

SUBSISTENCE HUNTING OF MARINE MAMMALS

Emer Rogan

Department of Zoology and Animal Ecology, University College, Cork, Ireland

Donna Kwan

School of Tropical Environment Studies and Geography, James Cook University, Townsville, Australia

Greg Donovan

International Whaling Commission, Cambridge, England

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Summary

Hunting of marine mammals has been an important means of subsistence for man from prehistoric times; and is still of importance in many parts of the world today. Initially, hunting by aboriginal, indigenous or native peoples was conducted within a limited area near the settlements, using traditional techniques in order to secure food, clothing and material for construction of dwellings and tools for the local communities. In more recent times, some management bodies have addressed the issue of defining subsistence harvesting, occasionally within management frameworks, but there is no overall agreed definition. This is partly because of the complexity and diversity of cultures, habitats and nutritional requirements of indigenous peoples. In some areas, such as in the Arctic, there is a hunting cycle of marine mammals. In contrast, in other areas marine mammals are used to supplement the diet on a seasonal basis (e.g. tropical marine hunting societies use of dugongs). In many of these regions marine mammals are also used for cultural and medicinal purposes.

1. Introduction

The term "marine mammals" encompasses at least 100 species, which depend on the ocean for most, or all, of their lives. It covers a diverse assemblage of species, with representatives of three mammalian orders, Cetacea, Sirenia and Pinnipedia. The Cetacea (whales, dolphins and porpoise) and Sirenia are exclusively aquatic, whereas the Pinnipedia (seals, sealions and walrus) are semi-aquatic. Throughout human history, many of these species have been commercially hunted, some to extinction, while many have formed the basis of subsistence hunting. Coastal archaeological sites provide evidence of prehistoric exploitation of marine mammals in many parts of the world, examples include hunting of seals and small cetaceans in the Stone Age of northern Europe and pre-Columbian sealing in North America.

Accounts of the hunting of marine mammals and the techniques used abound in the records of coastal communities throughout the world. In Europe, harbour porpoises (*Phocoena phocoena*) were taken seasonally in drive fisheries in Denmark until the end of the nineteenth century, but resumed during World Wars I and II. The history of pilot (*Globicephala melas*) whaling in the Faroe Islands is well documented with catch records going back to the sixteenth century. Along the coast of North America, harbour porpoises, pilot whales and seals were hunted first by native peoples and later by European immigrants. In the West Indies, pilot whales and other small cetaceans were harvested with hand held harpoons. Subsistence hunters have exploited manatees in West Africa (*Trichechus senegalensis*) and in the Amazon basin (*T. inunginus*). South American peoples hunted seal lions (*Otaria flavescens*) and fur seals (*Arctocephalus australis*) as well as many species of small cetaceans. In the North Pacific, Japanese fishermen have conducted drive fisheries and harpoon hunting for dolphins and

porpoises, in particular the striped dolphin (*Stenella coeruleoalba*) and Dall's porpoise (*Phocoenoides dalli*) and at Hokkaido, seal hunting, particularly for largha seal (*Phoca largha*) has a long history. Sea otters (*Enhydra* spp.) have been commercially hunted since the 1700s, mostly for their pelts. The numbers of all three subspecies have been significantly reduced. Protection was finally afforded in some areas near the turn of the twentieth century. Alaskan Inuit subsistence hunt for bowhead whale (*Balaena mysticetus*), white whale (*Delphinapterus leucas*), four species of seals, walrus and polar bears. Elsewhere in the Arctic, the Inuit of Canada and Greenland also take a combination of whale, seal and polar bears. In some areas, such as the Arctic areas of Greenland, there is a hunting cycle of marine mammals. Hunting of ringed seals with nets beneath the ice is important in winter. In the late spring, as the seals are moulting, they become more accessible to shooters, along with bearded seals, narwhals and white whales along the ice edge or along the leads in the ice. As the sea ice breaks up, open water hunting begins and ringed seals are less important, with the main species targeted being harp and hooded seals, small cetaceans, walrus and many species of seabird. As autumn approaches, large nets are placed along the coast to target migrating white whales and as the sea ice forms, "slippery-ice hunting" takes place, where hunters approach a breathing hole and wait for a seal to appear, killing the animal by shooting or harpooning.

Subsistence hunting has many definitions and management ideals vary, as indeed do the species hunted. Subsistence hunting generally refers to harvesting of wildlife when the direct products of hunting are consumed or used by indigenous people to meet their nutritional, subsistence and cultural requirements. Under some management regimes, for example, the International Whaling Commission, the term local aboriginal consumption includes trade in items that are by-products of subsistence catches.

Concerns of international organisations and conservation interests on the sustainability of some of these hunts are well founded. The history of commercial whaling and sealing offers excellent examples of bad management, and subsistence hunting of dugongs and manatees has probably contributed to the extirpation or severe depletion of local populations in many parts of their former range. As a group, marine mammals are K-strategists, being relatively long lived, with late sexual maturity and low reproductive output, reducing their ability to withstand environmental perturbation. Ecological perturbations caused by overfishing of food resources, in tandem with all other pervasive human disturbance including pollution, degradation of water quality and habitat, and anthropogenic climate change, makes them increasingly vulnerable. It is therefore important that proper management frameworks be established with the full involvement of local peoples.

The following sections give an overview of the biology and management of a number of marine mammal species taken as part of subsistence hunts.

2. Polar Bears

Polar bears (*Ursus maritimus*) are generally considered to be marine mammals as they are dependent on seals for sustenance and require the presence of sea ice as a platform from which to hunt. They are closely related to the terrestrial brown and black bears but

are easily differentiated from these by their overall morphology (longer neck and head, no shoulder hump), white pelage and Arctic distribution.

The world population of polar bears is estimated to be between 22 000 and 27 000, of which approximately 15 000 are in Canada. However, in some areas, numbers are not known. Polar bears are not evenly distributed throughout the Arctic, nor do they comprise a single cosmopolitan population and to date, at least 19 discrete populations are recognized.

Generally, males reach sexual maturity at about 6 years of age, but most do not successfully mate until 8 to 10 years or older. Sexual maturity in female polar bears can occur at age 4 but is normally at 5 to 6 years. Female polar bears enter a maternity den during the late autumn and females give birth, usually to a single cub, overwinter there and emerge in the spring. Polar bears are considered apex predators living among the Arctic sea ice. They feed mainly on ringed seals (*Phoca hispida*) and bearded seals (*Erignathus barbatus*), but also on harp seals (*Pagophilus groenlandicus*) and hooded seals (*Cystophora cristata*), depending on their location. They are opportunistic hunters and will scavenge carcasses of beluga whales (*Delphinapterus leucas*), walrus (*Odobenus rosmarus*), narwhals (*Monodon monoceros*) and bowhead whales (*Balaena mysticetus*). They have also been reported to prey on ungulates such as the Svalbard reindeer (*Rangifer tarandus platyrhynchus*). There is some concern about the levels of contaminants (particularly PCBs), habitat degradation, increasing interactions with humans, including prospecting for oil and gas, and the possible influences of global warming, on this species.

2.1. Hunting and Management

Hunting of polar bears is a part of the culture and economy of most of the indigenous people throughout the Arctic. Polar bears are principally hunted for their skins, although the meat is also used and in some areas, they are hunted for the purposes of creating and selling traditional handicrafts and clothing. All countries throughout the polar bear range—Norway, Canada, U.S.A., Denmark (for Greenland) and the Soviet Union—are signatories to an International Agreement signed in 1973, on the Conservation of Polar Bears. The Articles of the Agreement provide a framework for management, hunting regulations and restrictions, and encourage research and exchange of scientific information. After the agreement was signed, the World Conservation Union (IUCN) Species Survival Committee (IUCN/SSC) established a polar bear specialist group (PBSG) to co-ordinate research and management of polar bears on an international basis.

In some regions, bilateral agreements exist between adjacent countries for management of polar bear populations. There is, however, considerable variation between and within countries in management approaches. For example, in some areas, a quota system is applied (some Territories and Provinces in Canada), whereas in other areas hunting is totally banned (Norway, Soviet Union), or only allowed under licence (Greenland). The sex ratio of the bears taken, whether in the hunting of denning animals and/or of mothers with cubs, or of cubs only, is controlled, but varies according to jurisdiction. There is concern about poaching of polar bears that range over the Chukchi Sea between Alaska and Siberia.

Recent information on polar bears, including population estimates, numbers hunted and regulations pertaining to animals killed is summarized in Table 1. Population modeling suggests that the harvest should not include more than 1.5% of the total number of subadult and adult females in the population.

Population	Number	Sustainable Annual Kill	Mean Annual Kill	% females in harvest	Status ¹
Western Hudson Bay	1200	54	44	31	S ^a
Southern Hudson Bay	1000	43	45	35	S ^a
Foxe Basin	2300	91	118	38	S ^a
Lancaster Sound	1700	77	81	25	S ^a
Baffin Bay	2200	94	122	35	D?
Norwegian Bay	100	4	4	30	S ^a
Kane Basin	200	8	6	37	S
Queen Elisabeth	(200?)	9?	0	-	S?
Davis Strait	1400	58	57	36	S?
Gulf of Boothia	900	31	37	42	S ^a
M'Clintock Channel	700	32	25	33	S ^a
Viscount Melville sound	230	4	0	0	I
Northern Beaufort Sea	1200	42	29	43	S
Southern Beaufort Sea	1800	75	56	36	S
Chukchi Sea	2000 - 5000	86-214	76 and poaching	35	S?
Laptev Sea	800 - 1200	NA	Poaching?	Unknown	?
Franz Josef Land/Novaya Zemlya	2500 - 3500	NA	Poaching	Unknown	?
Svalbard	1700 - 2200?	NA	Incidental	N/A	S?
East Greenland	unknown	unknown	50 - 100	50	?

¹ S = stationary; D = decreasing; I = increasing; ? = indicated trend uncertain
^a Population is managed with a flexible quota system in which over-harvesting a given year results in a fully compensatory reduction to the following year's quota.

Table 1: Polar bear population, sustainable kill, mean annual kill and status in the 19 populations (after *Derocher et al., 1998*).

Most hunting is carried out for direct subsistence by professional hunters although recently, some countries have allowed Inuit-guided hunting by some non-native residents. For the most part, hunting is by traditional means with the use of motorized vehicles (aircraft, helicopters, snowmobiles and large vessels) being forbidden, or curtailed to the establishment of base camps.

3. Sirenians

The mammalian order Sirenia is represented by the dugong (*Dugong dugon*) and three extant species of manatees: the Amazonian manatee (*Trichechus inunguis*), the West African manatee (*T. senegalensis*) and the West Indian manatee with two subspecies,

the Antillean manatee (*T. manatus manatus*) and the Florida manatee (*T. manatus latirostris*). The only other modern sirenian, Steller's sea cow (*Hydrodamalis gigas*) was hunted to extinction in the eighteenth century. Sirenians are the only large aquatic mammal herbivores living today and are thus of ecological importance.

Throughout their ranges, sirenians have been subjected to intense human exploitation and continue to be impacted by habitat destruction, pollution, boat strikes and interactions with fisheries. All extant members of the Order Sirenia are now listed in the IUCN Red Data Book of Threatened Species as 'Vulnerable to Extinction' (IUCN 1996). All dugong populations are listed in Appendix 1 of the Convention on International Trade in Endangered Species (CITES) which prohibits trade of this species. The West Indian and Amazonian manatee are listed in Appendix 1; the West African manatee is listed in Appendix 2 of CITES.

All sirenians are found in warm tropical and subtropical waters. The dugong is strictly marine while manatees utilize riverine, estuarine and marine environments. Manatees are opportunistic, generalist herbivores, feeding on a variety of freshwater, marine and terrestrial plants. Dugongs are seagrass specialists. Sirenians are long lived (up to 60 years for manatees, and 70 years for dugongs), slow to reach sexual maturity (3-4 years in manatees; 4-15 years in dugongs) and have low reproductive rates (typically a single calf). This makes sirenians very susceptible to over-exploitation and slow to recover from population reductions.

3.1. Distribution

Only fragmented populations of the West Indian manatee exist over its once extensive range throughout the Caribbean, West Atlantic and in Central and South America. In the Caribbean, the Antillean manatee was reported to be most abundant along the coast of Cuba. Belize is reported to be the last stronghold for manatees in the Caribbean region. In many other Central and South American countries, numbers of Antillean manatees are believed to have declined but may still be relatively abundant in Guyana, Surinam and Costa Rica. The range of the Florida manatee is primarily peninsular Florida, but extends as far north as Virginia and as far west as Mississippi). West African manatees range from Senegal to Angola, on the west coast of Africa. The Amazonian manatee is the only species of manatee confined to fresh water and inhabits the Amazon Basin, mostly in Brazil. They are uncommon and close to extinction in Ecuador, Peru, and Columbia.

The range of the dugong extends throughout some 37 countries in the tropical and subtropical coastal and island waters of the Indo-Pacific from East Africa to the Solomon Islands and Vanuatu, and between about 26-27° north and south of the equator. Over much of this range, dugongs are only known from incidental sightings, accidental drownings and anecdotal reports of fishers and are believed to be represented by relict populations, separated by large areas where they are close to extinction or are extinct. The dugong's stronghold is Australia, where dugongs are most abundant in northern Australian waters from Moreton Bay in the east, to Shark Bay in the west. Torres Strait is the most important area for dugongs in Australia and probably in the world.

3.2. Historical Evidence of Subsistence hunting

Sirenians have a long history of utilization by many coastal peoples as sources of food, implements, medicine and a variety of other products. In many parts of their range, where dugongs and the manatees now exist as only fragmented isolated populations, subsistence hunting is generally restricted to opportunistic catches. However, the apparently large stable populations of dugongs in Australia and relatively low hunting pressure in most regions, has enabled many coastal aboriginal and traditional inhabitants of Torres Strait to maintain culturally important subsistence economies based on this species. The Torres Strait supports an important subsistence fishery by the traditional inhabitants, the Torres Strait Islanders and Papua New Guineans who live on the south-western coast of Papua New Guinea (PNG).

In south-west PNG, an artisanal fishery for dugong harvested up to 200 animals annually over a ten year period and these were sold in the local Daru market. The fishery collapsed in 1984 and legislation was introduced to ban the sale of dugongs. This ban is no longer enforced, however, and anecdotal information suggests that dugong meat is still occasionally being sold in the Daru market.

Throughout their former range manatees, probably formed at least a component, if not a staple part of the diets of many indigenous communities. Archaeological evidence indicates that the West Indian manatee had been hunted in Florida since the time of the earliest known occupation by people (8500-6000 B.C.). Subsistence hunting was continued by other tribes who migrated from the north after the aboriginal population in Florida was virtually eliminated following European contact in the eighteenth century. These tribes collectively known as the Seminoles hunted manatees for meat, oil and bones until at least the end of the nineteenth century. The Antillean manatee according to folklore has also been subjected to a long history of hunting in the Caribbean. It is still hunted at undetermined levels, in some Caribbean and Central and South American countries.

Amazonian manatees have been hunted since at least 1542 when they supported an active commercial fishery for their leather. Prior to this, the species was hunted only for its meat by the indigenous tribes of the region. Hunters now mostly hunt them for local consumption but manatee meat has been occasionally reported in markets in major towns in the Amazon. Hunting of the West African manatee also has a long history and is prominent in the tradition and folklore of some indigenous hunters. Levels of subsistence (illegal) harvests of this species are hard to quantify but subsistence hunting and incidental or opportunistic kills are implicated as causes of local depletions of some populations.

Anecdotal reports suggest that dugongs were once a very important subsistence resource for many countries in the Indian sub-continent and islands, South East Asia, East Africa, Western Pacific and South Pacific. In Australia, the existence of large populations of dugong has allowed it to remain of great cultural, nutritional and socio-economic importance to some coastal aboriginal and Torres Strait Islander peoples. The long-standing importance of dugongs for subsistence by Torres Strait Islanders has also been traced in archaeological deposits dating back at least 2000 years. Many Torres Strait

Islanders depend on the dugongs for subsistence and as the basis of their traditional way of life, which is protected under the Torres Strait Treaty, an international treaty between Australia and PNG. Other coastal Aboriginal communities in northern Australia also harvest dugongs for local consumption but there are few data on catch rates.

There is also evidence that dugongs were hunted in the Arabian Gulf and probably in the Red Sea approximately 4000 years ago. Prior to the discovery of oil in the Arabian Gulf, dugongs were a common food source in Bahrain with an annual harvest of hundreds. In 1986 and 1988 between 70-100 dugongs were reported to have been sold in Abu Dhabi. However, hunting of dugong is no longer permitted in the United Arab Emirates. They were still actively hunted in the Red Sea as recently as 20 to 30 years ago. Currently hunting no longer occurs and dugong is only eaten occasionally as a result of incidental catches by fishers. Outside Australia, the only significant subsistence harvesting reported in contemporary times was 550 to 1000 dugongs during 1979 and 1980 in the Mollucas, Indonesia.

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Biographical Sketches

Emer Rogan graduated from University College, Cork, Ireland, with a Ph.D. in Zoology. She is currently (2002) a lecturer in the Department of Zoology and Animal Ecology at University College Cork, where she co-ordinates an MSc course in Fisheries Management, Development and Conservation. Her main research interests are in the biology and conservation of marine mammals, especially small cetaceans. She is a member of many professional organisations, including the scientific committee of the International Whaling Commission and the Cetacean Specialist Group of IUCN.

Donna Kwan is a marine ecologist with research interests in artisanal and subsistence fisheries for green turtle and dugong in both the Papua New Guinean (PNG) and Australian sectors of Torres Strait over the last 15 years. Her MSc research with James Cook University and supported by the PNG Department of Fisheries and Marine Resources provided a comprehensive description of one of the largest remaining artisanal green turtle fishery in the Indo-Pacific region and recommended a management strategy for a sustainable fishery. Her PhD research with James Cook University focused on the biological context for a sustainable traditional dugong fishery in the Australian sector of Torres Strait. She is currently involved in helping the Australian Fisheries Management Authority and Torres Strait Regional Authorities and Torres Strait Islander communities develop effective community-based arrangement strategies for both dugong and green turtles in the Torres Strait region.