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# Has designating and protecting critical habitat had an impact on endangered North Atlantic right whale ship strike mortality?

Kaitlyn A. Mullen [a,b,*], Michael L. Peterson [a], Sean K. Todd [b]

[a] Department of Mechanical Engineering, University of Maine, 5711 Boardman Hall, Room 219, Orono, ME 04469, USA
[b] Allied Whale, College of the Atlantic, 105 Eden Street, Bar Harbor, ME 04609, USA

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ABSTRACT

Ship strike is the major anthropogenic source of mortality for severely endangered North Atlantic right whales. Two primary tools are given to US wildlife managers by the Endangered Species Act post-listing to ensure species survival by reducing negative anthropogenic impacts: (1) creating a recovery plan and (2) defining and protecting critical habitat. This study reviews and analyzes the impact these strategies have had in reducing North Atlantic right whale ship strike mortality in US waters from 1973 to 2011. Defining and protecting critical habitat poses distinct spatial and human-use overlap challenges when applied to highly migratory species. Managers should consider two different levels in designating critical habitat for highly migratory species such as the North Atlantic right whale: permanently protected critical habitat in areas where species take up seasonal residence, and temporarily protected migratory habitat to maintain functional migration corridors between seasonal residence critical habitat areas. Managers and stakeholders should also be aware that, given current definitions for North Atlantic right whale critical habitat, human-use overlap in critical habitat areas is inevitable. Instead of eliminating human-use in critical habitat, wildlife managers should apply a combination of adaptive human-behaviors, functional habitat definitions, and on-going habitat-use studies to reduce ship strike mortality, particularly for pregnant and nursing females. Ascertaining methods to effectively manage North Atlantic right whale critical habitat is particularly relevant as current regulatory actions aimed at reducing North Atlantic right whale ship strike mortality will be reviewed by the National Oceanic and Atmospheric Administration in December 2013, offering wildlife managers an opportunity to adjust current ship strike mortality reduction strategies in order to improve the population growth rate.



## 1. Introduction

The primary aim of the Endangered Species Act of 1973 (ESA) is to reduce or eliminate the impact of commercial and federal activities on severely threatened or depleted species in the United States until those species recover to an extent that they no longer require federal protection to maintain a viable population [1]. The ESA enables wildlife managers to define critical habitat; i.e., portions of habitat currently or historically occupied by a species that are inherent to its present-day survival [1]. The ESA also limits wildlife managers, preventing all space occupied by a species from being designated as critical habitat [1,2]. Designation of critical habitat can occur only after an economic cost/benefit analysis demonstrates the conservation benefits of such designation outweigh the economic costs, or if best available science indicates a habitat must be designated in order for an endangered species to recover [1,3].

While designating critical habitat is useful for focusing negative anthropogenic impact mitigation efforts, this action does not specify management actions relative to that habitat, and does not create a habitat preserve [2]. To assist in bridging this gap, the ESA enables managers to develop species-specific recovery plans delineating mitigation actions necessary to ensure survival and recovery [1]. Recovery plans also define time frames for implementing management actions and estimation of associated costs [1]. Finally, the ESA requires a review of each species recovery plan every 5 years to ascertain plan effectiveness [1,3].

While the ESA has experienced some success, many more listed species have been extirpated than have recovered [4,5]. Reviewers have pointed to a reduction in ESA funding, a lack of managerial efficiency, and conflicting managerial priorities as potential reasons for lack of species recovery under ESA protection [6–8].

Improvements in species status have been linked to the creation of species recovery plans and definition of critical habitat [2]. Most

* Corresponding author at: Department of Mechanical Engineering, University of Maine, 5711 Boardman Hall, Room 219, Orono, ME 04469, USA.
Tel.: +1 20 7944 737 9.
*E-mail addresses:* kaitlyn_a_mullen@yahoo.com (K.A. Mullen), mlpeterson23@gmail.com (M.L. Peterson), stodd@coa.edu (S.K. Todd).

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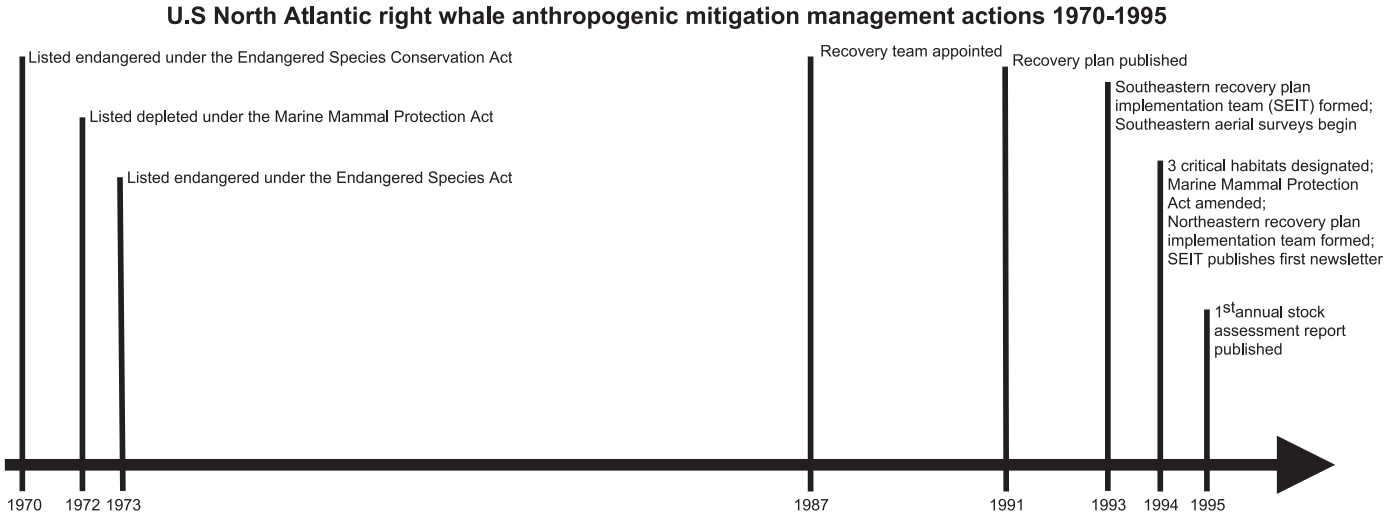


**Fig. 1.** Timeline of actions taken by US wildlife managers to protect North Atlantic right whales from negative anthropogenic interactions from 1970 to 1995. Two distinct periods of activity occur; one in which North Atlantic right whales are listed under applicable legislative acts, and a second period following publication of the recovery plan in which basic stock assessment and habitat-use evaluations begin.

endangered species that improve status post-ESA listing have been sessile, sedentary, or have had limited ranges [5,9]. Conversely habitat fragmentation has been implicated as a reason for the lack of recovery in many highly migratory species [3,9–11]. Non-recovering endangered species often suffer from a lack of scientific understanding relative to population dynamics and habitat-use, preventing proactive management actions [2,5,12]. Although seasonal high-use areas are often protected habitat, migration corridors between these areas often do not receive similar protection [3,10,11] leaving individuals vulnerable to negative anthropogenic impacts.

North Atlantic right whales, *Eubalaena glacialis*, herein after referred to as right whales (this paper does not discuss their Pacific counterpart, *Eubalaena japonica*), were listed as endangered following ESA enactment in 1973 and remain one of the most critically endangered marine species listed [13–15]. Right whales are a highly migratory species with the majority of current species range contained within 80 km of the shore along the US and Canadian eastern seaboards [14,16]. Two major anthropogenic causes of mortality have been identified for this species post-listing; ship strike and entanglement in fishing gear. Ship strike mortality is currently the largest known cause of all right whale mortality [14,17,18].

Right whales are further protected by additional legislation within US waters. The International Convention for the Regulation of Whaling banned commercial harvesting of right whales in 1949, and right whales are also protected under the Marine Mammal Protection Act of 1972 [19,20]. While the International Convention for the Regulation of Whaling, the Marine Mammal Protection Act and the ESA all prevent takes of right whales, only the ESA provides for habitat definition and protection [1,19,20].

In compliance with the ESA, the National Marine Fisheries Service (NMFS) published a right whale recovery plan in 1991 [15]. NMFS updated this recovery plan in July 2001 and August 2004 [15]. In compliance with recovery plan goals, the National Oceanic and Atmospheric Administration (NOAA) designated right whale critical habitat in 1994 [21]. Of the three areas designated within the US, two include feeding grounds located within the Gulf of Maine, and the third includes calving grounds located along the coast of Georgia and Florida [15,21].

In 1991 the recovery plan estimated the right whale population at a minimum of 350 individuals [15]. As of 2011, the NMFS right whale stock assessment estimates this population at a minimum of 396 individuals, indicating a minimum average of 2.3 individuals per year accruing in the population during this time [22]. The NMFS stock assessment report estimated a mean right whale population growth rate of 2.4% during 1990–2007 [22]. This low growth rate combined with a significant decrease in crude survival probability during 1980–1994 [23] has contributed to stable and/or decreasing right whale population estimates [13,15,22].

Wildlife managers listed right whales as one of the first endangered species under the ESA, published right whale recovery plan over 20 years ago, designated right whale critical habitat more than 15 years ago, and as of yet right whales have not exhibited significant gains in population growth or survival rates. As such, this paper will examine the specific impact defining and protecting critical habitat has had on reducing right whale ship strike mortality during 1973–2011. This paper will focus on wildlife management actions taken to reduce negative anthropogenic impacts under the ESA within designated right whale critical habitat areas. Finally, this paper will develop recommendations to improve the efficiency of future critical habitat management methods, particularly for similar highly migratory species listed under the ESA.

## 2. Negative anthropogenic impact mitigation actions, 1970–1995

After listing right whales under applicable protected species acts in the 1970s, US wildlife managers appointed the Northern Right Whale Recovery Team in 1987 (see Fig. 1) [13,15]. As required by the ESA, this team published a recovery plan in 1991, in which anthropogenic mortality from ship strike and entanglement in fishing gear were identified as the two largest threats to species recovery [1,15]. Following ESA recovery plan recommendations, two regional implementation teams were formed; one for southeastern calving grounds (SEIT) in 1993 and one for northeastern feeding grounds (NEIT) in 1994 [15]. While both the SEIT and the NEIT included representatives from multiple stake-holder groups, the NEIT also included international representation from Canada's Department of Fisheries and Oceans [15]. In 1993 the SEIT began conducting seasonal aerial surveys in calving grounds to determine right whale habitat-use, gather population information, and to alert ships to the presence of right whales [15].