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INTERNATIONAL WHALING COMMISSION

Preliminary report on a new baleen whale mortality at the Golfo de Penas, southern Chile, that occurred late 2019 summer

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ABSTRACT

Häussermann et al. (2017) reported the largest mass mortality event of any baleen whale. It took place in the Golfo de Penas, Southern Chile, during early 2015. All identifiable whales were sei whales (*Balaenoptera borealis*). A few more whales were recorded dead in early 2016 (n=16) in the same area. Here we preliminarily report a new mortality event that occurred in early 2019. Overall, 27 sei whale carcasses were found in the northern Golfo de Penas, in the areas of San Quintín (21) and Seno Newman (6) (with a similar estimated time of death). Skin and bone samples were taken to genetically confirm species identification and to complement ongoing population analyses (Pérez-Álvarez et al. 2019). Average length was 11.5m (ranging between 9.7m and 14m), indicating most of the whales were weaning and immature (when compared with Southern Hemisphere whaling data). A few sightings of live sei whales, including adults and juveniles were recorded at Seno Newman while searching the shoreline. A wider search at the Golfo de Penas area is currently being undertaken using very high resolution satellite imagery, after being tested for the 2015 event (Fretwell et al. accepted). We also report similar scale of mortalities during early 2017 (n = 19) and 2018 (n = 8). These mortality events highlight the Golfo de Penas as an important area for sei whales during austral summer, stress the need for a better understanding of these events and their likely environmental triggers, raise the alarm of a recurrent event that has been happening (at least) since 2012 with unusual regularity and highlight the need for continuous and systemic monitoring in the area

INTRODUCTION

In March 2015, by far the largest reported mass mortality of baleen whales took place in the Golfo de Penas, in southern Chile, with the synchronous death of at least 343, primarily sei whales, *Balaenopetra borealis* (Häussermann et al. 2017). It was hypothesized that the causes could be attributed to harmful algal blooms during a building El Niño. The presence of older remains of whales in the same area indicated that mass mortality events have occurred before. Moreover, in the following year, more dead whales were found.

Here we show that this type of events has continued in each subsequent summer (2017 and 2018) and report details of the latest event, in early 2019.

RECAP: 2015 MASS MORTALITY (HÄUSSERMANN ET AL. 2017)

Somewhere between the end of February and end of March 2015, more than 300 whales died and stranded at the Golfo de Penas with about 30 more further south (Fig 1). Most of the whales were found at the Seno Newman and Seno Escondido. The 28 whale carcasses that could be identified to species level were all sei whales, while 15 of these identifications were confirmed genetically. To date more than 80 remains have been molecularly identified as sei whales (Pérez et al. 2019). Thirty whales were examined in detail and 16 specimens measured between 6 and 15 m, ranging from weaning and 1-year-old individuals (62.5%), immature (18.75%) to fully grown specimens (18.75% see Table 1). The stomach and intestine content of two whales showed presence of paralytic shellfish toxins and amnesic shellfish toxin.

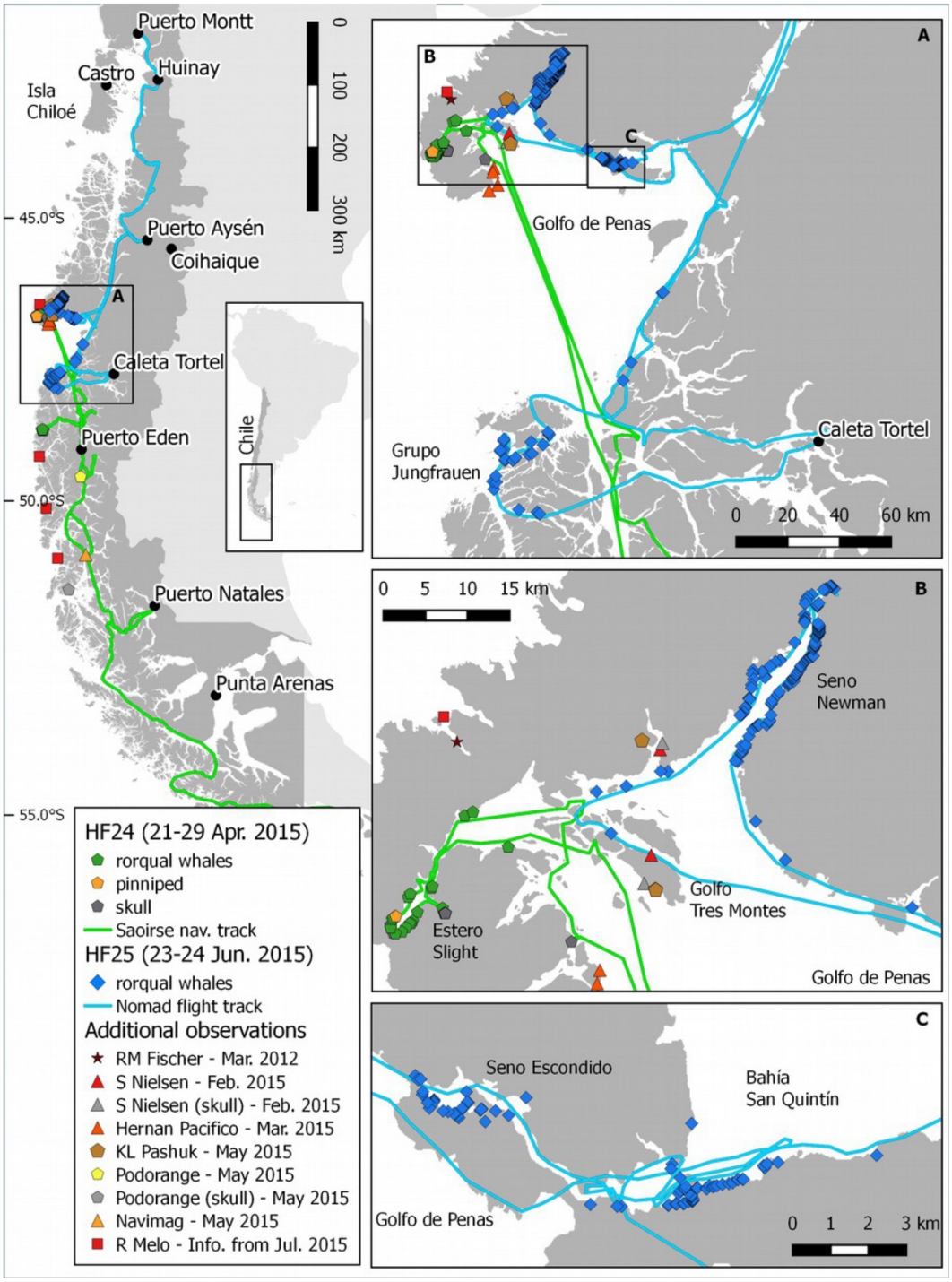

Figure 1. Track of two surveys in 2015 and location of whales found dead (taken from Häussermann et al. 2017)

Table 1. Comparison of body size data (total length) from a vessel based expedition of 2015 (only Caleta Buena) and the 2019 expedition. Total length measurements were compared with the growth curves and classifications of Lockyer (1977) to determine growth classes as a indication of ontogenetic structure of the death assemblage.

Expeditio	Weaning (≤1 year old)	Immature (1<I<8)	Mature (≥8 years)
Caleta Buena 2015*	62.5%	18.75 %	18.75 %
Seno Escondido – Golfo Tres Montes 2019	65%	30%	5%

*Measurements from the Armada de Chile-Sernapesca Expedition on May of 2015.

RECAP: 2016 MORTALITY (HÄUSSERMANN ET AL. 2017)

Between January 23 and March 1, 2016 (Expedition Huinay Fiordos 27) and between April 27 and May 30, 2016 (Expedition Huinay Fiordos 29), two expeditions were undertaken to the areas between Seno Escondido and Seno Newman. Sixteen new carcasses were found, two of which were molecularly identified as sei whales.

During this survey seven killer whales were observed attacking a sei whale, which as a consequence beached itself, it swam away sometime after the event but it was found dead on a nearby beach the next day.

2017 MORTALITY

While on a tourist trip to San Quintin area, one of us (Daniel Torres) found a recently dead sei whale on March 24, 2017 (Fig 2).

During a survey undertaken between 4-28 May 2017, 19 baleen whales were found, including 5 whales with flesh on the body; the remaining 14 were skeletons. Tissue samples were obtained from 2 of the more recent dead whales, and genetic analyses confirmed species identification as sei whales.

Fig 2. Sei whale found at Forelious Peninsula on March 24th, 2017 by one of us (Daniel Torres).

2018 MORTALITY

During 2018 three surveys were undertaken. The first was conducted in February to Seno Newman area and no new whale remains were found. The second was conducted in September only to Seno Escondido and San Quintin (while looking for southern right whales) and no new whale remains were found. A third was conducted to San Quintin, Seno Escondido and Seno Newman between November, 25th and December, 7th. Here 8 new whale remains were found with 6 of these with flesh on the body.

2019 MORTALITY

The first indication of the summer 2019 mass mortality came from a helicopter survey undertaken on March 24th, 2019, by one of us (Daniel Torres) to San Quintín area passing over Seno Escondido. Ten dead whales were found, most of them stranded on the shore and a few floating carcasses close to shore (Fig 3).

Figure 3. Helicopter survey track (blue line) indicating position of whales (yellow pin with *ballenas* label), numbers and approximate GPS positions. On the right side is a picture taken from a HD video recorder.

Following this finding, the *Saoirse* survey which aimed initially at collecting oceanographic data and observations of live whales around the Golfo de Penas was diverted to the Seno Escondido area to confirm the report of newly dead whales and to obtain samples from these whales. It was also decided to survey the Seno Newman and surrounding area further to the west, where most of the whales from the 2015 event were found. This survey was undertaken between March 26th and April 26th (Fig. 4 and Fig. 5).

Overall, the *Saoirse* survey recorded 27 dead whales, 21 on the San Quintin and Seno Escondido areas and 6 further west at the entrance to Seno Newman. All of these whales were in a similar state of decay, still retaining substantial amount of flesh (Fig. 6), probably dying between January and March 2019 . Based on morphological characteristics obtained from photographs taken, one of us (Carlos Olavarría) identified 13 of them as sei whales, being unable to identify the rest. Tissue samples (skin and/or bones) were taken for genetic confirmation of the species ID. Twenty of the whales were measured, ranging from 9.7m to 14m, measuring on average length of 11.5m, with a greater proportion of younger whales and only 5% adults (Table 1).

During the survey searching for dead whales, several live sei whales were observed swimming south of Seno Newman (Fig. 7), including what appeared to be a cow-calf pair.

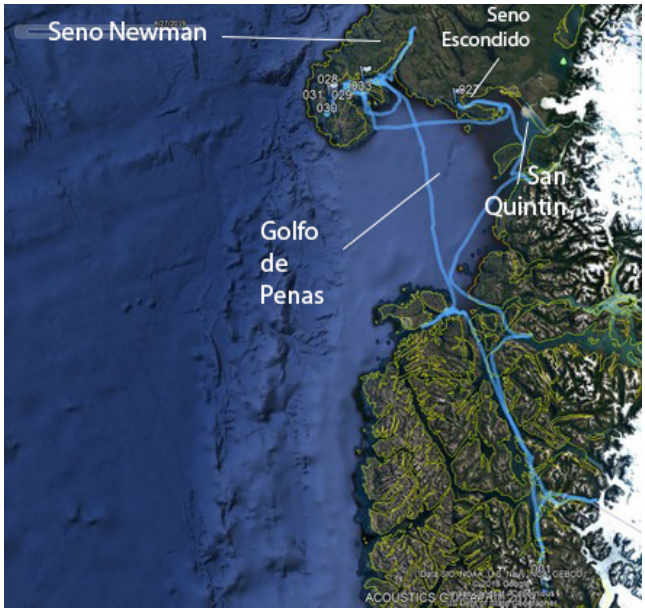

Figure 4. *Saoirse* survey track (blue) between March 26th and April 26th 2019, showing the main areas: Golfo de Penas, Seno Newman, Seno Escondido and San Quintin.

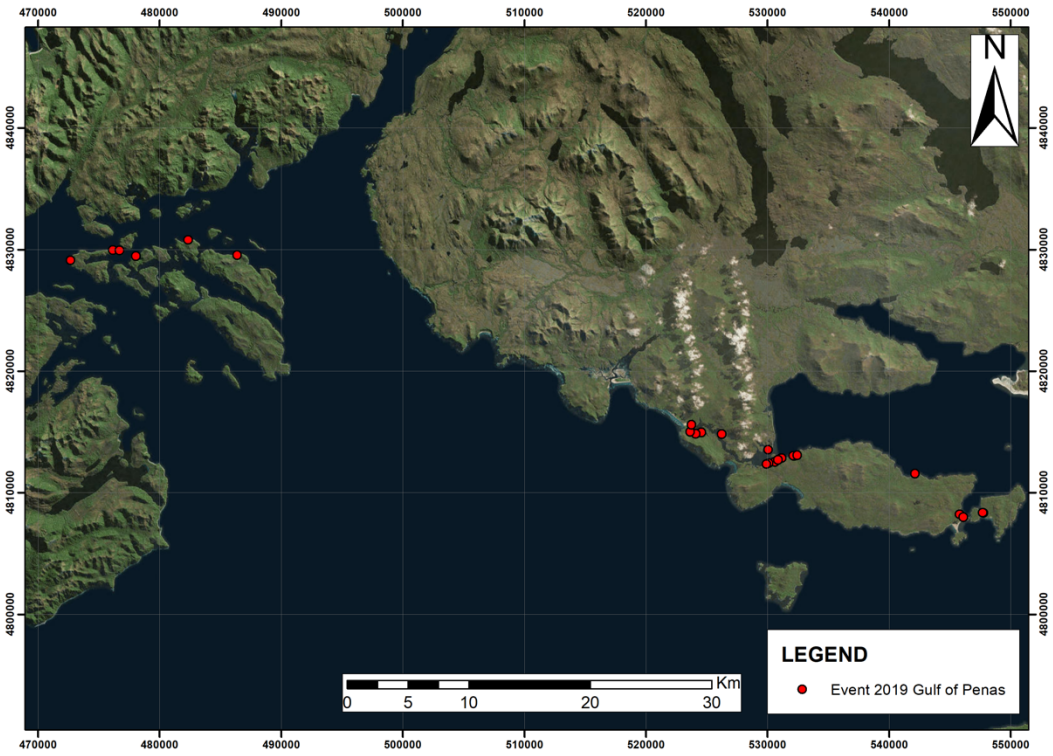

Figure 5. Stranded whales recorded during *Saoirse* survey between March, 26th and April, 26th 2019.

Figure 6. Sei whale coded PP2019_DW-19 measuring 11.4m. Photo (c) William Darwin

Figure 7. A sei whale swims past the sailing vessel *Saoirse*. Photo (c) Keri-Lee Pashuk

REMARKS

- New dead whales have been found and recorded annually since 2015, when the largest mass mortality occurred in the Golfo de Penas, southern Chile (Häussermann et al. 2017).
- In 2015, more than 300 carcasses were reported dead with similar time of death at the beginning of the year. For 2016, 16 new carcasses were found, including 5 with flesh remains. In 2017, 19 carcasses were found, 5 of which presented flesh. In 2018, only 8 carcasses were found. Finally, for 2019, 27 whales were found, all with flesh remains.
- The only species that has been positively identified is the sei whale. Despite some degree of decomposition, 28 whales were morphologically identified from the 2015 mortality and 13 from the 2019 event. This species identification has been confirmed by genetic analyses, where overall 93 whales have been identified, all as sei whale (Perez-Alvarez et al. 2019).
- These mortality events highlight the Golfo de Penas as a habitat for sei whales during austral summer, which was described as earlier as in the 60s by Japanese scouting vessels (Häussermann et al. 2017).

- The compilation of findings of relatively fresh whale carcasses clearly points to a recurrent event that has been happening (at least) since 2012 with unusual regularity, somewhere late summer, early autumn, except 2018.
- Similar to the 2015 mortality, where 16 whales examined in detail measured between 6 and 15m long, in the 2019 event 20 whales ranged from 9.7 and 14m.
- The growth group assignment based on total length revealed a majority of young whales (weaning and immature), similar to what Budylenko (1977) described for the general area.
- A wider search of the Golfo de Penas area is currently being undertaken using very high resolution satellite imagery, after it was successfully used to examine the 2015 event (Fretwell et al. accepted). The imagery currently being analysed consists of three satellite images taken in February 2019 and covering most of Seno Newman. It includes one WorldView-2 satellite image (2nd February 2019), one WorldView-1 satellite image (12th February 2019), and one GeoEye-1 satellite image (18th February 2019). The imagery is being systematically scanned using ArcGIS 10.4 ESRI 2017 as in Cubaynes et al. (2018).
- It is urgent to undertake systematic environmental monitoring of the Golfo de Penas area, as it has been hypothesized that harmful toxic algal blooms could play a role in these events as well as interactions with killer whales.

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