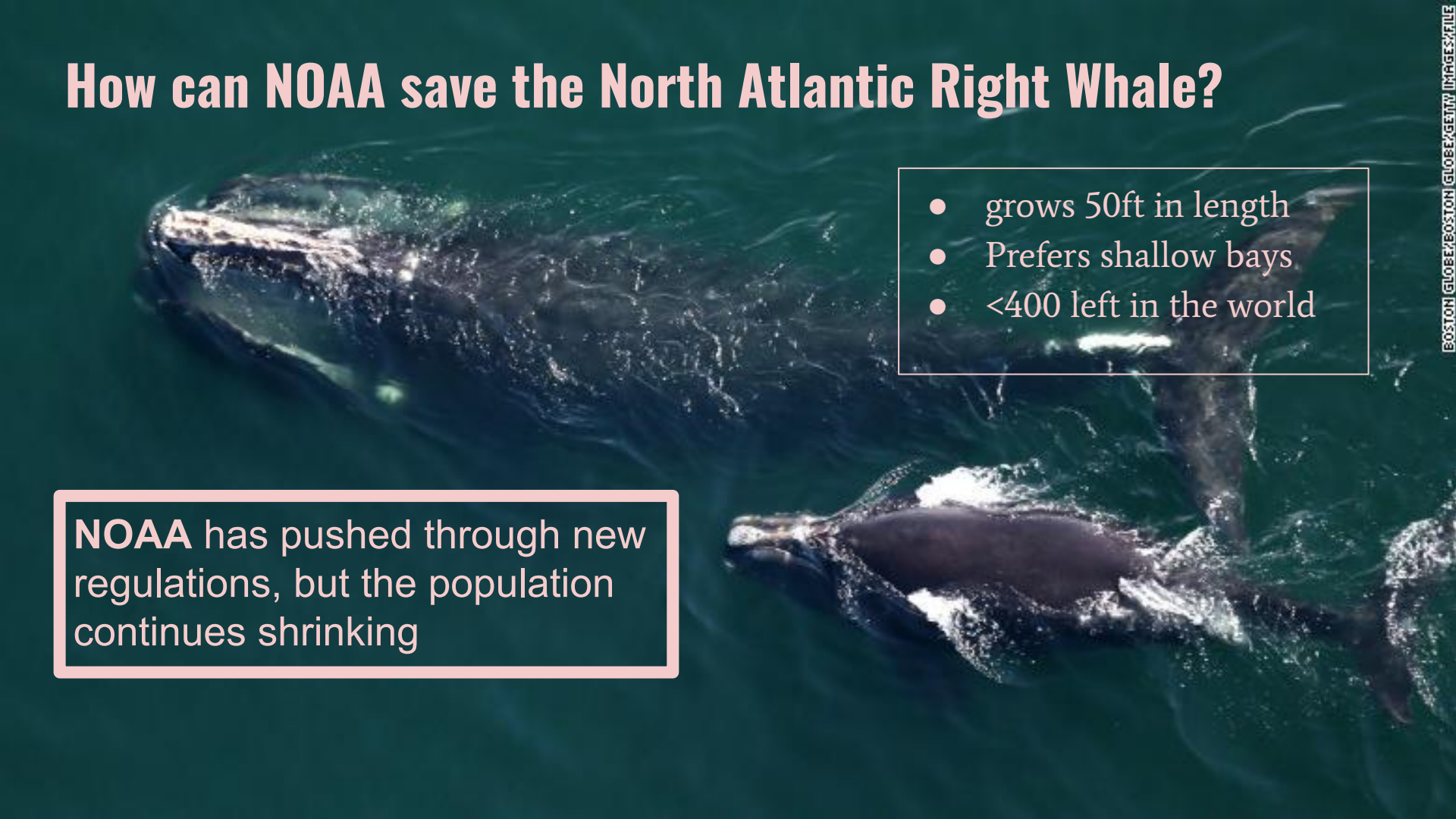
# NOAA finds Right Whales

...

It’s not a wrong whale!

# How can NOAA save the North Atlantic Right Whale?



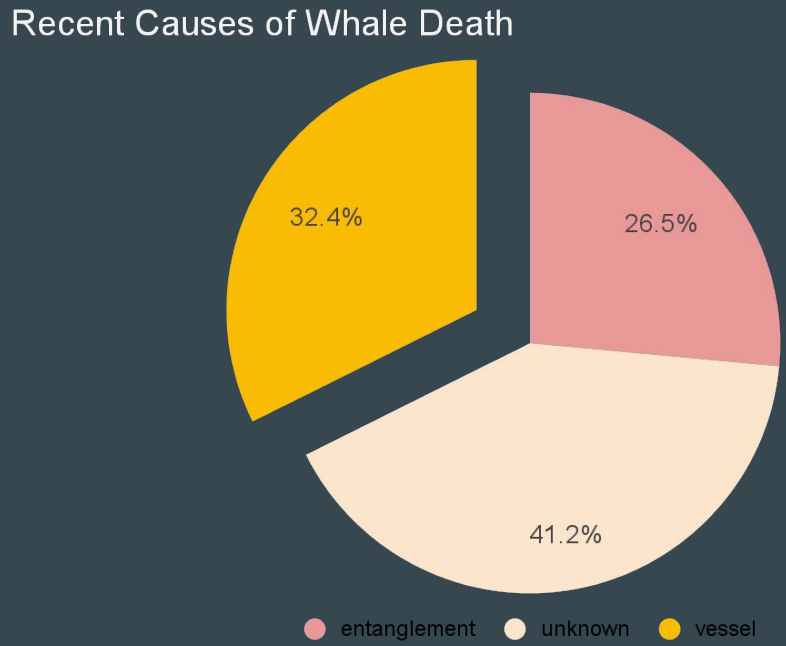
- grows 50ft in length
- Prefers shallow bays
- <400 left in the world

**NOAA** has pushed through new regulations, but the population continues shrinking

# Problem

Whale population is shrinking
In the last 5 years, 10% of the population (34 whales) have been killed

**NOAA** must locate the whales in a timely manner in order to protect them

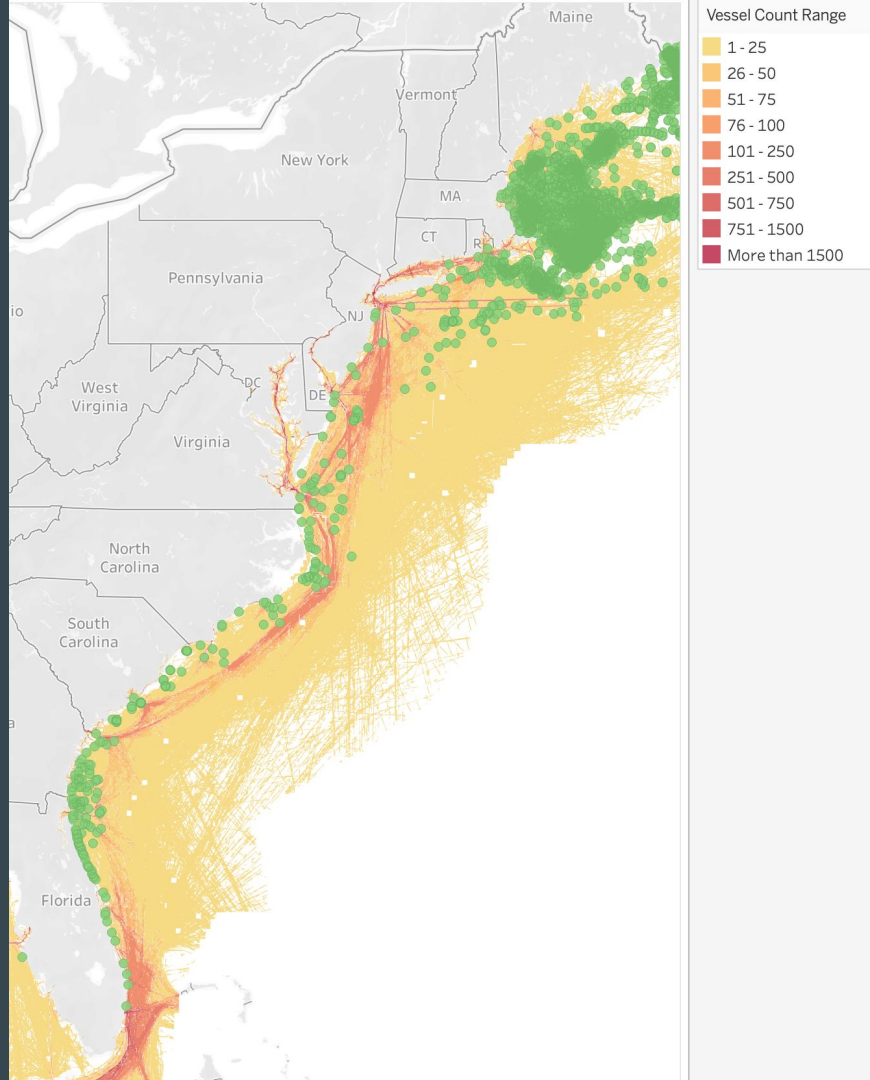


# Shipping and Whale Locations

- Right Whale historic locations in Green
- Shipping in Yellow to Red

Right Whales habitat heavily crosses with:

- Shipping traffic
- Atlantic Fishing



# Buoys Can Save the North Atlantic Right Whale

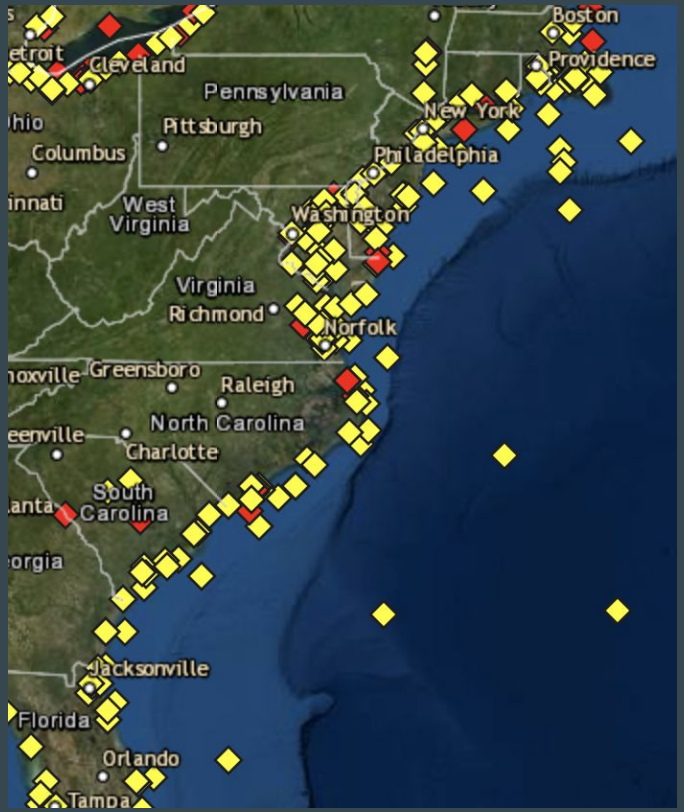
Positioned in **traffic areas** to guide ships

Near live **data transmission** capabilities

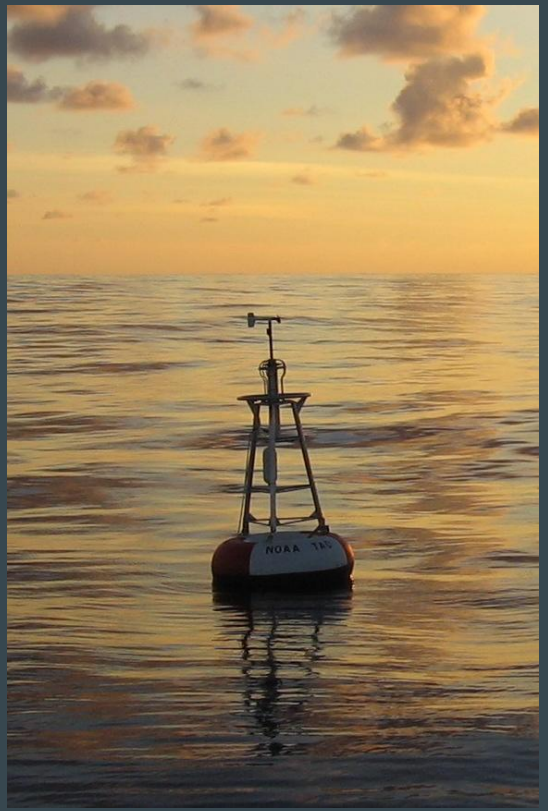
Record and process sound

**Using Buoys to locate whales can:**

- Alert ships to nearby whales
- Alert NOAA to potentially trapped whales
- Provide live data on whale locations for research



# The Data



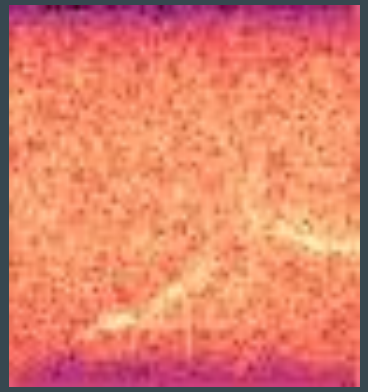
- 2 sec labeled audio clips
- Underwater recordings from bouys
- Binary label: Right whale?
- Unbalanced classes: 1:5
- Contains other whales, boats, noise.
- 30K datapoints

# Transformation and Augmentation

Spectrogram: A spectrogram is a picture of sound.

- Horizontal – Time
- Vertical – sound frequencies
- Color – loudness

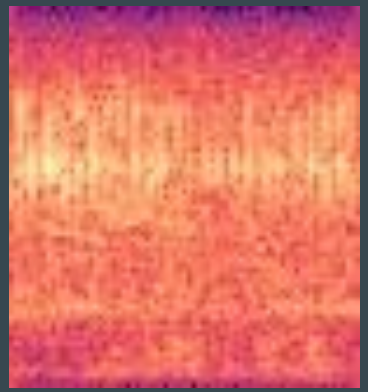
Right Whale



## Augmentation

- Transform to square
- Logscale for frequency and volume to adjust for human hearing

No Whale



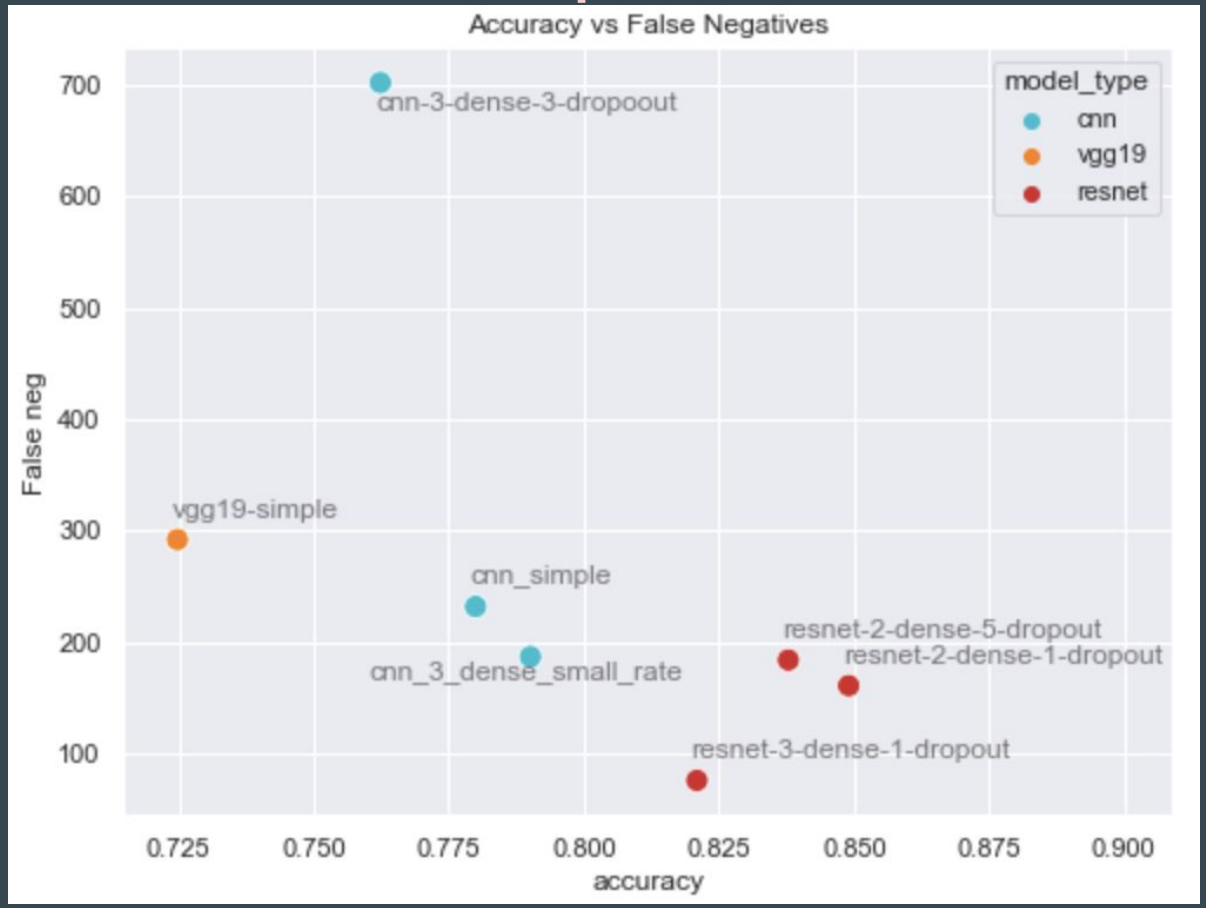
# Quick Metrics Discussion

**Goal: Protect whales by alerting ships, and rescuing from entanglements**

**Cost of FN:** Death of Whale from ship collision or entanglement - Critical

**Cost of FP**: Unnecessary ship slowing, or wasted resources to check fishing nets - Medium

# The Models Attempted




- Transfer Learning using **Resnet50**
- Transfer Learning using **VGG19**
- **CNN**

Resnet performed slightly better than CNN on Test

# Best Performance on Test

## Resnet50 Transfer

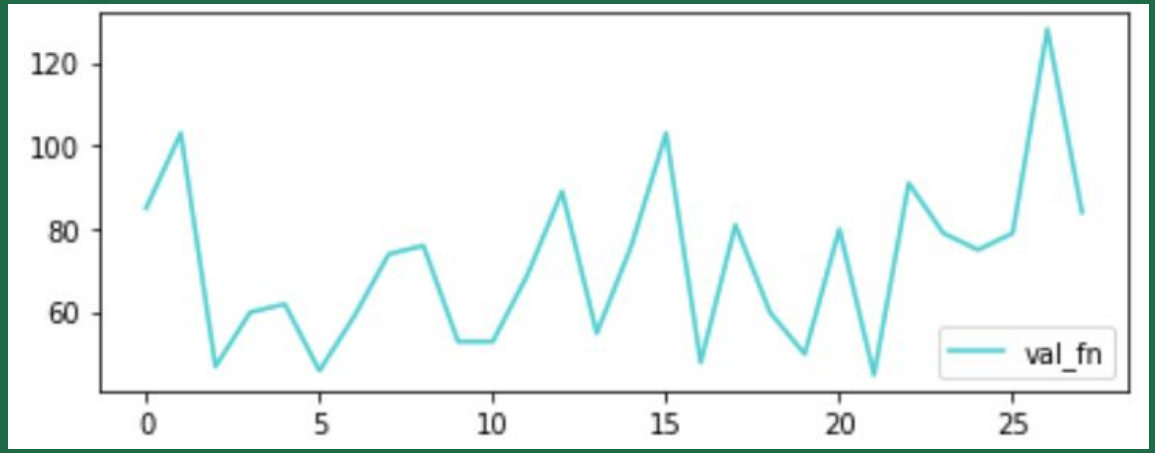
Recall: .77 - .89

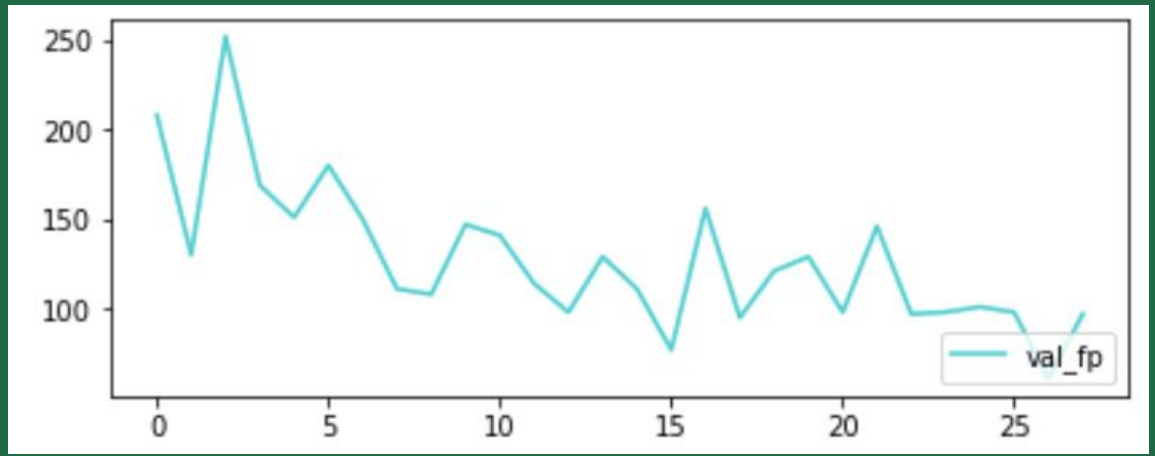
Precision: .58 - .65

AUC: .92

Accuracy: .82 - .84

# Resnet Training Details




- Resnet50 +imagenet
- 2 - 3 layers: Dense + Dropout

- Trained w/ early dropout - 28 epochs
- 100 - 1000 node layers
- .1, .3, .5 dropout
- Adam w/ .0001 rate

# Next....

- Noise Reduction in Input
- Sound Clipping
- Variety of locations and times of year
- More compute & data eng

We can act as the whales radar, and send a ship an alert based on their live environment

# Why?

- 400 whales
- 69,510 mi of coastline
- Decreased Birth Rates
- ¾ largest ports in the US

We can **locate and track** whales, **reduce** ship whale **collisions**, alert to **entanglements**

# Lets Save Some Whales!

# Whales and Food

Whales eat zooplankton

Zooplankton are affected by temps, salinity

Live into on temps and salinity available from buoys