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# Report of the second workshop on mortality of Southern right whales (Eubalaena australis) at Pennsula Valds, Argentina

International Whaling Commission

INTERNATIONAL
WHALING COMMISSION

# Report of the second workshop on mortality of Southern right whales (*Eubalaena australis*) at Península Valdés, Argentina

5-6 August 2014, Puerto Madryn, Chubut, Argentina

## Contents

## 1. INTRODUCTORY ITEMS

### 1.1 Opening and welcome address

Dr. Rolando Gonzalez, Director of the Centro Nacional Patagónico (CENPAT), welcomed participants to the CENPAT. Further words of welcome and introduction were given by Paniego (Alternate Commissioner of Argentina to the IWC) and Musmeci (Ministro de Ambiente y Control del Desarrollo Sustentable de Chubut). The list of participants is given as Annex A and the meeting schedule and list of presentations is given as Annex B.

### 1.2 Meeting arrangements

Rojas-Bracho was appointed Chair. Iñíguez-Bessega and Bellazzi agreed to serve as the lead rapporteurs, with various other participants helping to draft parts of the report on an as-needed basis.

Iñíguez-Bessega (Coordinator of the IWC Conservation Management Plan of the South West Atlantic population of southern right whales - CMP) provided a brief introduction to the CMP and noted that one of its priorities is to develop and implement a strategy to minimise kelp gull harassment on southern right whales at Península Valdés, Argentina. He also thanked the IWC for allocating funds for the workshop.

### 1.3 Document available

No new documents were prepared specifically for the Workshop. Most of the new material was presented in the form of slide presentations (see Annex B), of which summaries have been incorporated into this report.

### 1.4 Report

The Workshop was informed that its report was to be completed in time for submission as a document to the IWC Scientific Committee meeting in May 2015 in San Diego, USA. Responsibility for preparation and editing of the draft final report was assigned to Rojas Bracho and Iñíguez Bessega on the understanding that it would be circulated to participants for review prior to final revision.

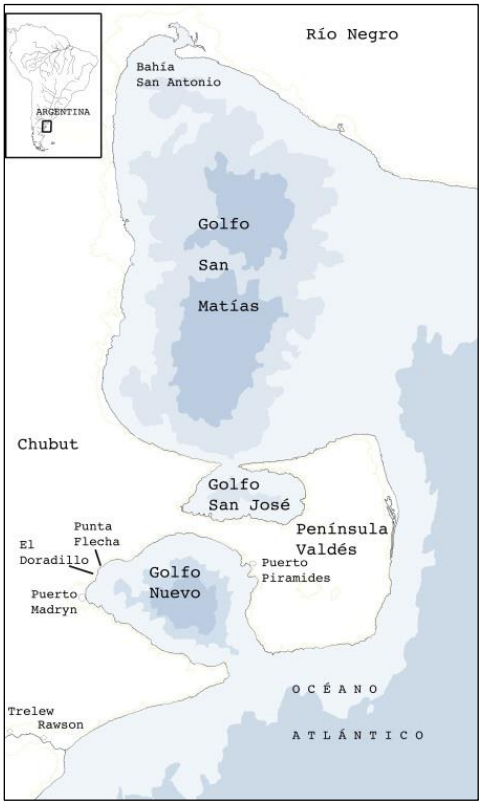


Fig.1. Coastal map of Península Valdés and Golfo San Matías, Patagonia, Argentina. Map by FPN and WCS.

## 2. UPDATE ON THE LONG-TERM STUDIES OF SOUTHERN RIGHT WHALES OFF PENINSULA VALDES.

### 2.1 Long-term aerial and vessel survey data

Crespo summarized the progress made by the Marine Mammal Laboratory (LAMAMA), CENPAT-CONICET and the Universidad Nacional de la Patagonia San Juan Bosco, Puerto Madryn, Chubut, the Instituto de Biología Marina y Pesquera 'Alte. Storni' and Universidad Nacional del Comahue, San Antonio Oeste, Río Negro on the abundance and trends of southern right whales in the Península Valdés region during the period 1999-2013 estimated from aerial and boat surveys (Crespo *et al.* 2014).

During the last fifteen years, the LAMAMA has developed an aerial survey approach to monitor seasonal changes in distribution and abundance within years and over time. A monitoring area was defined around Peninsula Valdés totalling a coastal strip of 350 n.miles (620km) with the plane flying parallel to the coastline at an altitude of 500 feet. All animals (mother-calf pairs, solitary individuals and breeding groups) were counted. A total of 55 aerial surveys were performed in 1999, 2000, and from 2005 to 2013. The rate of increase was estimated from the slope of the linear regression of the log-number of whales through time (i.e. the number of whales and number of calves at the peak of the breeding season for each year surveyed). The annual rate of increase for the period 1999-2013 (excluding 2001 to 2004 and 2008 to 2010 – considering the flights due to logistic problems rendered poor quality data) was 6.2% (CI 95%= 4.2, 8.1; $R^2$= 0.93, $n$= 7 for all animals and 6.6% (CI 95%= 4.2, 9.0; $R^2$= 0.82, $n$= 7) for new-born calves. If all eleven years are included, the estimated rates of increase are lower (although not significantly): 4.2% (CI95% 1.1-7.3) for all whales and 5.2% (CI95% 2.8-7.6) for calves.

The rate of increase was also estimated from Generalized Linear Models using the full data set. Both Poisson and negative binomial models were applied. Predictor variables included Year and Month, considered as continuous variables (Month 1-12; Year 1999-2013). Monthly variation in number of whales was modelled using also the Month$^2$, allowing the models to explore a non-linear relationship between numbers of whales and temporal variables. The selected model indicates that population has increased in 4.57% annually (95% IC= 2.84 – 8.82%) and that the number of calves born in Península Valdés has increased by 7.01% per year (95% CI = 3.5 – 11.49% per year) from 1999 to 2013.

Distribution in terms of distance to the coast was examined using a binomial non-parametric test. The proportions of whales observed on the two sides of the aircraft (coastal - offshore side) was compared with a theoretical random distribution with $p$=0.5. In the surveys carried out from 2005 to 2010 the proportion of whales (of all classes) on the offshore side increased.

The number of whales outside the coastal monitoring zone was estimated from small boat surveys in the deeper waters of Golfo Nuevo and Golfo San José using random transects from January 2001 to August 2011. Using standard distance sampling methods applied to individual animals, density ($D$) was estimated as 2.61 whales/km$^2$, and the effective strip width was about 73m. The CV was rather high (28.04) and the low encounter rate was the most important component of the variance (93.1%).

In addition, several vessel surveys have been carried out in the coastal zone of Golfo San Matías, to the north of Península Valdés around the peak of the breeding season. Mother-calf pairs, breeding groups and solitary individuals were counted with higher concentrations around Bahía de San Antonio and Puerto Lobos.

In summary, Crespo noted that the trend of the population is positive, irrespective of the estimation method, that density outside the aerial monitoring zone is also increasing and that the area used by the whales seems to be expanding. If Península Valdés is assumed to be the optimum habitat, then once it becomes 'saturated' the rate of growth in the area might be expected to decrease and whales might start to move to other less densely occupied regions where there is still potential for growth. He believed that the above results provided indications that this could be the case.

### 2.2 'Punta Flecha Observatory' observations

Morand reported on the results of the third season of counts of southern right whales from the Punta Flecha Observatory (Golfo Nuevo) carried out by Fundación Patagonia Natural, Wildlife Conservation Society and Facultad de Ciencias Naturales-Universidad Nacional de la Patagonia San Juan Bosco (UNPSJB). The Observatory is located 17 km from Puerto Madryn in the Municipality's protected area 'El Doradillo'. It is excellent location, on a cliff 30m above sea level from which whales may be seen easily up to 15 km away on

a clear day. Most mothers raise their calves during the first months of life near the northern coast of the Golfo Nuevo between Playa Colombo to the East and Doradillo to the West.

Counts take place each year during the months when the whales are present (June to December), using a method developed in 2012. Figs 2 and 3 show the number of whale counts from the Observatory in 2012 (between September to December) and 2013 (between July to December) respectively (Morand *et al.* 2013, 2014). Peak numbers for various classes in a single count were for all whales, 91 in September 2012 and 122 in September 2013; for mothers with calves, 14 in September 2012 and 49 in September 2013; for single adults, 54 in September 2012 and 46 in July 2013; and for groups of adults (2 to 5 individuals), 2 in September 2012 and 2 in September 2013. The reduction in the number of whales in October in the Observatory area might be explained by whales moving east towards the Puerto Pirámides area in Golfo Nuevo.

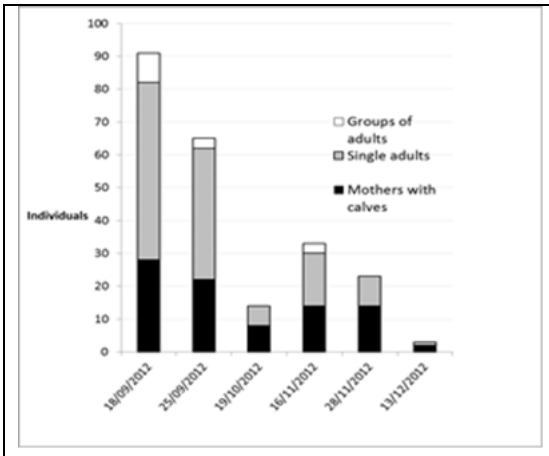


Fig 2. Results of the 2012 season counts from the "Punta Flecha" Observatory.

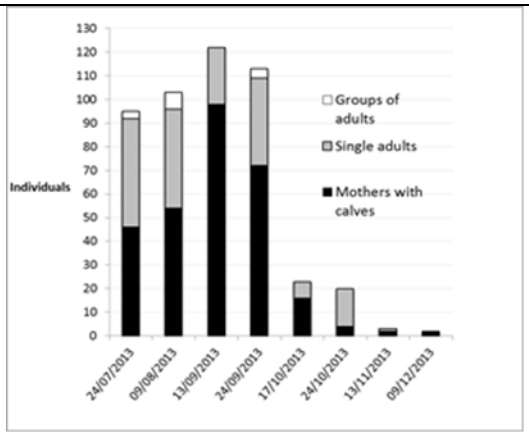


Fig 3. Results of the 2013 season counts from the "Punta Flecha" Observatory.

## 3. BACKGROUND AND UPDATE INFORMATION ON THE STATUS OF THE KELP GULL

Yorio, presented his work with Lisnizer and Borboroglu, on the population status of the kelp gull (*Larus dominicanus*) along 1,800 km coastline of the provinces of Chubut and Rio Negro.

The surveys and censuses conducted between 2006 and 2008 (Lisnizer *et al*, 2011) indicated 68 breeding sites with a total population of 72,600 pairs (over 60% of these colonies and pairs were located in northern Golfo San Jorge). Nine breeding sites and a total of 13,300 pairs were identified for the Península Valdes and surrounding area. Data for the period 1994 and 2008 show that the breeding population in Chubut and Río Negro increased by 37%, at an annual rate of 2.7% (from 52,700 to 72,600 pairs). Significant differences were found in the population trends in the different coastal sectors surveyed, consistent with the differential distribution of 'anthropogenic food subsidies' along the study area. While the sectors corresponding to the San Matías and San Jorge gulfs (Río Negro and Chubut, respectively) showed significant population increases, sectors in the centre of the study area remained stationary. The two sectors with the highest population growth were characterized by the high availability of commercial fishing discards, indicating the possible influence of fisheries in the observed patterns. Demographic models showed that the population dynamics in the region involves transfer of individuals between colonies (e.g. source-sink type processes). Dispersal and recruitment of individuals from other sites were instrumental in the growth of the number of breeders in Golfo San Matías and San Jorge, and were also instrumental in the growth of the smaller colonies, which generally had higher growth rates. The dispersal of individuals between colonies, the establishment of new colonies and disappearance of others, and the existence of a differential population dynamics dependent on colony size suggests a metapopulation structure and dynamics of the kelp gull in the region. These conclusions are supported by genetic studies which indicate an absence of significant genetic structure and suggest important levels of mixing among colonies. Thus a single colony or a small region should not be considered as the unit of effective management, but rather work should be focused on a larger scale to take into account the potential connectivity among colonies.

Yorio emphasized that the anthropogenic food subsidy provided by commercial fisheries appears to be more relevant in demographics than urban waste obtained at local dumps. While fish waste generated by fish processing plants that is disposed of in open pits within or close to urban dumps may be also significant, its availability to gulls is inconsistent and depends on the use of this waste for fish meal. He also noted that there appeared to be no clear relationship between the trends in abundance of kelp gulls and the rate of attacks.

Bertelotti noted that the peak of kelp gulls attacks on whales are in winter. The Workshop **agreed** that an increase in attack rates on whales might result not only from an increase in the number of gulls in the area, but also from the spread of the attack behaviour through learning.

## 4. SHIP STRIKES AND ENTANGLEMENT

The Prefectura Naval Argentina (Coast Guard) developed and implemented legislation (Disposicion Madr, RIA Nº 069/09) to reduce ship strikes with southern right whales in the nursery ground of Península Valdés, Patagonia Argentina through the establishment of a navigation corridor in Golfo Nuevo from 1 June to 30 November each year (IWC/61/CC12rev.).

Argüelles (Applied Ecophysiology Laboratory – LAECOF, CENPAT) described recent findings on the areas shared by Southern right whales and ships close to Puerto Madryn in Argentina, which could generate space use conflicts. Whales are now concentrated around harbours and recreational use areas (water sports and whalewatching activities), increasing the collision risk between whales and ships, especially in Bahía Nueva (Golfo Nuevo) where there are no navigation constraints. In particular, there is an area with 80 to 120m depths adjacent to Bahía Nueva used by ships as a route to enter to Puerto Madryn port that is now intensively used by whales. In November 2013, five whales were tagged with a suction cup device containing a time-depth recorder (TDR) to obtain data on dive patterns in the route of access to this port. Individuals tagged in Golfo Nuevo dove to depths close to 80 m. The duration of dives can also last for more than 20 minutes dives, which may also increase the risk of collision. A better understanding of whale distribution, abundance and diving patterns will be useful for predicting the potential consequences of the human activities on the population and the development of effective mitigation measures to protect whales (and vessels). At the end of this project, recommendations were given to the Prefectura Naval Argentina to improve the navigation corridor.

In discussion, it was noted that of the nearly 700 stranded whales that have been examined between 2003 and 2014 by the Southern Right Whale Health Monitoring Program (SRWHMP), less than 1% (n=6) only 6 showed signs of blunt-force trauma and only two were confirmed as vessel injuries indicating that this may be more of an animal welfare issue than a conservation threat at this time.

With respect to entanglement of southern right whales in mooring and fishing gear, interactions between whales and vessel mooring gear were recorded in the 1980s. The Red de Fauna Costera of Chubut is working with the Puerto Madryn Nautical Club to improve vessel mooring and reduce entanglement, as advised by Mattila of the IWC. There were no records of whales with entanglement evidence or marks in their body in 2013.

The Workshop **agreed** that recreational boats, including kayaks, need more regulations and it **recommends** continued work to improve mooring.

## 5. UPDATE ON MORTALITY AROUND PENINSULA VALDES

### 5.1. Southern right whale strandings at Peninsula Valdes.

Between 2003 and 2013, a total of 672 dead southern right whales (Fig. 4) have been recorded and examined at the Península Valdés nursery ground and surrounding areas along the Argentine coast by the SRWHMP. Rowntree *et al.* (2013) and several reports have been provided to the IWC (Uhart *et al.*, 2008, 2009; Rowntree *et al.*, 2011; Sironi *et al*., 2012).

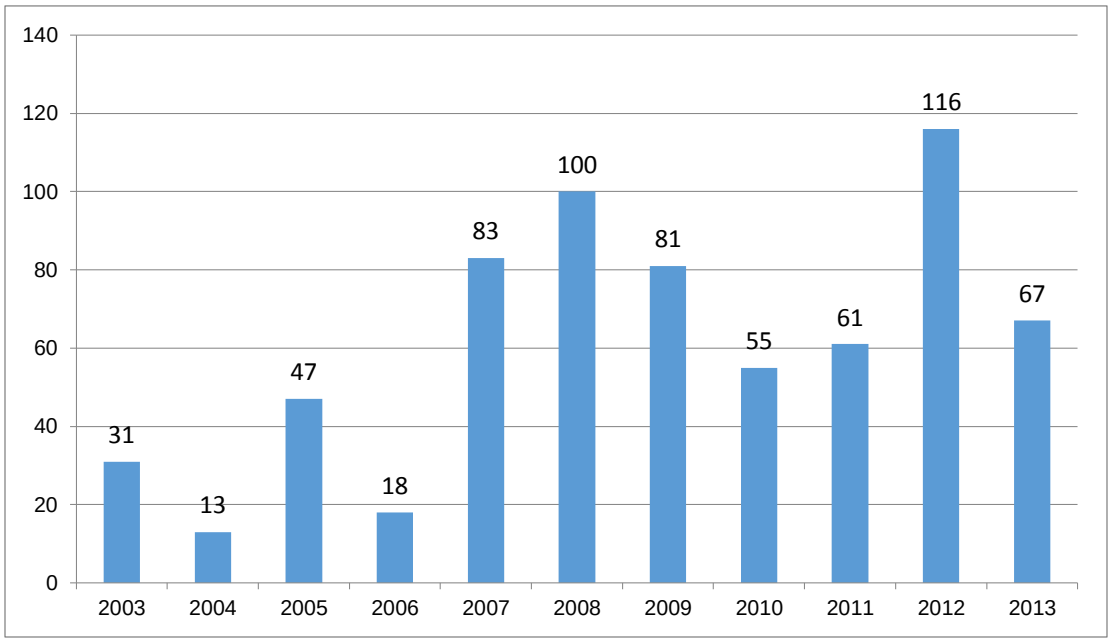


Fig 4. Annual number of dead southern right whales recorded at Península Valdés from 2003-2013 by the Southern Right Whale Health Monitoring Program.

Uhart provided updated information on Southern right whale strandings during the 2012-2013 seasons at Península Valdes from the Southern Right Whale Health Monitoring Program (SRWHMP). At least 116 whales died in 2012, which is considered the highest reported number for the species. The number of dead whales was 67 in 2013. As in previous years, most of the dead whales were newborn calves (113 or 97% of strandings in 2012 and 63 or 94% in 2013). More deaths were recorded in Golfo Nuevo (100 or 86% in 2012 and 53 or 79% in 2013) than in Golfo San José (14 or 12% in 2012 and 14 or 21% in 2013), with two strandings (2%) on 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 it died a few minutes after it was found. The remaining whales were dead when reported or found. Post mortem examinations were performed on individuals to the extent that carcass condition allowed. Research efforts to unravel the causes of these unexplained deaths continue. Sustained high calf mortality rates could slow the population's recovery.

There was some discussion in the Workshop as to whether it was appropriate to call the mortality events observed in Argentina as a 'die-off'. McAloose believed that it was not appropriate but the participants did not develop a consensus view on this matter.

**5.2 Possible population level consequences of the high mortality**

Sironi on behalf of Marón *et al.* examined possible immediate and delayed population consequences of the increased calf mortality discussed under Item 5.1. During the last decade, southern right whale calves began dying in large numbers on their nursery ground at Península Valdés (564 calf deaths in 2005-2013). Normally, adult females give birth once every three years (Whitehead & Payne 1981, Burnell 2001, IWC 2013a). Two, four and five-year calving intervals are interpreted as evidence of calving failure (Knowlton et al. 1994, Burnell 2001).

He noted that the frequencies of abnormal intervals are expected to increase when the perinatal (late-term foetus and calf) mortality rate increases. Marón *et al.* searched the annual aerial photo-ID database (Ocean Alliance / Instituto de Conservación de Ballenas) to determine the frequencies of directly observed 2-, 3-, 4- and 5-year calving intervals between 1971 and 2009. They found that in the four years of highest calf mortality (2005 and 2007-9), two-year intervals were eight times higher than in 'typical lower-mortality' years when fewer than 35 calves died, and four times higher than the total of the five most recent lower-mortality years (2000-2003, 2004 and 2006).

Marón *et al.* used a simple quantitative model to examine the potential short- and longer-term effects of an increased calf mortality rate on population growth. Their results indicated that under a variety of scenarios

examined, if elevated rates of calf mortality continue for another decade or two, the population's growth rate will probably slow substantially.

Assumptions and parameters of the population model are:

- Two-year calving intervals are assumed never to be successful (*i.e.*, the prior calf is always lost).
- Probabilities of having a 3-, 4- and 5-year calving intervals are 0.74, 0.09 and 0.13 (Cooke et al. 2001, 2003)
- Birth sex ratio is 0.5 (Tormosov et al. 1998).
- Yearly adult female survival is 0.98 (Cooke et al. 2003).
- Weaned female calves (juveniles entering their second year) survive to enter the resting cohort at age 8 with probability 0.92 (Cooke et al. 2001).

Under these assumptions the equilibrium annual growth increment is 0.065.

The Workshop discussion focussed on the results for four scenarios presented by the authors:

(1) Scenario 1. No mortality crisis occurs in the next three decades (2005-2035) (i.e. all fixed parameters remain unchanged) (annual growth rate 6.5%);

(2) Scenario 2. The annual rate of perinatal calf loss permanently changes from 0.13 to 0.3 starting in year 2005, consistent with the observed increase in calf mortality, but nothing else changes (Rowntree et al. 2013) (the population size would be 81% of that expected in 2035 under Scenario 1, with an estimated annual growth rate of 5.3%);

(3) Scenario 3. Scenario no. 2 + female and juvenile mortality slowly increase beginning in 2005, owing to the stresses induced by increased pregnancy and parturition rates (66% of the population size expected in 2035 under Scenario 1, estimated annual growth rate of 4.3%);

(4) Scenario 4. Scenario no. 3 + female and juvenile mortality rates increase by 30% in 2005, owing to some combination of the effects of increased pregnancy and of the environmental changes that are causing increased perinatal calf mortality (56% of the population size expected in 2035 under Scenario 1, estimated annual growth rate 3.6%)

Females born prior to 2005 (when the die-off began) will now have reached adulthood given that females on average have their first calf at 9 years of age. Future recruitment to the reproductive population is expected to be lower for the post-2005 cohorts that were depleted by high rates of calf mortality; if the high calf-mortality levels persist, then population growth rate is predicted to be substantially depressed.

The Workshop discussed that it is appropriate to assume that two-year calving intervals are never successful (i.e. the prior calf is always lost). Crespo suggested that not only a 3-year calving interval but also 4 and 5-year calving intervals can be considered normal (in accordance with Scenario 2). Sironi noted that the observed increase in two-year calving intervals (i.e., calving failures) since 2005 is coincident with the ongoing calf die-off, and that this observation is based on the resighting histories of individually known adult females, some of whom are known since 1971.

The Workshop noted that the population continues to increase (although the rate of increase is lower, in some cases considerably) under all of the investigated scenarios. Coscarella commented that the increase in calf mortality could be directly related to the increase in population size and hence that density-dependence factors are already affecting right whales of Peninsula Valdes. Sironi noted that the increase in calf mortality has been abrupt and that the increase in calf mortalities (and the estimated decrease in population growth rate) have not been recorded in any other southern right whale population.

## 6. POSSIBLE CAUSES OF HIGH CALF MORTALITY

During discussions, the five main hypotheses for the high calf mortality identified by the first IWC workshop (IWC, 2011) were reviewed in the light of any new information:

(1) decreased availability of food;

(2) exposure to biotoxins;

(3) infectious disease;

(4) kelp gull attacks; and

(5) a combination of all.

**6.1 Diet and food availability**

Sironi on behalf of Maron (Unpublished data) presented recent information on the diet of southern right whales that calve off Península Valdés, Argentina. Fatty acid analysis in the blubber of whales sampled in 2011 showed that mothers of living calves fed on Antarctic krill and Calanoid copepods in comparison to mothers of dead calves that fed on a more varied diet. Calves are approximately 9-10m long at weaning. Studies conducted on dead calves that stranded in 2003-2012 showed that blubber thickness was similar in low and high mortality years along most regions of the whales' body. However at the dorsal-anal position (closer to the peduncle) blubber was significantly thinner in years of high mortality. This may suggest a nutritional factor in calf death, and further research is being conducted by the SRWHMP to address this hypothesis.

In discussion, the Workshop noted the study of Leaper *et al*. (2006) which revealed that right whales off Península Valdés have fewer calves than expected following years of low krill abundance in the waters off Islas Georgias del Sur/ South Georgia, when sea surface temperatures are higher than normal after the El Niño southern oscillation.

6.1.2 *Evidence of feeding at Península Valdés*

D'Agostino reported on recent studies that indicate that *E. australis* often feeds in Peninsula Valdés, mainly during spring. Microscopic analysis of planktonic remains found in faeces from stranded (spring 2010) and living individuals (spring 2004 and 2005) was undertaken. All the remains were identified, detecting a clear dominance of copepods. A more detailed and comparative analysis was done using scanning electron microscopy and confocal laser scanning microscopy. Mandible gnathobases found in faeces were equivalent in structure and morphometry to those obtained from dissections of preserved *Calanus australis* (copepodites 4-6), a common copepod in Golfo Nuevo and Golfo San José. Furthermore, a significant positive linear relationship between the width of *C. australis* mandible gnathobases edge and total length of preserved individuals was found, allowing inferences to be made of the stages of copepod ingested. The question In addition, fragments of the diatom *Pseudo-nitzschia* spp. frustules were found in all faecal samples studied; all are potentially toxic. These findings indicate for the first time, the relevant role of *C. australis* copepodite 5 as the main prey for *E. australis* in Peninsula Valdés, as well as, the presence of *Pseudo-nitzschia* spp. in faecal material of these whales (see Item 6.2).

**6.2 Biotoxins**

Trace levels of biotoxins (saxitoxin and domoic acid) have been found in tissues of about 8% of dead individuals (4 of 51 whales analyzed by the SRWHMP and collaborators). Although red tides have become more frequent in recent years in the area, and some of these deaths coincided with toxic blooms, the Workshop **agreed** that it is unlikely that known biotoxins could explain the recurrent annual calf deaths at Península Valdés although it cannot be ruled out that there may be an unknown biotoxin or one that has not been detected involved.

Following the presentation of D'Agostino (see Item 6.1) it was noted that *Pseudo-nitzschia* spp could cause chronic damage to organs. The Workshop **recognised** the importance of using solid phase adsorption toxin tracking (SPATTs) to determine dissolved biotoxins in the water column and its variation during calving season. The technique involves the passive adsorption of biotoxins by the sampler resin, like in bivalves.

**6.3 Diseases**

Fiorito (LAECOF – CENPAT) presented preliminary results of a study carried out to determine the causes of skin lesions in Southern right whales in Península Valdés. Samples of skin lesions were obtained from free-living and dead stranded whales. The presence of poxvirus as the primary agent of skin lesions was confirmed by histopathological analysis, transmission electronic microscopy (TEM) and PCR assays. Poxvirus has been described in a number of cetaceans, primarily odontocetes (Pearce et al. 2008, Blacklaws et at. 2013, Van Bressem et al. 2009) with one report in a mysticete (Bracht et al. 2006). The presence of poxvirus in cetacean populations is related to stressors and is believed to be a clear sign of environmental degradation (Geraci *et*

*al*.,1979; Van Bressem *et al*., 2009). Although clinical and epidemiological data do not indicate that poxvirus infection induces a high mortality rate when endemic, it is suggested as a possible cause of death in neonates and calves without protective immunity (Van Bressem *et al.*, 1999).

Fiorito also referred to the related concern over the effect of kelp gull attacks on right whales (see Item 5.3.4). It has been previously noted that kelp gull lesions may cause a decrease in the epidermal barrier, affect thermoregulation, cause severe dehydration and stress, and subsequently the death of individuals affected (e.g. IWC, 2013). Isolation of bacteria from wounds caused by gulls suggest those wounds as a possible route of entry for bacteria or other pathogens into the systemic circulation, which could potentially lead to the death of some individuals. *Erysipelothrix rhusiopathiae* was isolated from typical square edge wounds in a stranded and in a live whale (Fig. 5). The clinical disease associated with *E. rhusiopathiae* is called erysipelas in birds and mammals or erysipeloid in humans. The pathognomonic sign of erysipelas in many species is the presence of diamond-shaped skin lesions. Cetaceans are the marine mammals most susceptible to this disease (Suer & Vedros, 1998 and Higgins 2000). Other bacteria were also isolated: *Enterococcus faecaelis*, *Staphylococcus epidermidis* and *beta haemolytic Streptococcus.* Fiorito further noted that Pox virus was also recorded in a bowhead whale (*Balaena mysticetus*) from Alaska (Bracht *et al.* 2006).

Fig 5. Wounds caused by kelp gulls with particular square shaped. *Erysipelothrix rhusiopathiae* was isolated from these wounds in a stranded and in a live whale (Photos credits: C. Fiorito, SRWHMP and A. Velez).

McAloose presented the results of histological analyses of tissue samples from whales that died along the shores of Península Valdés between 2005 and 2012. Post-mortem examination with tissue collection and histologic examination was performed in 212 whales. A cause of death was identified in 12. These were blunt force trauma (6; one was a confirmed ship strike), pneumonia (2), myocarditis (1), myocarditis and meningitis (1), and (probable) bacterial sepsis in a calf with gull wounds in the skin (1). Lesions to suggest virus,

protozoal, or toxin exposure (which can be subtle and are difficult to identify in autolyzed samples; all samples contained mild to severe autolysis) were not seen. Conclusions from this work suggest that while trauma or inflammatory or infectious disease occur occasionally and is important in several individuals, it was not present in the majority of whales and does not explain the consistent, annual high mortalities.

In addition, because gross evidence of gull wounds was seen in 80 of the 212 whales, histology to describe lesions in detail was performed. Of the 80, skin was available for histologic examination from 57, and histologic lesions consistent with skin trauma were confirmed in 40 of the 57. Epidermal clefts and erosions were most common; ulcers were relatively less common. Erosion or ulceration with dermatitis (inflammation) was more common than erosion or ulceration without dermatitis; inflammation in the underlying hypodermis was uncommon. Viral inclusions or cellular changes typical of known viral pathogens were not seen in skin samples with or without lesions. Death due to bacterial sepsis that may have developed secondary to an infected gull wound was seen in only 1 of the 40 whales (this whale also had inflammation in the liver and lungs). only once. In general, the histologic findings Histologic findings in the skin of the remaining 39 whales did not explain/reveal the cause of death. Despite this, the direct or indirect effects of gull harassment and wounds in the high recurrent deaths remains to be completely investigated.

**6.4 Kelp gull – southern right whale interaction**

The kelp gulls that feed on the skin and blubber of living southern right whales at Península Valdés notably affect the whales' behaviour and cause severe lesions (e.g. see discussions in IWC, 2011 and IWC, 2013).

*6.4.1 Incidence of attacks and lesions*

Sironi presented information on the frequency of kelp gull attacks and the southern right whale behavioural responses from cliff-top observation points annually from 1995 through 2013 (Fig. 6). Observers also documented the occurrence of gull-inflicted lesions by direct observations of dead whales since 2008. The targets and frequency of gull attacks have changed over time. Currently mother-calf pairs receive the majority of attacks. Since 1995, attack frequency on mother-calf pairs doubled in Golfo Nuevo but increased less dramatically in Golfo San José from 2005-2013. The attack frequencies in Golfo Nuevo in 2011 and 2013 were the highest since 1995. Calves have become the primary target of attacks, perhaps because they have not adopted the resting postural changes used by their mothers to avoid the attacks, and because they swim relatively slowly and spend more time at the surface. Some 73% of dead calves assessed for ante-mortem gull attack lesions from 2008-2013 had between 1 and 25 lesions. Gull harassment reduces resting and nursing bouts, increases travel speed and even interrupts the whales' social interactions (Rowntree et al., 1998, Sironi, 2004). The behavioural effects of intense gull harassment in combination with gull-inflicted wounds and other factors (Thomas et al., 2013) could compromise right whale calf survivorship in the Península Valdés region.

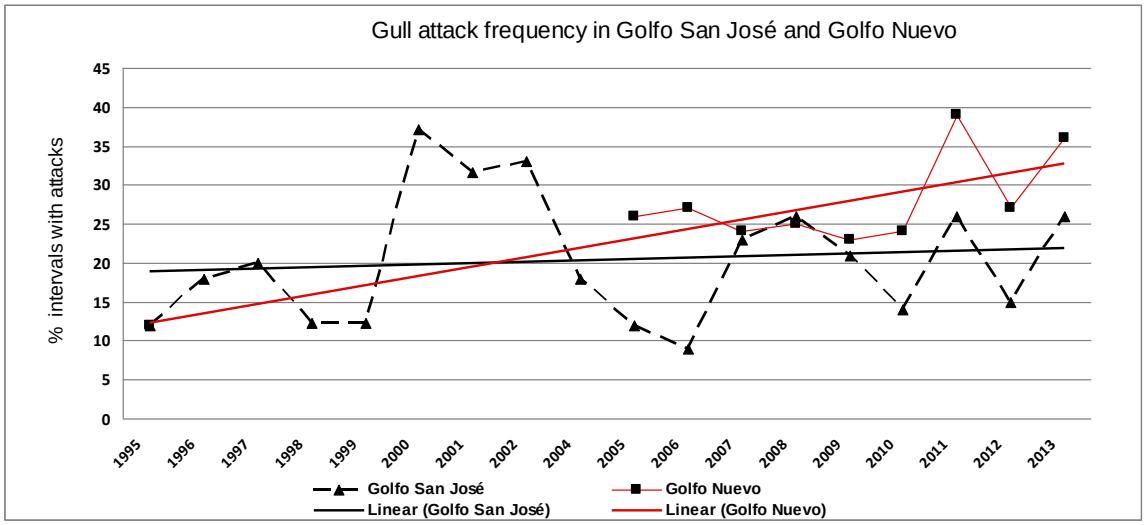


Fig. 6. Gull attack frequency in Golfo San José and Golfo Nuevo for the period 1995-2013.

Sironi on behalf of Marón *et al.* summarized their work on the increased wounding of right whales by kelp gulls. Gull attacks may negatively impact mother-calf pairs causing them to spend energy and time fleeing

gulls rather than nursing. Using aerial survey photographs (Ocean Alliance / Instituto de Conservación de Ballenas photo-id catalogue) the occurrence, number and relative size of gull lesions in *circa* 2,000 living mother-calf pairs sighted from 1974-2010 were recorded (Fig 5). The percentage of pairs with gull lesions increased from an average of 3.3% in 1974 to 71% in 2010. Prior to 2000, calves and mothers had roughly equal numbers of lesions, but since then calves have had larger numbers. Since 1995, very few pairs have been lesion-free. The size of lesions also increased in the 2000s. The sustained increase in number and size of gull-inflicted lesions on live whales is a physical indicator of the increase in kelp gull harassment on the Península Valdés right whales over the past four decades.

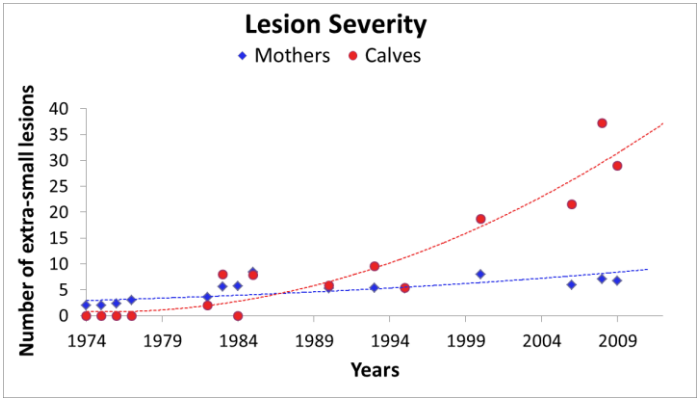


Fig 7. Number of lesion severity in SRW mothers and calves (1974-2009)

*6.4.2 Behavioural changes*

Fazio (LAECOF-CENPAT) reported on the most recent information on the change in Southern right whale breathing behaviour in response to kelp gull attacks in Península Valdés. Recently, whales have been developed a particular avoidance skill to keep their backs hidden from the attacks, through the behaviour of 'oblique breathing', in which whales breathe keeping only their head out of the water. Recent results suggest that all age and sex classes of whales can breathe obliquely. Emergence of the oblique breathing seems to have proceeded in three stages:

(1) 2008-2010 - the origin, with rare observations;

(2) 2012 - the spread, when the behaviour was registered only during gull attacks; and

(3) 2013 - the establishment, when whales performed it in a preventive manner, even when attacks were not occurring.

Most of the observed kelp gull attacks on whales were off El Doradillo beach; the percentage of oblique breathing at that location increased from 2.8% in 2010 to 69.4% in 2013. This behaviour, which has not been elsewhere in the Southern Hemisphere, is likely to have extra energy costs. This could be detrimental to whales, especially for recently born calves (which breathe twice as often), the main target of the parasitic gulls. However, given the increasing prevalence of this behaviour, it seems to be a useful strategy to prevent attacks by gulls. Recent reports from El Doradillo indicate that gulls attack callosities and the area behind the blowhole which might be in response to the new avoiding behaviour developed by southern right whales.

Fazio further noted that the behavioural response of resting or travelling whales to gull attacks included also the 'crocodiling' or 'galleon' posture (see Thomas and Taber, 1984; Rowntree et al., 1998; Sironi and Rowntree, unpublished data; and IWC, 2011). This behaviour has also been observed in South Africa and Australia.

In discussion, Uhart suggested that measuring and comparing CO2 levels in blows of whales breathing normally and in oblique positions, could be a way to assess whether the whales were getting adequate oxygenation with this change in breathing pattern (lack of oxygenation could lead to detrimental health effects requiring significant physiological adjustments).

The Workshop **highlighted** the emergence of new behaviours to external changes (i.e. gull attacks)

*6.4.3 Evidence of stress in marine mammals*

Sierra gave a presentation on stress-related tissue damage in marine mammals. 'Stress' has been defined as "demand for adaptation" with the recognition that organisms constantly adjust their physiological systems to maintain homeostasis. Apprehension may be a mild psychological stressor that may intensify to become anxiety, fright or even terror. In this context, it is clear that the issue is not whether cetaceans are 'under stress' in a given condition, they are always under demand for adaptation, but whether the degree of stress experienced is physiologically detrimental (Cowan and Curry, 2002, Cowan and Curry 2008).

Tissue damage related to acute stress in marine mammals has been previously described, either associated to live stranding or sharp trauma caused by ship strikes (Herráez *et al*., 2012; Sierra *et al*., 2014). Regarding lethally struck animals, tissue injury could be considered a stressor. A typical stress response is initiated with the development of a wound and/or other painful trauma. Although physiological stress has some benefits, an extreme or prolonged response with release of catecholamines and sustained, high blood cortisol and aldosterone levels are potentially damaging to the heart and the skeletal muscle. Chronic stress, however, can elicit health implications, affecting immunocompetence, reproduction and the viability of an affected animal. Old and young specimens are the most susceptible within a population, so it would be expected that they suffer from these adverse effects, which could be reflected as natural origin diseases, including emerging or re-emerging infectious diseases, as a cause of death.

Sierra also mentioned that in animals suffering severe stress-related muscular injury, large amount of myoglobin is released in blood tract which can causes irreversible damage to organs (i.e. kidney).

In discussion, Sironi suggested that the possible effect of the lack of sleep caused by kelp gull harassment should be considered in the future.

## 7 MITIGATION APPROACHES TO KELP GULL ATTACKS

### 7.1 Approaches to control

Davis reviewed the available information for control of gulls and discussed aspects of gull behaviour that need to be understood in order to effectively control them.

Gulls can be controlled at their nesting colonies, at their night roosting locations, or in areas where they feed or 'loaf'. Control at colonies is fairly straightforward but is often not practical. Gulls spend their nights at communal roosts on bodies of water; roosts are used traditionally year after year. Control has not been attempted at night roosts but successful control could lead to subsequent changes in the daytime distributions of the gulls involved.

Most research on gull control techniques describes attempts at preventing gulls from feeding at waste-handling facilities. There is good information related to preventing gulls from feeding at these fixed locations (using fireworks, falconry, remote control aircraft and habitat management). There is also good information on preventing gulls from feeding at, or otherwise using, larger areas such as airports (using same methods as landfills with addition of dogs or killing). These are all terrestrial habitats.

The challenge at Peninsula Valdés is to develop methods to reduce the number of attacks on right whale calves.

In discussion about the feasibility of achieving significant gull population reductions, Davis emphasised that gull control must be consistent and persistent to prevent the birds from accessing their food source so that they go elsewhere to feed. Gulls must recognise the control as a threat for them. He commented that since the proportion of attacks has increased since 1994, it is probably still a relatively small proportion of gulls harassing whales. If it is only gulls from one or two colonies, it may be necessary (and effective) to control those colonies. Three possible solutions were presented. (1) Use of remote controlled model aircraft: this might be well received by general public because it is not lethal. (2) Culling gulls from boats. (3) Reduce landfills and fishing discharges.

In Davis' view the best method is the second one, culling. The use of remote controlled model aircraft would not be successful considering distances to be covered and weather conditions, whilst reduction in landfills and fisheries discharges requires political determination and support. While the culling from boats might be

considered to add additional pressure on whales during the first year, this might be reduced if it occurs outside the peak breeding season.

**7.2 Action Plan to minimize gull-whale interactions**

Bertellotti (LAECOF-CENPAT) reported the results of the Chubut province government management actions to reduce kelp gull attacks to Southern right whales.

The implementation of a pilot project through the culling of the gull attackers started in 2012, with advice from CENPAT. A total of 27 trips (639 shoots) were carried out, outside the area of whalewatching (between Punta Alt and Punta Cormoranes). A vessel protocol was developed in which two expert shooters operated from the bow and the shot was not made until the gull was in a 'safe shot' position (from a whale perspective) determined by the skipper who was an experienced whalewatching captain. In 2012, three guns were tested, an air rifle, a 22 calibre rifle and a 12/40 calibre shotgun. The latter was the most successful (39% efficiency) and was thus used during 2013 and 2014. The mean length of a 'manoeuvre' is 3' but most manoeuvres are shorter. Dead gulls were collected. With the completion of the methodological work in 2012, the government authorities decided to continue the evaluation of the effect of culling gulls near the whalewatching area, around Puerto Pirámides.

During the 2013 whale season, 1,230 gulls associated with whales were removed. The efficiency (Dead seagulls/number of shots per 100) was 60% (the peak was 545 in July). The percentage of sightings with attacks (frequency of sightings of at least 10 minutes, with at least one observed attack) in 2013 was lower (28%) than in 2012 (40%). Attack rate (number of attacks per time unit) monitoring was undertaken from boats (Puerto Pirámides) and from land (El Doradillo) being in 2013 (19.5%), similar to the one in 2012 (19.3%). Bertellotti concluded that the culling actions successfully reduced gull attacks in the area near Puerto Pirámides, decreasing the absolute value of the percentage of sightings with attacks, and the distribution of the attack rates over the season. However the culling near Puerto Pirámides seemed to have no effect in El Doradillo.

Bertellotti reported that in August 2013 actions were suspended due logistical and funding problems. These problems remained for the rest of the season, affecting the continuity of the study. In conclusion the workshop recommended: (1) Start early in the season and do not interrupting culling, (2) culling all gulls interacting with whales; (3) monitor attack rates (Puerto Piramides and El Doradillo); (4) carry out a census of the breeding colonies of gulls; (5) Discuss in relevant forums the possibility of reducing gull population outside the area of attacks (i.e. regulating them in landfills, in rookeries and within breeding colonies); and (6) reduce the amount of urban and fish waste landfills and fishing discards at sea.

In discussion, Yorio suggested that some priority should be allocated to reducing fishing discards at sea, as highlighted in IWC (2011). With respect to the long term effect on gulls of the culling program, Bertellotti noted that culling appeared to have a very local effect and that once culling is suspended, things return to their former situation.

In conclusion, the Workshop **recommends** that:

(1) the culling programme is continued to allow more robust conclusions on its efficacy to be reached - it requests the Government of Chubut to consolidate it;

(2) the fishing industry as well as mayors of Chubut coastal towns need to participate in discussions related to gull control;

(3) that the following three actions to reduce gull harassment are implemented:

   a. current provincial regulations to eradicate open waste disposal areas are enforced;

   b. measures are taken to reduce fishing discards at sea; and

   c. the Action Plan to mitigate Kelp gull – whale interactions is continued and fully supported.

## 8. STRANDINGS OFF SANTA CATARINA STATE, SOUTHERN BRAZIL

Sironi on behalf of the authors (Groch, Moreira, Kolesnikovas and Flores) summarised Southern right whale strandings off Santa Catarina State, Southern Brazil from 2002-2013. A number of strandings have been reported in earlier years (Lodi et al., 1996; Greig et al., 2001; Santos et al., 2001). Gomes (2005) presents a review on strandings between 1936 and 2004 and reported 45 stranding records for the period along the Brazilian coast. Most of this records occurred in Rio Grande do Sul State, south of the species main concentration area in Santa Catarina. From the total, 57.7% (N=26) were calves and 68.9% (N=31) occurred between 1990 and 2004, resulting in a rate of 2.1 strandings/year.

Southern Brazil is a wintering ground for the southern right whales and its population has been recovering from intensive commercial whaling (IWC, 2013). Between 2002 and 2013 a total of 23 strandings were recorded, including all age/size classes of adults, sub-adults and calves (the sex ratio was approximately 1:1). Calves represented 61% of the stranded whales. An annual rate of 1.9 strandings was observed with one (4%) confirmed case of mortality due to human activities (vessel strike). 19 strandings were of single, dead individuals. Four whales stranded live. Of the live animals, one calf died shortly after stranding, two juveniles were successfully rescued and one adult was euthanized. Strandings occurred from July to November with a peak of 61% in September, coinciding with the peak of occurrence and abundance of the species in this region. Although no systematic beach, boat or aerial surveys were conducted to evaluate stranding mortality, a stranding network protocol was established in 2007, as part of a Right Whale Environmental Protection Area created in the region and the National Action Plan for the Conservation of Great Whales. This continued effort is likely to enhance the scientific knowledge and management procedures for the conservation of southern right whales in Brazil.

## 9. COASTAL WILDLIFE NETWORK OF CHUBUT (RED DE FAUNA COSTERA-RFC)

Montanelli provided a summary on the coastal wildlife network of Chubut (Red de Fauna Costera de Chubut - RFC). RFC was created in 2009 by the Provincial Wildlife Agency (Dirección de Fauna y Flora Silvestre). The RFC network was formalised by the Provision of Law #75/11 and ratified by Chubut Government's Decree Law # 731/14.

RFC is an inter-institutional group (National and Provincial Government Agencies, Municipalities, NGOs, Scientific Institutions, whalewatching companies, volunteers) which provides immediate response to events involving wild marine animals such as oiled or injured marine birds and mammals, unusual mortality events, cetacean strandings and large whale entanglements. The RFC response prioritises animal welfare and the prevention of public health hazards. RFC also promotes scientific research, education and raises public awareness. The RFC has developed training activities with D. Mattila (NOAA and IWC Secretariat) during the First Disentanglement Workshop in March 2012 and A. Fernández (Universidad Las Palmas Gran Canarias, Spain) on pathology and necropsy in November 2012

The Network has six response cells along Chubut's coast (Fig. 8) set in Península Valdés, Puerto Madryn, Rawson, -Playa Unión-Magaña, Camarones, Comodoro Rivadavia and Rada Tilly). Each cell has a local co-ordinator, a core team, and trained volunteers.


Fig 8. RFC cells.

## 10. SATELLITE TELEMETRY

Little is known about the movements of southern right whales to and from the calving grounds at Península Valdés or about their activities and movement in their wintering grounds. Harris presented an upcoming project involving the use of satellite telemetry in southern right whales. This project aims to generate information about the migratory routes of southern right whales that calve each year in Península Valdés and the potential location of their feeding areas in the South Atlantic Ocean.

During a pilot phase to be carried out in October 2014 researchers will instrument up to eight whales from Golfo Nuevo and Golfo San José with latest-generation satellite transmitters, and use remote sensing technology to follow the animals as they conduct their annual migration to feeding destinations. This would be the first time that animals from this species are tagged with satellite transmitters and tracked as they move into the Southwest Atlantic Ocean.

This information will contribute our understanding of factors that have caused or contributed to the high levels mortality observed in southern right whales over the past decade (see Item 5 and 6).

The project will be led by G. Harris, H. Rosenbaum and M. Mendez of the Wildlife Conservation Society (WCS) and A. Zerbini of the Aqualie Institute of Brazil, National Oceanic and Atmospheric Agency (NOAA) and Cascadia Research Collective. The project will be carried out in collaboration with Fundación Patagonia Natural, Instituto de Conservación de Ballenas/Ocean Alliance and the University of California Davis. Support and safety at sea will be provided by the Government of Argentina.

## 11. CONCLUSIONS AND RECOMMENDATIONS

The Workshop concluded that good progress has been made since the 2010 IWC workshop (IWC 2011) in a number of areas. The Workshop also supported the strong recommendations made by the IWC Scientific Committee that research and long-term monitoring of this stock should continue without interruption.

Based on previous information (IWC 2011, IWC 2013a, Thomas *et al*. 2013) and discussions that occurred during the current meeting, the Workshop **agreed** that in terms of explaining the high observed calf mortality, attention should focus on the following three main hypotheses:

(1) kelp gull and southern right whale interaction and its effects on whale behaviour and health;

(2) density-dependent processes and their effects on right whale population dynamics;

(3) a decline in food availability and its effects on right whale body condition and health.

To assist in investigating these three hypotheses, the Workshop **acknowledged** the importance of the IWC Conservation Management Plan for the Southern Right Whale Southwest Atlantic population[1]. Its **recommendations** below are based upon actions presented in that plan. The Workshop **recognised and emphasises** the importance of cooperation and collaboration between all research groups and stakeholders to build the knowledge needed to answer this complex situation.

### 11.1 General recommendations

The Workshop **strongly supports** studies to detect and investigate strandings and the corresponding analysis of samples collected to evaluate body condition and presence or absence of any causes of mortality (e.g. diseases, biotoxins, ship strikes, entanglements, etc.) (FCV-UBA, SRWHMP, LAECOF/CENPAT and IADO). It **encourages** improvements in the implementation of robust necropsy protocols with a priority on the analysis of tissue samples (RFC, SRWHMP).

The Workshop also **strongly supports** the work of the Coastal Wildlife Network of Chubut and the Southern Right Whale Health Monitoring Program. It **urges** authorities and others to ensure adequate resources including both provision of equipment and adequate long-term funding. Associated with this, the workshop

[1] https://iwc.int/index.php?cID=2948&cType=document

**recommends** the development of a regional entanglement response strategy in conjunction with the IWC**.** While reported entanglement rates are low, they are almost certainly under-reported and may increase in the future. Given the success of the first workshop on training in entanglement response led by D. Mattila (IWC Secretariat) in Chubut in March 2012, the Workshop **recommends** a further training workshop be held in Argentina. This in accord with previous recommendations to work on mitigation measures (IWC 2013b). Continued Dtag studies will also assist in identifying areas shared by southern right whales and ships close to Puerto Madryn in Argentina, which could generate space use conflicts and possible mitigation measures (LAECOF/CENPAT, FVSA).

**11.2 Kelp gull and southern right whale interaction**

Work on this interaction **should continue as a top priority.** In order to accomplish this action the workshop **recommends**:

(1) Continued support for the maintenance and updating of databases associated with long-term monitoring work including: aerial photo-identification of live whales since 1971 (Ocean Alliance / Instituto de Conservación de Ballenas); records of dead whales since 2003 (Southern Right Whale Health Monitoring Program); and aerial and nautical counts of live whales since 1999 (Marine Mammal Laboratory – CENPAT). In particular, the Workshop **recommends** that the updated databases are analysed to map the spatial and temporal distribution of gull attacks based on the photographic record and the direct observation during the surveys.

(2) Continued monitoring of the frequency of gull attacks and their effects on whale behaviour (ICB/OA, LAECOF/CENPAT, LAMAMA/CENPAT, FPN).

(3) Continued development, implementation and support for the Action Plan to mitigate kelp gull-SRW interactions, recognising the efforts made by the government of Chubut thus far (Item 7.2), (Ministerio de Desarrollo Territorial y Sectores Productivos, Ministerio de Ambiente y Control de Desarrollo Sustentable de Chubut, Secretaría de Turismo y Áreas Protegidas de Chubut, Dirección de Fauna y Flora Silvestre de Chubut, LAECOF/CENPAT). In particular, the Workshop **recommends** that:

(a) the culling programme is continued to allow more robust conclusions on its efficacy to be reached (LAECOF/CENPAT, FCV-UBA);

(b) the fishing industry as well as mayors of Chubut coastal towns need to participate in discussions related to gull control;

(c) current provincial regulations to eradicate open waste disposal areas and prevent new areas are enforced under the program on *Gestión Integral de. Residuos Sólidos Urbanos* - GIRSU (Ministerio de Ambiente de Chubut, Agencias ambientales Municipios de Puerto Madryn, Puerto Pirámides, Rawson and Trelew);

(d) measures are taken to reduce fishing discards at sea including the development of an Action Plan to reduce fishing discards at sea (Government of Argentina, Subsecretaría de Pesca y Acuicultura de Chubut and Dirección de Pesca de Río Negro, fishing industries, CENPAT, FPN, ICB);

(e) a new assessment of the population status of kelp gulls off the province of Chubut and Río Negro is undertaken since the last one was undertaken in 2007. (CENPAT).

(4) Provision of logistical and financial support for the following studies to further examine possible mechanisms linking gull attacks to high mortality:

(a) detailed investigations of physiological responses to direct or indirect effects caused by kelp gull attacks. (SRWHMP, ICB/OA, LAECOF/CENPAT, FCV-UBA);

(b) measurement and estimation of the energetic cost caused by "oblique breathing" in southern right whales calves including comparison of respiratory frequency and $CO_2$ levels (Rowntree and A. Fazio);

(c) detection of potentially harmful pathogens in whale blows;

(d) measurement of stress hormones;

(e) consideration of the possible impact of sleep deprivation (LAECOF/CENPAT, SRWHMP, ICB/OA).

(f) continue the ongoing studies to detect viruses, bacteria and fungi in kelp gulls (RFC, SRWHMP, ICB/OA, LAECOF/CENPAT, FCV-UBA).

**11.3 Density-dependent processes**

The Workshop **highlighted** the importance to continue and further develop studies on demography and population dynamics both in terms of understanding possible density-dependent processes but also in terms of evaluating and prioritising potential threats and mitigation measures. The Workshop therefore **recommends:**

(a) Continued financial and logistical support to ensure the long-term monitoring of abundance, trends and biological parameters including the long-term aerial photo identification programme (WCI/ICB, the CENPAT aerial surveys to monitor trends in abundance (LAMAMA/CENPAT, Instituto de Investigación de Biología y Desarrollo Pesquero 'Almirante Storni', ICB/OA, SRWHMP, RFC, FVSA).

(b) A thorough examination of modelling exercises related to this population including an updated population assessment using Cooke's approach (IWC, 2013a) and exploration of other analytical approaches (IWC, LAMAMA/ CENPAT, ICB/OA).

(c) Continued studies on demography recommended by the 2010 workshop (IWC, 2011) and review of known individuals to examine changes in life history parameters that may be related to effects of density-dependence (LAMAMA/CENPAT, ICB/OA, FPN).

(d) Assessment of potential changes in habitat use by whales (LAMAMA/CENPAT, LAECOF/CENPAT, ICB/OA).

(e) Revision of historical demography through DNA analysis (LAMAMA/CENPAT, SRWHMP).

**11.4 Decline in food availability**

This is a complex issue to explore, especially in the short-term. However, given its potential importance the Workshop **recommends:**

(1) Increased telemetry work to identify feeding areas such as the satellite-tag tracking study presented under Item 10 (WCS, Dirección de Fauna y Flora Silvestre de Chubut, NOAA, Aqualie Institute of Brazil, Cascadia Research Collective, FPN, OA/ICB, University California Davis).

(2) Assessment of long-term (including effects of climate change) and recent trends in the quantity and quality of right whale prey, coupled with attempts to link these to right whale reproduction and calf survival at Peninsula Valdés (IADO, LAMAMA/CENPAT, OA/ICB, MINCYT, LAMAMA/CENPAT, IWC Southern Ocean Research Partnership).

(3) Continued assessment of the body condition of dead (SRWHMP) and live (OA/ICB) southern right whales when they arrive at Peninsula Valdés.

(4) Continued studies on genetic and isotopes of southern right whales to obtain information on diet (SRWHMP, OA/ICB, LAMAMA/CENPAT, WCS).

**11.5 Increased public awareness**

The workshop also discussed the best way to communicate mortality of southern right whale to the press and the general public, in particular the whale-gull interaction. It was agreed to change the message give to the public (e.g. use the word mitigate, whale-gull interaction instead of attack, avoid to use the word plague, etc.) and to organize a small expert workshop to develop a strategy for the public awareness effort which should treat the mortality of whales as a complex system and must:

i.) Develop a communication protocol,

ii.) Include an educational component,

iii.) Develop a leaflet to distribute within the tourist industry (e.g. Asociación Turística de Hotelería y Restaurantes, Guías Balleneros, etc.),

iv.) Meet with media.

Participants also agree to communicate these workshop conclusions to the provincial government to be incorporated in the Management Plan of Península Valdés.

## 12. CONCLUDING REMARKS

The workshop **recognised** the support of the government of Argentina and the province of Chubut to better understand the unusual high mortality of southern right whales at Península Valdés. Whilst recognising the progress made, it **stresses** that further commitment is required to develop long-term actions to ensure the effective conservation of southern right whales and their habitat, in accordance with the objectives of the IWC's Conservation Management Plan.

Researchers also thanked the whalewatching companies that provided support to conduct studies from their vessels.

Finally the workshop **emphasized** on the importance of sharing all the available information on this species in the Southern Hemisphere.

The workshop thanked the IWC Delegation of Argentina and the province of Chubut for their efforts in bringing together the participants and organizing the workshop; to the IWC for financial support and L. Rojas Bracho for chairing the workshop and finishing on time.

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# Annex A

# List of Workshop Participants

**Administradora Área Natural Protegida Península Valdés**
Martín Canale

**Administración de Parques Nacionales**
Leonardo Buria

**Bottazzi avistajes – WCA**
Miguel Bottazzi

**CENPAT-CONICET**
María Belén Argüelles
Marcelo Bertellotti
Mariano Coscarella
Enrique Crespo
Valeria D'Agostino
Silvana Dans
Mariana Degrati
Ana Fazio
Carla Fiorito
Florencia Grandi
Rocío Loizaga de Castro
Pablo Yorio (also WCS)

**Dirección de Fauna y Flora Silvestre de Chubut**
Paula Castro
Alan Jones
Silvana Montanelli
Sandra Rivera

**Foro para la Conservación del Mar Patagónico y Áreas de Influencia.**
Santiago Krapovikas

**Fundación Patagonia Natural (FPN)**
Guillermo Caille
Ricardo Delfino Schenke
Servane Morand

**Fundación Tierra Salvaje (WEF)**
Gabriela Bellazzi (also Programa de varamiento y desenmallamiento de la Red de Fauna Costera de Chubut )

**Fundación Vida Silvestre Argentina (FVSA)**
Alejandro Arias

**Instituto de Conservación de Ballenas (ICB)**
Mariano Sironi (also SRWHMP)
Diego Taboada

**IWC Delegation of Argentina**
Miguel Iñíguez Bessega
Juan Pablo Paniego

**IWC Conservation Committee**

Lorenzo Rojas Bracho (Chairman)

**LGL Limited**
Rolph Davis

**Ministerio de Ambiente y Control del Desarrollo Sustentable de Chubut**
Sofía Alderete
Lorena Arabia
Marcelo Galban
Laura Maruschak
Paola Rivero

**Municipalidad Puerto Madryn**
María Cabrera

**Southern Right Whale Health Monitoring Program (SRWHMP)**
Lucía Alzugaray
Lucas Beltramino
Matias Di Martino
Denise McAloose (also WCS)
Virginia Rago
Marcela Uhart (also University of California Davis)
Marco Vecchiato

**Secretaría Ambiente y Desarrollo Sustentable de Argentina**
Nadia Boscarol

**Universidad Las Palmas Gran Canaria**
Eva Sierra Pulpillo

**Universidad San Juan Bosco**
Carlos Adrián Días

**Whales Argentina**
Ricardo Orri

**Wildlife Conservation Society (WCS)**
Guillermo Harris (also FPN)
Denise McAloose (also SRWHMP)

# Annex B

# Schedule and presentations

1. Introduction
    a. Opening and welcome
    b. Arrangements –chair and rapporteurs
    c. Documents and document control.
    d. Reporting –format, timing, assignments

2. Presentations
    a. Dirección de Fauna y Flora Silvestre, Chubut. **S. B. Montanelli**.
    b. Number of southern right whales *Eubalaena australis* and population trend in the neighborhood of Península Valdés during the period 1999-2013 by means of aerial and boat surveys. **E. Crespo**.
    c. Counts of whales from the "Punta Flecha" Observatory (Nuevo bay, Argentina): Third season. **S. Morand**, A. Rodríguez, G. Harris and G. Caille.
    d. Population status of Kelp Gulls *Larus dominicanus* in Chubut and Río Negro. N. Lisnizer, P. García Borboroglu and **P. Yorio**.
    e. Whales and vessels: Pattern used of Bahía Nueva and potential risk of collision. **B. Arguelles**, M. Coscarella, M. Bertelotti.
    f. Change in Southern right whale breathing behavior in response to gull attacks. **A. Fazio**, B. Argüelles and M. Bertelotti.
    g. Immediate and delayed population consequences of increased calf mortality in the southern right whales of Península Valdés, Argentina. C.F. Marón, M. Uhart, V. J. Rowntree, **M. Sironi**, R. Payne, F. R. Adler and J. Seger.
    h. Skin lesions in southern right Whales of Pla Valdes, Argentina: A possible conservation concern. **C.D. Fiorito** M. Bertelotti and D. Lombardo.
    i. Southern right whale strandings during 2012-2013 seasons at Península Valdés, Argentina. **M. Uhart**, M. Sironi, V. J. Rowntree, M. Di Martino, L. Beltramino, V. Rago and M. Franco
    j. Kelp gull attack frequency on southern right whales at Península Valdés, Argentina with data for the period 1995-2013. **M. Sironi**, V. J. Rowntree, M. Uhart, L. Valenzuela, C. Marón, A. Chirife, M. Di Martino and M. L. Lipoma
    k. Increased wounding of right whales by kelp gulls at Península Valdes, Argentina. C. F. Marón, M. Uhart, V. J. Rowntree, **M. Sironi**, R. S. Payne, F. R. Adler and .J. Seger
    l. Histologic lesions in sites of ante-mortem kelp gull-induced wounds in southern right whales stranded at Península Valdés, Argentina between 2005-2012. **D. McAloose**, M. Di Martino, A. Chirife, V. Rago, S. H. Olson, L. Beltramino, N. Mohamed, L. Pozzi, L. Musmeci, L. La Sala, M. Sironi, V. Rowntree and M. Uhart.

m. Red de Fauna Costera Provincia del Chubut. **S. Montanelli**.

n. Stress-related tissue damage in marine mammals. **E. Sierra Pulpillo**.

o. Review of gull control approaches, methods and options. **R.A. Davis**.

p. Action Plan to minimize Gull-whale interaction. **M. Bertellotti**.

q. Remains of planktonic organisms in fecal material of individuals Southern right whale (*Eubalaena australis*), Península Valdés, Chubut, Argentina. **V.C. D'Agostino**, M.S. Hoffmeyer and M. Degrati

**r.** Right Whales strandings off Santa Catarina State, Southern Brazil, 2002-2013. **K. Groch.**

s. Shedding light on the migratory routes and feeding grounds of southern right whales that breed in Península Valdés, Argentina. **G. Harris**.

3. Conclusions and recommendations.