

Exploring Nutritional Condition as a Possible Cause of the 2019 Unusual Mortality Event in Gray Whales

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**Laguna San Ignacio
Ecosystem Science Program**

A Project of the Ocean Foundation in Baja California Sur, Mexico



Feeding grounds

Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image IBCAO

Google Earth

Unusual Mortality Event (UME) 2019

Country	2019
Canada	10
U.S.	123
Mexico	81
Total	215

(NOAA, 2019)

Determine the nutritional condition of the gray whales using aerial photogrammetry

Breeding grounds

Varying rates of calf production

2017 (Normal)
2018 (Medium)
2019 (Low)

Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Data | DEO-Columbia, NSE, NOAA

Google Earth





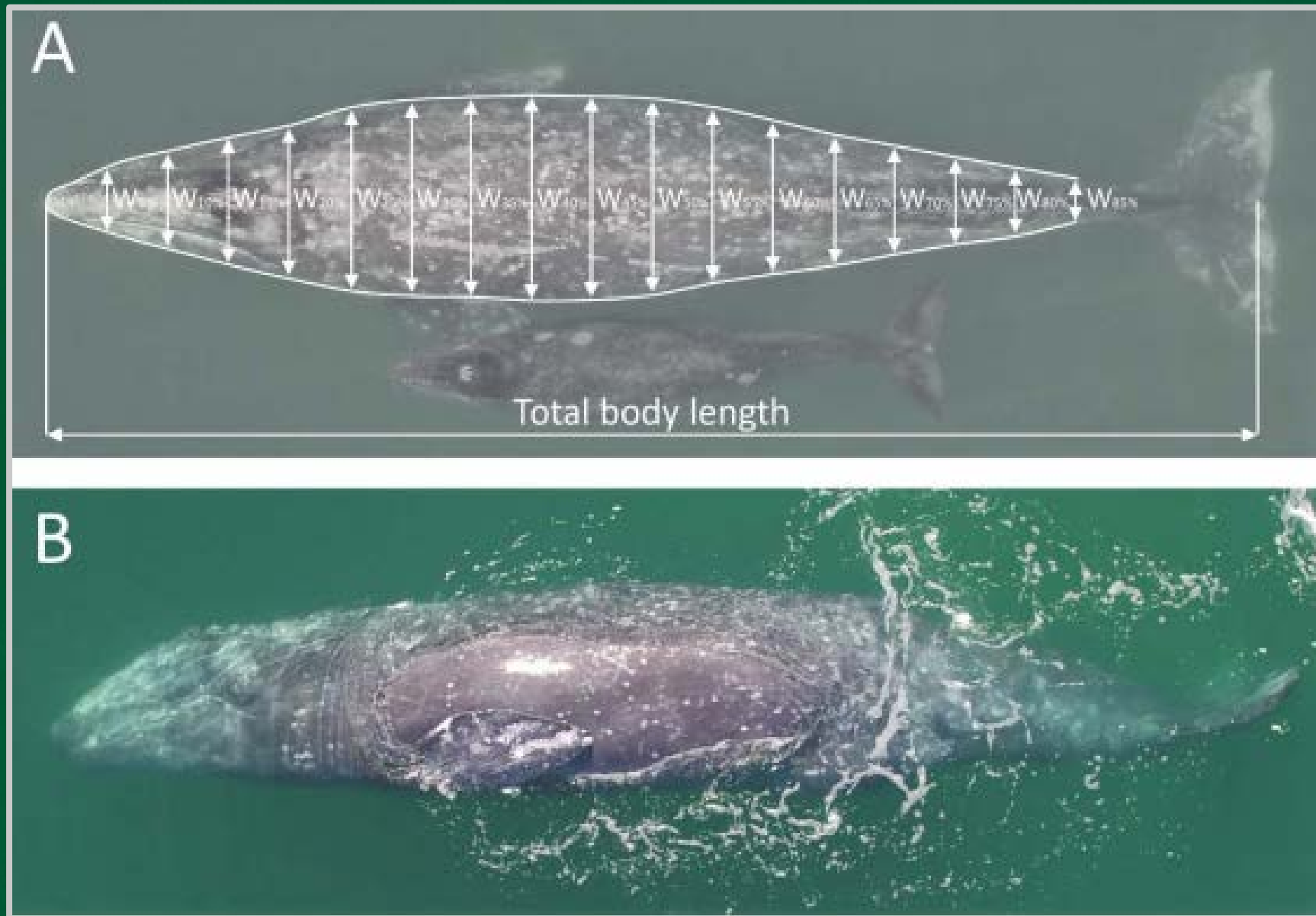
Good picture



Bad picture



Gray whale aerial photogrammetry measurement sites

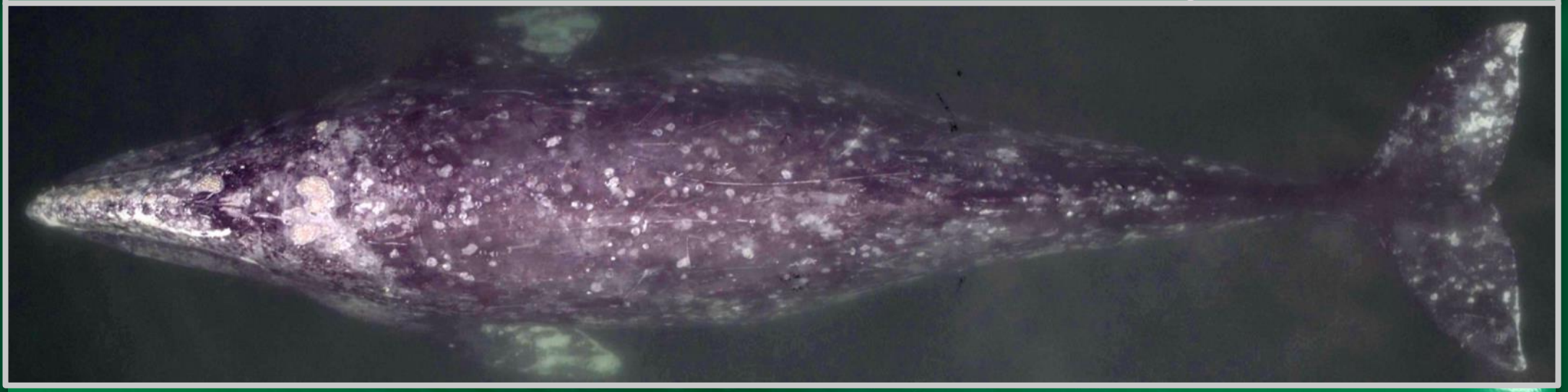


Results – Sample size

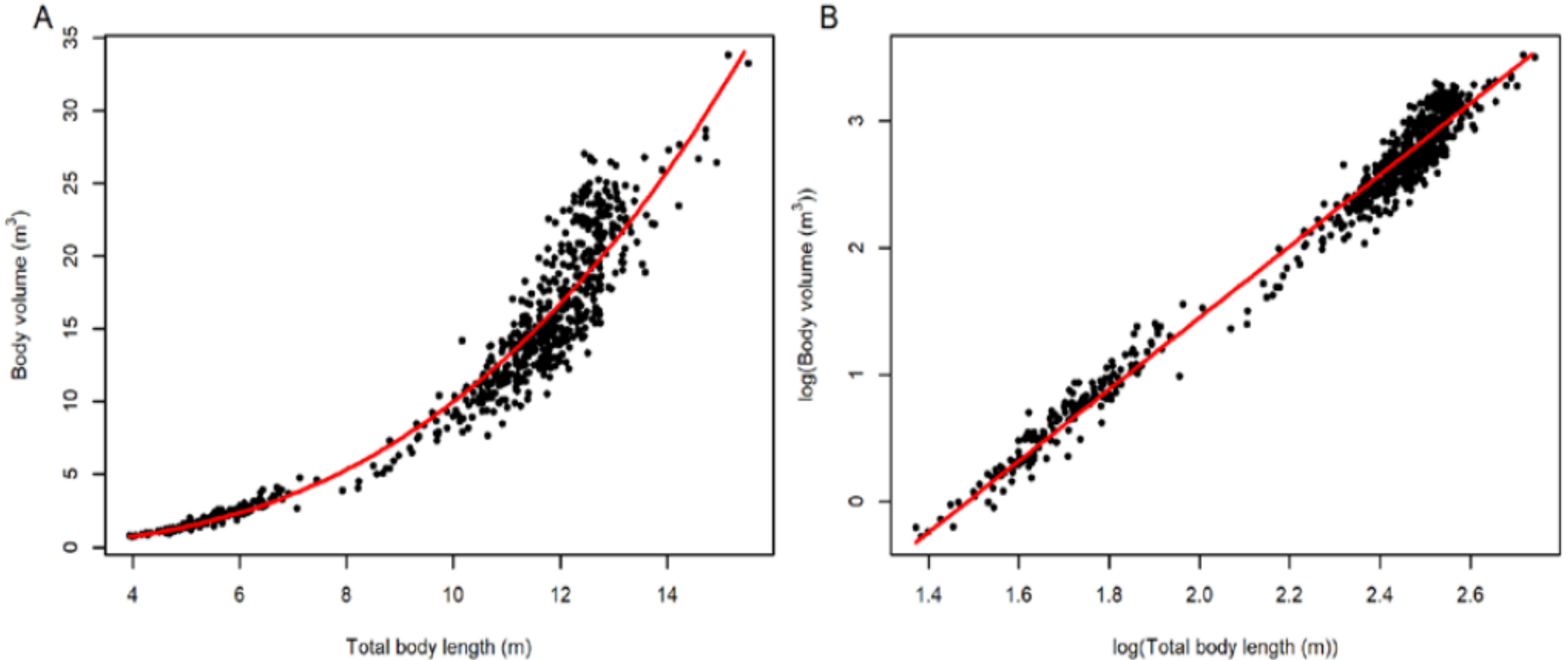
- 1,246 measurements
- 75 were recorded in 2017
- 531 in 2018
- 640 in 2019
 - 266 lactating females
 - 322 calves
 - 173 juveniles
 - 485 unaccompanied adults



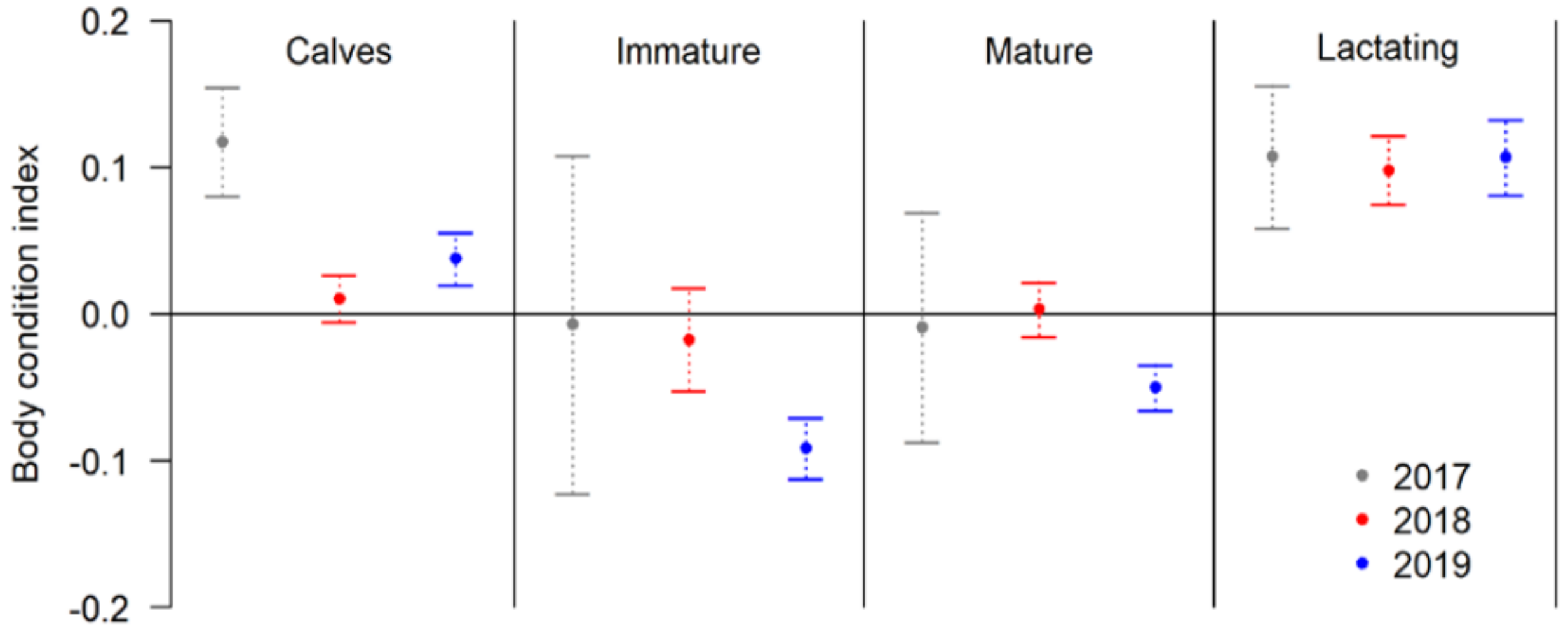
Skinny vs fat



Gray whale body volume versus body length relationship



Gray whale body condition in Laguna San Ignacio, between 2017 and 2019, divided into reproductive classes.



Gracias por su atención

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