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Food for Thought

How we all kill whales

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Today there is enormous popular interest in marine mammals. Western media tend to dwell on the ongoing debate about commercial whaling by Japan, Norway and Iceland. There is, however, relative silence as to how the shipping and fishing industries of many if not all maritime countries are also catching and sometimes killing whales, albeit unintentionally. Thus, western countries have, through the development and increase in fishing and shipping in continental shelf waters, essentially resumed whaling as vessel speeds and fishing gear strength have increased in recent decades. The ways in which these animals die, especially in fixed fishing gear that they become entangled in and swim off with, would raise substantial concern with consumers of seafood were they to be aware of what they were enabling.

Keywords: animal welfare, bycatch, entanglement, mortality, whaling.

Introduction

In the summer of 1983 my first job out of veterinary school was as an observer for the International Whaling Commission examining the efficacy of explosive harpoons for killing fin whales on an Icelandic whaling vessel (Lambertsen and Moore, 1983). Later, I encountered a very different way of killing whales. A North Atlantic right whale was first sighted entangled in fishing gear in May of 1999. Five months later it was dead off Cape May, New Jersey, USA. The entangling rope and gillnet had dissected off the blubber on its back (Figure 1) while it was still alive. The necropsy report, p. 1 (Early and St Aubin, 1999) includes the following description:

> Rope and gillnet tightly wrapped around both pectoral flippers, and a single line was stretched tightly over the dorsum between the two flippers. The full thickness of the skin and blubber was absent over the dorsal thorax, as though the line had incised the blubber to the fascia, then migrated posteriorly, flensing the animal as it worked its way along. The tautness of the line which now rested against the muscular body wall was consistent with the extreme tension that must have been required to cut through the integument. The missing section of skin and blubber measured 1.4 m at its widest mid dorsally and tapered to narrower points dorsal to each pectoral flipper, but nevertheless exposing both scapulae.

These two very contrasting scenarios of how humans kill whales have preoccupied me ever since. The whalers were intent on killing for profit, and did so with remarkable efficiency. My primary and sincere concerns as a scientist centred on whether the hunt was sustainable. In contrast, the entangled animal was killed without intent, but in addition to concerns about the loss of this individual member of an endangered species, the veterinarian in me was extremely concerned about the animal's welfare while it was taking five months to die. Yet some advocates in the USA, UK, Australia and other countries criticize Japan, Iceland and Norway for their commercial whaling, while ignoring the unintentional killing of whales in many countries, including all of those listed in this sentence. The concept of individuals of one nation judging another nation's motivations for and methods of killing whales, struck and strikes me as being far from clear ethically.

In this essay, I will explore the conservation and welfare factors at work in these two ways in which man kills whales today, i.e. intentionally and unintentionally. I will focus primarily on commercial whaling and entanglement, but recognize that there are other topics that could be included, such as scientific whaling, aboriginal whaling, euthanasia of living stranded whales, lethal and sublethal vessel strikes, and the effects of ocean noise and contaminants on whales. But before going further, I point out that the word *whaling* is defined in the Oxford English Dictionary as "the action, practice or business of catching whales". Importantly, this means that the unintentional

Figure 1. Female North Atlantic right whale (*Eubalaena glacialis*: Catlog # 2030), 13.5 m long. First sighted: 29 June 1990. First sighted entangled: 10 May 1999. Last seen alive: 13 September 1999. Sighted dead: 20 October 1999 (Conger and Knowlton, 1999). The wound in the blubber coat dissected off by the rope and gillnet stretched over the dorsum between the two flippers is clearly visible. The skin has been lost through decomposition exposing white blubber. Photo Credit: Lisa Conger, New England Aquarium.

capture and killing of whales is, by that definition, whaling. I will discuss both whaling for profit (commercial whaling) and whaling by default (fishing gear entanglement). Further, before critics of commercial whaling respond that fishing gear entanglement is fundamentally different to commercial whaling, they should remember that whenever fixed fishing gear is set in areas that are known to be frequented by large whales, there is a probability (that is gear and species dependent) that whales will get captured by the gear and that these encounters will affect the whale's welfare and sometimes be lethal (Cassoff *et al.*, 2011). Many of these animals, if large enough to break out, are subsequently "released" as they swim off with the gear attached. However, as with catch-and-release fisheries (Bartholomew and Bohnsack, 2005) and other commercial fishery bycatch release (Davis, 2002), survival is by no means assured. Likewise, some collisions of vessels with whales also involve capture, such as when rorquals are caught on the bulbous bows of large ships and brought to port dead (Norman *et al.*, 2004). I should also acknowledge that there are other welfare concerns, both for fish being harvested and for the harvesters. I will not consider either of those substantial subjects in this essay.

Whaling by design

Killing whales with harpoons and associated tools has been commercially profitable for at least 1000 years, since King Sancho (the Wise) of Navarre levied a tax on baleen plates in 1150 in the city of St Sebastián (Markham, 1881). This early Basque harvest, and the commercial extinction of the Northeast Atlantic stocks of right whales before American whaling even became a business, was the first of many boom and bust cycles.

Open boat whaling evolved from shore-based whaling to European and American whaling from larger mother vessels offshore (Reeves *et al.*, 2007). These fisheries relied primarily on handheld harpoons, using drag to tire a whale to enable delivery of lances to vital organs in the chest. Such events could take hours to complete, and many animals were struck but not killed.

The explosive harpoon and faster vessels later enabled wholesale, sequential devastation of balaenopterid and sperm whale stocks around the world (Tonnessen and Johnsen, 1982). Most of the concern at that time was with loss of stocks, many of which have yet to recover significantly (Clapham *et al.*, 1999; Magera *et al.*, 2013). It was only in recent decades that the nature of the death caused by an explosive harpoon became a central theme of some antiwhaling protests (Brakes *et al.*, 2004). The message was a mixed one: hunting whales is cruel; there are not enough of them. Studies of the efficacy of explosive harpoons have shown them, at least in some cases, to be comparable with other hunting methods (Lambertsen and Moore, 1983; Knudsen and Oen, 2003). However, many NGOs and conservation-minded bureaucracies have highlighted welfare concerns in the hope of reducing whaling mortality, when really, the bigger questions are the following: (i) for a given species and stock, are there sufficient animals to sustain a given mortality, given our limited ability to adequately estimate whale population size? (ii) Can we manage whaling to ensure its sustainability, given (a) our historical abject failure to do so; and (b) our inability to manage many, if not most, high seas fisheries for sustainability today? The answer to these questions remains an emphatic "No".

Whaling by default

In addition to understanding the realities of commercial whaling, it is also important to consider other ways in which humans unintentionally kill whales. The general case for concern for marine mammal conservation over and above direct harvests from whaling and sealing was made well by Hofman (1995), who outlined the major conservation threats: vessel strike, fishery bycatch, marine debris, food chain effects, oil and chemical spills, noise, and unusual mortalities. A detailed conservation action plan was published by IUCN (Reeves *et al.*, 2003). Further, the diagnosis of, and case definitions for, vessel and entanglement trauma have recently been published for cetaceans and pinnipeds (Moore *et al.*, 2013), and a case series of chronic large whale entanglement mortalities has recently been published (Cassoff *et al.*, 2011). Here, I focus on entanglement, as it is a major conservation and welfare issue for large whales.

Entanglement

The scale of pinniped and cetacean mortalities from acute fishing gear bycatch entanglement has been estimated to be hundreds of thousands of individuals per year (Read *et al.*, 2006). This probably fails to account for the majority of large whale entanglement mortalities. Large whales are often powerful enough to break free from the anchored fishing gear and swim off, with residual gear around their appendages. This gear adds substantial drag, and over time if the animal cannot shed the gear, or be disentangled by humans, the

drag depletes energy reserves, and ultimately the animal dies. Such mortalities are underestimated for three reasons: (i) most balaenopterid whales, such as blue and fin whales, are negatively buoyant and sink on death, but they may refloat after decomposition gases have accumulated; (ii) right and bowhead whales, although normally buoyant on death can also sink if they are so sufficiently lipid depleted that they are also negatively buoyant; and (iii) many offshore entanglement events and sequelae are never reported or sighted, given a lack of onshore winds or currents in many areas. On the eastern North American Continental Shelf, death by entanglement in fishing gear was on aggregate the most commonly diagnosed cause of death among 323 individuals from eight large whale species: 18% entangled, 10% vessel struck, 14% non-human related, and 57% undiagnosed (Table 2 in van der Hoop *et al.*, 2013b). In contrast to the case in commercial whaling, aboriginal whaling, and vessel strike, the time to death for whales that do not drown acutely can be extremely prolonged. Fatally entangled right whales can take an average of six months to die (Moore *et al.*, 2006). An example is shown in Figure 1. This has been described as a very serious animal welfare concern (Moore and van der Hoop, 2012). Furthermore, there are many cases of persistent sublethal entanglement in North Atlantic right whales. Knowlton *et al.* (2012) p. 293, summarize their analysis of data for the period 1980–2009:

> Photographs of 626 individual whales were assessed and 1032 unique entanglement events were documented. Of the 626 animals, 519 (82.9%) had been entangled at least once and 306 of the 519 (59.0%) had been entangled more than once. Males and females were entangled at similar rates. Juveniles were entangled at a higher rate than adults. On average, 25.9% of adequately photographed animals acquired new wounds or scars from fishing gear annually with no significant trend over time detected.

There are currently about 500 North Atlantic right whales in existence (Pettis, 2013). The population is growing slowly, but sublethal effects are astoundingly extensive and a major welfare concern. Another way to think about this is that the majority of North Atlantic right whales are repeatedly more restrained than any animal in a zoo. These data on entanglement morbidity and mortality support the concept that right whale habitat on the eastern North American Continental Shelf is fully industrialized (Kraus and Rolland, 2007). We tend to talk about the ocean as wilderness yet, in this area and others, it is far from that, and instead is the focus of industries that kill whales by design and default, as well as of other industries (such as energy extraction) that affect the environment.

Conclusions

Man has been killing whales for millennia, and with increasing effectiveness when being killed intentionally. The explosive harpoon has been a major factor in that advance. This efficient killing method has led to the near extinction of major large whale stocks in both hemispheres. Unintentional whale killings have also grown to be of substantial concern both in terms of marine mammal stock conservation and also through the way in which the animals die. Drowning of small cetaceans and pinnipeds in nets is, of course, a concern. This has on occasion been successfully mitigated by changing fishing practices, such as in the tuna/dolphin interactions in the Eastern Pacific (Perrin, 2004). But the least humane ways to die occur when large whales are powerful enough to break out of the fixed gear that entangles them and swim off, dragging the gear for months, or when smaller animals are cut out of gear but are still entangled, such as is commonly seen in pinnipeds with gillnet fragments encircling their necks (p. 24, Moore and Barco, 2013). As an animal in this situation grows, it becomes increasingly constricted by the neck entanglement, which at times lacerates the trachea (personal observation). For the large whales, it is drag that is the likely source of their ultimate demise (van der Hoop *et al.*, 2013a), by slowly draining them of the energy needed to swim and fight infections. Palliative measures have included removal of entangling fishing gear by trained disentanglement teams (IWC, 2010), which is a recent and major training focus of the International Whaling Commission (IWC, 2011). However only 10% of documented entanglements, as evidenced by entanglement scars, are actually observed as whales carrying fishing gear (Knowlton *et al.*, 2012). Most entanglements are not witnessed at the gear carrying stage, making most lethal entanglements not amenable to disentanglement attempts. Thus prevention of entanglement is the only lasting solution, given the difficulty of disentanglement. Prevention measures have largely hinged on gear modification, such as sinking ground lines and breakaway links (NOAA, 2014).

Thus, citizens of nations that undertake substantial fishing in marine mammal habitat could consider these pressing domestic issues, and at the same time encourage whaling nations to reconsider the considerable sustainability concerns that their industries raise. In the USA there have been at least eight management actions designed to reduce large whale entanglement on the US east coast (see Appendix Table S1 in van der Hoop *et al.*, 2013b), yet the problem only seems to be escalating. This failure stems from an inability to effectively test proposed solutions prior to their deployment. There needs to be a fundamental shift in terms of fishery management for mitigating whale entanglement, not only using tested, practical, safe and effective gear modification, but also by focusing on keeping the gear and the whales separate in time and space, as proposed by Myers *et al.* (2007). Such a proposal may seem radical and unacceptable from a fishing industry perspective, however it would create Marine Protected Areas that could serve fishery conservation agendas as well as marine mammal conservation agendas (Agardy *et al.*, 2003; Jones, 2007). Wherever there is substantial deployment of fishing gear around the world, there is unintended but inevitable whale mortality of concern both in terms of welfare and population sustainability. Whaling, by design or by default, should be scrutinized carefully.

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