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FORAGING ECOLOGY OF BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*) IN GALVESTON BAY

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Introduction

- Bottlenose dolphins (*Tursiops truncatus*) are an ecologically important, long-lived apex predator that act as a sentinel of Galveston Bay (GB)
- Due to crucial data gaps, the National Marine Fisheries Service considers GB a high priority area for dolphin research
- One of the most important factors affecting bottlenose dolphin movement patterns is the spatial & temporal distribution of prey resources
- Stable isotope analysis (SIA) & Bayesian mixing models have become useful tools to estimate proportions of prey consumption by predators

Objectives

- Estimate important habitats in the GB system used for foraging, with photo-identification (photo-ID) & behavioral data
- Estimate likely proportions of different prey items consumed by dolphins using stable isotope mixing models

Methods

- Boat-based photo-ID surveys were conducted between 2015-2017
- Remote biopsy tissue sampling using a crossbow & modified dart from free ranging dolphins from 2015-2017 to run SIA ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) (Fig. 1)
- Probable feeding/feeding: patrolling shrimp boats, fluke out diving, swirling, fish in mouth, fish chasing, fish tossing, quick & variable directional movements
- Habitats characterized by nearshore, open bay, & channel (Fig. 2)
- Used previously published data¹ of $\delta^{13}\text{C}$ & $\delta^{15}\text{N}$ on potential prey items & fish collected from 2015-2016 otter trawling to model proportions of prey consumed using the package MixSIAR (v 3.1.10) in R (v 3.6.1)
- Used discrimination factors of 1.01‰ for $\delta^{13}\text{C}$ & 1.57‰ for $\delta^{15}\text{N}$ ² in the model



Figure 1: The left photo is the crossbow operator & photographer preparing to take a tissue sample. On the right is the modified sampling dart rebounding off of the dolphin with the sample intact.

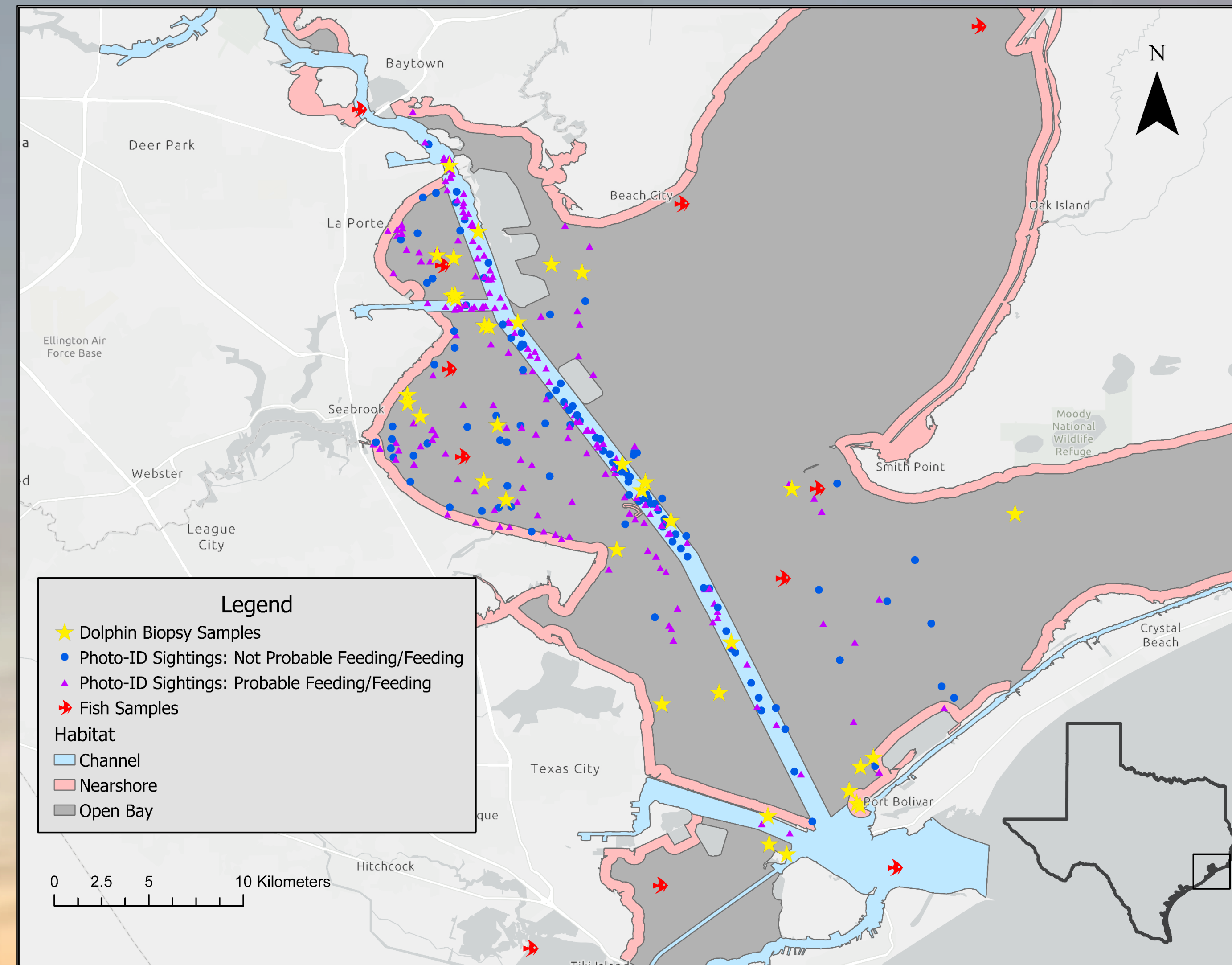


Figure 2: Study area in Galveston Bay, TX mapping locations of photo-ID sightings, biopsy samples of dolphins & fishes, & different habitats

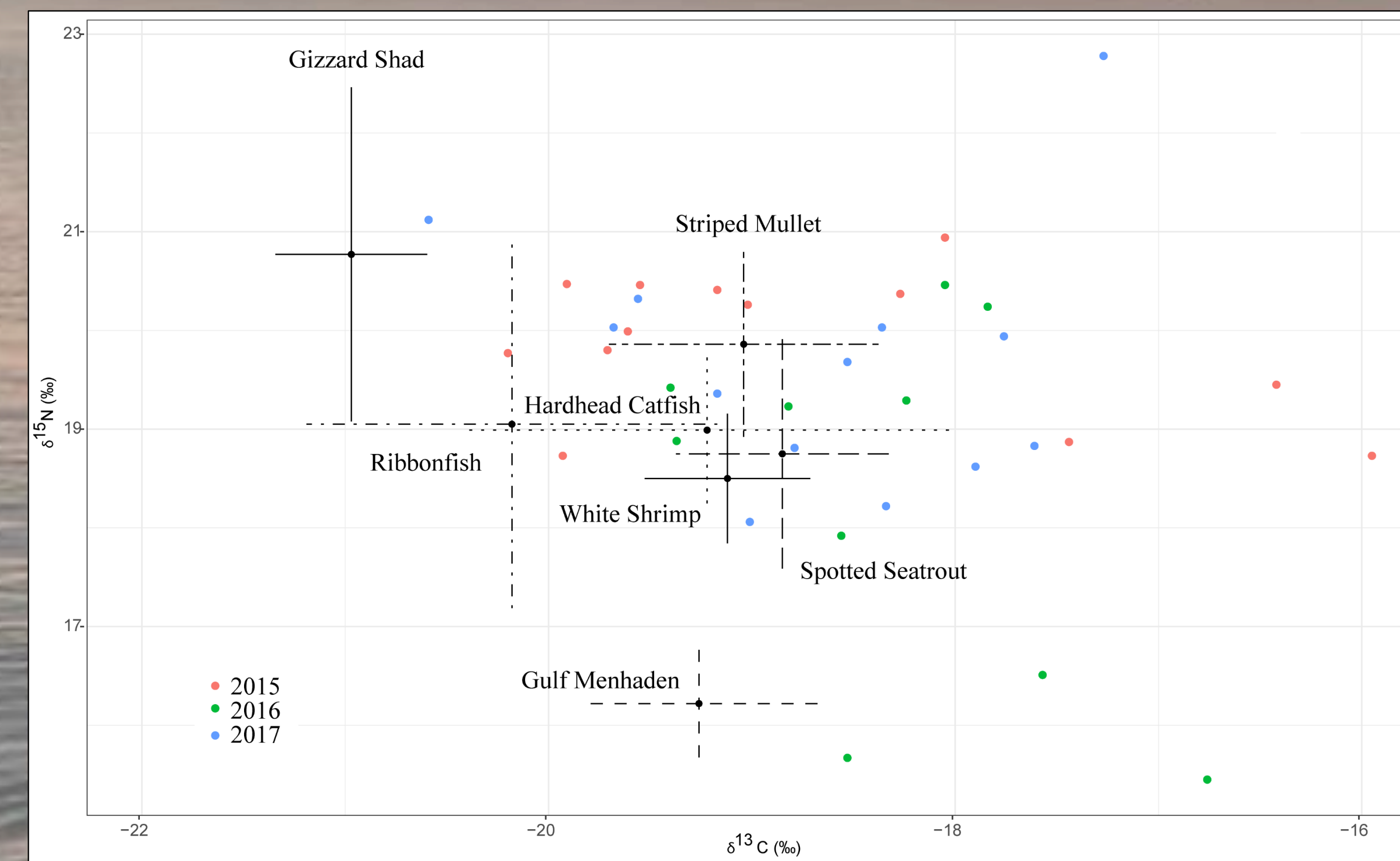


Figure 3: Isospace plot of $\delta^{13}\text{C}$ & $\delta^{15}\text{N}$ values from dolphin biopsy samples (colored points) collected 2015-2017, nekton from previously published data¹, & from fish samples collected in 2015-2016 (black points with ± 1 SD of mean)

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Literature Cited

- ¹Barcenas, Danielle L. (2013). University of Houston-Clear Lake. Use of stable isotope analyses to describe trophic dynamics of aquatic ecosystems in Galveston Bay, Texas.
²Giménez, J., Ramírez, F., Almunia, J., Forero, M. G., & de Stephanis, R. (2016). From the pool to the sea: Applicable isotope turnover rates and diet to skin discrimination factors for bottlenose dolphins (*Tursiops truncatus*). *Journal of experimental marine biology and ecology*, 475, 54-61.

Results

- 75 photo-ID surveys, 303 group sightings
- Of 303 sightings, 191 were observed probable feeding or feeding; 100 of the 191 sightings were observed in the channel habitat
- 37 biopsy surveys, 36 tissue samples
- Of the 7 species evaluated in this model:
 - Striped Mullet was estimated to make up 30.3% of the total diet, as the primary prey source, for the overall sampling period (Fig. 4)
 - In 2015 & 2017 Striped Mullet composed an estimated 33.5% & 36.5% of the total diet, respectively
 - In 2016 Striped Mullet dropped to 14.3% while Spotted Seatrout increased to 42.8% of the estimated diet

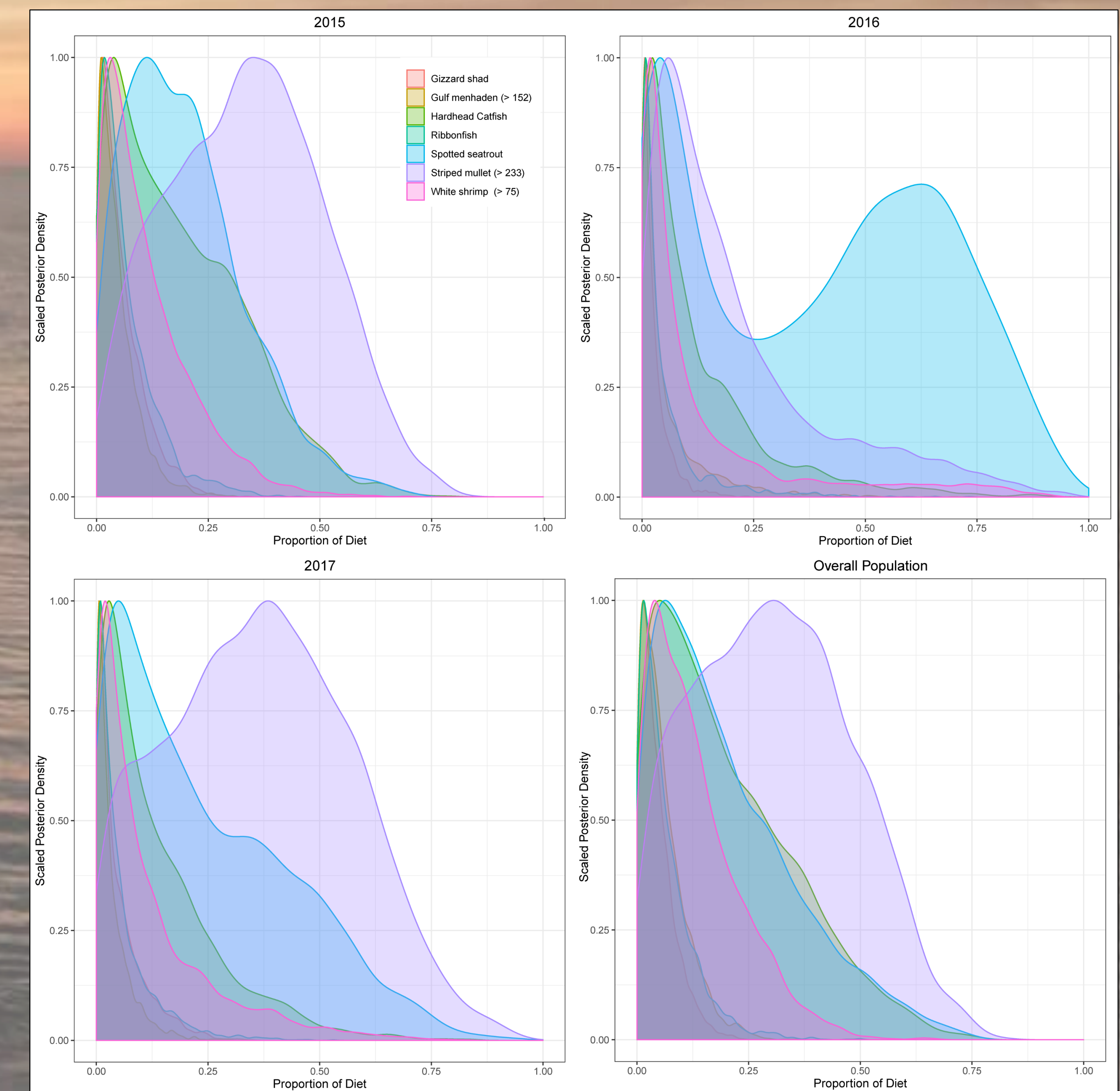


Figure 4: Posterior plots comparing proportions of diet by year & the overall population

Discussion

- Yearly prey abundance may be a crucial factor contributing to disparities in the estimated contributions of prey in GB dolphin diets
- Although Striped Mullet & Spotted Seatrout were the highest proportions in the overall diet, different fishes not used in this study with similar $\delta^{13}\text{C}$ & $\delta^{15}\text{N}$ values may fulfill a substantial part of dolphin total estimated diet