SOCIETY FOR MARINE MAMMALOGY: SMALL GRANTS IN AID OF RESEARCH (2018) GRANT REPORT

Project Title: "Are Guiana dolphins organized in generalist populations of specialist individuals?"

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Project Summary

Individual specialization, where individuals within populations are either specialized or generalized in terms of resource use, has implications on ecological niches and food web structure. The Guiana dolphin, *Sotalia guianensis*, provides a good model system to study intrapopulation variation in resource use, for being distributed in coastal waters along central and southwestern Atlantic Ocean in discrete populations of mostly resident individuals experiencing the same habitat. Initially, our goal was to evaluate the degree of diet variation among Guiana dolphin individuals from the Norte Bay, Santa Catarina state. However, the SMM grant allowed to investigate individual niche variation across different Guiana dolphin populations to understand how population/community processes (e.g. social structure, population density and presence of conspecifics), and habitat features (e.g. resources richness, habitat heterogeneity) may influence the degree of specialization. For this, we used a dataset consisting of sequential individual tooth samples to quantify both individual- and population-level niche variation.

Research questions

Specifically, we asked how habitat and resource competition drive temporal consistency (WIF) and individual specialization (WIF/TNW) in resource use across three Guiana dolphin populations. We hypothesized:

(a) a wider total niche width with more specialist individuals (higher incidence of individual specialization) in the Caravelas River population due to the great diversity of habitats, ecological release from heterospecifics and smaller groups structure
(b) a narrow niche with more specialist individuals within the Babitonga Bay population, given the interspecific and intraspecific competition (coexistence with franciscana dolphin and high population density) within a well-defined small home-range.
(c) a narrow niche with generalist individuals within Norte Bay population, due to the highly cohesive formation of population and interspecific competition.

Project progress

Teeth were collected from stranded carcasses of Guiana dolphin individuals from the Norte Bay (*n* = 16) (27°30'S - 48°35'W) and the Babitonga Bay Estuary (*n* =12) (26°28'S - 48°50'W), southern Brazilian coast, and the Caravelas River Estuary (*n* = 9) (17°30'S - 39°30'W) eastern Brazilian coast. The specimens were held in the scientific collection of the Aquatic Mammals Laboratory (LAMAQ) from the Universidade Federal de Santa Catarina (UFSC), the Humpback Whale Institute (IBJ) and the Universidade da Região de Joinville (Univille), Brazil.

I have already completed the three key stages of the project:

        1. Age estimation: I mounted 37 teeth to guide the micromilling extraction.

        2. Tooth sampling preparation: I cut 37 teeth in longitudinal sections and treated them to accentuate the growth layers.

        3. Tooth sampling and micromilling: I extracted growth layers dentin samples with the micromilling system.

Current stage

        4. Currently, I am analyzing individual- and population-level niche variation. We will measure the degree of individual specialization (IS) of each population following the Roughgarden`s framework, which partitioned the total niche width of a population (TNW) in two components: the within-individual component (WIC) that reflects the average of individual niches width, and the between-individual component (BIC) that represents the variance among individuals' niche. We will estimate BIC as the total standard deviation in $\delta^{13}C$ and $\delta^{15}N$ values of sampled individuals, and WIC as the mean standard deviation in $\delta^{13}C$ and $\delta^{15}N$ values obtained along the longitudinal growth layers samples within individuals. Therefore, we will use the mean variability within individuals (WIC) as a measure of temporal consistency and the degree of individual specialization as the percent of within-individual component of total niche width (WIC/TNW), where low values (close to zero) indicate higher specialization and high values (close to 1) indicate lower individual specialization.