and Cleghorn 1996; Borum *et al.* 1997; Borum and Dritsas 1997) which indicates the importance of such groups and the opportunities for learning which are presented (Diamond 1986; McManus 1987).

In preparing this review I spent two days at the Vancouver Aquarium on a weekend watching visitors as they encountered the underwater viewing gallery for beluga whales. Eighty-two percent of all visitors occurred in groups that contained children. An average visit was about 3 minutes, but the range of time spent per group was considerable. Time spent by the group at the exhibit seemed clearly related to the age of the youngest child and their attention span (with the exception of carried or wheeled babies). Younger children (3-5) watched very briefly and then went on to exhibits which could be manipulated. Older children typically spent more time in contact. Systematic studies have similarly found that children control the pattern and pace of activities in informal education settings (Rosenfeld *et al.* 1982).

The quality of the contact which occurred between the child and the whales seemed related to parental reactions and activities. On average less than 8 comments were made within a family group about the whales. But some parents stimulated interactions with questions geared to the child's age, or interests. "How many whales are there?" "Can you see the baby?" "Are there boys and girls?" "Why does the whale go up there (to the surface)?" "What's the nicest thing about that whale?" "What is he looking at?" Such educational leadership by parents often produced long discussions and investigations. Given the importance of parents and families in the learning of attitudes and values it seems clear to me that education programmes with captive marine mammals must more effectively help parents as teachers within their facilities. The importance of peers also cannot be overlooked as a vast majority of children choose peers as their favoured social group for visiting informal education facilities (Birney 1988).

Educational technology and methods: James once said that requirements for good education are a good student, a good teacher and a log to sit on. There may be one teacher in captive marine mammal education programmes, or two. Both the animal and the human interpreter can be regarded as teachers.

On the animal side, some species of teachers, such as orca in my experience, quickly lose interest in the students. Others, such as harbour seals and beluga whales, seem to more or less endlessly maintain interest in humans. Age may also be an important factor determining the responsiveness of the animals to visiting humans. Such responsiveness may be critical to the teaching quality of the animal. Surveys show that wildlife experiences which are most impressive to park visitors are those in which the animal responds them (Lien 1989). Thus, the grey jay that takes bread from one's hand has more impact than a distant view of a grizzley bear. Facilities have used shows to increase the animals prowess as a teacher. Many of the show stunts are based on the animal's participation with the trainer or the audience. One of the most popular events in many shows is the one where the animal splashes everyone.

Surveys have found that over 85% of people want to touch the animals (Tilt 1986). This is particularly true of whales and has undoubtedly lead to 'swim with' and 'petting' programmes. There is a sound educational technology behind such a programme. However, there are clear risks to both humans and animals as well (Anon. 1989; Lockyear 1990; Beck *et al.* 1994; Shane 1993; Santos 1997; WDCS 1999). In this regard the development of whale interaction or petting programmes at both the Vancouver Aquarium and Marineland of Niagra Falls are of concern. Such programmes may prove unacceptable (NMFS 1988). In any event, to ensure safety such activities must be very carefully evaluated, monitored and regulated (WDCS 1999).

The second teacher is the interpreter or trainer. In my experience these individuals vary greatly in the understanding they bring to the teaching situation of educational objectives, or their personal role and influence in the educational process. Typically the public identifies aquarium staff as caring about the animals; they are perceived as good people (Roper 1992). Vicariously, the staff who have a close relationship with the captive animal, provide the experience of intimate contact with it. Perceived as caring and, the intimate of the animals, imbues the staff with a position of authority and respect, a powerful position in which to teach attitudes and values, not

just information. Revelation to audiences of their attitudes and feelings about the animals in and of itself can be an important mechanism of achieving educational objectives.

Educational goals should always guide the selection of educational technology. If the educational goal are both informational and attitudinal ones and the objective is to "promote an improved understanding of, and an appreciation for (the animals) and their ecosystems" (CAZPA 1995) then several teaching techniques must be employed. Given the importance of the social context in most attitudinal learning incorporation of human teachers as well as animal teachers is important (Caduto 1983).

Evaluations of aquaria education using captive marine mammals:

Content of marine mammal education programmes:

I always tell my students that 'education is about lighting fires, not filling up buckets'. But it is the routine of filling the bucket that delivers the wisdom, excitement and concern. Hence, the quality of information in educational programmes is a key measure of their quality.

Content evaluation is the process by which educators evaluate if a curricula meets the basic requirement for education; i.e. the content accurately reflects knowledge in an area. Hoyt *et al.* (1999) have evaluated the content of programmes at several marine mammal facilities and found deficits; they feel information presented did not agree with best scientific knowledge. The best facility in their study was, happily, the Vancouver Aquarium. I'm unaware of similar content analyses for media, whale watching tours, etc. Standards for education all require that programmes are based on "the best current scientific knowledge" (CAZPA 1995). Every facility must subject their educational content to such a standard.

Empirical evaluations:

Empirical evaluations of aquaria programmes are fairly difficult to find. More impact evaluation is available concerning other informal education programmes. Evaluations of the educational value of museums have been reviewed by a variety of

authors (Koran *et al.* 1999; Bitgood 1989; Wellington 1990; Falk and Dierking 1992; Bitgood *et al.* 1994; Ramey-Gassert *et al.* 1994; Tunnicliffe 1995; and others). These studies generally evaluated short-term effects; some did and others did not find positive results.

Falk and Dierking (1997) asked a variety of age groups, from 0-10 year olds to adults about early primary school field trips years after the trip was taken. Ninety-six percent of all participants remembered the trip and remember the grade/age it was taken; 79% could remember social details of the trip, such as who went with them; virtually all could remember one specific event or thing from the trip. Nearly 80% of all ages interviewed reported that they thought about the trip after it was over; 75% said they thought about it frequently (Falk and Dierking 1997).

Exit surveys from U.S. aquariums featuring captive marine mammals show visitors describe their experience as educational (97%), enjoyable (98%), moving (98%), and as one that increased commitment to preservation of the animals (91%) (Roper-Starch 1998). Of course this sample most likely, at the outset, participated in the aquarium experience because they in the first place believed they would learn something (Brookfield Zoo 1996). Visitor expectations typically dominate informal education experiences (Rosenfeld *et al.* 1982), even in children (Birney 1988).

While this survey is encouraging for those who believe education is an important benefit of captive marine mammals it does not provide information about specific experiences that are most important, their relative impact on different audiences, or the comparative effectiveness of alternative educational programmes. In general there is an remarkable lack of empirical data available on educational benefits of captive animal display. Reasons behind this are traditional - generally education is a motherhood issue and further, because humans such competent learners, it is felt that any exposure makes it inevitable.

Some surveys (Yerke and Burns 1991; Brookfield Zoo 1996) find insignificant differences in knowledge between pre and post-show interviews. However, pre-show scores were extremely high (high 80's and 90% correct); showing significant differences with such an attenuated sample will always prove difficult. Some studies have found increased knowledge and attitude scores as a result of exposure to live

animals during curricula presentations (Saunders and Young 1985). Heinrich and Birney (1992) found that live animal demonstrations at zoos were remarkably effective in achieving their goals. Retention rates of up to 83% for some messages were found six weeks after the experience. Lien (1990) found that effects of hands-on children's contact with animals in a touch tank could be measured in increased interest and awareness in ocean animals six months later.

Some studies (Serrell and Raphling 1993) have described difficulties in measuring affective learning in informal education. Sherwood *et al.* (1989) studying the effects of live animals vs. preserved specimens on student learning found that gains in both short-term and long-term affective learning as measured by changes in attitudes were achieved only when students interacted with live animals. An important finding in many studies has been that children often do not differentiate between what they experienced and what they learned (Rosenfeld *et al.* 1982).

There is an expanding body of literature which evaluates the impact of informal education (eg. the Museum Learning Collective http://mlc.lrdc.pitt.edu.mlc/) but relatively little on the impact of exposure to captive marine mammals. This is a critical oversight by those concerned about education programmes with marine mammals maintained in captivity and must be rectified. Motherhood statements about education are not adequate to determine what is, or isn't, being learned in education programmes, how well education programmes are working, or how they might be improved. Solid, empirical evaluations are necessary to do this and to justify the continued maintenance of marine mammals in captivity to the public. Such evaluations cannot be simple-minded; they will not be quick or easy. But they are required and, sadly, missing at present.

Alternative ways of teaching about whales:

Alternatives to educational programmes based on captive marine mammals which have been suggested include TV, videos, movies, IMAX, magazines, books, audio cassettes, school presentations, demonstrations, the internet, computer games, and the like. It is beyond the scope of this review to comment on all of these. Generally one would expect each would reach different audiences (Ostman and Parker 1996) and

be better at conveying certain types of educational messages than others. Each would also have limitations unique to the medium. There may be linkages between different kinds of educational exposure. For example, one gets a book to read about seals after seeing a film on them. From the fact that the modern public knows so much about whales before they come to the aquarium (eg. Brookfield Zoo 1996) it is clear that alternative exposures are available, and they use them. The interactive relationship between types of curricula or exposures is important and it may, or may not, be that exposure to captive marine mammals has a unique or important role in stimulating these interactions. That is simply not known.

Research has shown that there is a relationship between knowledge of oceans and the amount of TV programmes about oceans viewed (Fortner 1985). Walters and Lien (1985) showed that even for Canadian children that live on an ocean, much of their knowledge of that environment and its inhabitants comes from TV. Several years ago the British Broadcasting system did an interesting audience impact study of wildlife film viewers. Different scripts with scientific, anthropocentric or animal-centred narratives were written for the same footage. Many reviewers of all scripts reported that TV was better than the real thing, as just as in sports, "you see more of it on TV than if you're there". Many viewers preferred a kind of eco-porn which presented the animal in only a good light and did not show predation or mating. Most of the tested viewers preferred the anthropomorphic script (Bunker 1999).

In this review the only one alternative direct exposure to marine mammals will be discussed - that of whale watching - will be discussed in some detail.

Whale watching:

Whale watching has, in the past two decades, become the fastest growing wildlife-based industry in the world. In 1991 in the U.S. there were an estimated total of 3,430,225 whale watchers that spent $46.25 million U.S. dollars; By 1994 that had climbed to 4,074,195 whale watchers spending over 65.75 million U.S. dollars a year (Hoyt 1992; 1995). Numbers in Canada in 1991 were 185,200 whale watchers on commercial tours that paid $5.75 million U.S. dollars; in 1994 that number had climbed to 462,000 spending $14.20 million U.S. dollars (Hoyt 1995).

It is estimated from exit polls that 44.5% of all visitors to Newfoundland from June through September participate in whale watching; in addition the activity is becoming more and more popular with residents. Whale watching tours in Newfoundland carry from 120,000 - 150,000 passengers per year. It has grown to be a major business and is the key to a growing marine ecotourism business (Lien 1999; unpublished data). In Quebec, over 300,000 visits per year are made to see the beluga whales in the Saguenary-Saint Lawrence Marine Park (Heritage Canada 1999). Over 50 tour boat operators work in the area. Many additional visits occur at Mingan Islands and Rimouski.

A single, isolated beluga whale in Nova Scotia is the subject of thousands of visitors per year (Kinsman 1999). A recent survey in Nova Scotia found there are 32 commercial whale tours operators. They use 45 passenger boats and operate from June through October with two trips per day. There are 25 whale watching companies in New Brunswick with similar equipment. Prices in New Brunswick and Nova Scotia range form $20-$37.00 (J. Conway, DFO, pers. com.). Recently DFO estimated that over 300,000 commercial whale tours occur along the British Columbia coast (Lochman and Ellis 1999).

In 1998 it is estimated that well over a million people engaged in commercial whale watching in Canada (Lien 1999, unpublished data). Costs of a trip range from $25.00 to $80.00; it its estimated that direct revenue from the activity is at least $50 million per year. Duffus and Dearden (1993) estimated that whale watchers at Johnstone Strait spent $370-$400 per whale watching trip. If a more reasonable economic benefits multiplier is used, the whale watching industry is now worth a quarter of a billion dollar a year industry in Canada. Using Duffus and Dearden (1993) total expenditures may be as high as 400 million dollars per year.

Much of the impact of whale watching can be very local. In Churchill, Manitoba there are two major tour boat operators that use three large vessels and many small ones for whale watching. It is estimated that approximately 10,000 whale watchers come during two summer months to this small place. The attraction is able to keep restaurants and hotels filled; the summer business is the basis for the entire years economy.

"J Lien, Live-capture and captive maintenance review."

Most studies of the impacts of whale watching have focussed on the impact of the activity on the animals themselves (Johnstone Strait Killer Whale Committee 1992; Postle and Simmons 1994; IFAW 1997; Gilbert and Saguenay-St. Lawrence Marine Park 1998). There have been few systematic efforts to evaluate the short-term or long-term impact of such exposure to the animals. Forestall and Kaufman (1994) has noted the research and monitoring value of commercial whale watching. There have been efforts to provide educational guidelines for whale watching (IFAW 1997). Kinsman (1999) has pointed out that expectations learned from viewing captive whales may have negative transfer to the viewing of wild whales. She describes visits to an isolated wild beluga where people give the animal toys, attempt to place hands and feet in its mouth, and even attempt to ride it.

Whale watching could well be a very good alternative to some of the educational benefits of public exposure to live marine mammals in captivity. The Alliance of Marine Mammal Parks and Aquariums, however, has noted this may be impractical, as engaging similar numbers of people in whale watching as now visit captive marine mammal facilities would require an extremely dramatic escalation in whale watching activity which some feel has already grown out-of-control. Given concerns regarding impact on the animals, and the absence of demonstrated educational benefits, such a course would, at least cause additional concerns about animal welfare and conservation. Costs to the animals might not be justified by educational benefits.

Rehabilitation and reintroduction of cetaceans now in captivity:

Marine mammalogists have been concerned about reintroductions of marine mammals for sometime and have struggled with the biological and practical considerations regarding such releases to the wild. Most of this discussion has focussed on animals that were captured for clinical reasons, held for brief periods of time and, on recovery or rehabilitation, were reintroduced. The recent "Free Willy" exercise has stimulated public discussion about rehabilitation and reintroductions, particularly of orca, and encouraged some to believe that all captive cetaceans can be released into nature.

Reintroductions may be justified for practical, educational and welfare reasons. Rarely would such reintroductions be justified for conservation reasons. In fact reintroductions could pose some conservation treats to wild populations with introductions of novel disease or infestations. These could likely be minimized by attention to medical details of any release but a precautionary approach is necessary.

Reintroductions of clinically captured animals is most commonly done for practical reasons. Aquaria and treatment facilities would quickly get filled-up with harbour porpoise, harbour and harp seals and sea lions.

Reintroductions could be promoted and conducted for educational reasons. Educational objectives during such events could be to teach concern for animal welfare, basic biological and ecological

information and awareness of threats a wild marine mammal will face. For some audiences, and for some teaching objectives, a reintroduction can serve as a captivating show which may have important educational impact. But such events may also be criticized for their underlying environmental view such as Davis (1998) provides for captive education programmes. Reintroducations of long-held animals perhaps have the underlying message that even if we violate natural order, we can always provide the resources and knowledge to fix it. In any event, as empirical assessments of the educational impact of reintroducations is minimal, encouragement of mass reintroducations on this basis is not warranted at the present time.

Reintroducations of marine mammals maintained over long periods in captivity may be justified for welfare reasons. If there are not over-riding scientific and educational benefits of captive maintenance, and if captive conditions with experience do not provide adequately for the animals care and welfare, and if reintroductions will not impact animals that remain in wild populations, with sufficient rehabilitation reintroduction may improve the animals welfare. At present here is insufficient experience to warrant any endorsement of the wide-scale release of long-kept marine mammals however.

In fact only a few animals presently held in captivity should be considered as priorities for release. Many captive marine mammals held in Canada are now captive born. Release of such animals would be a low priority. Some captive born animals may be the result of the inter-breeding of different stocks of animals and may be genetically unfit for release. All captive marine mammals in Canada, with the exception of a few clinical captures, have been maintained in captivity for periods greater than one year. Rehabilation and releases of animals captured for relatively short-term scientific projects (less than one year) would be the most practical and have the best likelihood of success. Any animal captive longer than one year would not be a priority at present.

The Marine Mammal Commission of the U.S. has been charged with developing standards for the rehabilitation and reintroduction of marine mammals into the wild. This will take some time. Of 20 bottlenose dolphins groups held in captivity for more than a year and released; only 6 have been successfully followed-up. No orca maintained in captivity for more than a year have been successfully released at this point (K. Balcomb, AZA, 1995). St. Aubin *et al.* (1988), Brill and Friedl

(1993),Kleiman *et al.* (1992), UFAW (1992) , Beck *et al.* (1994), NMFS (1996) and others have presented discussions on rehabilitation and reintroduction of captive animals to the wild. These have produced general suggestions for such exercises which include: sufficient funding, needs to reinforce a self-sustaining wild population, reintroductions should occur only in ecologically suitable areas and in habitats where threats to the animal are minimized, appropriate educational planning, consultation with all regulatory agencies and the interested public, minimal threats to wild populations, wild populations should be below carrying capacity, stringent veterinary standards, reasonable chances for survival in the wild, and appropriate training in essential survival skills. All of these are formitable tasks.

The Workshop on Releasing Marine Mammals into the Wild (MMC 1991) concluded that, with the exception of highly endangered species, risks to wild populations from transmission of viral diseases from the release of rehabilitated captive animals, make such endeavours inadvisable. Although holding hope for gaining experience, the previous Canadian review of the live-capture and maintenance of captive marine mammals (Cowan 1992) concluded "given the present state of knowledge, the release to the wild of cetaceans that have been in captivity for extended periods is inappropriate." NMFS has emphasized what information is required before reintroductions are encouraged. I find it hard to escape the same conclusion although active discussions in the U.S. (A. Jeffreys, NMFS, pers. com.) may be a basis for standards for releases, and experience with actual releases elsewhere, may in future provide a basis for setting standards for better conducting rehabilitation and releases to the wild.

Communications received during this review:

E-mails, letters, faxes and submissions were received from members of the public during this review. One Canadian NGO widely advertized an announcement calling for a boycott of this review: they were not successful. Many quality presentations were received. The most substantial presentations where permission was received are included in the Appendix III (Vols. 1-5) of this report. Several of the groups provided videos; these have been deposited with DFO. The purpose of this section is to very briefly summarize the most important presentations. I believe that, because of the excellent presentations from a diverse group, that I was able to learn the

views that exist in the public about live-capture and captive maintenance of marine mammals.

Whale and Dolphin Conservation Society (WDCS): This society was established in 1987 and currently has a membership of 70,000 worldwide. It is based in the U.K. WDCS fosters conservation, welfare and appreciation for all whales, dolphins and porpoises. Their submission included a review of the scientific justifications for maintaining cetaceans in captivity (Mayer 1998), a summary of results of preliminary investigations into dolphin petting/feeding programmes in the U.S. (Stark 1998), a review of orca captivity (Hoyt 1992) and a handbook for captive cetacean campaigners(Mooney 1998). I was also referred to, and checked, their website (WWW.WDCS.ORG).

The WDCS objects to captivity for cetaceans as there are few educational or scientific benefits and alternative means to achieve both scientific and educational goals without using captive cetaceans.

Zoocheck/Canadian Federation of Humane Societies (Z/CFHS): These two Canadian organizations work together to optimize standards for captive animals. CFHS is a representative on the CCAC.

Z/CFHS provided a review of the decision of the Biodome in Montreal exclude live cetaceans in their programme (Brown and Penfound 1995), and an investigative report on Marineland in Niagra Falls (Penfound and McHattie 1998). I also had the opportunity to meet with them.

Their briefs emphasized the high total mortality of cetaceans captured for aquaria and the fact that recently developed aquaria have decided against maintenance of cetaceans. They note the that captivity benefits have failed to materialize for education, science and breeding. They presented a thoughtful analysis of the education which occurs as a result of exposure to captive marine mammals and found it wanting. Because of the nature of the natural environment of cetacea it is their belief that any captive standards will be inadequate.

Z/CFCS is particularly concerned about conditions at Marineland, specifically the housing for sea lions, use of isolation pools, and the petting of orcas by the public. They strongly argue that petting pools should not be allowed in Canadian aquaria. "At issue is not whether or not the presence of marine mammals adds to the attractiveness and viability of aquaria programmes, but whether or not those programmes have legitimacy, and whether or not animals suffer in the process of delivering those programmes."

Humane Society of the United States (HSUS): The HSUS is the umbrella organization for Humane Societies throughout the U.S. They provided publications on performing orcas (Hoyt 1992), a general case against marine mammals in captivity (Rose and Farinato 1995)and a variety of other publications and captivity standards (Riley 1993; Small and DeMaster 1995a; 1995b).

In their presentation HSUS argues that display facilities are limited in research contributions precisely because conditions limit necessary experimental controls. Further "No independent evidence exists that zoos and aquaria are effective tools in educating the general public about the biology and conservation status and needs of wildlife species". HSUS says a serious evaluation of the educational impact of aquaria is required. They expressed concern with the lack of enforceable standards for marine mammals in captivity, particularly in Canada.

Linda Sheehan: Ms. Sheehan completed an M.A. in Geography at the University of Victoria several years ago (Sheehan 1992) and provided a copy of her thesis. Additionally she provided insights into her thoughts regarding captivity of orca in several e-mail exchanges.

Ms. Sheehan does not believe that educational benefits, which she questions, or scientific benefits are a justification for maintaining orca in captivity. She acknowledges that some individuals may be deeply influenced by captive exposure to the animals but knows that people can be influenced in many ways. Captive display of cetaceans is a bit like the captive display of an aboriginal for Ms. Sheehan - it might create awareness and people could learn but, particularly in light of the fact that there are alternative ways to provide similar education, it is simply wrong. She was willing to examine scientific and educational use of captive orcas and uses the lack positive data to argue

against captivity. But fundamentally captivity of orca is just wrong because it violates the animal's rights, and causes suffering in a sensitive, intelligent animal.

Newfoundland Natural History Society (NNHS): This group is a major naturalist organization in Newfoundland and Labrador and has frequently taken advocacy positions on environmental issues. It was one of few environmental Canadian organizations that responded to the current review solicitation for public comment.

Motivation behind live-captures was an important factor for NNHS. They would not accept live-captures from threatened populations for captivity, or captures from any populations on which an adequate information base is not available. Profit-driven captures should not be permitted, but educational or scientific justifications are acceptable. They note that there are techniques for the study of wild populations which now eliminate the need for some captive studies; however, they also point out that some studies on captive animals are necessary. They emphasize that not all live-captures result in captivity and that these have important scientific benefits; they urge that standards for short-term live-capture need to be developed. NNHS emphasizes that education means "what people take away with them".

Saguenay-Saint-Lawrence Marine Park (SSLMP): Parks Canada staff describe a particular case in 1996 when a group of scientists wished to collect blood samples from 20-30 belugas; the work involved temporary capture. Because of uncertainty of the value to management of the endangered St. Lawrence beluga population, and the example such scientific harassment might set for whale watching operators in the area, the SSLMP opposed the capture plan.

Over 300,000 visitors come to SSLMP each year to engage in whale-watching. They note that while whale watching may have educational potential "it is not always the case when no commentary is provided, when many boats circle the animals and when approaches are not respectful of whales. With captive whales, the educational potential may also depend on how the animals are presented."

Atlantic Veterinary College (AVC): Work at AVC with marine mammals is primarily concerned with investigating causes of mortality in seals and whales. They are also on occasion do clinical captures for treatment of sick or injured animals, but

this work is limited and opportunistic. Seals are held maximally for four weeks in small tanks until they are rehabilitated and released. These captures are under permit from the DFO and both animal care and protocol are reviewed by CCAC procedures.

Merritt Clifton (Editor Animal People): Animal People is described as a news service covering animal protection world-wide. Mr. Clifton noted that the protection community has recently focussed on rehabilitation issues simply because there have been few live-captures. If Canada engages in live-captures for captivity "the muted rage of the past few years (will resurface) with more money behind it than ever before, and an older, much more politically astute group of activist leaders directing the campaign."

David St. Aubin: David St. Aubin is a respected Canadian and U.S. marine mammal researcher. He has published 41 journal articles, book chapters or books based on information derived from live-captured marine mammals. He currently is the Director of Research and Veterinary Services at Mystic Aquarium in Mystic, CT.

Dr. St. Aubin notes that live-capture has been going on in Canada for decades, most of it involving brief restraint for sampling and tagging prior to release. Satellite technology greatly enhances the scientific pay-offs from such captures. Other captures result in extended captivity but are also important for gaining information particularly on energetics and metabolism, sensory physiology, reproduction, health and disease, and nutrition. He notes the large number of publications at Canadian universities which have resulted from captive animal research. He notes that there have been disease outbreaks in the wild claiming lives of many animals, investigations of which were hindered by the absence of adequate baseline data for blood and tissues. Dr. St. Aubin also argues with the review by Mayer (1998) in that it ignores the important work on metabolism, renal physiology, sensory capabilities and immunological function which have been done in captivity.

Regarding the live-capture of beluga, Dr. St. Aubin argues that extensive telemetry data now show such captures do not disrupt the normal behaviour of animals. Similar data with other marine mammal species should relieve concerns about the impact of live-capture itself. He also points out that survivorship in captivity for some species of cetaceans, such as beluga and bottlenose dolphins, are not different than found in wild populations.

Montreal Biodome: At one time the Biodome considered maintaining cetaceans in their facility but in 1993 decided that it would not acquire any marine mammal for public display and education. Reasons behind this was (1) the use of re-created ecosystems instead of 'star' species to better serve environmental awareness and education; (2) consideration of inadequate facilities; and (3) strong public opposition from pressure groups. The Biodome believes that a "very good quality of education in marine mammal conservation can be offered without keeping any such animal in captivity."

John G. Shedd Aquarium: The Shedd has approximately two million visitors each year and actively studies the effects of their programming efforts on visitors. They point out the complexity of the benefits that one would wish from exposure to marine mammals and the difficulties in measuring them. They are eager to develop more rigorous and comprehensive programmes of impact evaluation. Linda Wilson of the programme evaluation staff at the Shedd provided many helpful references to the evaluation of educational impact.

Cetacean Society International (CSI): The Cetacean Society International is one of the oldest and most active whale protection NGO's in the U.S. It is their position that "it is no longer justifiable for cetaceans to be captured or maintained in captivity for purposes of exhibition, education or research. There exists a moral imperative for cetaceans in captivity to be maintained in optimal conditions for their physical and social well-being and for efforts to be made for their rehabilitation and release."

Consistent with this view they oppose the capture of belugas for display purposes. They wonder if the current Marineland of Niagra Falls application for beluga will be processed under older Canadian policies or will be examined in the light of the current review. They argue that the field-capture of some species of cetaceans may have unknown impacts on animals and feel that capture operations must be considered a significant impact on the entire social unit.

CSI considers that there are few actual scientific benefits from captivity and that education and awareness impacts are counter productive."In reality, almost every facility falls far short of professional standards for meaningful educational

programmes." They believe that Canada has failed to implement even the minimal standards for the maintenance of captive cetaceans developed in other countries.

Alliance of Marine Mammal Parks and Aquariums (AMMPA): The AMMPA is an international organization representing 39 marine life parks, aquariums, zoos, research facilities and professional organizations. In Canada, the Vancouver Aquarium is a member of AMMPA. They believe that there is strong public support for the public display of marine mammals. Although they quote some statistics their most convincing argument for this is that ' people vote with their feet'. Their submission concentrates on educational and scientific contributions of captivity and on standards for maintaining captive cetaceans.

A 1998 Roper poll is cited which indicates that " interacting or viewing live animals at public display facilities (was) the most valuable educational tool available to learn about marine mammals.....Almost everyone (97%) interviewed said their experience with live marine mammals had some degree of impact on their appreciation and knowledge of the animals." The AAMMPA note that there are published educational standards for member facilities which include: the objective of "promoting an improved understanding and appreciation of the animal and its ecosystem", use of best current scientific knowledge, and professional qualifications educational staff.

AAMMPA "members have spent about $20,000,000. in the past five years to conduct basic and applied studies". This research is devoted to maintenance and captive welfare but also to a wide variety of basic science more applicable to cetaceans in the wild.

Regarding standards for captivity they note that U.S. facilities recently participated in the Marine Mammal Negotiated Rulemaking Advisory Committee and were able to come to agreements with welfare interests regarding many standards.

Veronik de la Cheneliere: Veronik de la Cheneliere recently completed an M.Sc. thesis at McGill (de la Cheneliere 1998). Her thesis examined risks and benefits of an invasive study technique with wild cetaceans. She provides an analysis of risks to the animal and benefits to science that has application to other situations where scientific gain may result in costs to individual animals or small populations.

Brookfield Zoo: The Brookfield Zoo hosts one million visitors each year. Their captive bottlenose dolphins are exhibited in a setting that re-creates the Caribbean coastline. They note that their staff participates in a wide variety of scientific research programmes both in the aquarium and in the field.

Two enclosures came with the Brookfield Zoo submission that were of particular interest. One was their internal evaluation of their dolphin show done in 1996. Of interest was that 84% of visitor groups contained children. The survey examined both pre- and post-show knowledge scores. Knowledge scores increased in virtually all measured categories.

The second enclosure presented the ethical standards which the Brookfield Zoo uses to judge applications for animal acquisition.

Andrew Trites/Dave Rosen: Andrew Trites and Dave Rosen are scientists in the Marine Mammal Research Unit at the University of British Columbia. Dr. Trites is the coordinator of a multi-university, coordinated research programme on marine mammals.

The major concern of these scientists was that the need for captive research be recognized. Their current studies involve both field and captivity research on Stellar sea lions and causes of their recent decline in the wild. Captive research is done in the Vancouver Aquarium. Local research review is done both by the Vancouver Aquarium's research committee and by the University of British Columbia Animal Care Committee. Work in the field and aquarium are carefully coordinated. A benefit to the aquarium of sponsoring this research is that captive animals which are off-experiment are used in an educational programme which describes the problems the animals are having in the wild.

A concern was the permit application process through which DFO authorizes live-captures of marine mammals. Both scientists felt it could be improved by greater transparency and rigour; both also emphasized that the application process should not become the cumbersome exercise used in the United States.

Richard Sears: Richard Sears is the principal in the Mingan Island Cetacean Society and has been a boat tour operator which specializes in the blue whales of the Gulf of St. Lawrence for a long time.

He notes that there has been little judicious leadership by responsible organizations as whale watching has boomed. He fears an "eco-circus" with little actual interpretation. At present mercantile interests outweigh education, nature and the welfare of the animals. He requests reasoned consideration of what we are trying to do with whale watching.

Brad Hanson: Brad Hanson recently completed graduate degrees at the University of Guelph and presently works for National Marine Fisheries Service (NMFS) in the United States. The views he presented are his own and not necessarily those of his employer.

Brad Hanson notes the importance of live-capture for biological sampling, attaching telemetry etc. that are critical for stock structure analysis, monitoring of trends, identification of critical habitat and a variety of important management needs. He recognizes that there is always some risk in capturing a live animal but techniques developed over the last 40 years attempt to minimize this. He also notes that only a small fraction of any animal population is sampled in this way and that further reduces any potential impact on populations.

A specific permit application for Dalls porpoise in BC waters was discussed. He reports the request was denied by DFO on the grounds that it would be done near large whale watching fleets and would be opposed by a vocal animal welfare community. He argues that evaluation of such permit applications should be done based on scientific value and benefits to animal populations, not based on concerns of vocal public groups.

Robin Baird: Robin Baird has been an active marine mammal researcher in British Columbia and recently completed a post-doctoral study at Dalhousie University. He now works for the Pacific Whale Foundation. He has authored numerous scientific papers using wild marine mammals and is expert on marine mammal captivity; he authored a contract report for an earlier review (Baird 1992). He has been involved in the live-capture of four marine mammal species.

Dr. Baird notes generally the benefits of live-capture for populations in the wild. He relates his experience in attempting to gain a permit for the live-capture and tagging of harbour porpoise off British Columbia. U.S. and Canadian permits were applied for; the U.S. permit was granted but not one from DFO. He points out that, at present, "the criteria for applications are not explicit, the criteria for review are not explicit, the process is not transparent, and there is no mandated time limits for review of permit applications." Because of the lack of clear process and standards in the current permit application process Dr. Baird believes the process is open to political influence and personal bias. Facilitating good science is clearly in the best interest of understanding the biology and threats marine mammals face.

Jon Lien: (Yup. I sent something to myself!) Jon Lien is the leader of the Whale Research Group at Memorial University of Newfoundland and has worked with incidentally caught and stranded cetaceans for quite a while. Most of his work has been with wild whales but, on several occasions, he has worked for brief periods in aquaria with captive cetaceans.

Most live-captured marine mammals, in fact thousands of times more than animals caught deliberately, are captured incidentally in nets by fishermen in Canada. In some cases, such as the northwest Atlantic harbour porpoise, these incidental captures significantly impact on populations. Some sort of numerical balance in perspective is required.

It is critical that DFO, who is the responsible agency licencing fishing activity, to insure mitigation of fishing impact on marine mammals. Individual fishermen can release whales but often don't do it well. And because many entrapped animals are found with gear of unknown origin the fishing industry itself cannot adequately respond to such events. DFO must insure such live-captures are properly dealt with.

A second concern is with the permitting process in Newfoundland. It is extremely informal which can be an advantage but also neglects scientific rigour which should be brought to permit applications. A clear application process must be developed that is rigorous and transparent, as well as efficient.

Marineland: Marineland in Niagra Falls, Ontario is a theme park that uses seals, sea lions, bottlenose dolphins and orca in their presentations. It is a privately- owned facility that has approximately one million visitors a year.

Central to Marineland's presentation are new facilities which they have developed, as well as research they have supported, and their educational programme. Each spring Marineland has student days. Teachers are provided with a curricula book which introduces animals in the park, it also suggests some readings and provides school activities. Several researchers have used the park's marine animals for on-going projects. Management is eager to expand such programmes.

Marineland's success in breeding orca and in surviving offspring is a result of the good water quality and care animals receive. The facility has consulting veterinarians as well as several local veterinarians that oversee animal care.

"While it is of critical importance that we listen to the point of view of advocates for animal rights and to public opinion, it is equally important to consider the value of research, education and awareness when that public opinion opposes our practices. Balance in our use of animals is required." Referring to captivity and to whale watching their presentation asks "Is it better to bring a small number of animals to people, or a large number of people to animals? Which has the greater impact on the population of these species overall?"

No Whales in Captivity (NWIC): NWIC has been an activitist group that has been primarily interested in the Vancouver Public Aquarium but also is involved in larger animal welfare issues. Their particular focus has been orca, but also other species of marine mammals. NWIC developed a phase-out plan for cetaceans at the Vancouver Public Aquarium which they presented to the Vancouver Park Board that governs the Aquarium's real estate.

NWIC provided an interview with Dr. Jim Darling regarding his views on the scientific usefulness of captive marine mammal research. Dr. Darling does not believe that research on captive animals has application to wild populations. NWIC is critical of education which is said to result from exposure to captive marine mammals. "There is...no evidence that the aquaria-going public in anyway supports international whale

conservation. Even if this were true, it would have to be established that there is a correlation between that support and seeing whales in aquaria."

For NWIC the captivity issue is an ethical one; such a practice is wrong. Even if it were acceptable ethically, larger pools cannot help individual whales. They note that many abnormal behaviours develop in captivity. "Current collections of captive cetaceans, with their dismal survival and birth mortality rates, are simply not self-sustainable." If cetaceans are allowed in captivity further live-captures will be necessary.

The group calls for an independent dialogue with interested individuals to ensure the proper management of marine mammals in the future.

Whale Stewardship Project: The Whale Stewardship Project has the objective of improving the relationship between humans and whales so that they can coexist wherever they meet. They have been studying interactions of humans with the single white whale that resides by a community in Nova Scotia. They monitored human-whale interactions over 10 weeks in 1998; 200 hours of video were obtained.

WSP believes that attitudes toward whales learned in videos and through captive exposure transfers to their expectations of interactions with wild whales. People attempted to ride the animal, stand on her, feed her dead fish, give her toys and to put their hands, feet and even heads in her mouth. When intervention occurred people simply did not see what was wrong because of expectations developed through video or captive exposure.

WSP states that "until there is empirical evidence that public exposure to the captive whale/human relationship unequivocally has no link to the expression of such behaviour...A moratorium on all future captures....would seem the most prudent measure."

A conclusion: The Canadian public cares deeply about marine mammals and look to DFO as the management agency responsible for both their conservation and welfare. Marine mammals are totem species which are used to front larger concerns of animal rights, welfare, or conservation. Some of the public have concerns about all live-

captures of marine mammals, particularly cetaceans, but they are most concerned about long-term captivity. Cetaceans evoke the most care and emotion, seals, sea lions and otters typically less. A substantial portion of the Canadian public support captive maintenance of marine mammals; another smaller portion are against it. Those that support captivity do so conditionally, captivity must result in educational and scientific value. Those against captivity oppose it because it violates the animals rights, is cruel because of the nature of the animals involved, or that it is unnecessary. It is not likely that everyone will come to feel the same way about marine mammals in captivity, or needs to.

Recommendations:

DFO's mandate and marine mammals:

(1) Marine mammals are of passionate interest to much of the Canadian public who care deeply about their conservation and welfare. They have become a symbol of mans' abuse of nature, of the health of the ocean ecosystem and of the frontier for exploring the relationship between humans, animals and nature. DFO cannot manage marine mammals as it does fish. The public strongly supports scientific and management programmes for all marine mammal species, including those designated as "non-commercial" species. They want their passion for the animals expressed in government action and high quality management. There are no alternative management or regulatory agencies that can fill this mandate. The Department should in its policies and programmes recognize this basic reality. Marine mammal popularity is both a responsibility and an opportunity for the Department.

(2) The manner in which ocean resources are used has changed. Whales and seals are now of great recreational interest. Commercial viewing of this group of animals (whale watching) is a central focus in ocean ecotourism which has expanded into a major industry in all regions of Canada rivalling incomes from fisheries in many areas. The Department's investment in science and management should reflect this change. The tiny percentage of DFO resources that are presently used to study and manage whales and seals is unacceptable to much of the Canadian public. The Department should substantially expand its present science, communication and

management involvement with marine mammals to reflect current economic and social realities.

(3) DFO presently provides Canadians with a variety of informational and communication programs to educate them about ocean habitat, oceanographic and biological processes, and ocean species to gain compliance with guidelines or regulations, to develop support for management initiatives and programmes, to ensure safe recreational or commercial activity, to foster acceptable attitudes towards oceans and behaviours, and generally to generally advance the Department's mandate. DFO manages people and their impact on oceans and their inhabitants; it does not really manage marine mammals or other marine wildlife. Marine mammals represent an important point of contact for the Department with the Canadian public, and offers the Department an unequalled opportunity to present information to the public about the ocean ecosystem and DFO's role in managing it. The Department should fully utilize this opportunity.

(4) The live-capture of marine mammals for captive maintenance is restricted to only a few institutions in Canada. While it is not a major industry it may have important scientific and educational benefits. DFO is the only possible responsible agency that can regulate the activity and the public feels strongly that it must. This review concludes that there are not alternative venues for the regulation of the live-capture and captive maintenance of marine mammals in Canada and recommends that DFO accept the full responsibility.

(5) Live-capture of marine mammals for captive maintenance cannot independently be examined with respect to the mandate of DFO apart from its overall responsibilities toward marine mammals. Numerically live-captures for captive maintenance comprise only a very few animals. Short-term live captures of marine mammals occur regularly for scientific purposes and are extremely valuable. Incidental captures of marine mammals in Canadian fishing gear occur in the thousands each year and action must be taken to minimize the impact of such catches. Captures of marine mammals for clinical treatment are done regularly and must be monitored. DFO must have responsible management programmes to deal with all such live-captures. The Department to meet public expectations, and fill its mandate for marine mammal management, must take full and balanced responsibility for each of these.

(6) The Minister's Office expressed the objective for the present review of **leading the world in marine mammal programmes. To do this DFO must have resources to devote to the task. The Minister should ensure that resources are available to** implement recommendations in this report.

DFO and the public:

(1) This report should be used as a beginning for a more rigorous and active participation by DFO with the public it serves to optimize its educational contacts, to consult, and to fulfil its mandate for management of marine mammals. The Department should systematically circulate this report to interested individuals and groups to gather reviews and comments.

(2) The Minister would benefit from opinions and advice from both the general and professional public regarding the Department's policies concerning marine mammals. The Canadian public feels that management of marine mammals which relies only on in-house advice from DFO is inadequate. The Department should re-establish a Marine Mammal Advisory Committee to systematically gather such advice and provide recommendations to the Minister. Appointments to the Committee should insure a practical mix of interest groups and professional representation. Included should be the Canadian Council on Animal Care (CAC), the Welfare Committee of the Canadian Veterinary Medicine Association (CVMA) , the Canadian Association of Zoological Parks and Aquariums (CAZPA), representative eduction professionals and NGOs and *ex officio* DFO representatives. Such an advisory committee could meet electronically on a regular basis. Functions for this group should include reviews of applications for captivity permits and providing recommendations regarding DFO science and management of marine mammals.

(3) Live-captures of marine mammals for captive maintenance is supported with qualifications by the Canadian and North American public, the Marine Mammal Society, I.U.C.N. and others. The qualification for all is that there must be solid educational or scientific benefits of captivity. A dedicated and sincere segment of the Canadian public believes live-capture and captivity of marine mammals violates animal rights, and is cruel and unnecessary. Public opinions regarding the relationship of

humans to animals and nature have been changing over the past decades, and it is likely they will continue to evolve. There are substantial regional differences across Canada is the public's feelings about marine mammals. It is recommended that the Department in setting policies consider the welfare of animal populations primarily, but also is aware of both minority and majority feelings of Canadians regarding marine mammal captivity.

(4) It is recommended that the Department consult with the Inuvialuit Game Council, the Fisheries Joint Management Board and the Nunavut Wildlife Board regarding their views on recommendations and standards in this report. Co-management arrangements with these bodies may restrict DFO's policies and practices respecting live-captures and captive maintenance.

Problems with present live-capture and captivity regulation:

(l) DFO should be aware that at present there are serious inadequacies in regulating the captive maintenance of marine mammals in Canada.

(a) DFO, or other regulatory authorities, do not have adequate powers to enforce conditions of captive care and welfare of marine mammals.

(b) There are, at present, no recognized standards for captive marine mammal care for all holding facilities in Canada.

(c) There is no independent, transparent inspection programme that is publically accountable for ensuring appropriate captive care of marine mammals.

(d) There are inadequate controls on the import and export of marine mammals to or from Canada.

(e) There are inadequate regulations and controls on alternative programmes involving exposure to live marine mammals, such as whale watching, in Canada.

(2) There are additional problems in the management and evaluation of captive maintenance of marine mammals.

(a) Captive breeding programmes for cetaceans are operating on a small genetic base without adequate planning or coordination.

(b) There are inadequate demonstrations of the educational value of exposure to captive marine mammals.

(3) It is therefore recommended that until these problems are rectified, DFO should maintain a moratorium of captures of marine mammals for captive maintenance. Such a step will supply motivation to correct deficiencies. However, this is not meant to imply that such a moratorium should be permanent. When regulatory arrangements have been completed, when captive breeding cooperative arrangements are judged satisfactory, and if a satisfactory programme of educational evaluation has been established, DFO should, with advice from the Advisory Committee on Marine Mammals, review and modify the moratorium as appropriate.

Regulations and Policy Framework:

(l) At present there is adequate authority in the Fisheries Act, and in regulations under the act, to control the actual live-captures of marine mammals. Conditions placed on short-term live-capture permits for scientific purposes can ensure such activities minimize stress on captured animals and any possible impacts on wild populations.

(2) When marine mammals are live-captured for captive maintenance DFO has placed conditions on permits which set standards for their care and welfare. While such permit conditions may have some moral authority, under present acts and regulations in Canada, they cannot be enforced. This is not acceptable. Such an arrangement leaves animals originating from outside Canada, and in facilities already holding marine mammals, without regulatory control. This is not adequate to assure the public that its concerns for the welfare of marine mammals are adequately addressed. It is recommended that DFO establish new controls on live-capture and captive maintenance within the Marine Mammal Regulations. Several categories of permits are recommended: (1) Clinical Intervention Authorizations; Incidental Capture Assistance Authorizations, (2) Marine Mammal Holding Permits, (3) Marine Mammal Import/Export Permits and, (4) Whale watching Operators Permits. All permits would be held to standards.

(3) Clinical intervention authorization: The need for opportunistic clinical captures and intervention with injured or sick marine mammals is recognized. DFO should insure that in each region the public has a means for reporting marine mammals in need of assistance to appropriate authorities. It is recommended that appropriate permitting conditions should be specified under Marine Mammal Regulations. These should include the following:

(a) A permit classification which authorizes qualified professional individuals or groups to provide assistance to stranded, injured or sick marine mammals is recommended. Such arrangements may be flexible and should suit circumstances such as the species and number of animals which need help, and other local conditions. Facilities used for treatment should be assessed by the Canadian Council on Animal Care (CCAC) and governed by best veterinary practices. Permits should be renewed annually to provide authorization for dealing with such opportunistic events.

(b) Authorizations for clinical capture should be reviewed on a regional, basis. The Marine Mammal Advisory Committee and DFO-Ottawa should be informed of such arrangements by the regions.

(c) Clinical capture authorizations should allow the holding of animals for periods adequate to provide necessary treatment. If such treatment for practical or humane reasons is extended beyond a period of several months, the Department should be informed and plans for the animal reviewed under the scientific or educational captivity permit application procedures.

(d) Disposal of animals captured for clinical or welfare reasons that cannot be rehabilitated and reintroduced should be given some flexibility. Holders of clinical capture permits should be authorized to euthanise animals for humane reasons, or those animals which in their professional opinions will not survive release,. Euthanasia should follow guidelines of the CVMA and the CCAC. Captured animals may be used in educational or scientific captivity programmes conditional upon the institution holding Good Animal Practice certification from the CCAC. Such dispositions should be permitted after application for the appropriate permit is approved.

(e) Animals that die during clinical capture should be made available for educational and scientific use. The Marine Mammal Advisory Committee and DFO should facilitate this.

(f) Animals released following clinical capture should meet standards specified in rehabilitation and release guidelines.

(g) Clinical capture permitees should provide the Department with an annual summary of their activities. DFO should maintain records of these summaries. In cases of high levels of unexpected mortality, or disease, the permittee should be required to notify DFO immediately.

(4) Incidental capture assistance authorizations: DFO should establish an Entrapment Assistance Authorization within the Marine Mammal Regulations which recognizes the need to assist marine mammals that are incidentally caught in fishing gear. There are a number of requirements which should be recognized in this authorization:

(a) The Department should insure that there are no penalties or impediments which inhibit fishers from reporting incidental captures of marine mammals. Cooperation and assistance from the fishing industry in dealing with incidental impacts to the environment which result from their activities is critical. The public strongly supports programmes which assist marine mammals in trouble.

(b) It is recommended that DFO in each region establish a clear, well advertised means for fishers and the public to report incidental entrapments.

(c) Reports of animals in trouble requires action. The Minister should ensure that each DFO region has a marine mammal entrapment assistance programme in place to assist fishers and marine mammals in instances of incidental capture.

(d) A standing permit arrangement should be given for individuals or groups which the Department recognizes to deal with incidental captures. These individuals or groups should be required to provide the Department with summaries of their activities each year. The Marine Mammal Advisory

Committee should review entrapment assistance programmes from time to time and should insure they are conducted in approad with the appropiate requirements which may include compliance with CCAC policies and guidelines. Reported entrapments should be summarized by DFO annually.

(e) Animals that die as a result of incidental capture should be made available for scientific and educational use. The Marine Mammal Advisory Committee and DFO-Ottawa should facilitate this.

(5) Marine mammal holding permits: It is recommended that under Marine Mammal Regulations DFO establish a permit category for holding captive marine mammals. Holding permits should be made for scientific or educational use only; animals obtained primarily for captive breeding should be required to meet scientific or educational use standards. There should be a number of requirements for obtaining a holding permit.

(a) Holding permits should be issued on a year to year basis and renewed annually.

(b) To qualify for holding permits facilities must be assessed by the Canadian Council on Animal Care and must follow CCAC guidelines and policies, as revised from time to time. Full assessment by the CCAC occurs every three years, with special visits organized as necessary, in particular, a special visit is required each time a live-capture for captive maintenance application occurs.

(c) Facilities would be required to have Local Animal Care Committees (ACCs) established under the CCAC Terms of Reference for Animal Care Committees to review and approve any animal use proposal in accord with CCAC policies and guidelines as revised from time to time.

(d) To qualify for a holding permit, facilities must have an Expert Education Advisory Committee (EEAC) composed of recognized professional educatiors from the community the facility serves. The role of the EEAC is to advise the facility on its education programmes, assist with their development, insure coordination with other education programmes in the community and to review

annually the facilities educational achievements and certify the quality of their educational programmes.

(e) Annual renewals should require the submission of the CCAC's Animal Use Date Froms for marine mammals that reside in the facility, the annual Expert Education Advisory Committee (EEAC) report, and a copy of the current CCAC certificate of Good Animal Practice.

(f) In cases of repeated failures to maintain standard or pass inspections, DFO should have authority to seize animals.

(5) Import/Export permits: It is recommended that DFO establish an Import/Export Permit requirement under the Marine Mammal Regulations. There is at present no requirement to provide notification to anybody or to obtain any permit, except for marine mammals listed in Appendix II of C.I.T.E.S. A C.I.T.E.S. import/export permit is necessary to transport such marine mammals from/to Canada. There is presently no required certification of the animal's health or review of the facilities and care standards of receiving institutions. Supervision of such activities now only comes on requests from officials in the United States.

(a) The Minister should request that the Animal Health Division of the Department of Agriculture immediately implement a moratorium on the import/export of marine mammals until satisfactory mechanisms are in place to insure the welfare of transported animals. Further, the Minister should request that the Animal Health Division of the Department of Agriculture establish in its Health of Animals Act regulations regarding marine mammals, including the requirement of a DFO permit prior to import/export and satisfactory inspections of facilities.

(b) Transfers of animals to facilities that are not accredited by professional associations comparable to those in Canada, or to locations where standards of welfare and care differ substantially from those in Canada, should not be considered.

(c) Canadian facilities who export/import marine mammals must hold appropriate holding permits.

(d) If applications are made for export/import for breeding, there must be satisfactory stud book and cooperative breeding programmes in place for that species before a permit should be issued.

(e) If animals are to be acquired for long-term maintenance for educational or scientific reasons, appropriate permits for these activities should be held before any import is issued.

(6) Facilities that now hold marine mammals in Canada should be required to meet all new requirements within three years.

(7) Whale watching permits: It is recommended that DFO establish within the Marine Mammal Regulations a Whale Watching Operators Permit which would be required for all commercial enterprises engaged in this activity.

(a) DFO should implement a systematic study to establish standards and policies for the granting of whale watching operators permits.

(b) Guidelines to control whale watching should be identified in the regulations but compliance rahter than enforcement should be used to implement them.

Review of applications for live-capture and captivity:

(1) Each DFO region should have a marine mammal coordinator as a central officer to coordinate activities dealing with marine mammals and to implement reviews of permit applications for live-capture.

(2) There are substantial differences in the cultural sensitivities of various regions in Canada toward live-capture and captivity of marine mammals. This is not likely to change. Hence, the initial review of any live-capture permit application should be done at the regional level where sensitivity to local values would be greatest. The Marine Mammal Advisory Committee should be informed when a permit application is

received and asked to comment. DFO-Ottawa should maintain records centrally of all applications received and their disposition. The Committee should have the final decision regarding recommendations to the Minister only for captivity permits.

(3) Emotions regarding live-capture and captivity of marine mammals run high and the public generally supports captivity of marine mammals only with qualifications. Thus the Department should have clear and explicit policies regarding the captivity of marine mammals, indicate how these policies relate to the mandate of the department, and make clear the principles and standards respecting marine mammal capture and captivity which the Department follows. Regions should follow the same general process for permit application and review.

(4) DFO should make it clear that decisions regarding live-captures of marine mammals are based only on stated principles, standards and policies, and are not made based on political influence, or lobbying. A booklet should be developed which informs possible permit applicants, and makes transparent for the public, the permit application process and how applications are reviewed.

(5) The interested public should be given notice of applications for live-captures of marine mammals for a period of 60 days during which they can provide the Department with any relevant views or information they wish. This could be done on the DFO web page. Permit reviewers may consider such public comments in their decisions on applications but the principles regarding live-capture should not be violated.

(6) It is not clear that the need to gain public support for conservation of marine mammal populations in the wild, or the need for scientific information, is, or should be, confined by national boundaries. It is recommended that bans on exportation of any species from Canada purely because the application originates from another country be discontinued. Exports of animals from some Canadian populations may be necessary to maintain breeding programmes within captive populations. It should be noted, however, that there is great value in restricting marine mammal captivity to local species of interest.

(7) No leasing of marine mammals should be allowed under normal circumstances.

(8) User fees should be assessed on applications for live-capture of marine mammals for captive maintenance sufficient to cover the Departments costs in processing costs.

Scientific capture permits review:

(1) Short-term scientific captures of marine mammals should be permitted. These include those which result in short-term detention of the animal while it is fitted with telemetry, or while samples are taken. Such captures do not displace the animal from the capture location. Review of such applications should be conducted on a regional basis by DFO; the Marine Mammals Advisory Committee and DFO-Ottawa should be kept informed of such applications and have the opportunity to comment on their acceptability. This activity is generally extremely beneficial and should be facilitated.

(2) A standard application process should be adopted in all regions. A process which revises the 1992 recommendations of the Marine Mammal Advisory is adequate. The review process should be based on a peer review advisory system and should be completed at a regional level. Review of any application should include both DFO and qualified professionals from the public. A review period required for a permit at which time a reply to an applicant is required should not be longer than 90 days.

(3) A proposal describing the work to be undertaken must be submitted to the Department and then circulated for peer review. The peer review should include comments on the technical merit of the experimental work, it's likelihood of success, its contribution to the welfare of similar animals in the wild, and should evaluate alternatives to capturing animals.

(4) Evidence must be present from the institutions Local Animal Care Committee indicating the research protocol has been reviewed according to guidelines provided by the Canadian Council on Animal Care (CCAC). As only very few individuals in most institutions deal directly with marine mammals, additional reviewers of animal use should be requested from expert marine mammalogists who work in the area of the proposal.

(5) The review process should insure that scientific captures do not occur in protected areas unless populations in the area are of specific management concern. Collection locations which do not interfere with other activities, such as whale watching, should generally be required.

(6) Researchers and institutions who capture marine mammals for scientific study must provide the Department with progress reports on the scientific work every six months. The Department, regionally and in Ottawa, should maintain records of marine mammals captures and inventory reports and publications which result.

(7) If research on wild cetaceans is to be the major source of information for the management mandate of DFO then the Minister must insure that adequate funds are available for such research. The Department's effort, and its research funds, should not be restricted to only a few species of "commercial" interest but used on management needs of any marine mammal.

Scientific captivity permits review:

(Although conditions for scientific and educational capture are listed here as separate categories, as most captive marine mammals are used in both roles, normally any live-capture for captive maintenance should meet all conditions for both scientific and educational capture.)

(1) Maintaining marine mammals in captivity is viewed by the public and professional communities as acceptable because it results in benefits to the populations of marine mammals in the wild. A clear majority of marine mammalogists agree that captive animal research is necessary. It is recommended that it should be permitted with careful attention to the animal's welfare and with the constraint that it has some potential for application to the conservation and management of marine mammals of wild populations.

(2) It is recommended that scientific captivity permits can be considered for review only from facilities that have established Canadian Council on Animal Care (CCAC) inspections and Expert Education Advisory Committees (EEAC).

"J Lien, Live-capture and captive maintenance review."

(3) New standards for care, facilities and welfare recommended in this report should apply to all existing and future captivity applications.

(4) It is recommended that applications for scientific captivity permits should be made to DFO-Ottawa who involves regions in reviewing the application. A standard application process should be adopted. The review process should be based on a peer review advisory system. Once a proposal describing the work to be undertaken is submitted to the Department it should be circulated to interested individuals and professional bodies for peer review. The peer review should include comments on the technical merit of the experimental work, its likelihood of success, its contribution to the welfare of similar animals in the wild, and should evaluate alternatives to the study of captive animals. The review should be conducted by DFO-Ottawa staff. As DFO staff may have inadequate familiarity with the captivity of marine mammals, the Department should supplement its competence with outside experts as required. The final recommendation to the Minister regarding scientific captivity permit applications should be made by the Marine Mammals Advisory Committee.

(5) As the longevity of marine mammals in captivity typically is greater than any single researchers programme, ideas or funding, it is recommended that applications for scientific captivity include plans on disposal of animals on completion of specified research. If continued captivity is specified the application must include a detailed plan for the animals use and care. If unspecified future scientific study of the animals is requested the holding facility should have a specific procedure by which researchers may apply for scientific study of the animal(s), and a grant programme to support such research. The Department should also have research funds available to assist in supporting research on captive marine mammals. It is recommended that the Department should regularly review the productivity of facilities holding such scientific captive. Rehabilitation and reintroduction plans for captive animals should also be presented if continuing research or education is not planned. Reintroduction and rehabilitation must meet specified standards.

(6) Some animals may be captured and held for short periods of captivity for specific research programmes at the end of which reintroduction of the animal to the wild is planned. Normally such captive maintenance should be as brief as possible. Given present experience, it is recommended that such captives not be released if

maintained in captivity for over a year. If an animal is released reintroduction standards should be met.

Educational captivity permit review:

(1) Facilities holding marine mammals for educational reasons argue that information, attitudes and affection which result from the public's exposure to the captive animals is important for the conservation and welfare of animals in the wild. Those opposing captivity argue there are few educational benefits; negative benefits in that people learn a doministic attitude toward animals, or weak benefits compared to alternative exposures to marine mammals. However, there is not substantial empirical support for either view. Evaluation of these opposing contentions is an important priority. The lack of information fosters the continuing public dissension on marine mammal captivity. It is recommended that the Department take steps to insure that this information develops by requiring it and by assisting in funding it. This would be a major leadership initiative for DFO and Canada that would have world-wide benefits.

(2) A moratorium on educational captures of marine mammals is recommended until a body of empirical evidence accumulates which documents educational benefits of public exposure to captive marine mammals. The development of such professional evaluation programmes are the responsibility of all aquaria facilities and should be facilitated by DFO. This moratorium should not be interpreted as a permanent ban on future captive maintenance or live-captures of marine mammals. DFO should establish an advisory mechanism by which, as such information accumulates, a recommendation can be made regarding removal or continuation of the moratorium.

(3) The Minister should request that CAZPA adopt educational standards presented in this report. Facilities applying for a any permits for captive marine mammals should be members of CAZPA, or its foreign equivalent.

(4) Each facility that holds captive marine mammals must have an Expert Education Advisory Committee. Members of these committees should be experts in education in the community the facility serves. These individuals should, especially for those facilities that are presently sub-standard, develop an overall education plan with goals, plans and priorities. The EEAC should work regularly to advise holding facilities

on their programmes, assist in developing community linkages and evaluating progress in achieving educational goals.

(5) Facilities requesting permits for captures for educational purposes must demonstrate a clear record of professional educational programmes with marine mammals over a period of years. The requirements for such a programme are outlined in the section on 'educational standards'. The Department must assure itself than any facilities applying for live capture are optimizing the educational use of animals presently held. When permit applications for live-captures are received, members of EEACs should inspect the facility who is applying for a permit.

(6) Facilities that apply for live-capture of marine mammals should demonstrate that suitable animals presently captive, or captive-born animals are not available to meet educational objectives.

(7) Educational alternatives to marine mammals in captivity, such as whale-watching, have not been adequately evaluated and there is not substantial empirical information which is available on their educational impact, or on the impact they have animals in the wild. Commercial development of this activity has been rapid, dramatic and uncontrolled. It is recommended that the Department should develop a plan for managing whale watching activity, establish partnerships with interested individuals and groups in each region, and begin programmes which evaluates whale-watching for its educational benefits and the costs of such activities on the animals. The goal is to gain compliance with whale-watching safety and educational standards and minimize disturbance to the animals. If educational benefits of whale-watching do not warrant impact on the animals, a moratorium on further development this activity is recommended.

Permit application conditions:

(1) Applications for the live-capture of any marine mammal must consider as a first priority the conservation of populations in the wild. Under normal conditions, live-capture removals from a population should be permitted only if can be satisfactorily demonstrated they will have no negative impact on populations.

(2) Removals by live-capture from populations classified by COSEWIC, or equivalent bodies, as rare, threatened, or endangered should be permitted only in special circumstances in which captive research or breeding has direct application to conservation of the population in the wild.

(3) Standards in practice today are largely based on captivity mortality impacts and do not adequately insure best practice treatment. It is recommended that both health and welfare be fully considered in standards respecting facilities, captures, care, training, breeding, transportation and animal exchanges. It is recommended that consideration of the animals welfare while in long-term captivity must be based on more than keeping the animal alive but also on keeping it "happy", and include consideration of the animals natural environment and social grouping. Such consideration should be tempered with the understanding that captivity conditions will never be able to reproduce completely the natural environment of marine mammas and novel enrichment is required to induce variability and stimulation in their captive environments.

(4) The ban on orca captures should continue. No permits for breeding capture should be considered. If captive ASRs do not began to equal wild ASRs the practice of holding orcas should be discouraged.

(5) Captive bred animals can provide educational and scientific benefits, and it may reduce and limit the numbers of live-captures required from a population, but will not replace them. In fact, given present captive population sizes for all marine mammals, and the need for diverse genetics within a captive population, captive breeding insures a requirement for some live-capture of wild animals in the future. Captive breeding populations will result in some animals that are not suitable for further breeding, are not candidates for rehabilitation and reintroduction, and which must remain in captivity. DFO's policies must recognize this. It is recommended that all animals primarily captured for breeding meet educational and scientific use standards.

(6) There are inadequate stud book programmes for all species of captive marine mammals at present and coordination of breeding between different holding facilities is fairly informal. A moratorium on captures of all species of marine mammals for breeding purposes is recommended until such time as integrated, cooperative breeding plans are developed by North American institutions. Plans must give full consideration

to the genetics of present populations, including the anticipated needs for additional live-captures in the future, and demonstrate the contribution of the breeding programme to conservation of the species in the wild, or its contribution to minimizing the need for live-captures. Plans should present full information on mortality of reproducing animals and offspring in captivity. The Marine Mammal Advisory Committee should review plans that are developed for their acceptability.

(7) It is recommended that in considering an any application that the Department assure itself that any facilities applying for additional animals are optimizing uses of animals presently held.

(8) It is recommended that individual researchers and facilities with captive marine mammals are required to provide the Department with copies of reports and publications resulting from their work. The Department should maintain inventories of these publications and have the capability to provide interested scientists and the public with information regarding inventories of captive marine mammals in Canada and research conducted on them.

(9) It is recommended that animals that die during captivity are made available for scientific and educational use.

Proposed standards for captive maintenance of marine mammals:

Introduction: There are a number of care standards for marine mammals that have been developed (Klinowska and Brown 1996; Alliance of Marine Mammal Parks and Aquariums 1998; CAZPA 1994; APHIS 1990; APHIS 1999; and others). Some are presented in the Appendix of this report. Several have noted that general agreement on maintenance, care and treatment of marine mammals in captivity is commonly achieved (Klinoska and Brown 1996; Rose 1999) but that major disagreements occur in discussing the size of holding facilities. Rose (1999) characterized these discussions as welfare groups saying "bigger is better" while the representatives of holding facilities argued "bigger is more expensive". Recommendations regarding pool sizes are clearly a compromise between what one would wish and what one can provide.

It is beyond the capacity of this review to resolve facility disputes. I've retained the grouping classifications used in the U.S. although these do not entirely make sense to me. This was done as the CVMA did not specifically comment on them, and further they argued for the advantage of uniformity within North America.

What was possible was to develop a comprehensive draft set of standards for the captive maintenance of marine mammals. It is not likely they will please everyone. But the standards presented in this section of the review will provide a basis, and perhaps motivation, for discussion and review by interested groups. The moratorium in place until adquate regulatory control is in place should ensure this review takes place fairly quickly.

The process of developing the proposed standards was straight forward. Copies of the CAZPA (1995) standards for cetaceans, APHIS standards (1990) and APHIS (1999) were presented to the Welfare Committee of the CVMA with the request that they review them and present suggestions for draft standards for Canada. Their recommendations were then sent to the CCAC for comment. The final set of draft standard recommendations are presented here. My guiding principle was to avoid excessive prescription of practices; that seems to me to characterize developments in U.S. regulations. Micro-management rarely works and, in this instance, would not necessarily benefit the animals.

DFO should send these standards to CAZPA, and any other group which may be interested, for further review. Until any such additional reviews are completed DFO should adopt the following standards for decisions regarding live-capture and captive maintenance of marine mammals. They should also request that the CCAC adopt these standards for their inspection programme.

In their report the Welfare Committee of CVMA emphasized that CAZPA (1995) baseline standards for captive cetaceans are <u>minimum</u> standards. They also note "It is possible to prevent the keeping of cetaceans in captivity by setting large "'minimum" spatial requirements so that it becomes impossible to meet the standards. For example, there are no captive cetaceans in the U.K., where standards are extremely high." To overcome the tendencies of minimum standards becoming the rule, others have recommended that 'best practices' should be the requirement for all care and

welfare (J.Wong, CCAC, pers. com.). This means that practices should in every case reflect the best current professional opinion of proper care and treatment. The CVMA Welfare Committee notes that other standards, such as those of the European Association for Aquatic Mammals and regulations under the USDA-APHIS Animal Welfare Act are more or less comparable to those of CAZPA.

The CVMA Welfare Committee notes that the CAZPA standards for cetaceans are already four years old, and have not been implemented yet. "It is recognized that the development of standards and guidelines is a dynamic process. The CVMA supports the CAZPA paper recommendation that a formal review should take place every two years, to consider any new information regarding captive cetaceans. We also support the statement that, in order to maintain consistency within North America, standards will be indexed to at least be equivalent to those of the U.S." I have tried to follow U.S. APHIS standards but at points omitted what seemed to be excessive detail.

The CAZPA Baseline Standards for Captive Marine Mammals in Canada have not been developed for seals, sea lions and otters.

Based on the review of the CVMA, my review of the U.K., E.U. and U.S. standards, and comments by the CCAC, the following draft standards for the captive maintenance of marine mammals is proposed. The standards for cetaceans are based on those of CAZPA (1995) with modifications suggested as proposed by the Marine Mammal Negotiated Rulemaking Advisory Committee in the U.S. (APHIS 1999). Standards suggested here for seals, sea lions and otters are based primarily on APHIS regulations. Education standards are based on NMFS proposals on education using captive marine mammals and comments received on a discussion paper on education which they produced, and my discussions with educators.

General regulations for all captive marine mammals:

Education standards:

Each facility that holds captive marine mammals should have an Expert Education Advisory Committee (EEAC). Members of the committees should be experts in education in the community the facility serves and hold professional credentials.

These individuals should, especially for those facilities that are presently sub-standard, develop an overall education plan with goals, plans and priorities. The EEAC should work regularly to advise holding facilities on their programmes, assist in developing community linkages and evaluating progress in achieving educational goals. Facilities that hold captive marine mammals for educational purposes must have educational programmes that are professionally designed and stand up to the peer review of professional educators.

Educational programmes of facilities will depend somewhat on the species, facility capacity and local interests and problems, and their content may vary considerably. All should have clearly stated objectives which fosters interest in and respect for the animals, concern for their welfare and survival in the wild, and support for management of wild populations; affective and value education must thus be considered as important as informational education. Objectives should be incorporated into a curricula plan. The educational programme should use teaching methodology that is acceptable and has been shown effective.

Educational programmes must include school programmes (which may not be profitable), provide curricula materials for pre and post-facility visits, and include a teacher in-servicing programme. School materials and public displays should provide take away information and linkages to other educational programmes. There should be docent and volunteer training programmes in larger facilities. Volunteer training should include internship programmes training interested and qualified individuals in husbandry and rehabilitation techniques.

All educational presentations must use the best current scientific knowledge as the basis of the programmes and publications.

It is imperative that educational programmes be professionally evaluated for their short and long-term impact by peer reviewed, empirical studies which examine for altitudinal, informational and behavioural changes. Motherhood statements concerning the value of educational programmes are not sufficient validation of their merit. Only by careful evaluation can education programmes be optimized.

To renew annual holding permits the EEAC for each facility must prepare a review of educational programmes which describes educational programmes, presents plans for new programmes and evaluates the present status of activities at the facility. Empirical evaluations of facility programmes should be included with their report.

Scientific research standards:

All regulations and standards of DFO regarding maintaining marine mammals in captivity must be met. This includes mandatory inspection of facilities and care by the CCAC.

Research proposals involving animal use must be reviewed by the Local Animal Use Committee according to CCAC standards and policies. These committees should have representation from an interested NGO to insure transparency. External experts in the area of work proposed should be asked to assist in the peer review of proposals. The peer review should include comments on the technical merit of the experimental work, its likelihood of success, its potential contribution to the welfare of similar animals in the wild, and should evaluate alternatives to the study of captive animals.

Facilities should have an advertized application process for research. Facilities holding captive marine mammals should encourage proposals from researchers outside the facility and have a funding programme which assists outside researchers. Facilities should have funds to assist all researchers with publication of results obtained on their animals.

Professional staff at the facility should be encouraged to engage in field research relevant to their interests. An inventory of all scientific activities should be maintained including routine assessments and measures made on the animals.

Within facilities there should be programmes which emphasize scientific work that is conducted.

As facilities will normally use captive marine mammals in both education and scientific research, they should develop priorities and plans so the same animals can facilitate both.

"J Lien, Live-capture and captive maintenance review."

Captive breeding standards:

Each facility should participate fully in stud book programmes and cooperative breeding planning. Plans should give full consideration to the genetics of present populations.

The special circumstances which occur with pregnant females or females with calves require facilities to have adequate spatial requirements so that animals can be isolated. Maintenance arrangements during birthing and calf rearing should insure social groups are maintained. This standard applies to both males and females.

The reproductive status of males and females should be done using hormonal assays and/or ultrasonography.

Veterinarian and curatorial staff with experience in both pregnancy care, parturition and post-natal care must be present during breeding and birthing.

Births of calves should be videotaped. Public access during such events must be appropiately controlled. Each birth should be monitored to describe the sequence and timing of events. Physiological measures on the parturient female, such as respiration and heart rates, should be made as necessary. Careful and complete monitoring of calves is required throughout the post-natal period.

Contingency plans should be made for emergency intervention before, during or after delivery, unexpected pregnancies, weaning, illness or abnormal behaviour.

Deaths that result within breeding programmes, especially of new born calves, must be carefully documented.

Accumulation of animals as a result of captive breeding must be accompanied by appropriate increase in the facilities capacity for holding animals.

Transportation standards:

Data indicates increased mortality and stress during even fairly short transport of animals between facilities. It therefore is of the utmost importance that transportation is safe, humane and places the highest importance on the health and welfare of the animals. All transportation which takes more that two hours must be considered a threat to the animals health. Transportation of marine mammals should always use best transport practices indicated by expert opinion. This requirement assumes consultation with appropiate experts in this regard.

IATA, CITES and DFO regulations for animal transport must be met. In preparing animals for a move a general examination by an experienced veterinarian is required within 3-10 days of transport. This examination will include the evaluation of behavioural, feeding and medical records. For larger marine mammals a veterinarian or marine mammal expert should accompany the animal during transport and maintain monitoring records throughout the transfer.

Transport containers should be state-of-the-art and properly secured at all times. The containers should provide the animals with all necessary provisions to minimize stress. Containers must assure that the pectoral flippers are allowed freedom of movement at all times and permit the adjustment of the animals position. Containers may not include mixed species of animals. All loading and unloading of animals will insure the animals safety, as well as safety of human handlers. Holding areas of shipment terminals and carriers must be clean.

During shipments, skin moisture of cetaceans should be maintained by a nontoxic emollient. All necessary requirements for maintaining the animal's appropriate temperature must be available.

Sea otters must be shipped in containers that have false floors through which water and waste can freely pass to keep the interior of the transport unit free from waste materials.

Each transfer should be outlined in a document which describes pre-trip treatment and care, plans for the transfer, and contingency plans in cases of possible

emergencies. The document should also describe follow-up monitoring of the animal. Normally this document will be required by DFO for Import/Export permits. Shipments of animals must be accompanied by a full set of documents.

Record keeping standards:

Facilities must maintain records on animals in their inventory, acquisition and disposition of animals, food and nutrition, health and medical information, environmental quality, daily activities, and breeding and reproduction activities.

Acquisition and disposition records will include: date and location of acquisition, method of acquisition, sex, species, breeding history, identification traits or tags, date and location of disposition, method of disposition, health information. When animals die in captivity records should also be kept of uses which are made of corpses. All relevant information should be shared with stud book programmes.

Food and nutrition records for each animal will include: type and species of food; source of food; estimates of caloric value/weight; nutritional analysis, daily records of food intake, storage records including rotation, record keeping and freezer temperatures.

Health and medical records will include: dates of examinations, name of examining veterinarian, reason for exams, examination conditions, findings, actions taken, medications and supplements, estimates of individual caloric requirements, measurements, blood test results, other physiological test results, behavioural records, veterinary opinions, reproductive activities, transportation records and, finally, necropsy findings.

Environmental quality records will include: test parameters for water quality including temperature, ph, salinity, and bacterial counts. Tests for residual levels of water treatment chemicals and filtration logs are also required.

Daily records of animals include behavioural observation, anomalies and patterns, outside factors, types and quantities of food consumed, and the amount and type of interaction with keepers.

Propagation programmes will include full genetic and demographic records, breeding attempts, breeding loan agreements, and progeny.

Facility descriptions will include enclosure sizes and locations, water system descriptions, relationships between main pools and medical or holding pools, emergency protocols.

Safety of records will be such that they are protected from fire, flooding and other hazards. A duplicate set of records, as appropriate, should be kept in a separate location.

All records should be available for inspections. All records not necessary for current requirements should be archived.

Husbandry standards:

Marine mammal husbandry standards should always be based on the best practices indicated by expert opinion. This should be the over-riding standard to be met in all animal care and husbandry.

Food and nutrition provided by a facility for its animals must give a high quality diet of enough food types to allow adequate flexibility in response to variability in food supply and animals preferences. Food quality must be assured through frequent routine analysis. These should at a minimum include organoleptic and caloric values. Additional tests to monitor food quality at purchase and during storage may also include trimethylamine, peroxide, histamine, volatile nitrogen, heavy metals, bacterial counts. Food should be stored in optimal packaging, temperatures and obtained at optimal times. Short-term storage programmes, thawing procedures, and food preparation should be designed to prevent bacterial contamination and loss of nutrients. Such storage must be for periods of less than 12 hours and the nutritional value and wholesome qualities of food must be retained until the time of feeding. All thawed food

must be fed within 24 hrs. Vitamin supplementation as necessary should be designed for each animal. Supplements must not be used beyond the commonly accepted shelf life or dating on the label.

Storage and food preparation facilities must be appropriately cleaned and disinfected; bacterial contamination of all equipment and facilities should be monitored. All equipment and utensils used in food preparation shall be cleaned and sanitized after each use. Attendants and other personnel should adhere to an appropriate personal health regime. Facilities must be provided to facilitate staff hygiene. Waste disposal must minimize the risk of vermin infestation, odours and disease hazards.

Feeding must be done in a manner that insures all individuals within groups receive adequate nutrition. Consideration for age, species, condition, size and species of animal fed must be considered. Nutritional and caloric requirements for individuals must be estimated and adjustments made for growth, activity level, maintenance requirements, air and water temperatures. and gestation or lactation. Animals should be maintained at an optimum range for each animal. Attendants responsible for giving food should recognize and record deviations from a normal state of good health in each individual animal as loss of appetite may indicate a medical problem. Loss of appetite extending for longer than 24 hrs. must be reported to the veterinarian. A sufficient number of knowledgeable, uniformed employees or attendants must supervise public feeding. Records of the feeding of all individual animals would be available during inspections

Veterinary-medical programme standards:

Each facility must have a fully qualified, licensed attending veterinarian who oversees a programme of preventive medicine and clinical care, and who supports all other programmes which assure the health and welfare of the facilities animals. Facilities must fully abide by all relevant laws governing veterinary practice. The attending veterinarian should be fully aware of CCAC policies and guidelines and any CVMA Welfare Committee recommendations. The best practices based on informed veterinary opinion and experts in marine mammals should always be followed. Insuring these are followed is the primary responsibility of the veterinary programme.

"J Lien, Live-capture and captive maintenance review."

The veterinarian will implement a schedule of examination and health care programmes which include reviews of husbandry records, visual inspections of facilities and physical examinations of captive animals. The frequency of examinations will be at the discretion of the veterinarian in consultation with the curatorial staff. Veterinary rounds should be conducted at least once per week. Daily monitoring by husbandry staff should review each animals physical appearance, activity, temperament and any changes in behaviour which occur. All employees and attendants work under supervision of a caretaker that has demonstrable marine mammal husbandry and care experience and in concert with the attending veterinarian. A training programme should be provided by the animal curator and the veterinarian for all employees, appropriate to their duties, which includes husbandry techniques, handling techniques and reporting and record keeping protocols

Records of all scheduled activities will be maintained as well as records of all monitored physiological processes. Routine health monitoring will include body weights, food intake, haematology, blood chemistry hormonal analysis, vaccinations, comments on the animals general condition and behaviour.

The veterinarian will implement plans to ensure communication between feeders, trainers, staff, curators and the attending veterinarian is adequate. An emergency protocol should be developed in consultation with the curatorial staff. The veterinarian will ensure that the facility maintain on-hand adequate inventories of pharmaceuticals and medical equipment. Pharmaceuticals must be stored and used as required by law. Treatment regimens will be administered by the veterinarian. Parasite screening and treatment will be conducted where indicated.

The attending veterinarian will also advise on the maintenance, design and improvement of facilities.

Animal training standards:

Each facility will have an animal training policy which describes their basic philosophy of training and gives objectives and criteria for success. Clear statements regarding animal care and animal treatment, as well as training methods are required.

Procedures for accountability and review of training programmes should be outlined. The best training practices recommended by expert trainers should always be followed.

Training standards endorsed by professional organizations such as those used by the International Marine Animal Trainers Association should be used.

Training staff should be appropriately sized and qualified to meet programme requirements. Professional trainers who have membership in professional organizations, participate in trainer exchange programmes, have completed internships and preceptorships, subscribe to professional journal, are familiar with professional literature must be fostered and encouraged by the facility. Training staff should have demonstrable backgrounds of experience with marine mammals.

Training and performances of learned behaviours by animals must be evaluated regularly and their impact on the overall health and welfare of the animal assessed.

Training animals for performances which display animals as clowns, are demeaning or mocking of animals and do not have educational merit are not acceptable.

Water quality standards:

Water in all pools containing marine mammals shall be of a quality to insure the health of the animals which live there. Coliform bacteria counts shall not exceed 1,000 MPN/1000ml of water. Water samples must be taken at 48 hr intervals and averaged. If average counts do not fall below 1,000 MPN, then the water in the pool shall be deemed unsatisfactory and must be corrected immediately. Salinity of the water must be monitored and maintained at 15-36 parts per thousand.

When chemicals are used to treat the water, the chemicals must be at a quality that will insure the health of the animals. Water samples must be taken and tested at least once weekly for coliforms counts and at least daily for pH and tests for the presence of chemical additives. Facilities that use natural seawater may be exempt from pH and chemical testing but are required to test for coliforms. Results of all tests must be kept and available for inspections.

Water quality must be maintained by filtration, chemical treatment or other means. Animal and food waste shall be regularly removed to maintain water quality and pool hygiene. Walls and bottoms of primary pools should be constructed of nonporous, water proof finishes to facilitate cleaning and disinfection as necessary. These surfaces should be compatible with maintaining water quality. Where natural seawater pools are used, or where habitat designs incorporate wood or textured surfaces, use of some materials that are difficult to disinfect completely is permitted so long as they are optimally cleaned and kept in good repair. Naturally occurring organisms that occur on pool surfaces and do not degrade water quality need not be removed by cleaning methods. Facilities should develop and follow a written protocol for cleaning enclosure surfaces; these methods should not be hazardous to the animals. To facilitate cleaning, and other management, pools must have drain facilities which effectively lower water levels to facilitate such activities. All drains must be designed to prevent entrapments of the animals during use.

Each facility should have written contingency plans regarding emergency sources of water and electric power in the event of failure of primary sources. Such contingency plans should include evacuation and disposition of animals during long-term failures or disasters.

Requirements for enclosures:

Pools which house marine mammals must be secured from the unwanted entry of other animals or people. It is the responsibility of the facility to ensure the safety and containment of marine mammals it maintains at all times. Pools which are open to the public should be attended by uniformed employees at all times to protect animals from abuse or harassment by the viewing public.

Pools and dry facilities for marine mammals must provide for a variety of environmental enrichments to provide diversity and stimulation. Enclosures shall not have any loose objects or sharp projections and/or edges that might cause injury. Pools should be have adquate levels of natural light and fresh air.

Facilities holding marine mammals must provide fresh air by means of windows, doors, vents and air conditioning and should be ventilated with fresh air or air

circulated by means of fans, blowers or an air conditioning system which minimizes drafts, odours and condensation. Air temperatures within any facility must at a level and rate of variation that is appropriate for the species.

Spacial requirements: Enclosures for marine mammals must provide adequately for maintenance, care and welfare of the animal. Welfare of the animal means that size is adequate, social groups are provided and the captive environment provides diversity through the provision of enrichment programmes. The adequacy of enclosures provided impacts the quality of any scientific programme that may be conducted and may be an extremely important part of educational messages that are delivered. Because of differences in requirements of cetaceans compared to seals, sea lions and otters, each group will treated separately.

Cetaceans: Enclosure sizes one would wish for are generally far greater than what can be afforded. Financial constraints, however, are not an adequate excuse for provision of sub-standard enclosures. New or renovated facilities should built to dimensions that exceed spatial standards. In general, bigger is better.

There may be important species differences in size, activity, and social groups. For instance, interested NGOs almost unanimously suggest that orca cannot be appropriately housed because of their size, normal activity levels and social groups. Other species, such as beluga whales, may be more disposed to adapt to the constraints of captivity. Pools which continue to result in high mortality rates, health problems, frequent breeding failures, and stereotyped abnormal behaviours are indicators of failure to meet the welfare requirements of the animal. In the absence of adequate information, a formula is used to determine minimum pool sizes for cetaceans for cetaceans.

The baseline primary enclosure for two individuals of any cetacean species will be calculated using formula based on Average Adult Length (AAL). AAL is based on morphometric data from physically mature individuals of captive populations and/or from wild stocks. The standard AAL is a straight-line measurement taken from the most anterior location to the notch in the flukes.

Minimum space requirements provide the animal with sufficient space, both horizontally and vertically so that they are able to make normal postural and social adjustments with adequate freedom of movement. Four factors must be satisfied: minimum horizontal dimension (MHD), depth, volume, and surface area.

Cetaceans: The MHD for any primary enclosure housing species designated as Group I by APHIS will be 8.2 m or 3 times the AAL for the species housed, which ever is greater. Group I cetaceans (APHIS 1992) include beluga whales, killer whales, bottlenose dolphins, harbour porpoise, narwhales and long-finned pilot whales. Group II cetaceans include Pacific white-sided dolphin, common dolphin and Dall's porpoise. The APHIS standards (1992) give AALs for all species. MHD for pools for Group II cetaceans will be 7.32 m or 4 times the AAL of species housed in the pool.

In pools housing a mixture of cetacean species the pool MHD required is for the largest species.

When the MHD has been satisfied, the pool size may be required to be adjusted to increase the surface area and volume as cetaceans are added. APHIS provides standards for both Group I and Group II cetaceans for pool depths and water volumes in these circumstances for a range of MHDS (APHIS 1992) and these standards should be followed.

Minimum depth requirements (MDR) for all cetaceans must be 1.83 m or one-half the average adult length of the longest species housed in a pool, whichever is greater. Portions of a pool which do not meet the MDR cannot be included when calculating space requirements for cetaceans.

Pools which satisfy the MHD, and which meets the MDR, will have sufficient volume and surface area to hold up to two Group I cetaceans, or up to four Group II cetaceans. Minimum volume requirements are based on the formula:

$$\text{Volume} = \{ \text{MHD}/2 \}2 \times 3.14 \times \text{depth}$$

If additional animals are to be added to the pool, the volume as well as the surface area may have to be adjusted to allow for addition space. Requisite additional volumes must be based on the number and species of cetaceans which are added.

If more than two Group I cetaceans are housed in a primary pool, the additional volume of water required for each Group I cetacean in excess of two is based on the formula:

Volume = {AAL/2}x 3.14 x depth

When there are more than four Group II cetaceans housed in a primary enclosure pool the additional volume of water required for each addition Group II cetacean in excess of four animals is based on the following formula:

Volume = {AAL}2 x 3.14 x depth

When a mixture of both Group I and Group II cetaceans are housed together in the same primary pool both minimum depth and MHD must be satisfied. Volume is based on the following formula:

Volume = {MHD/2}}2 x 3.14 x depth

Volumes necessary for the cetaceans to be housed in the pool must be calculated by obtaining the sum of the volumes required for each animal. If this volume is greater than that obtained by using the MHD and depth figures, then the additional volume required may be added by enlarging the pool in its lateral dimensions, or by increasing its depth, or both.

Minimum surface area (MSA) for both Group I and II cetaceans are calculated by the following formula:

MSA = { AAL/2 } 2 x 3.14 x 1.5

Surface area requirements are provided by APHIS (1992).

Animals which are not for any reason compatible shall not be housed in the same enclosure. Animals should not be housed near activities or other animals that would cause unreasonable stress or discomfort. Animals that are know to be primarily social in the wild must be housed in their primary enclosure with at least one compatible animal of the same or biologically related species.

Typically animals should be housed in social groups in primary pools except when they are temporarily maintained in isolation for medical treatment, training or other special attention. Facilities must have in place, and available, enclosures to meet the needs for isolation, separation, medical treatment and training. Newly acquired animals must be isolated for a quarantine period from resident animals until a complete assessment of their health can be made. Temporary holding facilities must be adequate to not cause the animal housed discomfort. Long-term holding of animals in isolation pools is not acceptable. A written plan for animals that are housed separately is required which includes justification for the length of time the animal will be kept separated or isolated, the type and frequency of enrichment activities, and plans for interaction. These plans must be approved by the veterinarian and should become part of the animals records.

For cetaceans facilities should provide social grouping for all animals housed. Programmes which provide environmental diversity and enrichment programmes are required. All facilities housing cetaceans must have a minimum of one primary enclosure and one enclosure for management and medical use. Secondary pools may not be used for long-term housing.

Environmental enrichment should be provided to increase stimulation, provide diversity. Any non-food items used to provide entertainment or stimulation must be of sufficient size and strength to prevent ingestion or breakage or the causing of injuries. These items would also have to be amenable to cleaning and replacement.

Sound levels within all pools should be monitored and records should be maintained which shows the spectrum and levels of noise within pools under all conditions. Noise level standards can be expected in the future.

Facility standards for pinnipeds: Housing for pinnipeds must include a pool of water and a dry resting or social activity area that must be close to the surface of the water to facilitate hauling out. Pinnipeds are divided into Group I and Group II species. Group I species include harbour seals, harp seals, grey seals, California sea lions, Stellar sea lions. Group II pinnipeds include ringed, bearded and hooded seals. AALs are given for males and females by APHIS (1992).

The minimum dry resting or social area for Group I pinnipeds must be based on the square of the AAL for each animal in the group. If only one Group I animal is housed in an enclosure the minimum dry area must be twice the square of the AAL. For Group II pinnipeds the minimum dry resting area must be the sum of the squared AAL of all individual animals in the enclosure. If a single Group II pinniped is housed then the squared AAL must be doubled. If Group I and Group II pinnipeds are housed together the minimum dry area shall be the sum of the squared AAL of all individual animals. In mixed enclosures the area must provide barriers to provide relief from aggressive animals. When males are housed together the area must provide a division into areas separated by barriers which provide relief from any unreasonable stress caused by aggressive animals.

The minimum surface area of the pool for all pinnipeds shall be at least equal to the minimum dry area required. The MHD of pools must be 1.5 times the AAL of the largest species housed in an enclosures. Water in pools must measure 1 m in depth or 1/2 the AAL for the largest species housed, whichever is greater. Parts of pools that do not meet the minimum depth requirement cannot be used in the calculation of the dry resting and social activity area.

Housing conditions should provide normal social groupings in as much as possible. Environmental enrichment should be provided in the form of diversity of routines, facility design and activity programmes. Every facility that houses pinnipeds must have primary enclosures and secondary enclosures available for management or medical requirements.

Facility standards for sea otters: Enclosures for sea otter will contain both dry areas and pools. Dry resting areas required is the squared AAL x 3.14 for one or two otters. For each additional otter 1.96 m of addition dry resting area is required. The

AAL for sea otters is 1.25 m. The MHD of pools shall be 3 times the AAL. For each additional otter 2.23 additional cubic metres of pool volume are required. All facilities that maintain sea otters must have primary enclosures and secondary enclosures available for management and medical reasons.

Assessments:

Assessments by CCAC are required as a fulfilment of standards. CCAC assessment reports are confidential and provided only to the assessed facility. The CCAC must provide DFO with a certificate of Good Animal Practice for the facilities assessed by indicating compliance with CCAC standards. As a result DFO would be provided wityh a copy of the Good Animal Practice certificate as delivered to the applicant without jeopardising CCAC's confidentiality agreement with an institution.

Rehabilitation and reintroduction standards:

Rehabilitation and reintroduction of marine mammals will normally be done only with individuals in short-term captivity as a result of clinical captures. In such cases rehabilitation programmes must use best practices which are the result of informed opinions by attending veterinarians and marine mammal care specialists. There must not be significant threats to wild populations of animals as a result of reintroductions.

Reintroductions of animals held in captivity for periods longer than one year may not be practical or beneficial and should, at the present time, be discouraged. If experience warrants experimental releases may be carefully planned that are exceptions to this rule.

All released animals should be fitted with tags or telemetry devices which permit the success of the release to be monitored.

As an interim measure, if reintroductions are attempted, policy and standards recommended by the U.S. Marine Mammal Commission should be followed.

Other:

Additional details which specify standards may be obtained from APHIS (1992). Ambiguities or questions regarding the application of standards in a particular facility must be answered by referral to the CCAC, or the Welfare Committee of the CVMA.

All standards should be reviewed by DFO, the CCAC, the CVMA, CAZPA and the interested public at intervals not greater than two years.

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People and groups consulted - Acknowledgements:

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enjoyed the job greatly, although not the time constraints. The review gave me the opportunity to gather thoughts which were scattered for a long time; I hope have **brought a heart-based intellegence to the review and that it will help renew Canada's committment to marine mammal management.**