Correspondence

Saving Endangered Whales at No Cost

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The North Atlantic right whale is one of the most critically endangered marine species. Drastic overexploitation has driven this large, slow-swimming baleen whale to virtual extinction in Europe, while a small remnant population of ~350 individuals remains on the U.S. and Canadian east coast. Although this species has been protected for 70 years, recovery has been slight and extinction is still looming because of accidental mortality from shipstrikes and fishing gear (Figure 1A,B) [1]. Seventy five percent of appropriately photographed whales show evidence of entanglement, predominantly with lobster fishing gear, and this percentage has increased from 52% in the 1980s [2,3]. At the same time, the U.S. lobster fishery is severely overexploited (the inshore fishing mortalities in the two main U.S. regions are 0.69 and 0.84 [4], while 0.2 achieves maximum yield per recruit [5]). We argue here that this endangered whale species can be protected from entanglement mortality, and the fishery can benefit simultaneously, by a large reduction of lobster traps used; a classic win–win situation.

Lobster catches have increased substantially over the last 20 years, mostly in the Gulf of Maine, the world's most important lobster producing area (Figure 1C) [4,6]. Hence, lobster has become one of the most important fisheries in the U.S. ($367 million in 2004) and Canada (CDN $650 million in 2003). Along with the increase in catch came an expansion of fishing effort, here defined as the total allowed number of lobster traps in the water per day. Traps are tied to the surface via a buoy line, and to other traps via ground lines, all of which can cause whale entanglement [2]. The U.S. has implemented regulations in which fishing activity is modified but not reduced, and whale entanglement is still an increasing problem [7].

We highlight a stark contrast between the American side (state of Maine), and Canadian side (Lobster Fishing Area 34), of the Gulf of Maine (Figure 1C). These two areas have very similar biological characteristics, and have experienced similar increase in catch, although relative increases have been higher in Canadian waters (Figure 1C). The Canadian fishery is restricted to a winter fishing season, using only about 12% of the traps that are used on the U.S. side. Considering that Maine has about 30% higher catches than LFA 34, a year-round season, and eight to nine times more traps in the water at any given time, we derive that the number of traps used in Maine is 13 times greater than in LFA 34 to harvest the same catch (Table 1). The instantaneous fishing mortality that is optimal to obtain maximum yield per recruit is estimated around 0.2 [5]. The fishing mortality for Canadian lobsters is estimated to be much greater, usually 0.8 or higher [8]. This implies that even the Canadian catch should be reduced by about a factor of four to achieve maximum yield per recruit. Thus, Canadian fishing effort is about four times that required for maximum biological yield, and the fishing effort in the Gulf of Maine may be 50 times above what is required.

Consideration of the pattern of whale sightings (Figure 1D) provides a basis for selecting shorter lobster fishing seasons that reduce the risk of entanglement. Only 7% of the right whale sightings, corrected for effort, occur during the Canadian LFA 34 fishing season (last Monday in November to 31 May) north of 43°N (Figure 1D and Figure S1 in the Supplemental data). Thus, each lobster caught in Canada has less than 1% the impact on right whales as one caught in Maine. If Maine restricted its fishing season to 6 months and reduced the number of traps by a factor of 10, the same amount of lobster could be landed, with greatly reduced risk to right whales and other species. While this large reduction might initially appear to be a burden on the fishermen, given the high fuel and bait costs in the fishery, reducing effort will result in a substantial cost saving without reducing catches. It has been argued that such measures may disrupt the year-round 'feeding' of lobsters with trap bait that might have contributed to the large increase in lobster populations [9]. But this notion is inconsistent with the even larger increase on the Canadian side of the Gulf of Maine that occurred in the absence of year-round fishing and with less than 8% of the effort.

This huge excess effort in the lobster fishery is characteristic of a global problem. Many shrimp fisheries have much larger effort than needed to obtain optimum yields [10], and represent a key conservation issue for endangered sea turtles and fishes caught as bycatch [11]. Similarly, the global effort for tuna longline fisheries (~1.4 billion hooks in 2000) threatens turtles [12] and sharks [13] and is much higher than needed to achieve optimal yields. A reduction in effort in these fisheries would allow for a buildup of biomass and greatly reduced operating costs. However, the situation is still getting worse; in the lobster case there has been an increase of over 1 million traps in Maine in the last 10 years (Figure 1C). Interestingly, some Maine fishermen have taken steps to reduce the number of traps in order to maximize profits and yields [14]. On Monhegan Island, Maine, fishing has been voluntarily restricted to a winter season of 180 days per year, which allows fishermen to pursue other incomes while lobster populations are rebuilding. A further economic advantage is that a targeted fishery outside the summer molting season yields a higher quality product and better prices.

We conclude that right whales as well as fishermen would benefit from seasonal closures and trap limits at or below Canadian levels (currently less than half of U.S. trap limits). The comparative history of the two sides of the Gulf of Maine suggests that restraining fishing effort is economically viable and will help to save endangered whales from future declines and extinction. This provides a clear example of how an endangered species can be protected at no cost, a case that may be common with regard to bycatch species in other high-value fisheries.

Supplemental data

Supplemental data are available at http://www.current-biology.com/cgi/content/full/17/1/Rxxx/DC1

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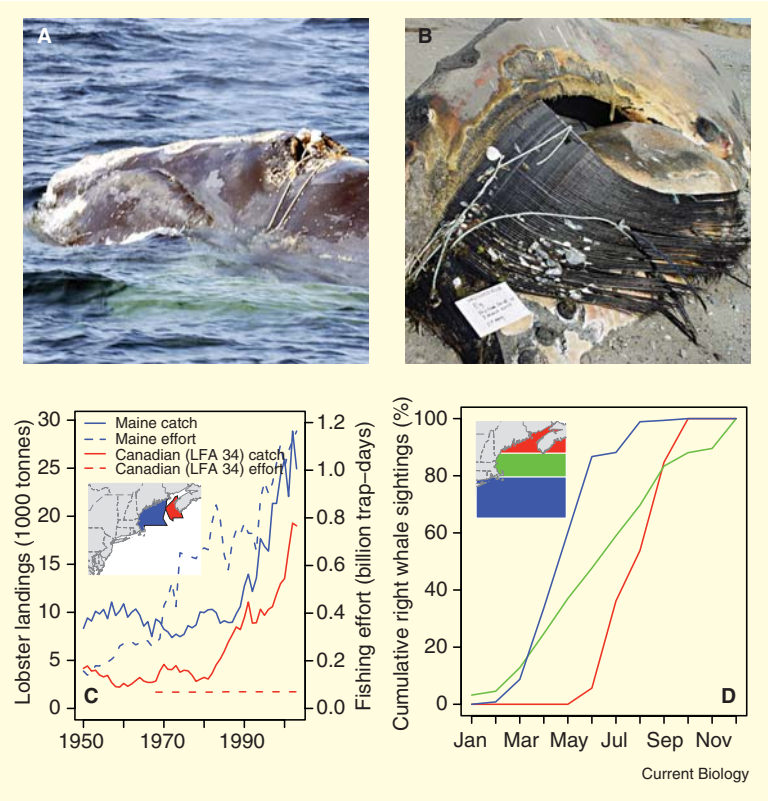
Table 1. Lobster fishing effort in Maine and LFA 34 (Canada) in 2003.

	Maine	LFA 34	Maine/LFA 34
Landings (tonnes)	24,935	19,000	1.31
Traps	3,189,471	369,750 (fall) 394,400 (spring)	8.62 (fall) 8.09 (spring)
Season-days	365	185	1.97
Overcapacity in Maine compared to LFA 34			~13

Figure 1. Lobster fishing in the US. and Canada and right whale conservation.
(A) Right whale entangled in lobster gear, September 2004. (B) Same whale, dead, April 2005. (C) Lobster landings (solid blue line) and effort (dashed blue line) in Maine versus the Canadian landings (solid red line) and allowed effort since 1968 (dashed red line) in the Gulf of Maine Lobster Fishing Area 34. This plot does not show the movement of effort offshore since 1980. The effort in both Maine and Nova Scotia is the maximum allowed, for example fishers may remove some gear in the winter. (D) Cumulative effort-corrected right whale sighting frequency for the Gulf of Maine for three latitude bands: red, north of 43.5°N; green, between 41.5°N and 43.5°N ; and blue, south of 41.5°N. (Panel A courtesy of the New England Aquarium.


A
B
Maine catch
Maine effort
Canadian (LFA 34) catch
Canadian (LFA 34) effort
Lobster landings (1000 tonnes)
Fishing effort (billion trap–days)
C
1950
1970
1990
Cumulative right whale sightings (%)
D
Jan
Mar
May
Jul
Sep
Nov
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