Estimating lactation cost in gray whales using Unmanned Aerial Vehicles

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Background

- Reproduction plays a major role in a species' life history strategy
- Whales exhibit one of the fastest mammalian offspring growth rate because their reproductive cycle is closely linked to their migration cycle
- Reproduction is energetically demanding, especially for lactating females

Research objectives

→ Quantify the costs of reproduction for lactating females

A. Link the calves' growth rate to the body condition of their mother

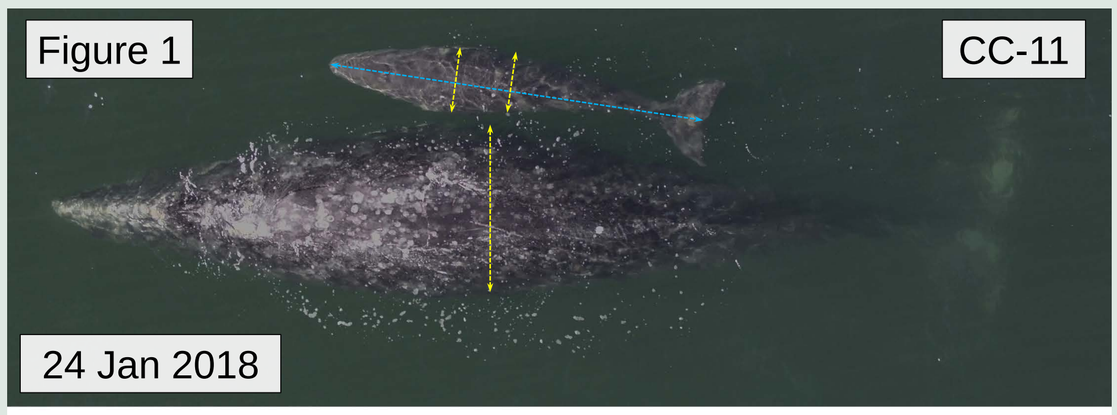
B. Assess potential effects of age and reproductive history (number of calves produced, inter-calving interval) on reproduction efficiency?

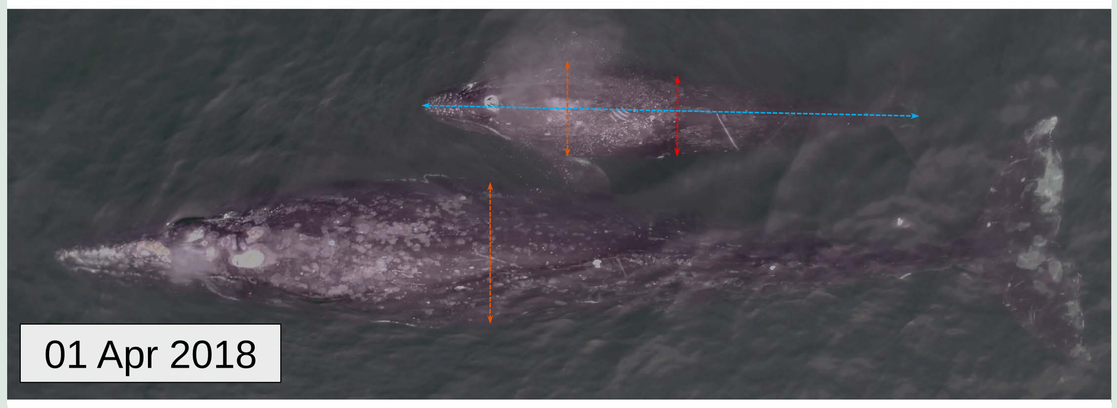
Methods: measuring body condition

- Field work in Laguna San Ignacio, Baja California Sur, Mexico, 17 January – 07 April 2018
- Collect body measurements using Unmanned Aerial Vehicles[1] (Measure the length and width of whales) [2]
- Link body condition and long-term reproductive history of individual females by combining boat-based and UAV photo-identification 1977-1982 / 1995-1996 / 2006-2018

Preliminary results

- 452 UAV Flights (83.6h)
- 292 body condition measurements of 226 solitary individuals measured on average 1 time (min=1, max=2)
- 377 body measurements of 63 mother / calf pairs
- 45 pairs measured on average 3±1 times (min=2, max=7) with an average of 17 days (min=1, max=72) between recaptures





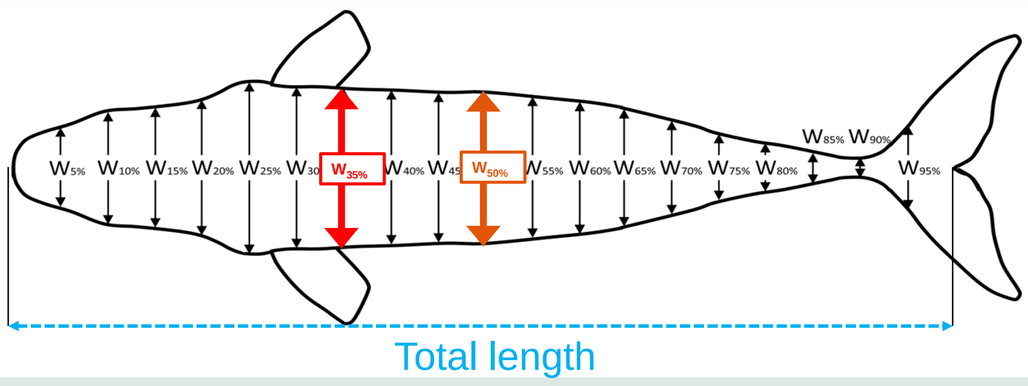


Figure 1

Mother:

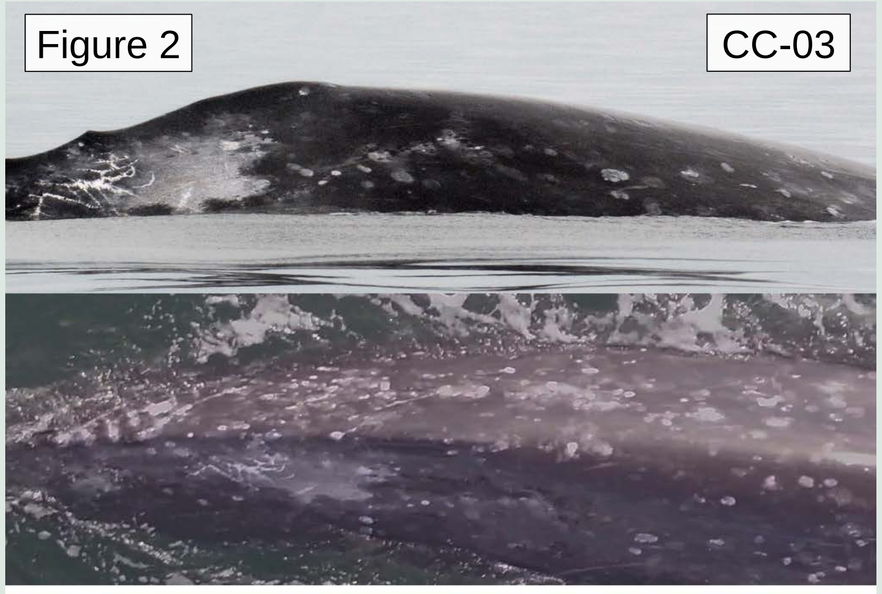
- -16.4% of width at 50% body length

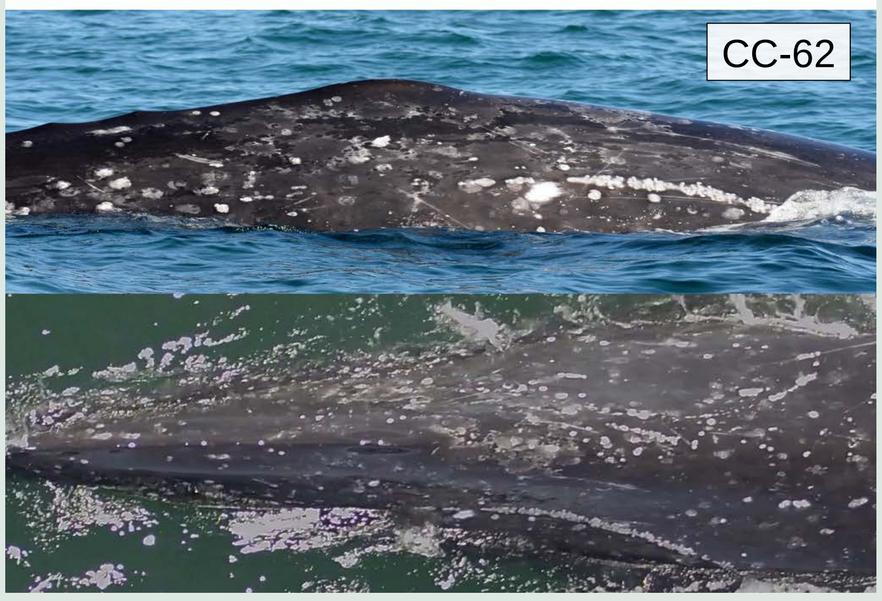
Calf:

- +29.5% in body length
- +38.9% width at 35% body length
- +46.2% width at 50% body length

Figure 2

At least 2 females first sighted with calf in 1977 and resighted with calf in 2018 (41 years apart; minimum age of these females: 48 years)





Results and Conclusion

A. We documented significant declines in body width of lactating females; and concurrently increases in body width and length of their dependent calves (Fig.1)

B. Lactating females' reproductive efficiency will be assessed based on available long-term (>40 years) photo-identification records (Fig. 2)

Assessing the costs of reproduction of individual whales over a breeding season, by monitoring changes in their body condition, provides valuable information on the health of the population

Acknowledgements

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References

[1] *Christiansen F, Dujon AM, Sprogis KR, Arnould JPY, Bejder L (2016) Noninvasive unmanned aerial vehicle provides estimates of the energetic cost of reproduction in humpback whales.*

[2] *Christiansen F, Vivier F, Charlton C, Ward R, Amerson A, Burnell S, Bejder L (2018) Maternal body size and condition determine calf growth rates in southern right whales.*