

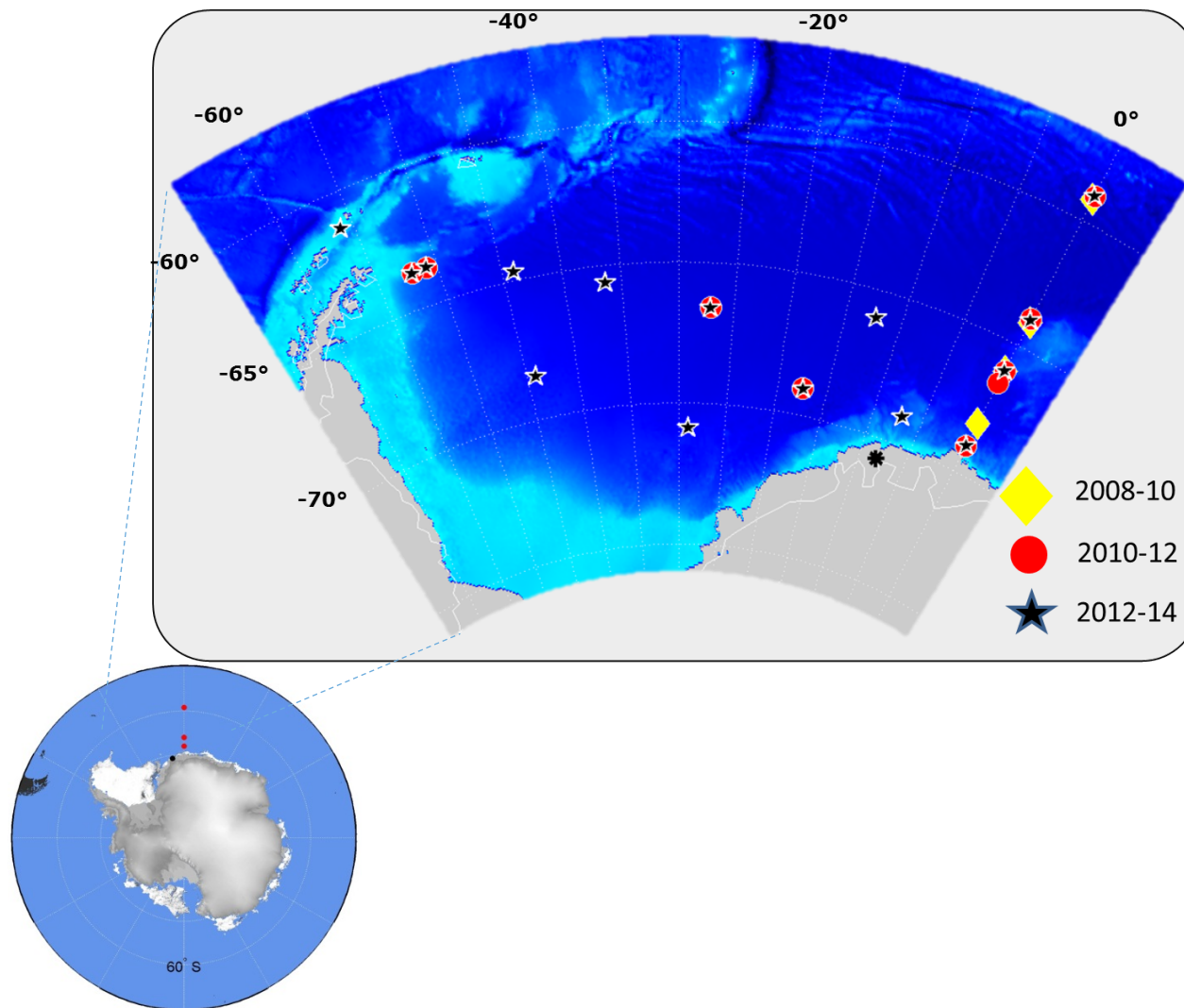
SAMBAY

San Antonio Model BAY for passive acoustic
density estimation

Daniel Zitterbart and Alejandro Cammareri

Hafos Array

7 Million km²



Density and abundance from PAM

$$D = \frac{n(1-c)}{apT_K r}$$

n: counted cues

c: false positives (depends on detector)

p: detection probability (acoustic prop, noise)

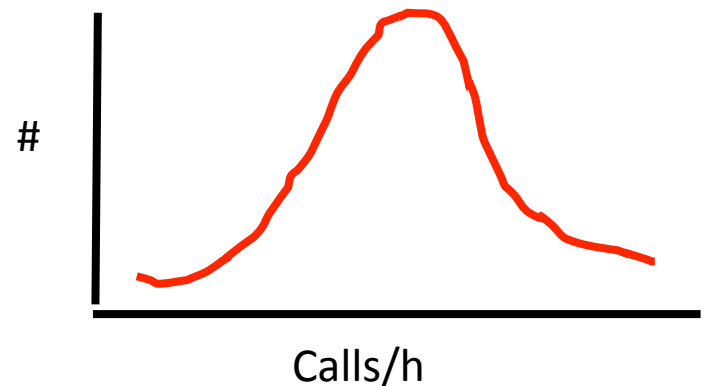
a: surveyed area (distance/direction estimation)

r: cue production rate (distribution/ individuals)

T: time period

Marquez 2011: Since the **largest proportion** of the variance associated with the density estimate is due to **cue rate estimation**, we strongly recommend dedicated studies which should look at **estimating cue rates over time and space**.

Marquez 2013 (DCLDE): There is a need for a **study designed to use density from pam**, as up to now all datasets **were opportunistic**



2015 field season



Target Species

- Southern right whale (~ 120) in $\sim 400\text{km}^2$

Measure Density using 4 different methods

- satellite imagery (WW2, 0.5m resolution)
- land-based distance sampling
- aerial line transect distance sampling (plane with observer)
- passive acoustic monitoring Density Estimation (6 element hydrophone array)

Measure PAMDE covariates (using a RIB)

- Individual cue rate variation (with Individual ID, using AUV)
- Acoustic time and behavior budgets
- Source Levels (with Individual ID)
- Acoustic propagation (detection probability)

~400km²

● hydrophones

— Point Transect Distance Sampling Area

— Line Transect Distance Sampling Area

