

Final Report

Society for Marine Mammalogy Grants in Aid of Research 2021

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Impact of interannual climate variability on the trophic habits of Guadalupe fur seals: assessment of time series along whiskers.

The Guadalupe fur seal (*Arctocephalus philippii townsendi*, GFS) is in a recovery process since its near extinction in the 1920s (Hubbs, 1956). Understanding their trophic habits is key for their conservation and responsible management and that of their ecosystem. In this study, we plan to determine the impact of interannual climate variability on GFS trophic habits (habitat use/trophic breadth) via stable isotopes analysis in whiskers. Also, these isotope ratios were used to analyze latitudinal movements, due to the influence of different isoscapes throughout regions across the Northeast Pacific (Cherel et al. 2009, Amador-Capitanachi et al. 2020).

A total of 32 GFS of different sex and age classes (15 adult females, 2 subadult males, 8 juvenile males and 7 juvenile females) were sampled on Guadalupe Island in Mexico (2017-2020). Continuous time series of up to 4 years were obtained for each fur seal from sequential whisker analyses. Growth rate of whiskers may depend on the species; however, in general each 3 mm section across the whisker corresponds to ~21-37 days for otariids (Kernaléguen et al. 2012).

Results of the project:

Isotopic niches by sex and age classes showed that adult female GFS had the smallest ellipse area size, based also on a lower standard deviation compared to other age classes. This may be because of more specific or localized feeding grounds in adult females compared to other immature classes, such as juveniles. On the other hand, subadult males presented the highest average $\delta^{15}\text{N}$, which could be related to a higher trophic position relative to other GFS classes.

Juvenile males presented the largest isotopic niche, both in ellipse and polygon sizes, followed by juvenile females (Fig. 1, Table 1). This may be the consequence of their greater dispersion during

their foraging trips. In this regard, they are sexually immature and do not need to return to the breeding colony so often, unlike adult females who alternate their foraging trips with maternal care and nursing on Guadalupe Island (Gallo-Reynoso, 1994).

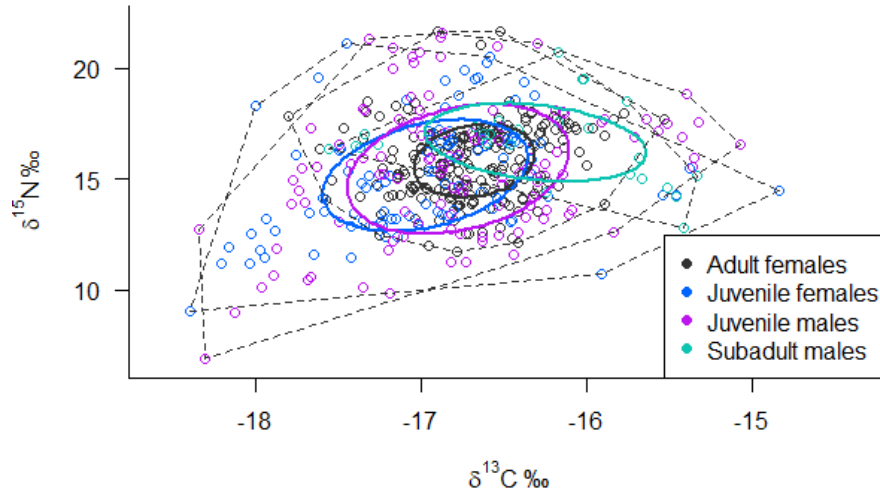


Figure 1. Isotopic niche of adult female, juvenile female, juvenile male, and subadult male Guadalupe fur seals (*Arctocephalus philippii townsendi*) from Guadalupe Island during 2017, 2018 and 2020.

Table 1. Mean and standard deviation of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values, and size of corrected standard ellipse area (ellipses) ($\text{SEAC}\%{}^2$) and size of total polygon area (dotted line) ($\text{TA}\%{}^2$), of Guadalupe fur seals (*Arctocephalus philippii townsendi*) from Guadalupe Island B.C. Mexico during the 2017-2020 period.

Sex and age classes	Mean $\delta^{15}\text{N}\%{}_{\text{‰}}$	Mean $\delta^{13}\text{C}\%{}_{\text{‰}}$	Standard dev. $\delta^{15}\text{N}\%{}_{\text{‰}}$	Standard dev. $\delta^{13}\text{C}\%{}_{\text{‰}}$	SEAC $\%{}^2$	TA $\%{}^2$
Adult females	15.83	-16.68	1.65	0.36	1.85	15
Juvenile females	15.17	-16.97	2.51	0.62	4.65	26.82
Juvenile males	15.47	-16.77	2.92	0.67	5.94	27.42
Subadult males	16.66	-16.31	1.76	0.67	3.71	8.58

For each whisker, we obtained a series of isotopic values, representative of years prior to the date of collection, allowing us to observe intra-annual oscillations related to the trophic habits of GFS and climatic variability. For example, adult females exhibited oscillations between -15.5‰ and -18.0‰ in $\delta^{13}\text{C}$ values over time, presenting the most negative values during the months of March

and November. Values of $\delta^{15}\text{N}$ were very similar through time, ranging from 15.8‰ to 17.3‰ (Fig 2).

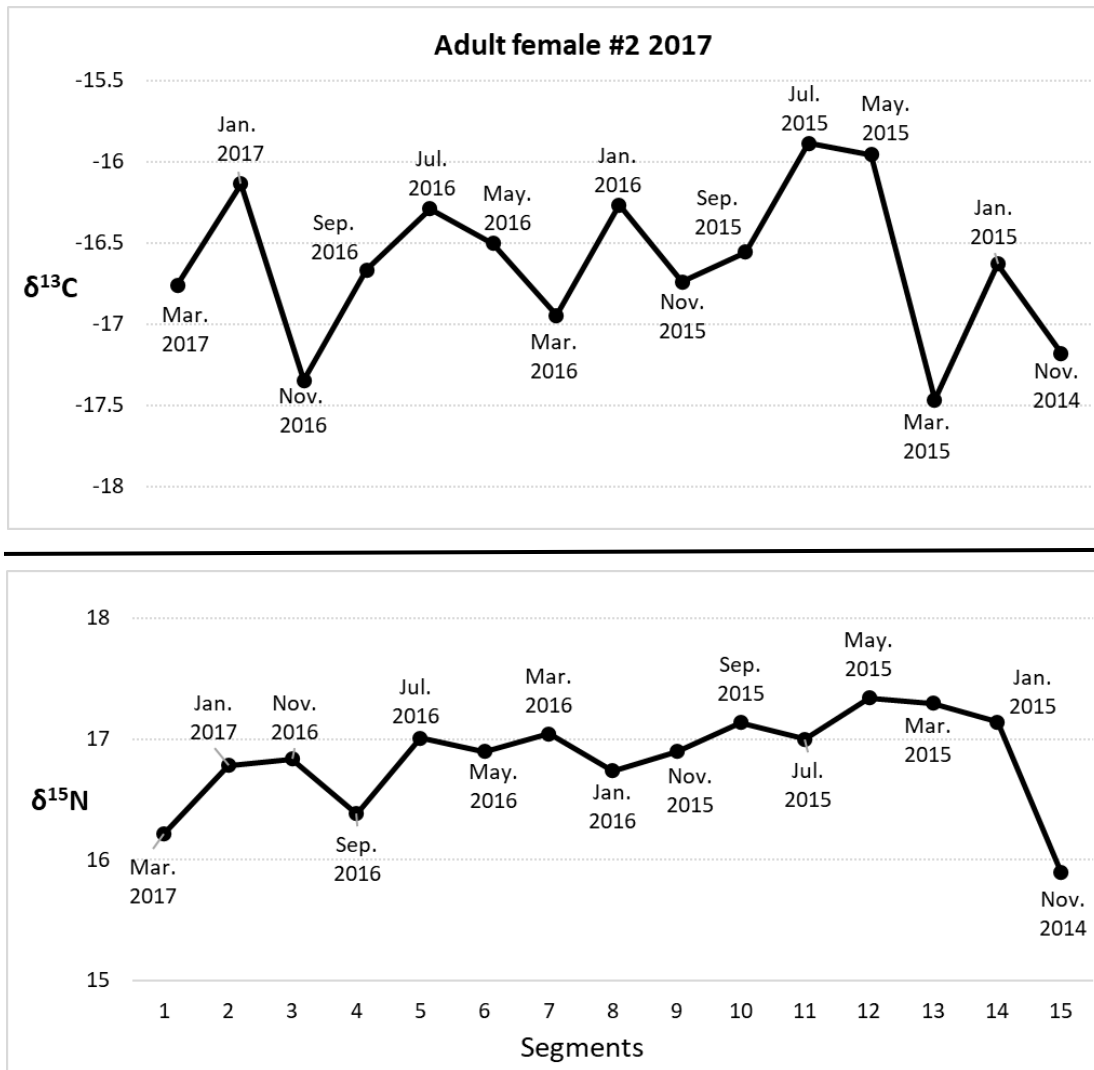


Figure 2. $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values along the length of a whisker from an adult female Guadalupe fur seal.

Once the statistical analyzes are completed, a manuscript will be submitted with the results obtained. All the publications produced will include an acknowledgement of the Society for Marine Mammalogy.

I would like to thank to The Society for Marine Mammalogy for the financial support given to this project, as well as for the trust deposited in myself.

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