

Updated information for 2012-2013 on southern right whale mortalities at Península Valdés, Argentina

Sironi, Mariano^{1,2}, Victoria J. Rowntree^{1,2}, Matías Di Martino^{1,5}, Lucas Beltramino¹, Virginia Rago⁵, Marcelo Franco⁴ and Marcela Uhart^{1,3}

¹ Programa de Monitoreo Sanitario de Ballena Franca Austral / Southern Right Whale Health Monitoring Program, Puerto Madryn, Argentina

² Instituto de Conservación de Ballenas, Argentina and Ocean Alliance, USA

³ One Health Institute, University of California, Davis, USA

⁴ Subsecretaría de Turismo y Áreas Protegidas, Provincia de Chubut, Argentina

⁵ Wildlife Conservation Society, Wildlife Health & Health Policy, Buenos Aires, Argentina

ABSTRACT

Southern right whales (*Eubalaena australis*) are experiencing high mortality rates at Península Valdés, Argentina. In 2003, the Southern Right Whale Health Monitoring Program was established by a consortium of NGOs to monitor the health status of this population by post-mortem examinations. Previous reports to the IWC included information through 2011. Here we update information for the 2012-2013 seasons. A total of 672 dead whales were recorded on the Península Valdés nursery ground and surrounding areas along the Argentine coast between 2003 and 2013. At least 116 whales died in 2012, which represents the highest number of southern right whale deaths ever recorded in one calving and nursing season (June – December). The number of dead whales was 67 in 2013. As in previous years, most of the dead whales were newborn calves (97% of strandings in 2012 and 94% in 2013). More deaths were recorded in Golfo Nuevo (86% in 2012 and 79% in 2013) than in Golfo San José (12% in 2012 and 21% in 2013), with two strandings (2%) in the outer coast of the peninsula in 2012. Most whales died in August – October (77%) in 2012 and in September – October (70%) in 2013. Only one calf was alive when it stranded in 2012, and died a few minutes after it was found. The remaining whales were dead when reported or found, and post mortem examinations were performed when and to the extent that carcass condition allowed. Biotoxins, infectious diseases and malnutrition are three hypotheses that have been proposed to explain the recurring high mortalities in this southern right whale population. Preliminary observations suggest that nutritional status and body condition could play a role in the differential mortality observed in different years. A fourth hypothesis, the physiological and behavioral effects of kelp gull attacks on newborn calves has been considered more recently. A common cause to explain the high mortality rates in this southern right whale population remains to be found.

INTRODUCTION AND BACKGROUND OF RECENT MORTALITIES

Southern right whale population dynamics have been studied continuously through annual aerial photoidentification surveys at Península Valdés since 1971 (Payne, 1986; Rowntree et al., 2001; Cooke, 2012). During the first 30 years of the study, deaths appeared to increase at a rate similar to the increase in number of whales using the calving ground, but an unexpectedly large number of whales (47) died in 2005 (Uhart et al., 2008), and high mortality events have continued annually with an average of 75 whales dying each year from 2007 through 2011 (Rowntree et al., 2013) and a peak of 116 deaths in 2012 (this paper). These are considered the most extreme mortality events ever observed for the species. In view of these deaths, it seems that this whale population and its ecosystem may be less healthy and robust than previously thought.

The Southern Right Whale Health Monitoring Program (SRWHMP, the “Program”) at Península Valdés is run by a consortium of the NGOs Wildlife Conservation Society (WCS), Instituto de Conservación de Ballenas (ICB), Ocean Alliance (OA), Fundación Patagonia Natural (FPN), the University of California, Davis and University of Utah, in collaboration with research centers and governmental agencies. It began in 2003 with support from the US National Marine Fisheries Service and more recently the US Marine Mammal Commission, and runs with funds from foundations, private donors and the NGOs and universities that direct the Program.

The aim of the Program is to evaluate the health status of the southern right whale population by conducting post-mortem examinations of the animals that strand each year on the beaches of Península Valdés and surrounding area. Also, it aims at discovering the causes of deaths and their conservation implications for the species. Here we report data

on strandings for the 2012-2013 seasons (June through December). Previous reports to the IWC included information through 2011 (Uhart et al., 2008, 2009; Anon., 2011; Rowntree et al., 2011; Sironi et al., 2012).

MATERIALS AND METHODS

Stranded whales are located by systematic land and aerial surveys conducted by the Program's researchers, and by reports from a local Stranding Network with nearly 70 members. The Network includes park rangers, fishermen, whale watch captains and company owners, diving companies, tour operators, nature guides, sailors, airplane pilots, artisanal fishermen, researchers, NGOs, and local authorities such as the Argentine Navy and the Argentine Coastguard. The Stranding Network has been essential to the success of the Program.

The stranding field team regularly surveys the coastline of Península Valdés from land, in regions where the whales concentrate, and by plane along the entire perimeter of the peninsula. When dead whales are found or reported, the Program's field team of veterinarians and biologists travels to the site and follows a necropsy protocol that includes recording the location, an external examination, photographing and measuring the body, tagging the carcass and, depending on carcass condition, a partial or complete necropsy to collect samples of external and internal organs and tissues. Samples are analyzed by laboratories in Argentina and the USA. All results are reported annually to provincial and national government authorities.

RESULTS

At least 672 whales (of which 91% were calves) died in Península Valdés and surrounding areas between 2003 and 2013 (Di Martino et al., 2013). The number of deaths varies greatly between years (Fig. 1). For instance, while the annual effort to find dead whales remained the same, the mortality in 2007 (83 deaths) was 4.6 times higher than in the previous year (18 deaths), and the mortality in 2012 (116 deaths) equaled the total number of whale deaths in the two previous years combined (55 and 61 deaths in 2010 and 2011, respectively).

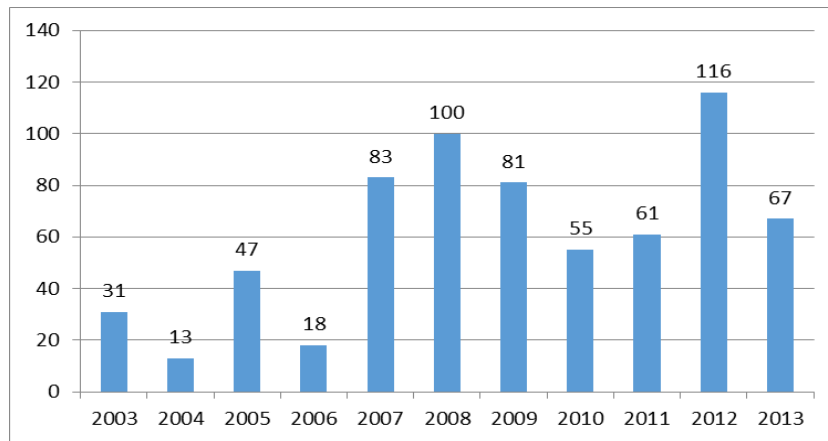


Figure 1. Annual number of dead southern right whales recorded at Península Valdés in 2003-2013 (Di Martino et al., 2013).

Summary for 2012:

The year 2012 was the most extreme so far in terms of right whale mortality at Península Valdés, with 116 deaths between June and December.

Most of the dead whales were found in the gulfs (100 or 86% in Golfo Nuevo, 14 or 12% in Golfo San José), and 2 (2%) were found along the outer coast of Península Valdés (Fig. 2). For comparison, during a photoidentification aerial survey on 13 and 14 September 2012, 332 whales (64%) were in Golfo Nuevo, 182 whales (35%) were in Golfo San José and 7 whales (1%) were along the outer coast (ICB/OA, 2012).

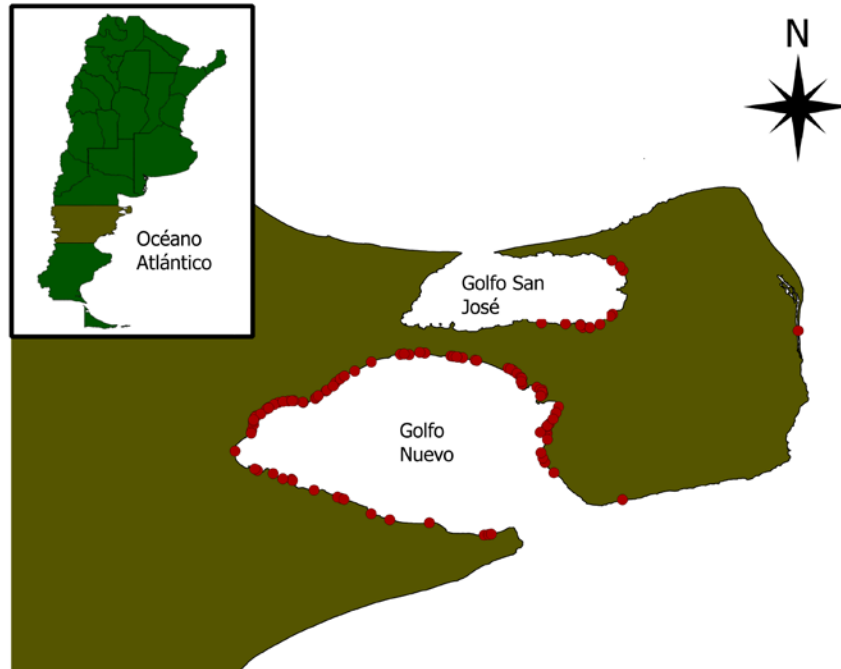


Figure 2. Location of dead whales (red dots) along the shores of Península Valdés in 2012.

Almost all whales that died in 2012 were calves (113 or 97%), with only 2 dead juveniles (2%) and 1 adult female (1%) (Table 1). The sex ratio of animals whose sex could be determined was 56 females:50 males. Most whales died in August (31 animals or 27%), September (29 or 25%) and October (29 or 25%). The Stranding Network reported 48 (41%) strandings in 2012, and the remaining 68 strandings (59%) were found during systematic land and aerial surveys by the Program's research team. Only one calf was alive when it stranded, and died a few minutes after it was found. The remaining whales were dead when found or reported.

Summary for 2013:

Sixty-seven whales died along the shores of Península Valdés in 2013. All strandings were found in the gulfs of the peninsula, with 53 (79%) in Golfo Nuevo and 14 (21%) in Golfo San José (Fig. 3). For comparison, during a photoidentification aerial survey on 3 and 6 September 2013, 531 whales (73%) were in Golfo Nuevo, 187 whales (26%) were in Golfo San José and 11 whales (1%) were along the outer coast (ICB/OA, 2013).

The majority of whales that died in 2013 were calves (63 or 94%), with only 2 dead juveniles (3%) and 2 adults (3%) (Table 1). The sex ratio of animals whose sex could be determined was 32 females:25 males. Most whales died in September (28 animals or 42%) and October (19 animals or 28%). The Stranding Network reported 24 (36%) strandings in 2012, and the remaining 43 strandings (64%) were found during systematic land and aerial surveys by the Program's research team. All whales were dead when found or reported.

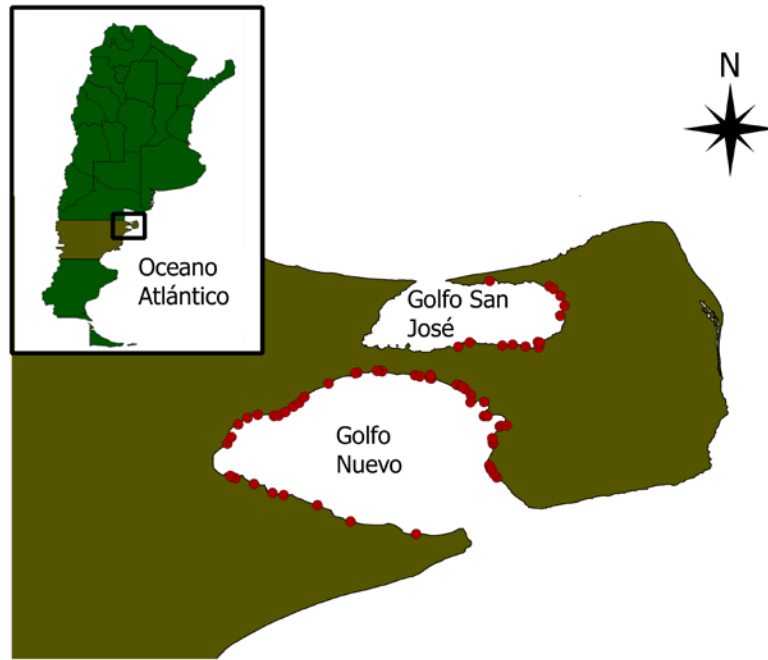


Figure 3. Location of dead whales (red dots) along the shores of Península Valdés in 2013.

Table 1. Age class distribution of 183 strandings recorded at Península Valdés in 2012 and 2013.

Age	2012	2013	Total	% of Total
Calves	113	63	176	96
Juveniles	2	2	4	2
Adults	1	2	3	2
Total	116	67	183	100

DISCUSSION

The high mortality of right whales at Península Valdés prompted the IWC Scientific Committee to convene a workshop of specialists in Puerto Madryn, Argentina in March, 2010, organized by the IWC, the US Marine Mammal Commission and Argentina’s National Research Council (CONICET) at the Centro Nacional Patagónico (CENPAT). Three leading hypotheses to explain the high mortalities were proposed: decreased availability of food, exposure to biotoxins, and infectious disease, or a combination of these factors (see Anon., 2011 for further details).

Since then, the Program focused its efforts on collecting samples and information that would help to further investigate these hypotheses. Trace levels of the algal biotoxins saxitoxin (STX) and domoic acid (DA) have been found in tissues of only 4 of 36 dead animals examined that died between 2004 and 2009 (G. Doucette and S. Fire, pers. comm.). The levels were much below those found in the feces of foraging North Atlantic right whales (Doucette et al. 2006, 2012; Rowntree et al., 2013). Ancillary diagnostic testing was performed on samples from a subset of the dead whales including routine histologic examination of tissues, serologic testing and PCR on select subsets of samples (McAloose, Uhart and SRWHMP, unpub.). Currently there is/are no consistent gross or histologic findings (with the exception of gull-peck lesions) or ancillary diagnostic results in or between years to explain recurrent annual southern right whale deaths at Península Valdés (Rowntree et al., 2013). At present, preliminary evidence suggests some differences in body condition and nutritional status between years of high and low mortality, which are being investigated further (Marón et al., 2012, 2013).

A second workshop to analyze scientific data on the southern right whale die-offs at Península Valdés was organized during the Annual Conference of the International Association for Aquatic Animal Medicine (IAAAM) on 23 April 2013, hosted by The Marine Mammal Center, Sausalito, California. Workshop participants noticed the strong signal of

kelp gull (*Larus dominicanus*) attacks as a unique, increasing, and acute element of the lifecycle of young right whale calves at Península Valdés, and agreed that a fourth hypothesis should be developed to guide evaluation of the possible contribution of gull attacks (Thomas, 1988; Rowntree et al., 1998; Sironi et al., 2009) to the ongoing calf mortality. A preliminary statement of this hypothesis is: “high levels of harassment by kelp gulls that peck on a calf’s exposed skin and then feed on the underlying blubber, cause significant physical injuries, energetically expensive avoidance behavior, and reductions in suckling time. This syndrome may result in, *inter alia*, decreased food intake, increased energy expenditure, exhaustion, catabolism, dehydration, and thermoregulatory stress, with cumulative and cascading effects that can lead to calf death” (Thomas et al., 2013).

The Program’s researchers systematically measure a number of variables on live and dead whales to monitor the effects of gull attacks on right whale behavior and health at Península Valdés. For instance, the prevalence of gull-inflicted lesions on the skin of dead whales was recorded on every whale that stranded with the back visible and skin present (47 whales in 2012 and 32 in 2013). Of these, 33 whales (70%) had severe ante-mortem gull lesions and 14 (30%) did not have lesions in 2012; while 27 whales (84%) had lesions and 5 (16%) did not have lesions in 2013. A complete analysis of this and other variables related to the effects of gull attacks (including data collected annually since 1995) will be presented in separate papers.

Since 2003, thousands of biological samples from southern right whales at Península Valdés have been collected by the Program and analyzed by collaborating scientists in a number of laboratories in Argentina and the USA. However, no consistent lesions, pathologic processes or elevated levels of algal biotoxins have been identified to explain the recent calf mortality events that can affect the population’s recovery (Rowntree et al., 2013).

ACKNOWLEDGMENTS

The Southern Right Whale Health Monitoring Program in Argentina has received funding from the Office of Protected Resources of the US National Marine Fisheries Service, National Ocean and Atmospheric Administration (Order #s DG133F-02-SE-0901, DG-133F-06-SE-5823 and DG133F07SE4651) the US Marine Mammal Commission (Grants # E4047315 and E4061768), The Ocean Foundation, the Island Foundation, the Pacific Life Foundation, the Lawrence Foundation, the Wildlife Conservation Society, Fondo para la Conservación Ambiental from Banco Galicia and Ocean Alliance.

We specially thank all members and collaborators of the Stranding Network, volunteers and collaborators of the Program and the Provincial Park Rangers of Península Valdés. D. Taboada and R. Schteinbarg, L. Valenzuela, C. Marón, J. Martino, M. Ricciardi at the Instituto de Conservación de Ballenas; Guillermo Harris, Guillermo Caille and the staff at Fundación Patagonia Natural; A. Chirife and P. de Diego; Fundación Ecocentro, Armada Argentina and Prefectura Naval have also been instrumental in our work. We thank Carlos Ibarra and Aeroclub Puerto Madryn for support with aerial surveys. Scientific advice and expertise was kindly provided by F. Adler, V. Alonso Roldán, R. Brownell, A. Friedlander, F. Gulland, J. Geraci, D. McAloose, W. McLellan, A. Pabst, K. Moore, M. Moore, S. Moore, D. Rotstein, T. Rowles, J. Seger and P. Thomas. Special thanks to William Rossiter from Cetacean Society International and DJ Schubert from Animal Welfare Institute for financial support to MS to attend the 65b annual meeting of the Scientific Committee of the International Whaling Commission in Slovenia to present this research. Research permits were issued by the Dirección de Fauna y Flora Silvestres and the Subsecretaría de Turismo y Áreas Protegidas of Chubut Province, Argentina.

REFERENCES

Cooke, J. 2012. Southwest Atlantic right whales: updated population assessment from photo-id collected at Península Valdés, Argentina. IWC/64/Rep 1 Annex F.

Di Martino, M., Beltramino L., Rago V., Sironi M., Rowntree V. and M. Uhart. 2013. Annual Report of the Southern Right Whale Health Monitoring Program. 20 pp. Available from icb@icb.org.ar

Doucette, G., Cembella, A., Martin, J., Michaud, J., Cole, T. and R. Rolland. 2006. Paralytic shellfish poisoning (PSP) toxins in North Atlantic right whales *Eubalaena glacialis* and their zooplankton prey in the Bay of Fundy, Canada. Mar Ecol Prog Ser 306: 303–313.

Doucette, G., Mikulski, C., King, K., and P. Roth. 2012. Endangered North Atlantic right whales (*Eubalaena glacialis*) experience repeated, concurrent exposure to multiple environmental neurotoxins produced by marine algae. *Environ Res* 112: 67–76

Instituto de Conservación de Ballenas / Ocean Alliance. 2012. Annual Report of the Right Whale Research Program at Península Valdés, Argentina (in Spanish and English). Available from icb@icb.org.ar

Instituto de Conservación de Ballenas / Ocean Alliance. 2013. Annual Report of the Right Whale Research Program at Península Valdés, Argentina (in Spanish and English). Available from icb@icb.org.ar

International Whaling Commission. 2010. Report of the Southern Right Whale Die-Off Workshop 15-18 March 2010, Centro Nacional Patagónico, Puerto Madryn, Argentina. IWC Document SC/62/Rep 1. 46pp.

Payne, R. 1986. Long term behavioral studies of the southern right whale (*Eubalaena australis*). *Rep. Int. Whal. Commn.* (special issue 10): 161-167.

Marón, C., Ward, R., Valenzuela, L., Sironi, M., Chirife, A., Di Martino, M., Rowntree, V., Uhart, M. and J. Seger. 2013. Body condition of right whale calves at Península Valdés: a preliminary study. 44th conference of the International Association for Aquatic Animal Medicine (IAAAM). Sausalito, April 21-26, 2013

Marón, C., Ward, R., Valenzuela, L., Sironi, M., Chirife, A., Di Martino, M., Rowntree, V., Uhart, M. and J. Seger. 2012. Preliminary study on the nutritional condition of southern right whales calves (*Eubalaena australis*) at Península Valdés, Argentina, by fatty acid analyses. II Congreso Latinoamericano de Mastozoología y XXV Jornadas Argentinas de Mastozoología (SAREM). Buenos Aires, 6-9 Nov.

Rowntree, V., MacGuiness, P., Marshall, K., Payne, R., Sironi, M. and J. Seger. 1998. Increased harassment of right whales (*Eubalaena australis*) by kelp gulls (*Larus dominicanus*) at Península Valdés, Argentina. *Marine Mammal Science* 14(1):99-115 (USA).

Rowntree, V., Payne, R. and D. Schell. 2001. Changing patterns of habitat use by southern right whales (*Eubalaena australis*) on their nursery ground at Península Valdés, Argentina, and in their long-range movements. *J. Cetacean Res. Manage.* (Special issue) 2: 133-143.

Rowntree, V., Uhart, M., Sironi, M., Chirife, A., La Sala, L., Pozzi, L., Musmeci, L., Mohamed, N., Andrejuk, J., Sala, J., Carribero, A., Franco, M., Seger, J., Brownell, R., and T. Rowles. 2011. Mortalities of right whales (*Eubalaena australis*) at Peninsula Valdes between 1971 and 2010: recent increases and their possible causes. SC/S11/RW2 presented to the International Whaling Commission, Sept 2011. [Available from the IWC Office]. 22pp.

Rowntree, V., Uhart, M., Sironi, M., Chirife, A., Di Martino, M., La Sala, L., Musmeci, L., Mohamed, N., Andrejuk, J., McAloose, D., Sala, J., Carribero, A., Rally, H., Franco, M., Adler, F., Brownell Jr., R., Seger, J. and T. Rowles. 2013. Unexplained recurring high mortality of southern right whale *Eubalaena australis* calves at Península Valdés, Argentina. *Marine Ecology Progress Series*, Vol. 493: 275-289..

Sironi, M., Rowntree, V., Snowdon, C., Valenzuela, L. and C. Marón. 2009. Kelp Gulls (*Larus dominicanus*) feeding on southern right whales (*Eubalaena australis*) at Peninsula Valdes, Argentina: updated estimates and conservation implications. Paper SC/61/BRG19 presented to the International Whaling Commission Scientific Committee, Portugal, June 2009 (unpublished). [Available from the IWC Office]. 12 pp.

Sironi, M., Rowntree, V., Di Martino, M., Chirife, A., Bandieri, L., Beltramino, L., Franco, M. and M. Uhart. 2012. Southern right whale mortalities at Península Valdés, Argentina: updated information for 2010-2011. SC/64/BRG12 presented to the International Whaling Commission Scientific Committee, Panama (unpublished). [Available from the IWC Office].

Thomas, P.O. 1988. Kelp gulls, *Larus dominicanus*, are parasites of the Right Whale, *Eubalaena australis*. *Ethology*. 79: 89-103.

Thomas, P., Uhart, M., McAloose, D., Sironi, M., Rowntree, V., Brownell Jr., R., Gulland, F., Moore, M., Marón, C. and C. Wilson. 2013. Workshop on the Southern right whale die-off at Península Valdés, Argentina. SC/65/BRG15

presentado ante la International Whaling Commission Scientific Committee, South Korea (unpublished). [Available from the IWC Office]. 5pp.

Uhart, M., Rowntree, V., Mohamed, N., Pozzi, L., La Sala, L., Andrejuk, J., Musmeci, L., Franco, M., Sironi, M., Sala, J., McAloose, D., Moore, M., Touhey, K., McLellan, W.A. and T. Rowles. 2008. Strandings of southern right whales (*Eubalaena australis*) at Península Valdés, Argentina from 2003-2007. Paper SC/60/BRG15 presented to the International Whaling Commission Scientific Committee, Chile, June 2008 (unpublished). [Available from the IWC Office].

Uhart, M., Rowntree, V., Sironi, M., Chirife, A., Mohamed, N., Pozzi, L., Franco, M. and D. McAloose. 2009. Continuing southern right whale mortality events at Península Valdés, Argentina. Paper SC/61/BRG18 presented to the International Whaling Commission Scientific Committee, Portugal, June 2009 (unpublished). [Available from the IWC Office]. 10pp.