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Gray whale's body condition in Laguna San Ignacio, BCS, México for winter breeding season 2022

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Abstract

The Eastern North Pacific (ENP) gray whale population (*Eschrichtius robustus*) feeds during the summer in the Bering, Chukchi, and Beaufort Seas, and migrates along the Pacific coast of North America to the breeding areas on the Baja California Peninsula in Mexico during the winter. The evaluation of the whale's body condition provides an indicator of the whale's health and reproductive condition and, by inference, is indirectly an indicator of the health of the environment. During the 2022 winter breeding season in Laguna San Ignacio (LSI), Baja California Sur, Mexico we photographed 788 gray whales, from which we were able to evaluate the body condition of 626 single whales (male or female without a calf) and 42 mothers with calves (Mc). Their condition was classified as “good”, “fair” or “poor”, according to the methodology developed for gray whales of the Western North Pacific (WNP). In 2022, the proportion of single whales with “good” body condition” was 43% (n=269), “fair” 37.5% (n=235) and “poor” 19.5% (n=122). For the body condition of mothers with calves in 2022, “good”, “fair”, and “poor” was 90.5% (n=38), 9.5% (n=4) and 0%, respectively. The percentage of single whales with “good” and “fair” body conditions increased compared to 2021, meanwhile, the percentages of whales with “poor” body condition decreased, being the lowest since the UME began in 2019. The percentage of Mc with “good” body condition was as high as the previous 3 years, but the numbers of Mc observed in the lagoon from 2019-2022 were the lowest since 2010. It is possible that the body condition of the gray whales observed in 2022 was the result of similar environmental factors as those that affected gray whales during the previous 3 years, however, it is necessary to compare and correlate the environmental data for the feeding areas and other breeding zones to fully comprehend the factors that contribute to the body and reproductive condition of the whales.

Introduction

The ENP gray whale population feeds mainly on Bering, Beaufort, Chukchi seas, and migrates every year along the North American Pacific Coast to their breeding grounds along the Baja California peninsula in Mexico.

Gray whale body condition reflects the whales' success at seasonal foraging, which in turn allows the analysis of reproductive trends of individuals and of the population. Levels of reproductive success are indicative of the survival of the species (Solelade-Lemos et al., 2020)

The National Oceanic and Atmospheric Administration (NOAA) declared an Unusual Mortality Event Mortality (UME) in 2019, due to the range-wide increase of gray whale strandings. During this previous UME from 1999-2000, and in the current UME from 2019-2022, the poor body condition observed in some gray whales suggests that poor nutritional condition contributed to the increases in mortality (Ronzón-Contreras *et al.*, 2019, 2020, 2021). Poor body condition has also been observed in some living gray whales and carcasses of dead whales stranded along the Mexican Pacific Coast, (Urbán *et al.*, 2011; Martínez-Aguilar *et al.*, 2019, 2020, 2021). Coincident with these increases in mortality, a significant reduction in Mother-calf pairs has been observed the breeding and calving lagoons in the years following each UME (LeBoeuf *et al.*, 2000; Urbán *et al.*, 2003, 2019, 2020, 2021).

In this paper, we analyzed the body condition of gray whales that occupied Laguna San Ignacio (LSI) during the 2022 winter by examining digital photographic images.

Method

Gray whales were photographed with digital cameras from a small boat (24 feet) inside of San Ignacio lagoon during the 2022 winter breeding season. For each whale, three body areas (the head, scapula, and flank) were assigned a numerical score and classified as “good”, “fair” or “poor” condition, according to the methodology developed for gray whales of the Western North Pacific (WNP) (Bradford *et al.*, 2012; Weller *et al.*, 2002) (Figure 1).

Results

In 2022, 788 gray whales were photographed in LSI, from which we were able to evaluate the body condition of 668 individual whales: 626 single whales (male or female without a calf) and 42 mothers with calves (Mc). The percentage of single whales with “good” body condition was 43% (n=269), “fair” 37.5% (n=235) and “poor” 19.5% (n=122). The condition of mothers with calves photographed in 2022 was 90.5% “good” condition (n=38) and “fair” condition was 9.5% (n=4). No mothers with poor body condition were observed in LSI in 2022 (Table 1).

Discussion

During the UME of 1999-2000, gray whales with poor body condition (skinny whales) were observed and were considered indicators of nutritional stress and food resource limitation (Gulland *et al.*, 2005). After this event from 2008 to 2011, the percentage of single whales with a poor body condition observed in LSI during the winter were only between 7.6% (2009) and 4.9% (2011) (Ronzón-Contreras *et al.*, 2020). However, in 2018 (before the 2019-2022 UME began) this percentage increased to 8.2%, and then increased to 23% in 2019, 30% in 2020, and 24% in 2021.

In 2022 the percentage of single whales with a good body condition was 43%, an increase compared with 42% in 2021, and has been the highest percentage for single whales for the last four years. Single whales in “fair” condition were 37.5% in 2022 compared with 33% in 2021. Finally, the percentage of single whales with poor body condition was 19.5% in 2022, and was the lowest since the beginning of the current UME in 2019 (Table 1). These decreasing percentages of “poor condition” whales suggest that a slow recovery of the whales’ condition is underway since 2021. However, a more extensive analysis of the data from other breeding areas is needed to understand if this trend is local or is happening for all the ENP population (Figure 2).

In relation to the Females with calves, their percentage of good body condition in 2022 was 90.5% which was similar to females with calves observed during the last 3 years, and no females with poor body condition were observed (Figure 3). While females with calves were generally in “good” body condition, it doesn’t mean that the body condition of females with calves are not affected by the factors that are affecting the body condition of single whales, because as single whales when they do not have a calf, they may be affected. For example, when the females are pregnant and don’t get enough food during the feeding season, they won’t be able to bring their calf to term and successfully birth and nurse the calf the next winter. Without a calf, they will be considered as single whales increasing the number of “fair” or “poor” body condition single whales observed in the lagoon (Ronzón-Contreras et al, 2021).

This situation has likely been observed in LSI since 2019, when a considerable number of known breeding age females have been seen without calves in years when they have been expected to reproduce. Our initial analysis of the life/reproductive histories of these adult breeding females from interannual photographic matches have shown longer intervals between calf production from 2 to 3 or more years.

Changes in environmental conditions are likely to affect whale body condition, through a more direct impact on whale prey sources throughout their range (Blanchard *et al.*, 2019; Burnham y Duffus, 2018; Feyrer y Duffus, 2015). Additional investigations are needed to correlate environmental factors with changes in gray whale body condition, and to understand the demographic and condition changes in the ENP gray whale population.

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Tables and Figures

Figure 1. Example of the values assigned to determine body condition for the postcranial area (head), scapula and dorsal-flank. The highest values are for the best condition.

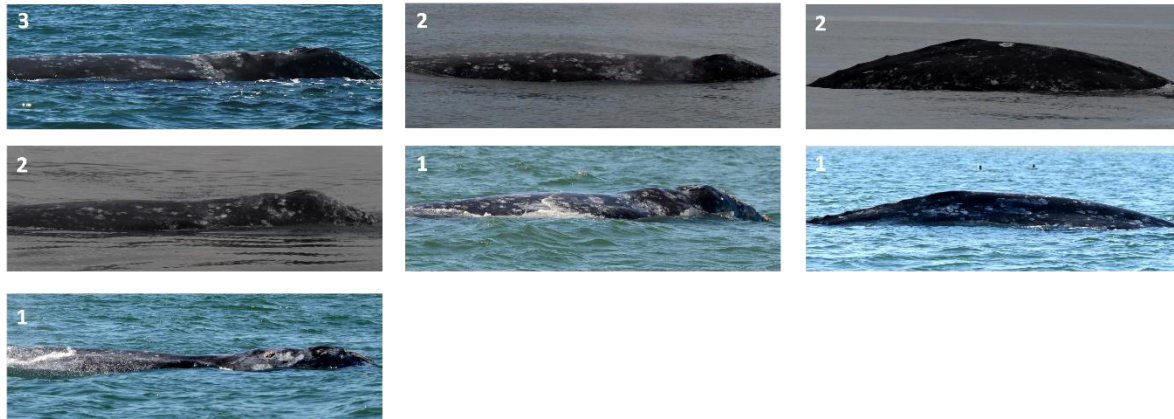


Figure 2. Percentage of single whales separated by body condition categories during 2019-2022

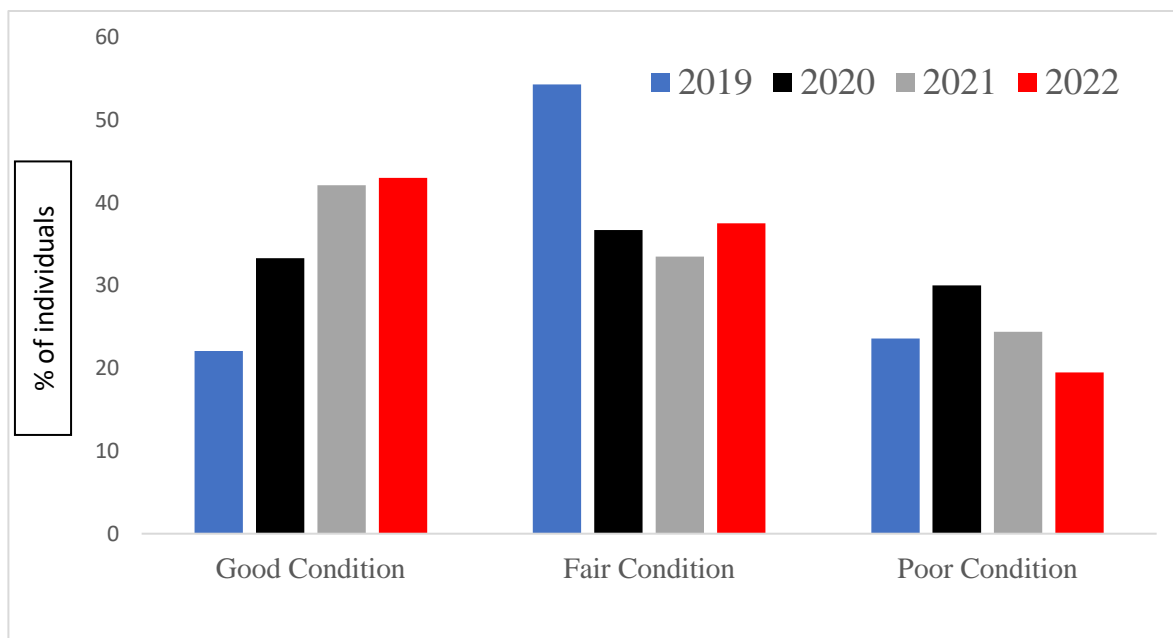


Figure 3. Percentage of Females with calf separated by body condition categories during 2019-2022

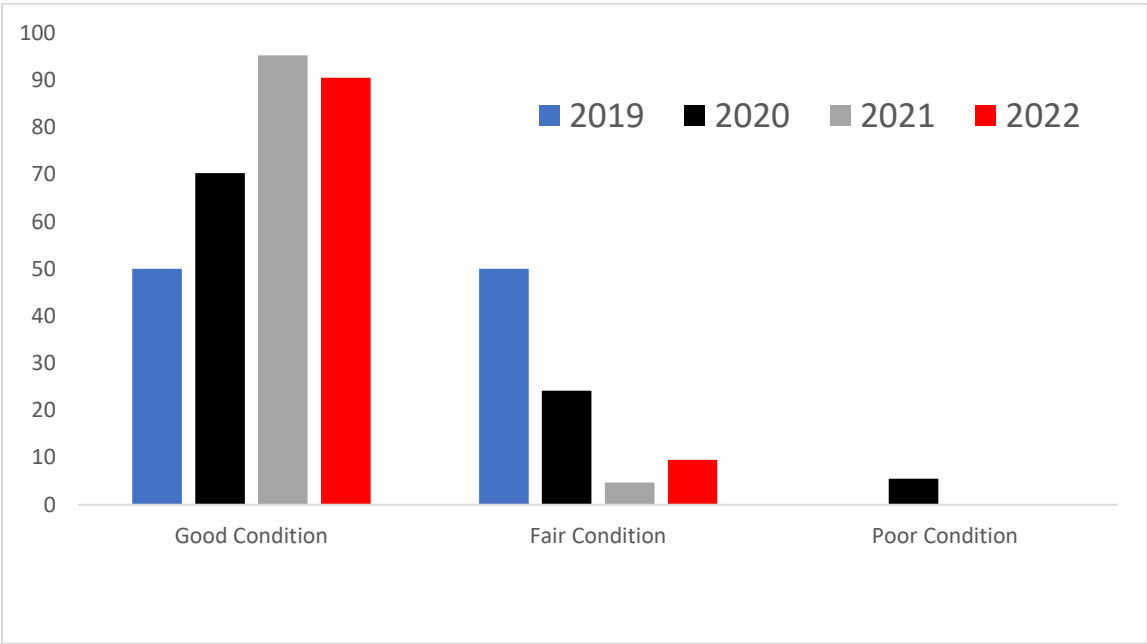


Table 1. Number and percentage of gray whales by body condition category and group type (Mc and Single whales) from 2019 to 2022

Singles / Year	2019	2020	2021	2022
No. whales Photo-identified	847	696	746	746
No. whales categorized	529	553	658	626
Good Condition	117 22.1%	166 33.3%	259 42.1%	269 43.0%
Fair Condition	287 54.3%	183 36.7%	206 33.5%	235 37.5%
Poor Condition	125 23.6%	150 30.0%	150 24.4%	122 19.5%

Mc / Year	2019	2020	2021	2022
No. whales Photo-identified	41	56	43	42
No. whales categorized	40	54	41	42
Good Condition	20 50.0%	38 70.3%	41 95.3%	38 90.5%
Fair Condition	20 50.0%	13 24.2%	2 4.7%	4 9.5%
Poor Condition	0 0.0%	3 5.5%	0 0.0%	0 0.0%