RIGHT WHALE NEWS

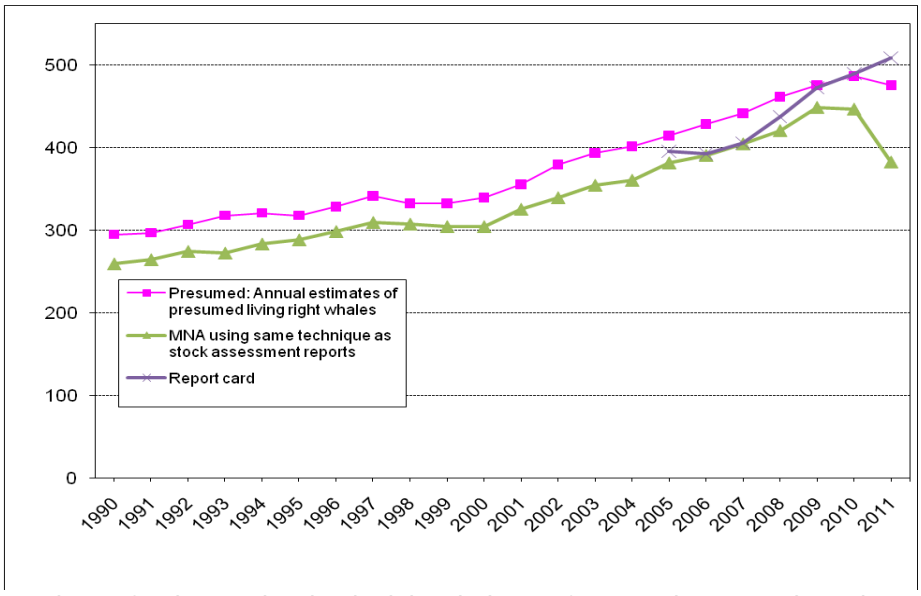
An independent forum for right whale conservation and recovery, published four times a year

Volume 20 Number 4 ***December 2012***

The 2011 North Atlantic Right Whale Population Estimate: 509

Contributed by Philip Hamilton, New England Aquarium

Each year, we prepare a report card for the North Atlantic Right Whale Consortium that details the status of the population and the research and conservation efforts that were undertaken in the previous year. Using the numbers of photographed right whales in the database as of 29 October 2012, the best estimate for the NA right whale population in 2011 is 509. This estimate is based on the number of catalogued whales believed to be alive, plus some additional photographed whales that have not yet been added to the catalog—but will likely be cataloged in the next year or two. In the graph below are the results from three methods of counting photographed right whales. It should be stressed that all these numbers are assessing the *photographed* population and do not estimate the actual population, which includes some animals that have never been photographed. The full report card, including the details of how the population count (three methods) is generated, can be found on the Consortium web site at: www.narwc.org/pdf/2012_Report_Card.pdf.



The population estimate for the North Atlantic right whale as of 29 October 2012, based on photographed whales through the end of 2011. Because the report card estimate (blue line) includes whales photographed but not yet entered into the catalog (typically about 30-35 animals), it is believed to be the most accurate of the three estimates for the previous year.

The North Atlantic Right Whale DNA Bank and Database

Contributed by Meagan Moeyaert and Bradley White, Trent University

Can you imagine identifying a 50-foot animal at the cellular level? Whether you can or you can't, this method of individual identification of North Atlantic right whales has been an ongoing effort since the late 1980's, and has evolved rapidly into a powerful tool that has shed light on many aspects of the population's genetic and behavioural biology. The North Atlantic Right Whale DNA Bank and Genetic Database, at Trent University in Peterborough, Ontario, are accessible at http://narightwhale.nrdpfc.ca/. The website provides genetic information on individual North Atlantic right whales, and links to the photo-identification catalogue, DIGITS, (http://rwcatalog.neaq.org/Terms.aspx). The site also provides sample submission and tracking applications.

The DNA bank contains 1123 tissue and DNA samples from 503 individual whales, including a bone fragment from an individual that lived during the 16th century. Biopsy and necropsy samples collected in the field are sent to Trent University, where the DNA is extracted and the genetic profiles are generated. Genetic profiles consist of sex, mitochondrial DNA haplotype, and the genotype at 35 microsatellites. Currently, 74% of catalogued individuals have been sampled and have genetic profiles stored in the Database.

The DNA Bank and Database are important tools for confirming and assigning identities to individuals sampled by biopsy or necropsy, and determining paternities, adoptions, and origin of fecal samples. It has also proven invaluable for the numerous research projects seeking to understand habitat use, and the genetic basis of the low rates of reproductive success in this species. Furthermore, a comparison of the genetic profiles for each whale sampled has shown that the North Atlantic right whale population has very limited genetic diversity. However, this loss of genetic diversity pre-dates 16th century Basque whaling, as the genetic profile of a 16th century individual did not differ significantly from that of the current population.

We have also learned that there is a significant skew in male reproductive success with multiple males having one or no paternities, and a few males having multiple paternities. Paternity analysis has also allowed for the construction of pedigrees for multiple individuals that help to visualize the promiscuous nature of the mating system. The pedigree for Sonnet (1123) is shown in the figure on page 4.

The identity of a deceased individual sometimes has to be determined by genetic profiles because decomposition usually makes identification via unique callosity patterns and scars difficult. Genetic profiles for necropsy samples consist of sex, mitochondrial DNA haplotype, and 5-7 of the most robust and variable microsatellites. However, in some cases, it is often difficult to obtain a full profile for a necropsy sample due to the natural process of DNA degradation during tissue decomposition. Once a DNA profile of a necropsy sample has been completed, it is compared to the profiles in the database to determine a probability of identity through a process of elimination (Table 1). If more than one individual has the same profile, additional microsatellite genotypes are determined to further eliminate individuals. The sightings records of all individuals not eliminated are checked to determine the individuals that have been

seen after a deceased individual is discovered. The term "probability of identity" is used when attempting to identify a deceased right whale because, with a small population size and high levels of inbreeding and relatedness, more than one individual of the population can share the same partial genetic profile from the necropsy sample.

Providing a probability of identity of the mother of deceased calves can be even more difficult. As the paternity of the dead calf is not known, which microsatellite allele came from the mother and which came from the father cannot be determined. In some cases, necropsy reports provide suggestions for the potential mother of the calf so the genetic profile of the deceased calf can be compared to the hypothesized mother.

The DNA Bank and Database will continue to generate profiles for calves and new individuals, and to address questions such as the location of the mating ground and reproductive performance of individuals. Additionally, samples from each individual will continue to be amplified by whole genome amplification to ensure that there will always be DNA for subsequent genomic research. Furthermore, a portion of the amplified genomes will be put into dry storage to alleviate the need for more freezer space and to ensure that all samples reside in two different locations in the case that one is compromised. For more information, references and further readings, please visit http://narightwhale.nrdpfc.ca/ and click on the "publication" link under the "resources" tab.

Table 1: The process of identifying a dead right whale depends on a process of elimination. In this example, possibilities for a deceased individual based on genetic profiles were examined. MJM9406 was a necropsy sample taken back in 2006. The individual was found to be a female with a D mitochondrial DNA haplotype. Scores for all 5 microsatellites were deduced and the complete profile was compared to all profiles in the database from D-haplotype females. The genetic profile of MJM9406 matched individual Catalog # 1267 who was last seen in early 2006. Therefore, this necropsy sample is likely from # 1267.

ID #	mtDNA	Sex	GT023	RW417	TV20	IGF	TV17
MJM 9406	**D**	**f**	**115/119**	**121/127**	**166/170**	**146/152**	**202/202**
1001	D	f	~~117/117~~	~~121/125~~	~~166/166~~	~~150/156~~	~~202/224~~
1004	D	f	~~117/117~~	~~121/123~~	166/170	~~148/150~~	~~202/226~~
1114	D	f	~~117/117~~	121/127	166/170	~~150/152~~	~~220/226~~
1127	D	f	~~117/119~~	~~121/123~~	166/170	~~150/150~~	~~202/204~~
1135	D	f	~~117/119~~	121/127	~~166/168~~	~~150/156~~	~~202/224~~

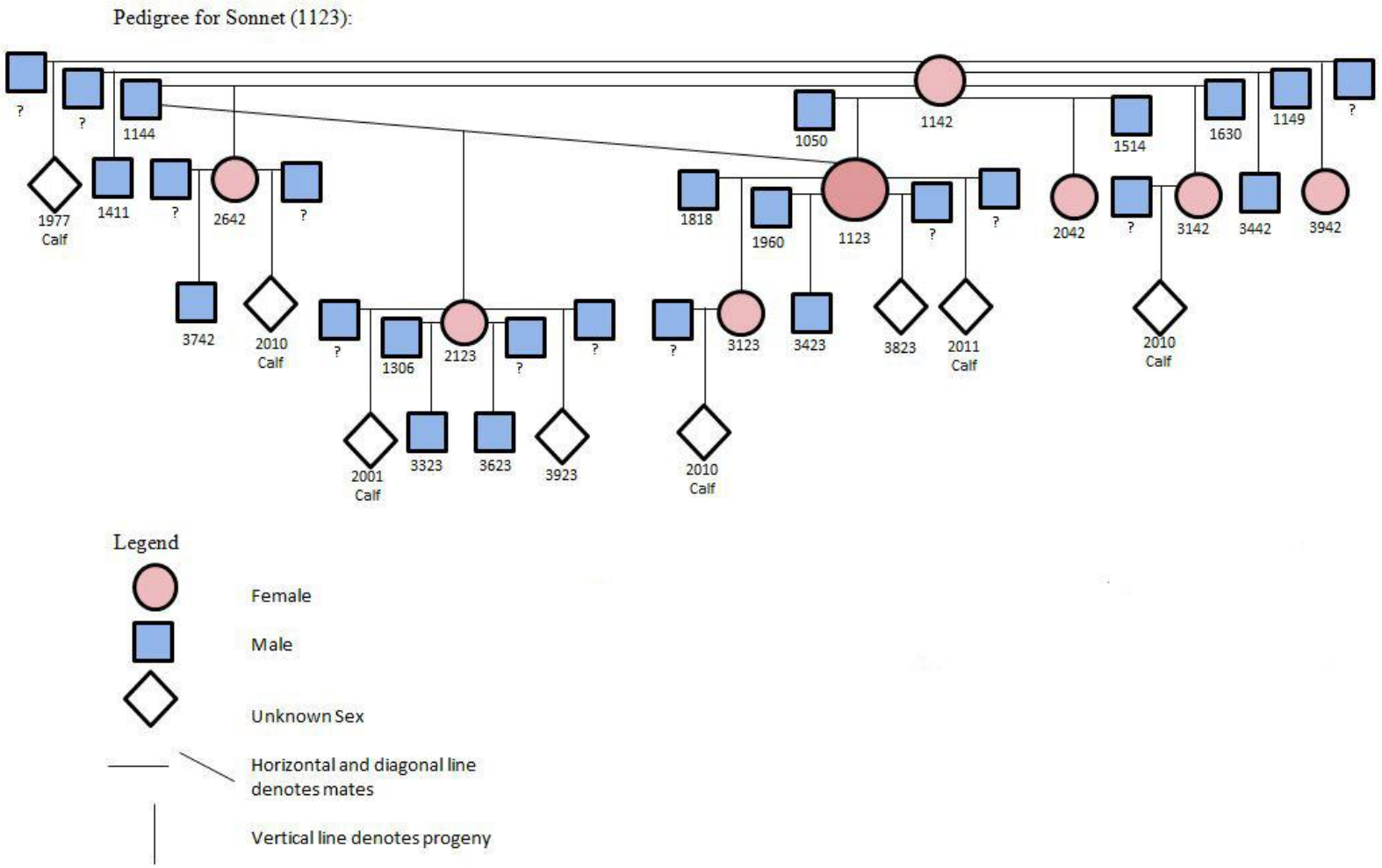


Figure 1. Pedigree for Sonnet (Catalog # 1123) represented by the largest pink circle. Sonnet is the daughter of #1142 (Kleenex) who had eight known offspring. Kleenex mated with #1144 (Dingle) to produce #2642 (Echo), one of Sonnet's sisters. Sonnet (#1123) herself mated with #1144 (Dingle) to produce #2123 (Couplet). Some males are labeled with a "?" when paternity information for a particular calf is lacking. Assigning paternities is based on a process of elimination and often more than one male is not eliminated as the potential father for a particular calf. This is a result of high levels of inbreeding and low levels of genetic variability in the population.

Money and Budget: Continuing Resolution

In October, President Barack Obama signed into law a six-month Continuing Resolution, which will fund the federal government at fiscal year 2012 levels through 27 March 2013. The legislation provides $1 trillion in funding, which represents a 0.6 increase above fiscal 2012 levels. Source: *Sea Technology*, November 2012

Butterflies and Whales

Jim Hain

The headline from *Science Daily* read, "Massachusetts Butterflies Move North as Climate Warms." The 19 years of trip accounts from the Massachusetts Butterfly Club provides a valuable scientific record, and another example of citizen science. The amateur naturalist group logged species counts on nearly 20,000 expeditions throughout Massachusetts. The data show a clear trend. "During the past 19 years a warming climate has been reshaping Massachusetts butterfly communities," says Greg Breed, lead author on the resulting Harvard study published in the 19 August 2012 *Nature Climate Change*.

Subtropical and warm-climate species such as the giant swallowtail and zabulon skipper—many of which were rare or absent in Massachusetts as recently as the late 1980s—show the sharpest increases. At the same time, more than three-quarters of the northerly species (species with ranges centered north of Boston) are now declining in Massachusetts, many of them rapidly.

The study creates new questions for managing threatened species. "For most butterfly species, climate change seems to be a stronger change-agent than habitat loss," says Breed. "Protecting habitat remains a key management strategy, and that may help some butterfly species. However, for many others, habitat protection will not mitigate the impacts of warming."

Related to shifts in geography are shifts in seasons. As right whales make their seasonal southward migration—both may be of interest. For the latter, phenology is the study of the timing of seasonal activity of plants and animals—and is a leading indicator of changes in the earth's environment. The USA National Phenology Network coordinates volunteer citizen scientists who help take the pulse of the planet. For more information, go to www.usanpn.org.

People and Changes

The Associated Press on 12 December reported that the head of the National Oceanic and Atmospheric Administration will leave her post at the end of February. "I have decided to return to my family and academia," Jane Lubchenco wrote to NOAA employees.

Calendar

25 January 2013. Marine Mammal Commission's Review of National Research and Conservation Priorities, 2nd meeting in the series, southeast U.S. region. St. Petersburg, Florida. 9:00 to 5:00. Meeting location and details available from Tim Ragen (tragen@mmc.gov) in mid-January.

7-9 May 2013. Marine Mammal Commission's Annual Meeting, probably in La Jolla, California. Details provided in next issue of *Right Whale News*.

6-7 November 2013. North Atlantic Right Whale Consortium Annual Meeting, New Bedford Whaling Museum, New Bedford, Massachusetts.

9-13 December 2013. Society for Marine Mammalogy Biennial Meeting. New Zealand.

Scientific Literature and Reports

Barlow, J. 2012. Passive acoustic monitoring of cetaceans, by Walter M.X. Zimmer (book review; see reference below). Marine Mammal Science 28(4): 782-784.

Erbe, C., A. MacGillivray, and R. Williams. 2012. Mapping cumulative noise from shipping to inform marine spatial planning. The Journal of the Acoustical Society of America 132: EL423-428.

Fortune, S.M.E., A.W. Trites, W.L. Perryman, M.J. Moore, H. M. Pettis, and M.S. Lynn. 2012. Growth and early rapid development of North Atlantic right whales (*Eubalaena glacialis*). Journal of Mammalogy 93(5): 1342-1354.

Fossi, M.C., C. Panit, C. Guerranti, D. Coppola, M. Giannetti *et al*. 2012. Are baleen whales exposed to the threat of microplastics? A case study of the Mediterranean fin whale (*Balaenoptera physalus*). Marine Pollution Bulletin 64(11): 2374-2379.

Hatch, L.T., C.W. Clark, S.M. Van Parijs, A.S. Frankel, and D.W. Ponirakis. 2012. Quantifying loss of acoustic communication space for right whales in and around a U.S. National Marine Sanctuary. Conservation Biology 26(6): 983-994.

Harkonen, T., K.C. Harding, S. Wilson, M. Baimukanov, L. Dmitrieva *et al*. 2012. Collapse of a marine mammal species driven by human impacts. PLoS ONE 7(9) e43130. 9pp.

Kennedy, A.S., D.R. Salden, and P.J. Clapham. 2012. First high-to-low latitude match of an eastern North Pacific right whale (*Eubalaena japonica*). Marine Mammal Science 28(4): E539-E544. doi:10.1111/j.1748-7692.2011.00539.x. Available from www.wileyonlinelibrary.com/journal/mms

Kaschner, K., N.J. Quick, R. Jewell, R. Williams, and C.M. Harris. 2012. Global coverage of cetacean line-transect surveys: Status quo, data gaps and future challenges. PLoS ONE 7(9) e44075. 13pp.

Kolesnikovas, C.K.M., K.R. Groch, A. Nunes de Maraes, P.A.C. Flores, D.J. Pretto, *et al*. 2012. Euthanasia of an adult southern right whale (*Eubalaena australis*) in Brazil. Aquatic Mammals 38(3): 317-321.

Knowlton, A.R., P.K. Hamilton, M. Marx, H.M. Pettis, and S.D. Kraus. 2012. Monitoring North Atlantic right whale *Eubalaena glacialis* entanglement rates: A 30 yr retrospective. Marine Ecology Progress Series 466: 293-302.

Neilson, J.L., C.M. Gabriele, A.J. Jensen, K. Jackson, and J.M. Straley. 2012. Summary of reported whale-vessel collisions in Alaskan waters. Journal of Marine Biology. 18 pp. doi:10.1155/2012/106282.

Rone, B.K., C.L. Berchok, J.L. Crance, and P.J. Clapham. 2012. Using air-deployed passive sonobuoys to detect and locate critically endangered North Pacific right whales. Marine Mammal Science 28(4): E528-E538. doi:10.1111/j.1748-7692.2012.00573.x Available from www.wileyonlinelibrary.com/journal/mms

Sironi, M., V. Rowntree, M. Di Martino, A. Chirife, L. Bandieri, *et al*. 2012. Southern right whale mortalities at Península Valdés, Argentina: updated information for 2010-2011. Unpublished Scientific Committee meeting document SC/64/BRG12, 21 May 2012, International Whaling Commission, Cambridge, UK. (available for download at www.iwcoffice.org).

van der Hoop, J.M., A.S.M. Vanderlaan, and C.T. Taggart. 2012. Absolute probabilty estimates of lethal vessel strikes to North Atlantic right whales in Roseway Basin, Scotian shelf. Ecological Applications 22: 2021-2033. dx.doi.org/10.1890/11-1841.1

Zimmer, W.M.X. 2011. Passive acoustic monitoring of cetaceans. Cambridge University Press, Cambridge, UK. 356 pp. ISBN 978-0-521-19342-9.

Right Whale News

Right Whale News is a publication of Associated Scientists at Woods Hole. It is disseminated online through the courtesy of the North Atlantic Right Whale Consortium. The Editor is Jim Hain. The editorial board consists of Julie Albert, Mark Dittrick, Tim Frasier, Robert Kenney, Scott Kraus, Bill McWeeny, Hans Neuhauser, and Melissa Patrician.

The current and back issues of *Right Whale News* published between 1994 and 2012 are available at the North Atlantic Right Whale Consortium website, www.narwc.org—under the *Right Whale News* tab.

To submit ideas, article topics, and comments, contact Editor Jim Hain at jhain@earthlink.net and place "RWN Editorial" in the subject line. To subscribe, contact Heather Pettis at hpettis@neaq.org and place "RWN Subscribe" in the subject line.

Citing *Right Whale News*: The requested format for citations from *Right Whale News* is: Right Whale News Volume(number): page(s). Alternatively, a less formal citation may simply use month and year of issue.