NOAA FISHERIES
Southwest Fisheries Science Center

History of Tagging North Atlantic Right Whales

Gradualism and Punctuated Equilibria in the Evolution of Attaching Tags to Whales

David W. Weller, Ph.D.
Director, Marine Mammal and Turtle Division
NOAA Fisheries, Southwest Fisheries Science Center
La Jolla, CA

North Atlantic Right Whale Tagging Workshop 12-14 September 2023

Evolution of Cetacean Tagging: Gradualism and Punctuated Equilibria

1932 to 1960s
Discovery Marks

1970s to 1980s
Birth of Cetacean Tagging

1983
First Satellite Tag on Whale (*Mn*)

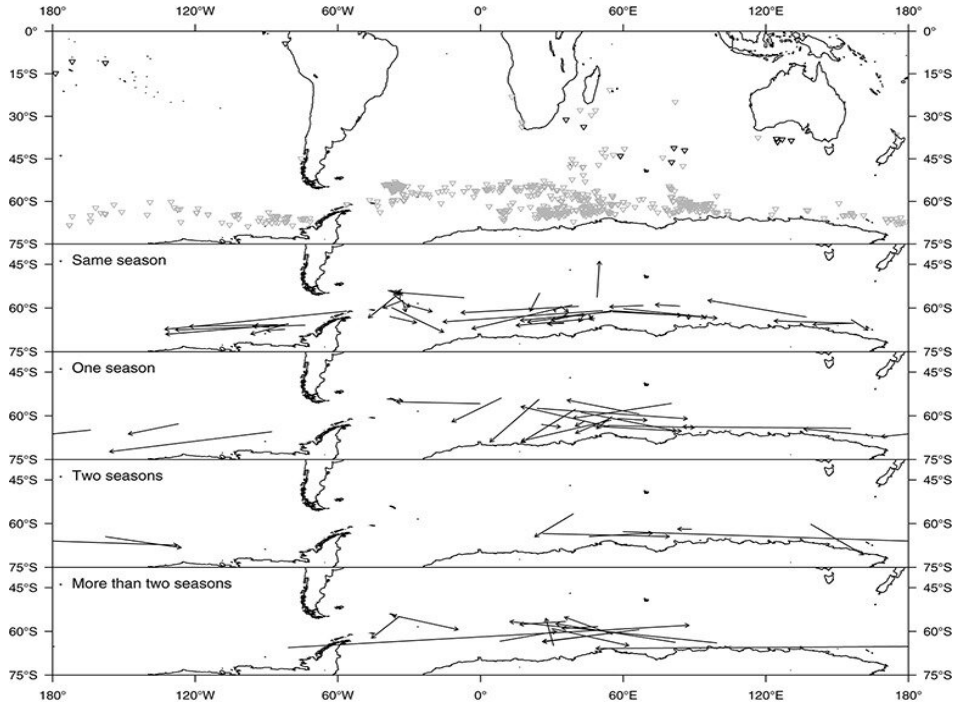
1990s to Present
Accelerated Advancements

The Pioneers

Ken Norris
Bill Watkins
Blair Irvine
Tony Martin
Bruce Mate
Jim Harvey
Steve Swartz
Rod Hobbs
Jeff Goodyear
Many others…

“Discovering” the Value of Tagging Data

- The start of using “tags” to track cetaceans was initiated in 1932 (to the 1960s) by the Discovery Committee to collect data on whaling catches
- The Discovery-type mark was a uniquely numbered steel tube, 28-cm long tipped with a lead point, labeled with a serial number and return address (see Rayner 1940)
- Tags were embedded into the blubber of whales via 12-gauge shotgun
- Whalers were rewarded for reporting information about their catch to the Committee after a tag was found on a caught whale
- Data were simplistic but insightful



Gradualism of Tag Designs 1970s to 1980s

1977

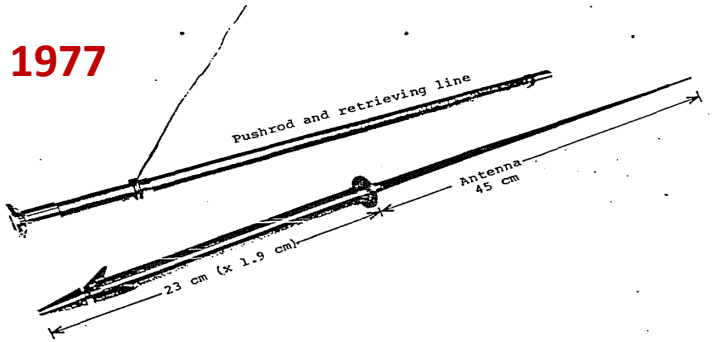


Figure 2. WHOI Projectile Tag (from Watkins, 1977)

1984

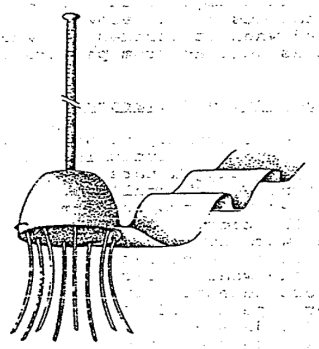


Figure 4. Barnacle tag with eight attachment tines, antenna, and visual streamer (from Mate and Harvey, 1984)

1984

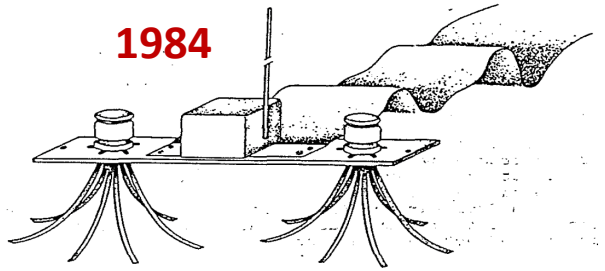


Figure 3. Radio tag showing transmitter (square box) with its antenna, visual identification streamer, and two "umbrella" attachments mounted on a base plate (from Mate and Harvey, 1984).

1985

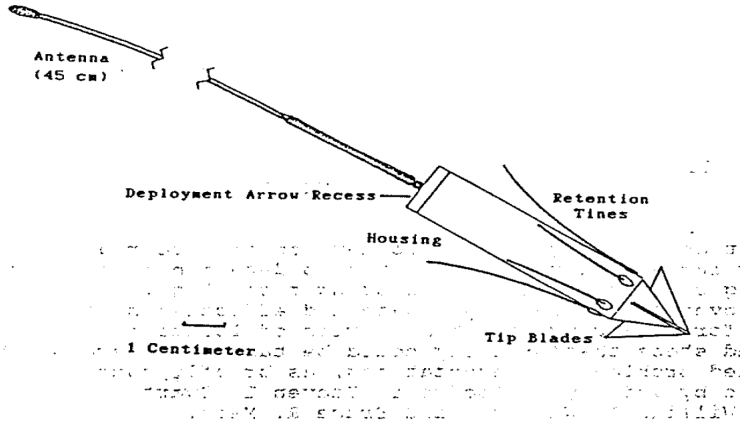


Figure 1. Capsule VHF Radio Tag (Goodyear, 1985)

1986

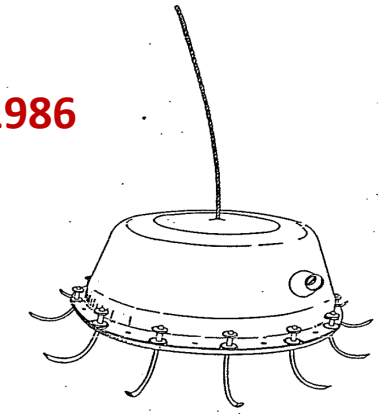


Figure 5. Platform transmitter terminal (PTT) with teflon-coated, spun-case housing, with 12 hollow (deployed) attachment tines.

From Montgomery (ed.) 1987

Rise of the Workshops: Collective Learning, Scientific Advancement, Ethical Awareness

- 1987 MMS (with MMC) - Workshop to Assess **Possible Systems** for Tracking Large Cetaceans (Montgomery 1987)
- 1999 NE Aquarium - Workshop on the **Effects** of Tagging North Atlantic Right Whales (Kraus et al. 1999; Quinn et al. 1999)
- 2005 MMC/NMFS - Large Whale Tagging Workshop (**effects**, **follow up, decision frameworks**) (Weller 2008)
- 2009 ONR - Cetacean **Tag Design** Workshop (ONR 2009)
  - **2009 – National Oceanographic Partnership Program (NOPP) – Call for Proposals**
- 2017 ONR/IWC/NOAA - Workshop on Cetacean **Tag Development**, **Follow-Up** and **Best Practices** (Andrews et al. 2019)
- 2023 MMC, NOAA, ONR, DFO - North Atlantic Right Whale Tagging Workshop

Towards a Common Target: Systems, Designs, Best Practices

- 1987 MMS (with MMC) - Workshop to Assess **Possible Systems** for Tracking Large Cetaceans (Montgomery 1987)
- 2009 ONR - Cetacean **Tag Design** Workshop (ONR 2009)
- 2017 ONR/IWC/NOAA - Workshop on Cetacean **Tag Development**, **Follow-Up** and **Best Practices** (Andrews et al. 2019)

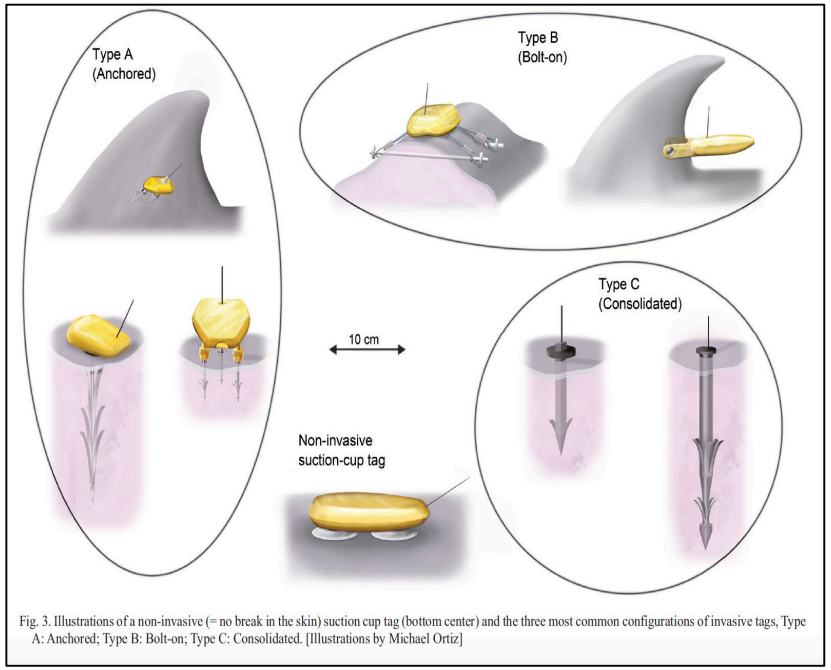
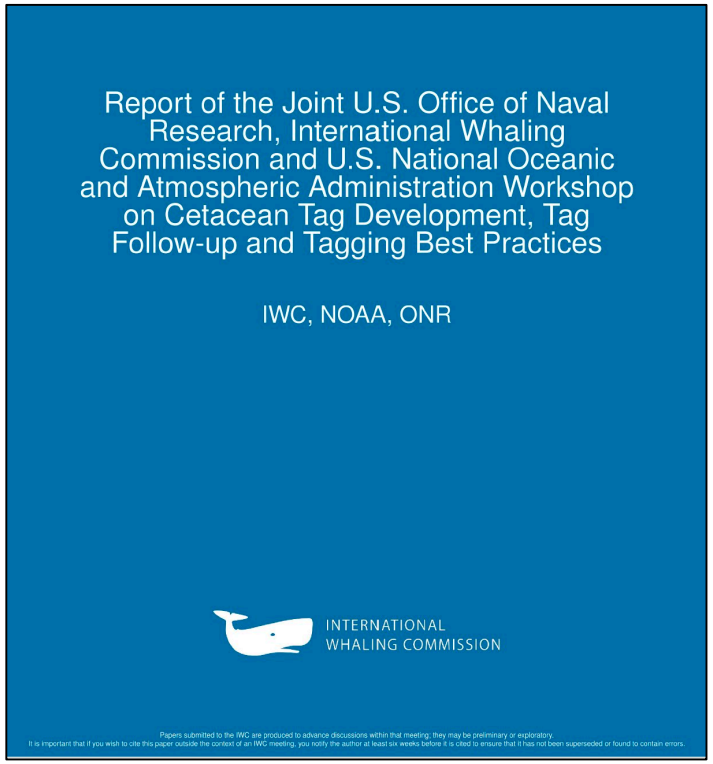


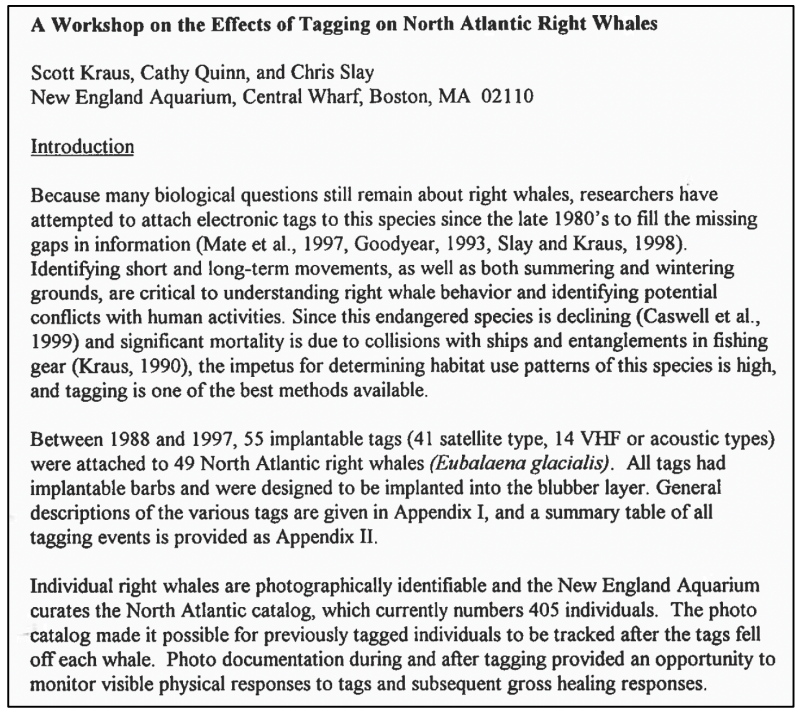
Fig. 3. Illustrations of a non-invasive (= no break in the skin) suction cup tag (bottom center) and the three most common configurations of invasive tags, Type A: Anchored; Type B: Bolt-on; Type C: Consolidated. [Illustrations by Michael Ortiz]

From Andrews et al. 2019



Acknowledging Risk - Evaluation of Behavioral, Physiological and Demographic Effects

- 1999 NE Aquarium - Workshop on the **Effects** of Tagging North Atlantic Right Whales (Kraus et al. 1999; Quinn et al. 1999)*
- 2005 MMC/NMFS - Large Whale Tagging Workshop (**effects, follow up, decision frameworks**) (Weller 2008)
- 2017 ONR/IWC/NOAA - Workshop on Cetacean Tag Development, **Follow-Up** and **Best Practices** (Andrews et al. 2019)



A Workshop on the Effects of Tagging on North Atlantic Right Whales

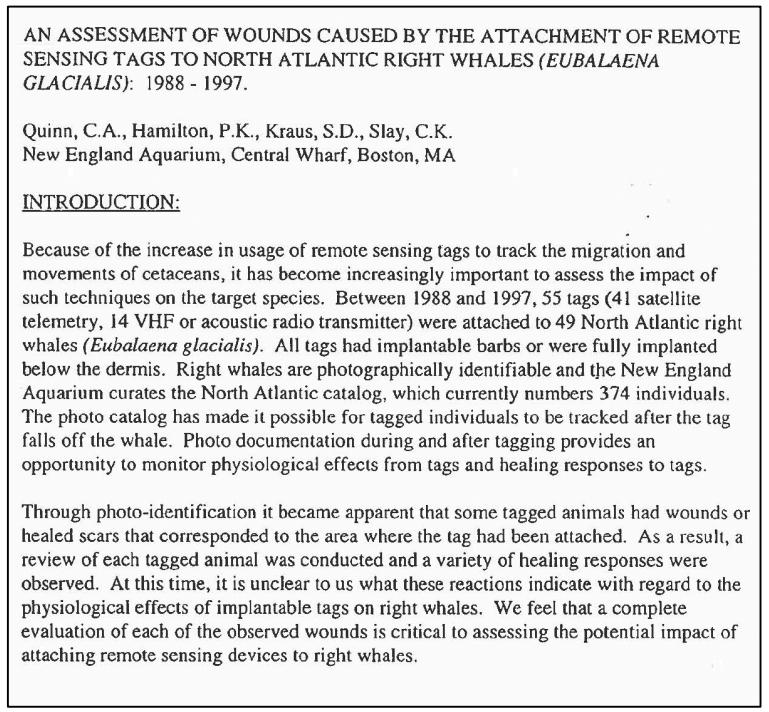
Scott Kraus, Cathy Quinn, and Chris Slay
New England Aquarium, Central Wharf, Boston, MA 02110

Introduction

Because many biological questions still remain about right whales, researchers have attempted to attach electronic tags to this species since the late 1980's to fill the missing gaps in information (Mate et al., 1997, Goodyear, 1993, Slay and Kraus, 1998). Identifying short and long-term movements, as well as both summering and wintering grounds, are critical to understanding right whale behavior and identifying potential conflicts with human activities. Since this endangered species is declining (Caswell et al., 1999) and significant mortality is due to collisions with ships and entanglements in fishing gear (Kraus, 1990), the impetus for determining habitat use patterns of this species is high, and tagging is one of the best methods available.

Between 1988 and 1997, 55 implantable tags (41 satellite type, 14 VHF or acoustic types) were attached to 49 North Atlantic right whales *(Eubalaena glacialis)*. All tags had implantable barbs and were designed to be implanted into the blubber layer. General descriptions of the various tags are given in Appendix I, and a summary table of all tagging events is provided as Appendix II.

Individual right whales are photographically identifiable and the New England Aquarium curates the North Atlantic catalog, which currently numbers 405 individuals. The photo catalog made it possible for previously tagged individuals to be tracked after the tags fell off each whale. Photo documentation during and after tagging provided an opportunity to monitor visible physical responses to tags and subsequent gross healing responses.



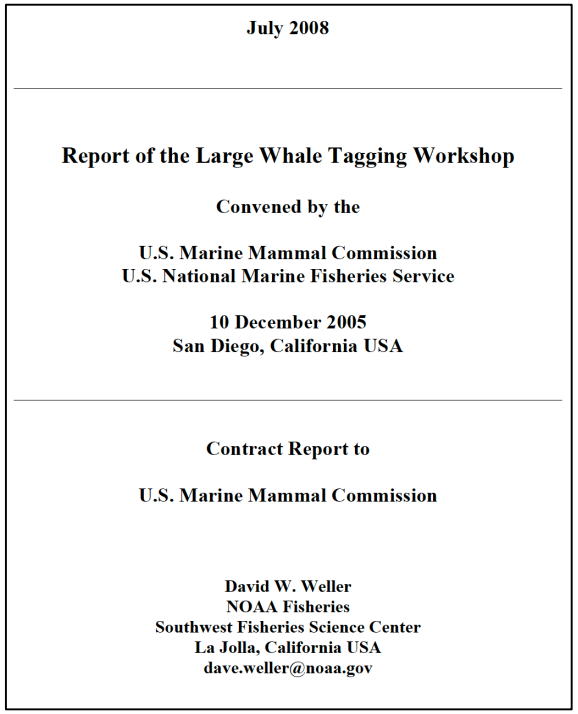
AN ASSESSMENT OF WOUNDS CAUSED BY THE ATTACHMENT OF REMOTE SENSING TAGS TO NORTH ATLANTIC RIGHT WHALES *(EUBALAENA GLACIALIS)*: 1988 - 1997.

Quinn, C.A., Hamilton, P.K., Kraus, S.D., Slay, C.K.
New England Aquarium, Central Wharf, Boston, MA

INTRODUCTION:

Because of the increase in usage of remote sensing tags to track the migration and movements of cetaceans, it has become increasingly important to assess the impact of such techniques on the target species. Between 1988 and 1997, 55 tags (41 satellite telemetry, 14 VHF or acoustic radio transmitter) were attached to 49 North Atlantic right whales *(Eubalaena glacialis)*. All tags had implantable barbs or were fully implanted below the dermis. Right whales are photographically identifiable and the New England Aquarium curates the North Atlantic catalog, which currently numbers 374 individuals. The photo catalog has made it possible for tagged individuals to be tracked after the tag falls off the whale. Photo documentation during and after tagging provides an opportunity to monitor physiological effects from tags and healing responses to tags.

Through photo-identification it became apparent that some tagged animals had wounds or healed scars that corresponded to the area where the tag had been attached. As a result, a review of each tagged animal was conducted and a variety of healing responses were observed. At this time, it is unclear to us what these reactions indicate with regard to the physiological effects of implantable tags on right whales. We feel that a complete evaluation of each of the observed wounds is critical to assessing the potential impact of attaching remote sensing devices to right whales.



July 2008

Report of the Large Whale Tagging Workshop

Convened by the

U.S. Marine Mammal Commission
U.S. National Marine Fisheries Service

10 December 2005
San Diego, California USA

Contract Report to

U.S. Marine Mammal Commission

David W. Weller
NOAA Fisheries
Southwest Fisheries Science Center
La Jolla, California USA
dave.weller@noaa.gov

*1988-1997 - 55 implantable tags deployed (41 satellite and 14 VHF or acoustic types)

Punctuated Equilibria 2009-2020

2009 - National Oceanographic Partnership Program (NOPP) and Interagency Committee on Ocean Science and Resource Management Integration

Joint Collaboration: NOAA, API, NSF, MMS (BOEM) and ONR that provide ~$3M in funding over a 3-4 yr period

TOPIC 1 - Improving attachments of electronic data loggers to cetaceans

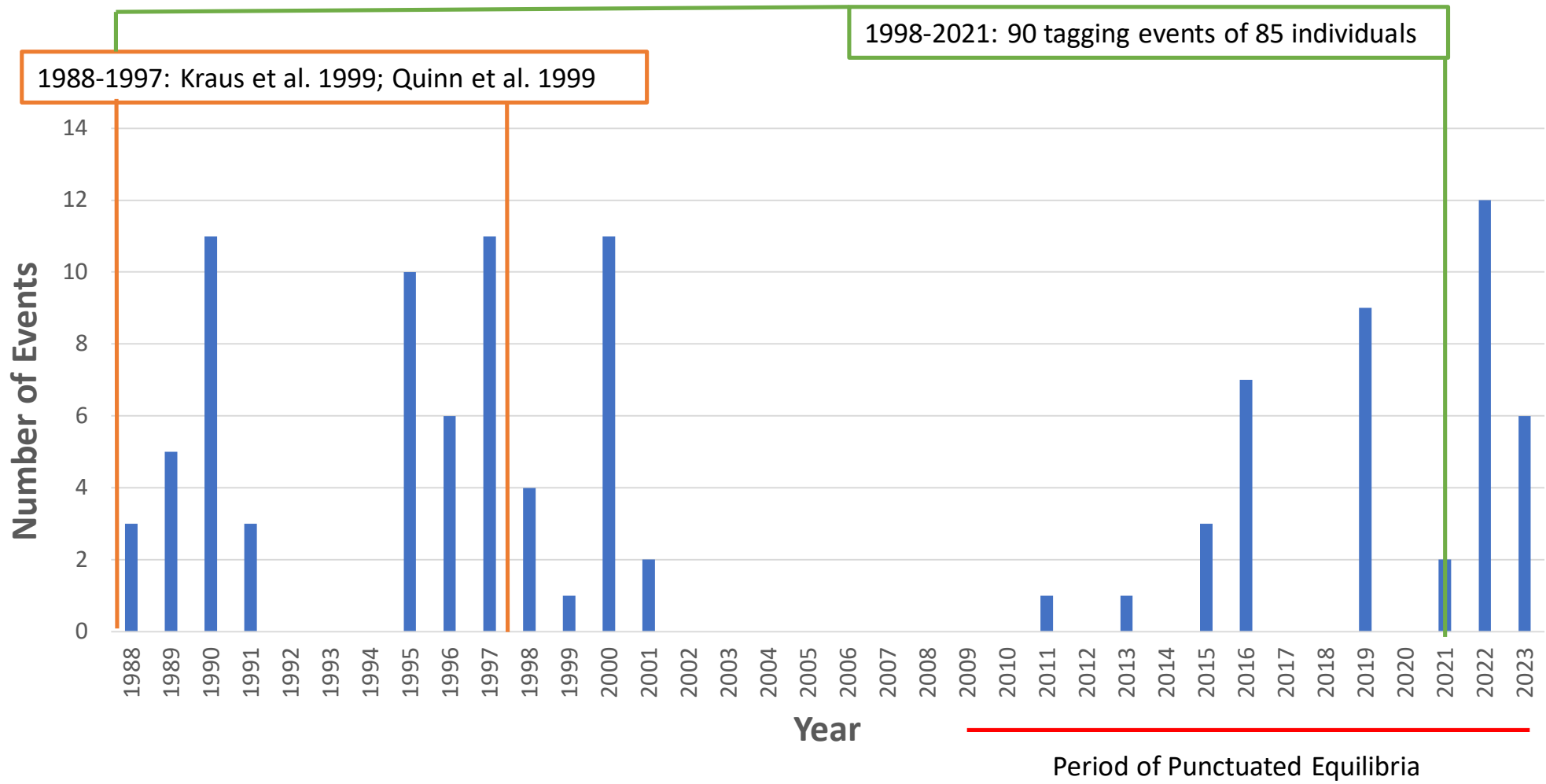
- **Sub-Topic 1A** – Determining causes of tag attachment success and/or failure
- **Sub-Topic 1B** – Case studies on short- and long-term physical, physiological and behavioral effects

Funding helped to advance rapid progress on:
(a) suction cup tag technology
(b) LIMPET (Type A) anchored tag technology
(c) evaluation of behavioral, physiological and demographic effects of implantable Type C tags (e.g. Gulf of Maine *Mn* and ENP *Er* and *Bm*)

Further Leveraging of NOPP 2009
2013 ONR – Type C tag redesign following detection of existing flaws
2018 ONR – Deployment and performance testing of redesigned Type C tags and potential effects
2020 ONR – Further evaluation of Type C tag performance and potential effects

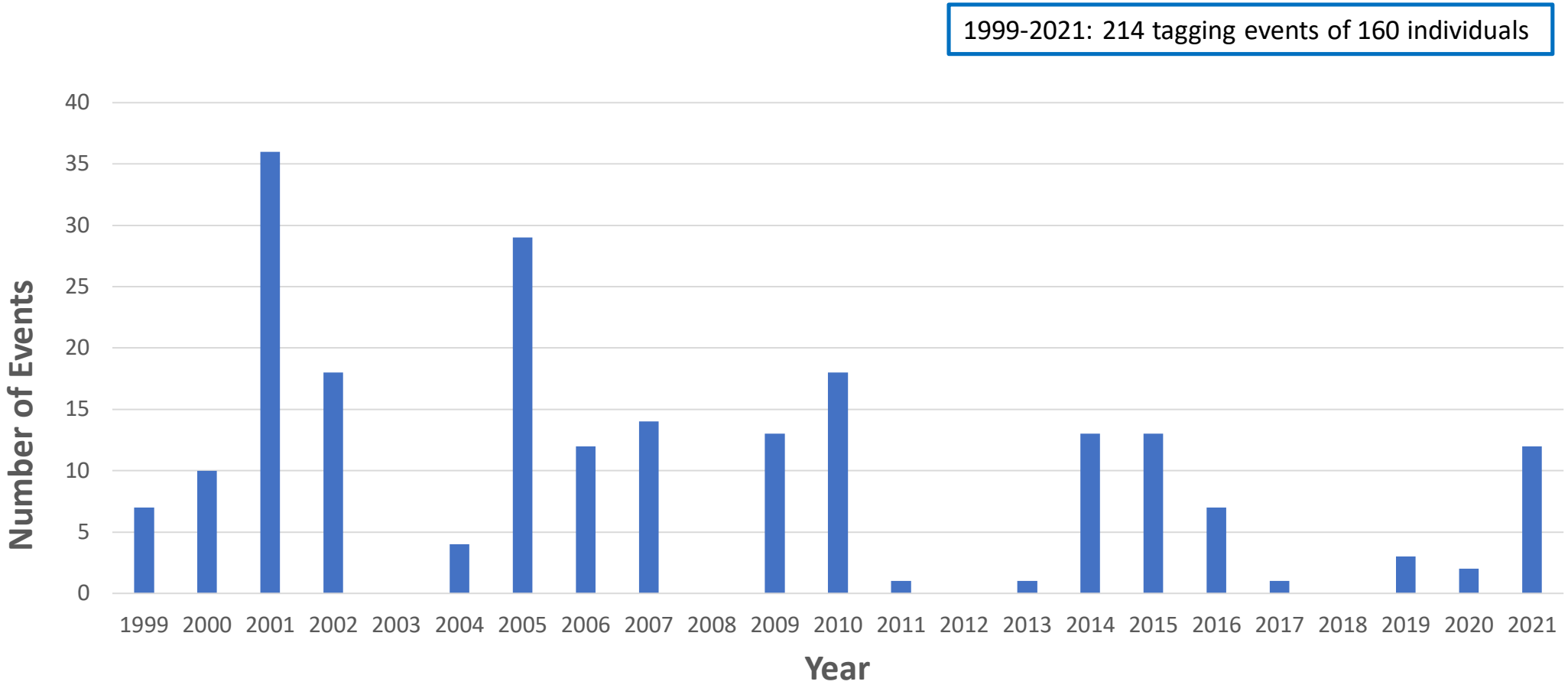

J. Durban and H. Fearnbach - NOAA Permit #1876-02

Attached Tags NARW 1988-2023



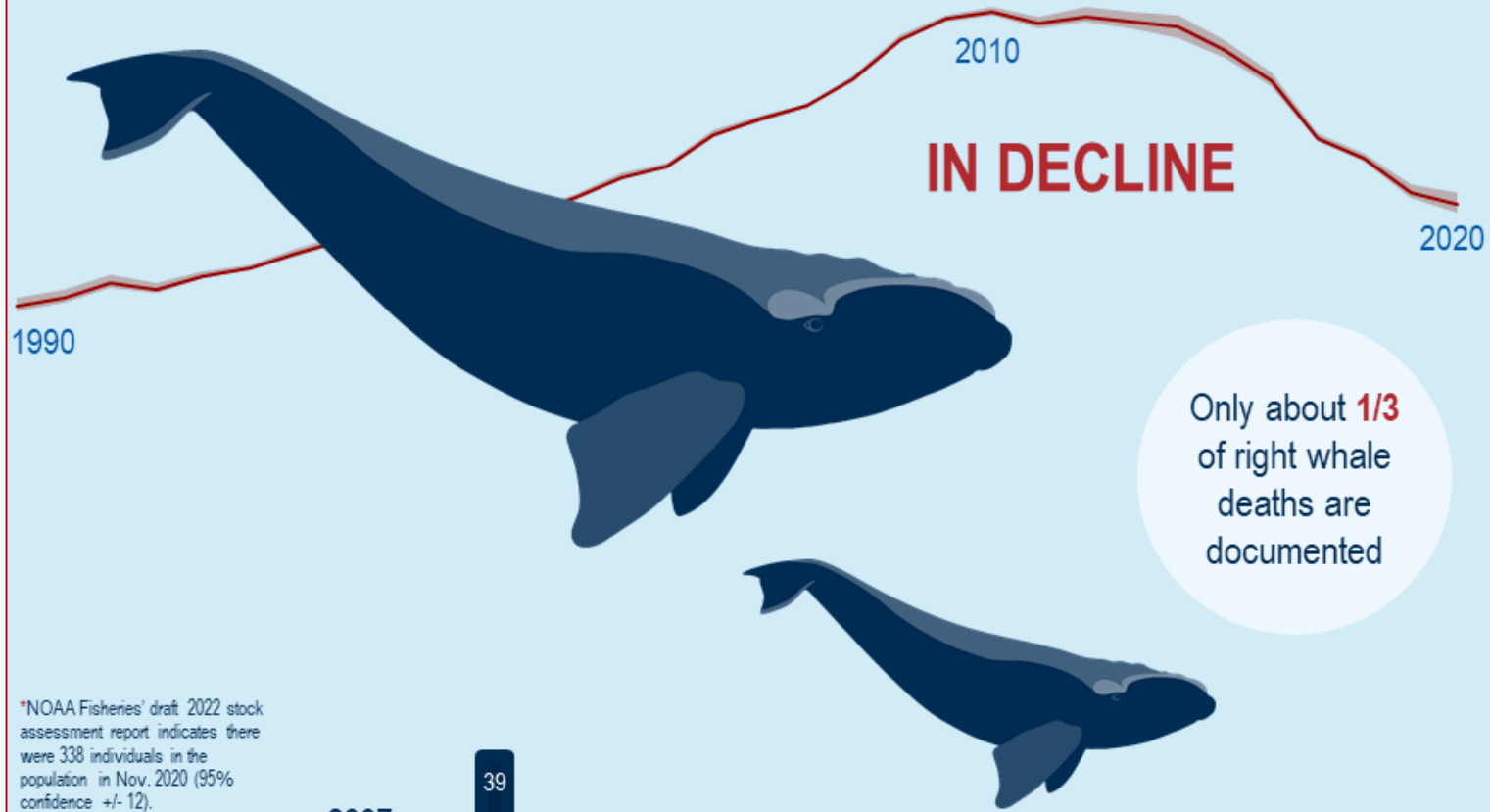
Sources: 1988-2021 New England Aquarium (A. Knowlton); 2019, 2022-2023 Fisheries and Oceans Canada (A. Labbé)

Suction Cup Tags NARW 1999-2021



Source: 1999-2021 New England Aquarium (A. Knowlton)

ENDANGERED NORTH ATLANTIC RIGHT WHALE Fewer than 350* Individuals



Only about **1/3** of right whale deaths are documented

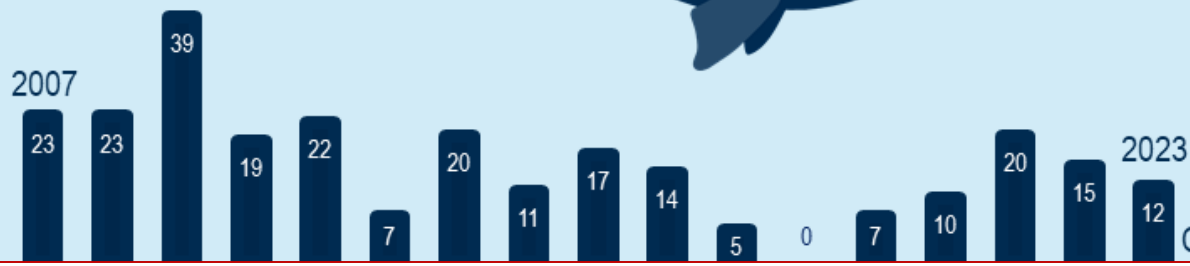
115 DOCUMENTED DEAD, SERIOUS, or SUBLETHAL INJURIES/ILLNESS**

UNUSUAL MORTALITY EVENT
2017 - Present

36 DEAD
- 13 Unknown causes
- 12 Vessel strikes
- 9 Entanglements
- 2 Perinatal deaths

34 SERIOUS INJURIES
- 31 Entanglements
- 2 Vessel strikes
- 1 Dependent calf

45 SUBLETHAL INJURIES/ ILLNESS
- 36 Entanglements
- 5 Poor body condition
- 2 Injuries of unknown cause
- 2 Vessel strikes



Calves born annually

*NOAA Fisheries' draft 2022 stock assessment report indicates there were 338 individuals in the population in Nov. 2020 (95% confidence +/- 12).

The abundance graph is based on Pace et al., 2017 and NOAA Fisheries stock assessment reports.

**Additional information available on NOAA Fisheries UME webpage.

Updated 7/20/2023

NOAA FISHERIES

Cost-Benefit Analysis of Tagging in the Context of Endangered Whales

The ever-increasing “need to know” conservation and management information on NARWs and other endangered whales calls for scientists, managers, stakeholders and the general public to assess whether the **benefits** of tagging in a given case outweigh the associated **costs** (i.e. risks to individuals).

If the answer to the above is **“yes”** - multi-context decision-making frameworks will be needed to ensure that precautionary approaches to tagging are undertaken and that specific need to know data can be collected (either stand alone or in concert with other methods)

If the answer is **“no”** - utilization, adaptation or development of existing or alternative methods capable (in time) of providing need to know information will be needed.