Thesis outline  
Marina Bozinovic

## Goal 1: Characterize the soundscape/acoustic habitat

#### Explore the relationship (spatial/temporal variation?) between soundscape metrics and environmental variables, and beaked whale (BW) detections. (Alternative: Describe the acoustic environment where deep-diving species are present/absent.)

* Exploratory: Create histograms, scatterplots, time series, facet graphs of:
  + A soundscape metric/BW presence + absence/env variable
    - Comparing TOL intensities between drift 8 and 10 (**only two drifts for now**)
    - Broadband levels, Third-octave levels at 63, 125, 2000, 5000, 20000 Hz
      * Are we interested in high frequencies (over 20 kHz)?
    - Which frequencies had the most loudness? What does the soundscape look like when there are high BW detections?
  + Oceanographic characteristics
    - Bottom depth (**done for drift 8**)
    - Bottom slope (**done for drift 8**)
    - Distance from shore **(done for drift 8)**
    - Distance from continental shelf (**done for drift 8**)
    - Sea surface temperature **(done for drift 8**)
    - Sea surface height anomalies **(done for drift 8)**
    - Sea surface height slope (in progress)
    - Chlorophyll-a **(done for drift 8**)
    - Curl of wind stress (in progress)
    - Mixed layer depth (MLD) **(done for drift 8**)
    - Mixed layer depth Temperature **(done for drift 8**)
    - Thermocline temperature (TTemp) **(done for drift 8**)
    - Thermocline depth **(done for drift 8**)
    - Temperature at 400 m **(done for drift 8**)
    - Salinity at 400 m **(done for drift 8**)
  + Other potential variables: seasonality, hour of the day (create time series for avg daily env.variable)
  + Questions: Does soundscape change when conditions change? Is sound seasonal?
* Fit a model (GAM, possibly zero-inflated, GLM, random forest, Akaike Info Criterion)

## Goal 2: Influence from vessels (connect sound to a source)

#### Explore how vessel presence influences and contributes to the soundscape

* Find instances of vessel in vicinity of drift vs. drift alone and compare
  + Number of ship passages, types of ships (**IN PROGRESS**)
    - Create buffer around whale detections (using 50nmi)
    - Find AIS vessels by lat/long that lie within buffer
    - Identify number of vessels that pass each drift
  + Closest ship passage (When a ship has a close encounter with a drift, how close is it on average? How is soundscape affected?)
* Does vessel presence create a louder soundscape?
  + Compare TOL 63 and125 intensities vs. ship presence
* Chronic vs. acute sound events
  + Instances where drifts and vessels overlap, plot time on x-axis and TOL125 on y axis