Vessel regulations in Maui

Vessel presence and whale behavior: implementing voluntary guidelines

JENS CURRIE

Chief Scientist

research@pacificwhale.org

Contributing Authors:
Stephanie Stack and Jessica McCordic

Presented to Marine Mammal Commission May 2019

Manuscript in prep *- please do not use these data without contacting the authors first*

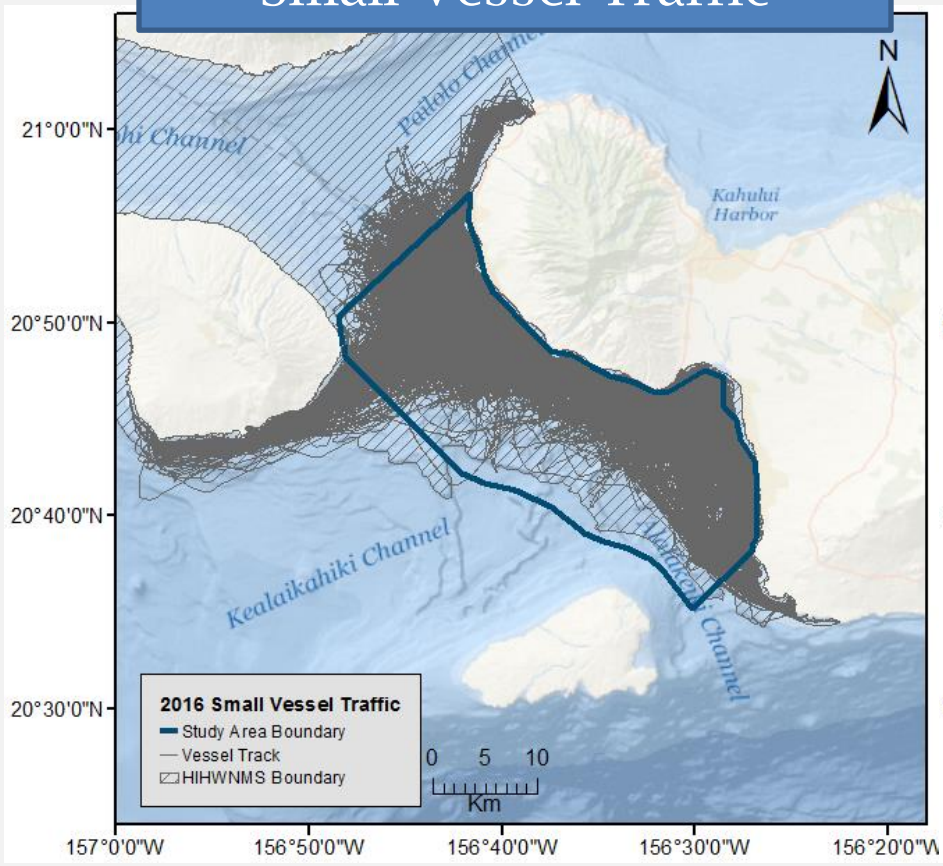
PACIFIC WHALE FOUNDATION

Whale and vessel traffic

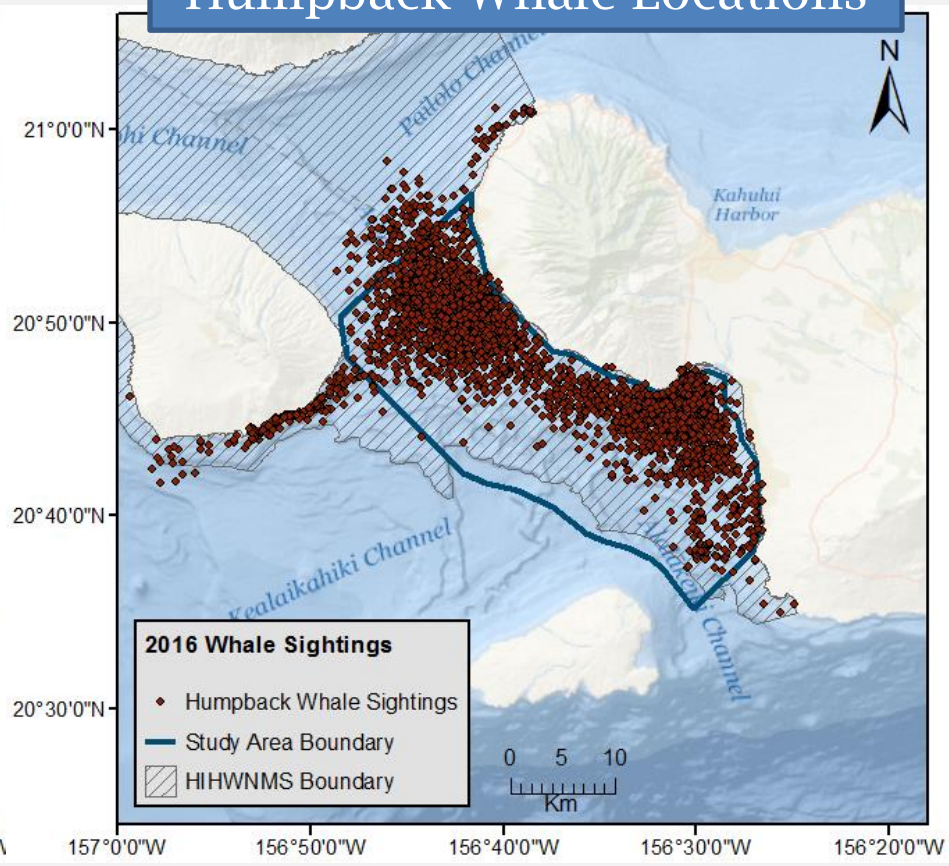
HIGH OVERLAP

There is a high potential for whale-vessel interactions in Hawai‘i.

Small Vessel Traffic



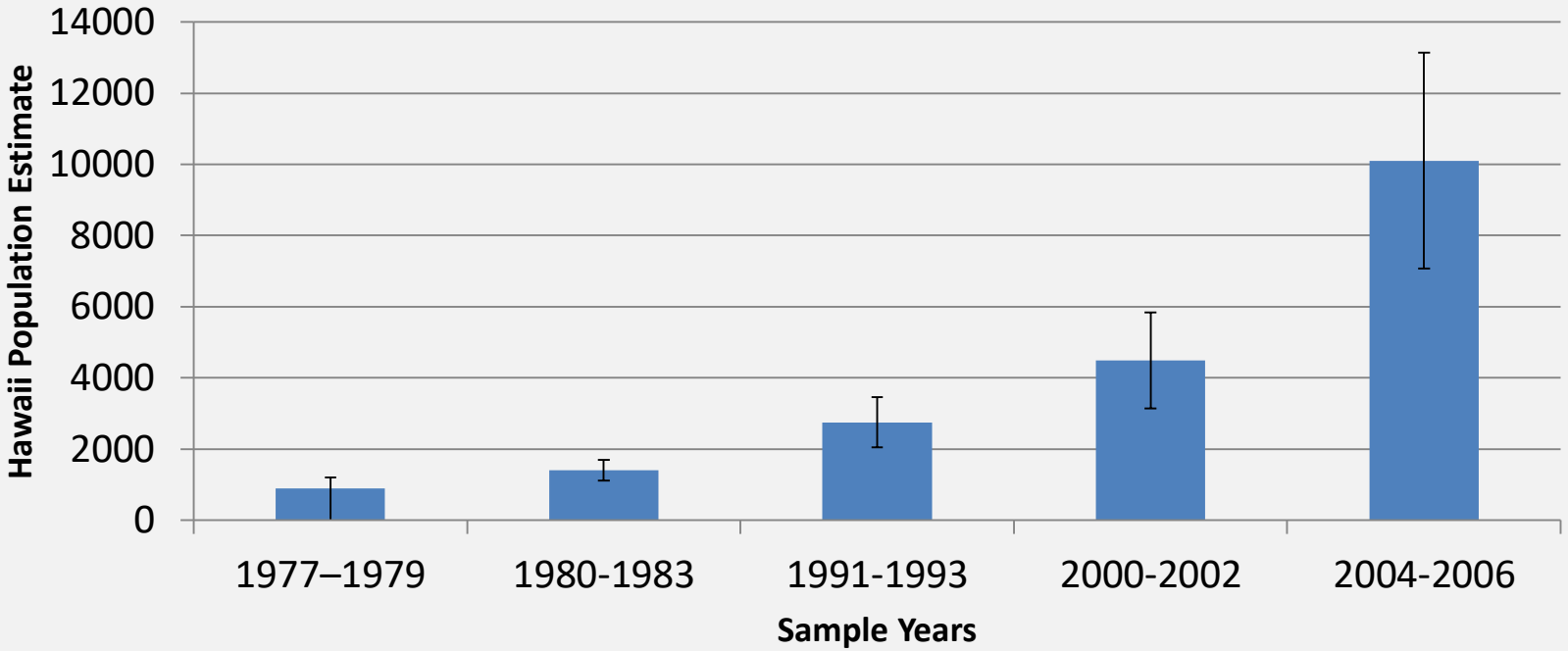
Humpback Whale Locations



Figures from Currie *et al.*, 2018

Hawai‘i DPS of humpback whales

FIVEFOLD INCREASE



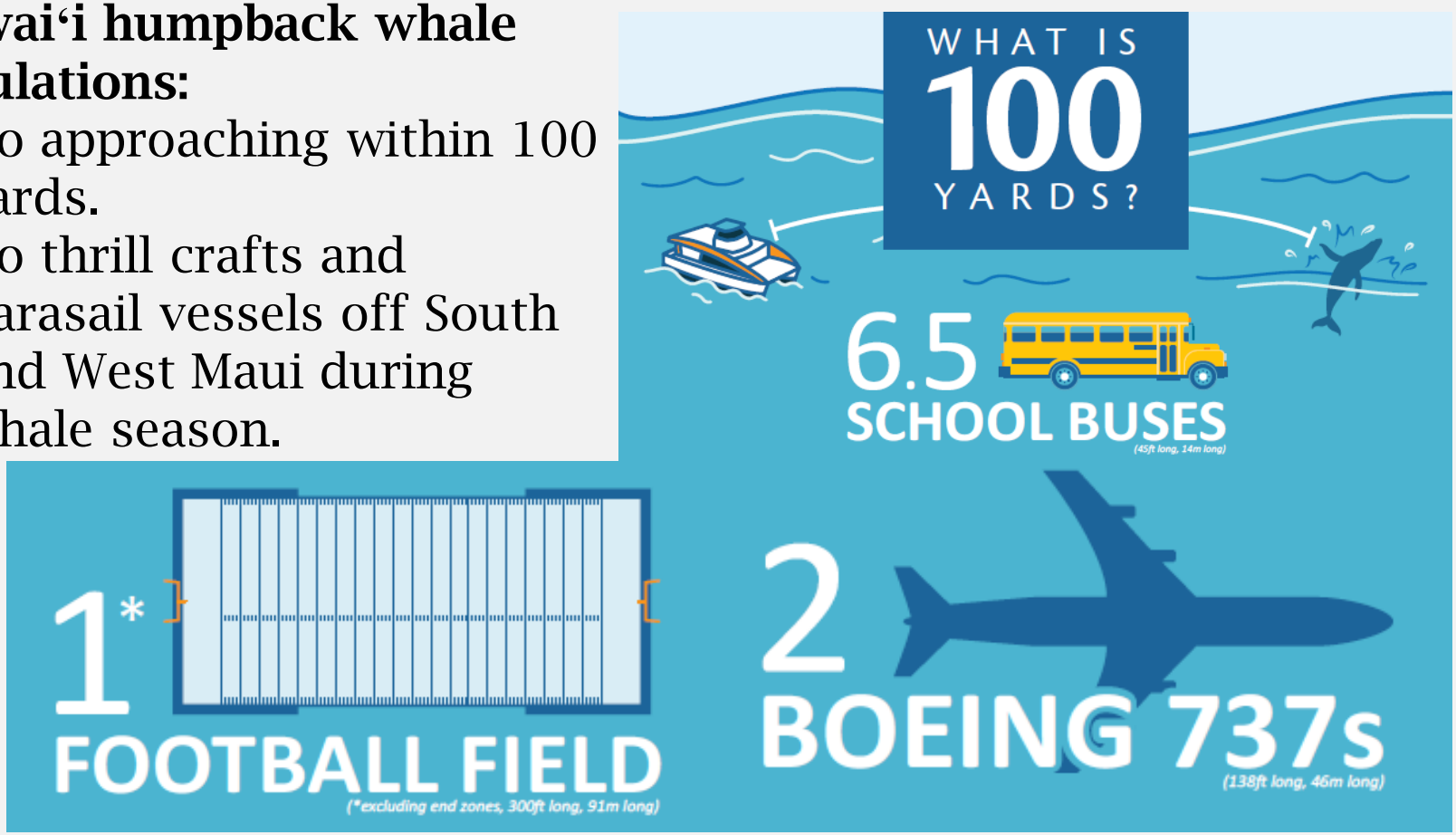
Darling *et al.* 1983; Baker and Herman 1987; Cerchio 1998; Mobley *et al.*, 2001; Urban *et al.*, 1999

Maintaining 100 yards

APPROACH LIMITS IN HAWAII

Hawai‘i humpback whale regulations:

- No approaching within 100 yards.
- No thrill crafts and parasail vessels off South and West Maui during whale season.

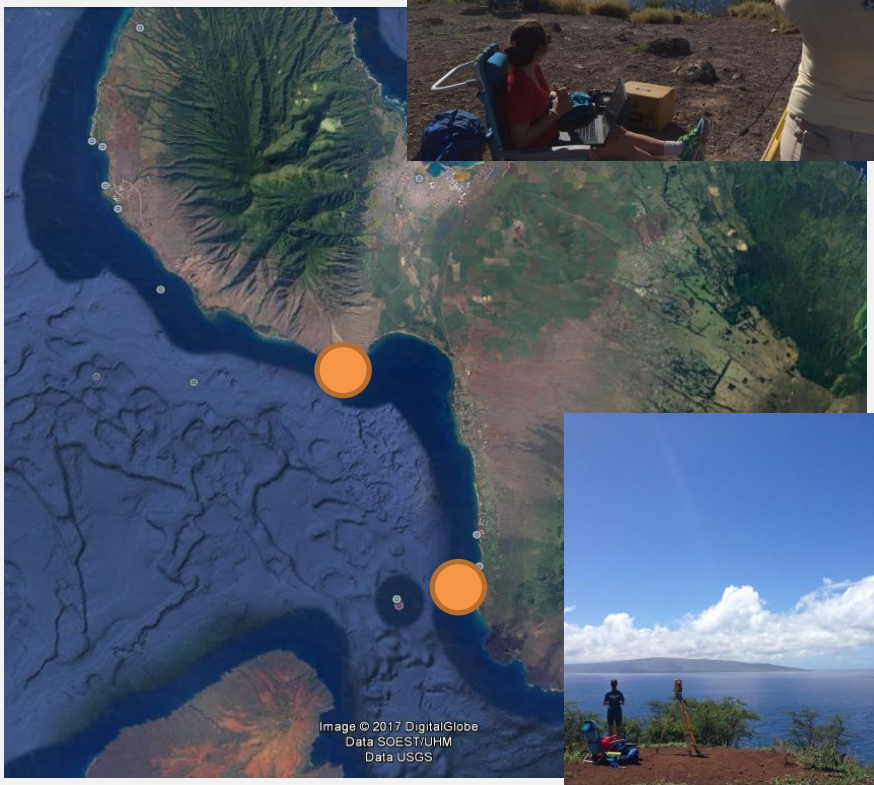


How are **whales** acting around **vessels?**

THEODOLITE RESEARCH: 2016-2018

Objective: To determine whether interactions with vessels affect whale behavior.

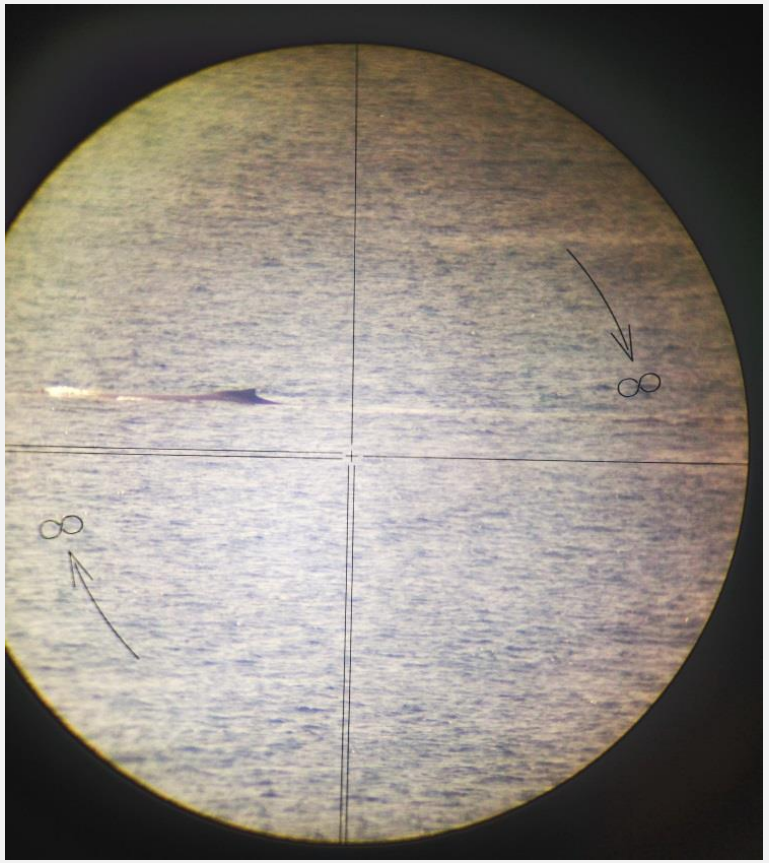
- Land-based observations remove the potential effects of a research vessel.
- Theodolite surveys conducted at two sites:
  - Papawai Point
  - Puʻu Olai



Time specific data collection

BEHAVIOR CHANGES OVER TIME

Pods were tracked for a minimum of 15 minutes and maximum of 2 hours before, during and after a vessel approached.



Recorded data on:

- Location of pod
- Number of blows and dives
- Pod number
- Date
- Vessel presence
- Vessel count
- Vessel distance to pod

Pod and vessel data collection

INFLUENCING FACTORS

Pod information:

- Composition
- Group size

Vessel information:

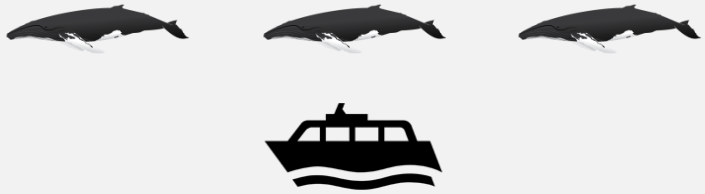
- Type (e.g. tourism vs. recreational)
- Motorized vs. non motorized

NMFS Research Permit # 16479

Defining encounter type

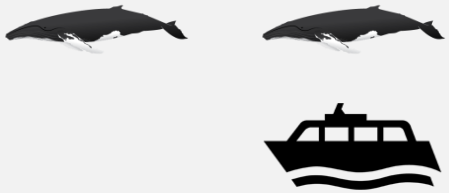
TESTING BEHAVIOR CHANGES

Before | During | After

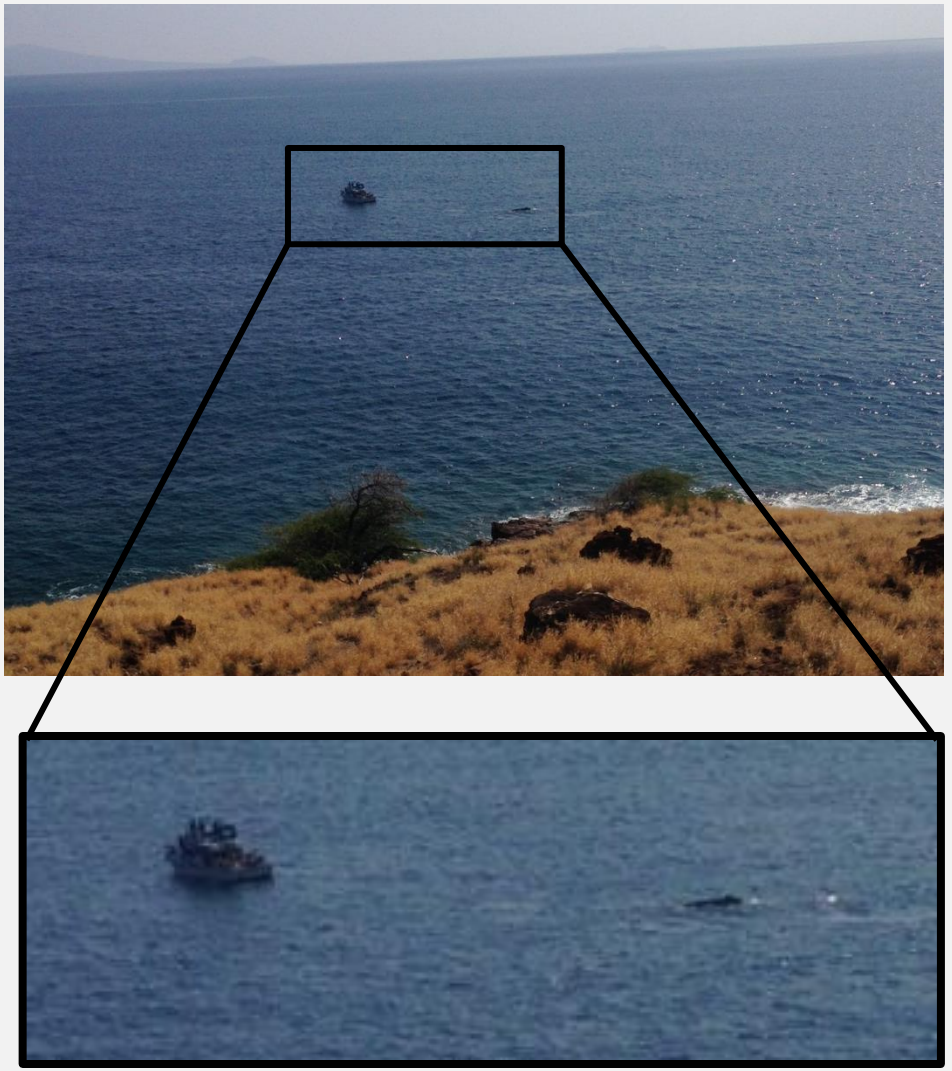


Control | Impact | Residual

Before | During



Control | Impact



Pod behaviors investigated

DO VESSELS CHANGE:

Swim speed:

- Pod swim speed in km/h.

Dive time:

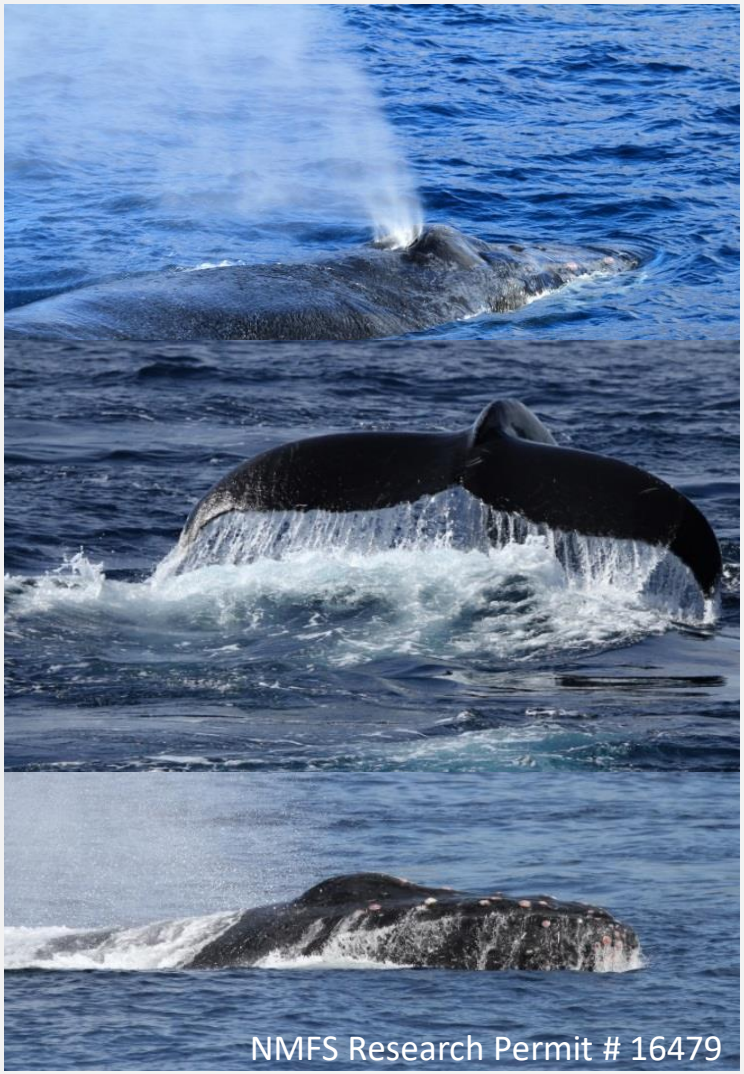
- Duration of dive in minutes.

Respiration rate:

- Number of blows/minute.

Directness index:

- Overall pod direction.
  - (0 - circular path; 100 - straight line)



Summary of **Survey Effort**

A total of 73 days were spent tracking humpback whales from 2016-2018.

We recorded data on:

- 316 pods
- 943 whales
- 472 vessel

NMFS Research Permit # 16479

Changes in swim speed

General Additive Model:

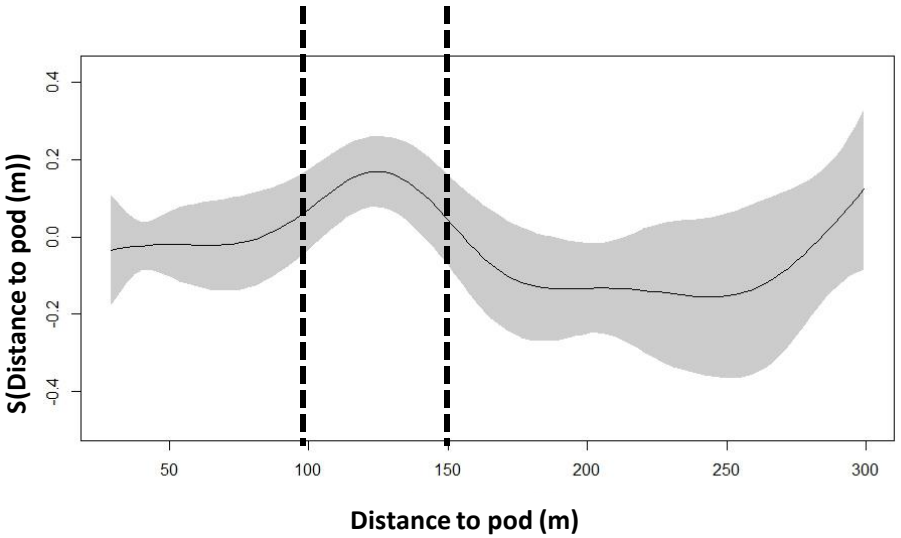
Speed ~ Pod composition + Distance to pod + *day*

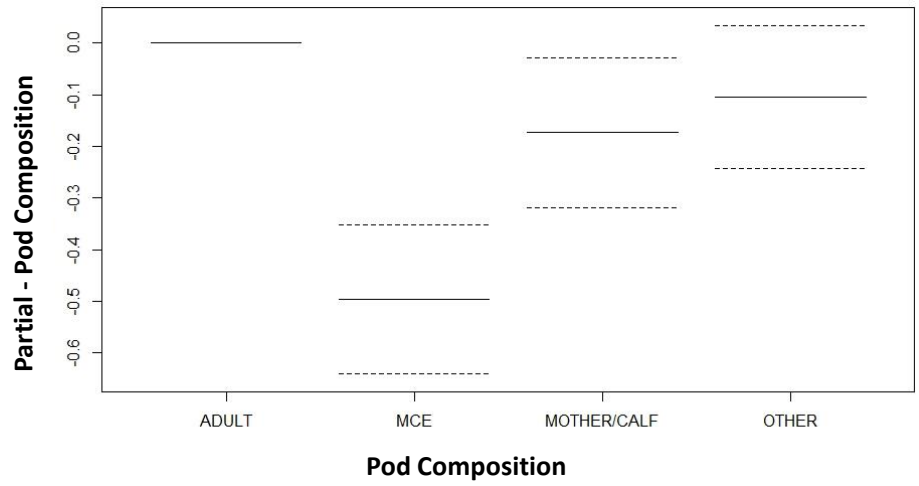
GCV = 3.63; Deviance explained = 14.1%

Swim speed was:

- Fastest when a vessel was 100-150 meters from a pod.
  (edf = 6.143,rdf = 7.231,p-value < 0.01)

- Slower for pods with calves.
  (MCE: t-value = -6.868, p-value < 0.001)
  (MC: t-value = -2.384, p-value < 0.05)





Changes in respiration rate

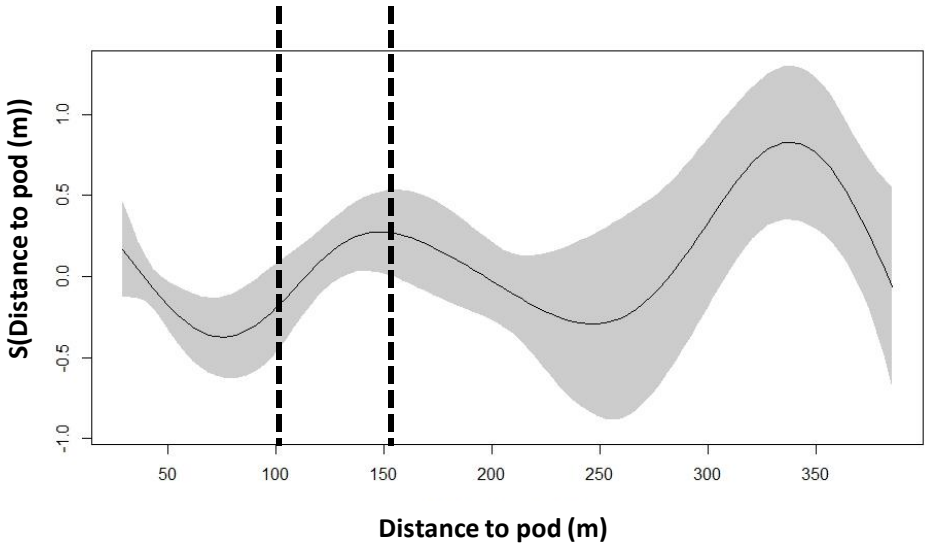
General Additive Model:

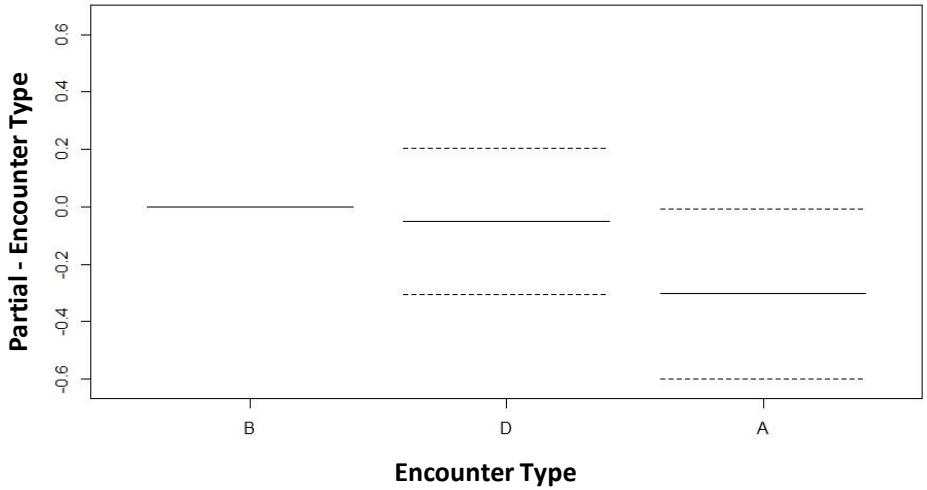
Blows ~ Encounter type + Pod composition + Distance to pod + *day*

GCV = 2.36; Deviance explained = 27.8%

The number of blows per minute:

- Changed with distance to vessel
  (edf = 7.482,rdf = 8.413,p-value < 0.001)
- Decreased after an encounter with a vessel
  (t-value = -2.039, p-value < 0.05)





Changes in travel direction

General Additive Model:

Directness ~ Encounter type + Distance to pod + *day*

GCV = 407.57; Deviance explained = 37.4%

The straightest line of travel occurred:

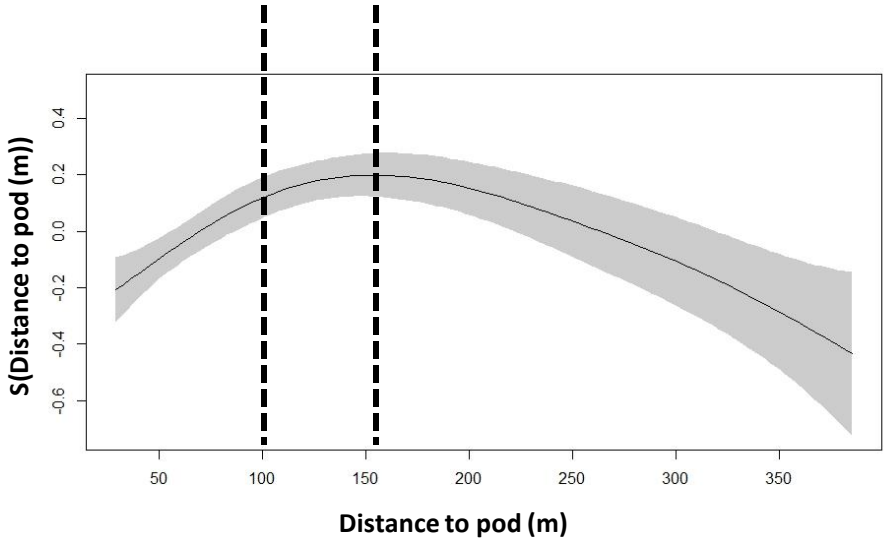
- When a vessel was 100-150 meters from a pod

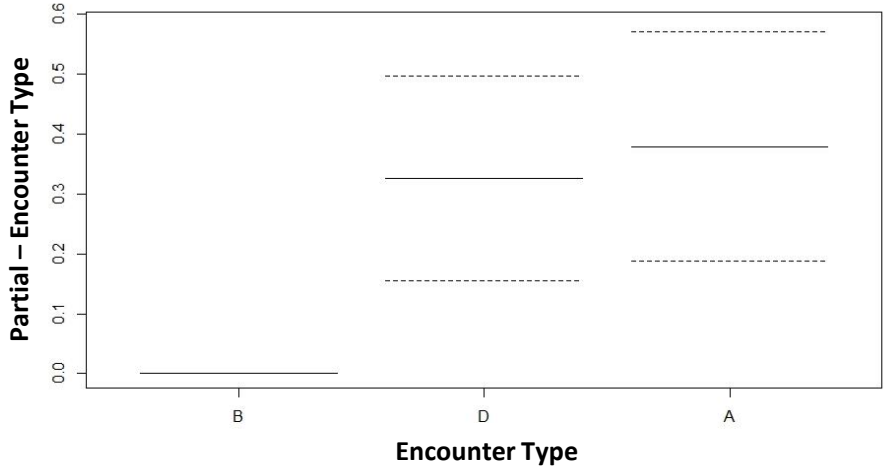
  (edf = 2.946,rdf = 3.591,p-value < 0.0001)

- During and after an encounter

  (During: t-value = 3.800, p-value < 0.0001)

  (After: t-value = 3.963, p-value < 0.0001)





Changes in dive time

General Additive Model:

Dive time ~ Encounter type + Pod composition + *Pod*

GCV = 24.17; Deviance explained = 29.0%

The shortest dive times occurred:

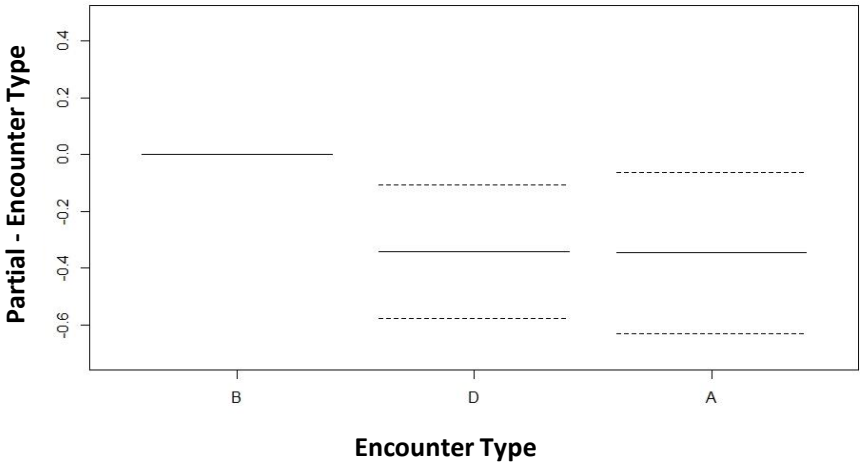
For mother-calf-escort pairs

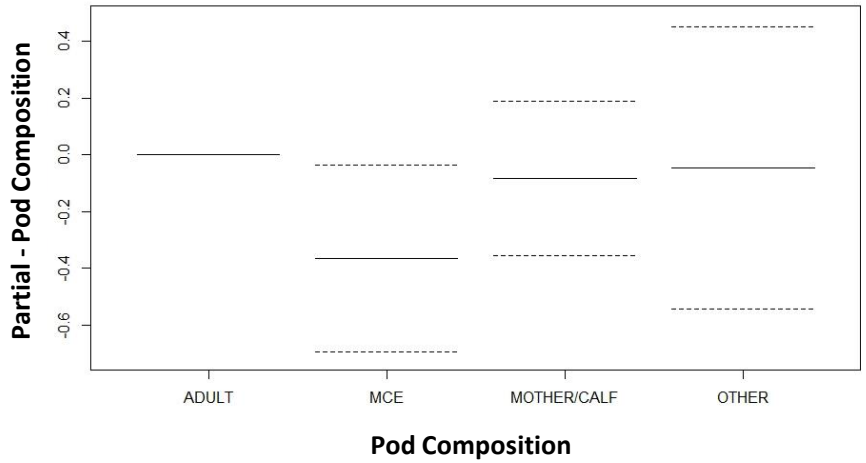
(t-value = -2.213, p-value < 0.05)

During and after an encounter

(During: t-value = -2.908, p-value < 0.01)

(After: t-value = -2.436, p-value < 0.05)





Biological importance

IMPLICATIONS FOR SPECIES

When a vessel is at or approaching the 100 yards limit, humpback whales display a **horizontal avoidance strategy**:

Similar to previous reports investigating humpback whale responses to vessels.

In some cases, whales change behavior to approach vessels.

Recommendations

BUILD ON CURRENT REGULATIONS

Observed Trends:
There is a potential energetic cost from short-term responses.

Difficult to quantify population-level effects but they are thought to be minimal.

Possible Solutions:
Further guidance on methods of approach and how and where to maintain 100 yards.
Implement a voluntary code of conduct.

Recommendations

FOLLOW ADDITIONAL GUIDELINES

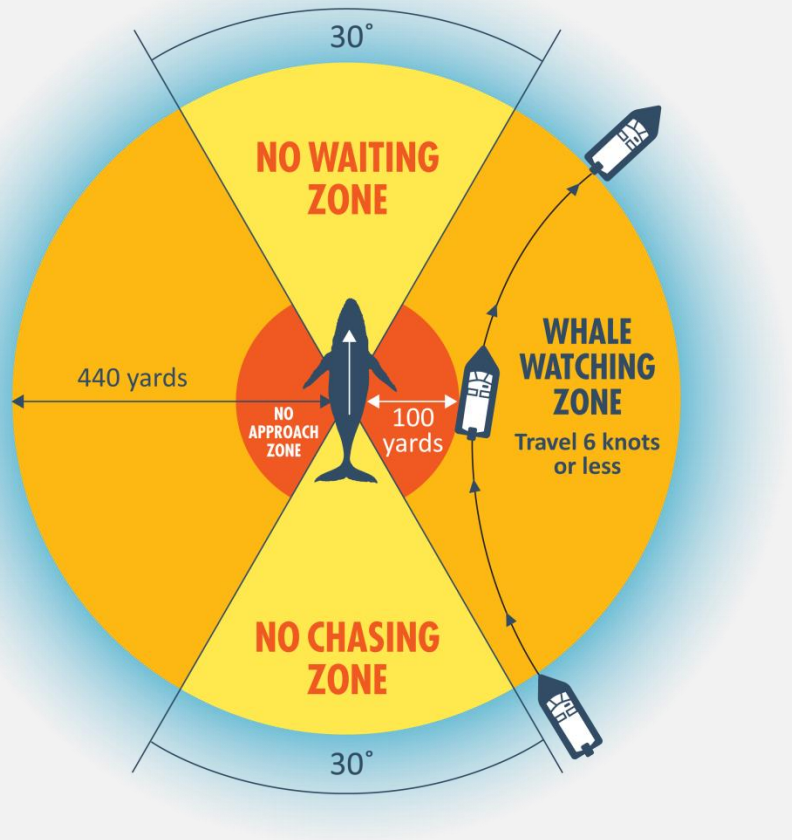
Currently **7 vessels** in Hawaii follow Be Whale Aware Guidelines

SLOW DOWN, WHALES AROUND

- Speed increases the risk of a collision.
- Reduce vessel speed to 15 knots or less November-December and April-May.
- Reduce vessel speed to 12.5 knots or less during the peak season of January-March.
- Reduce vessel speed to 6 knots or less when within 440 yards of whales.

WATCHING WHALES

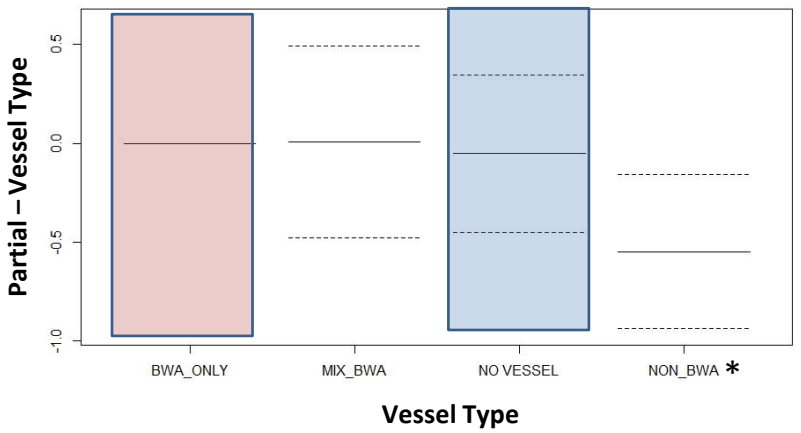
- Limit your viewing with whale groups containing calves to 30 minutes.
- No more than 3 vessels of any size or type should stop to watch a whale group.



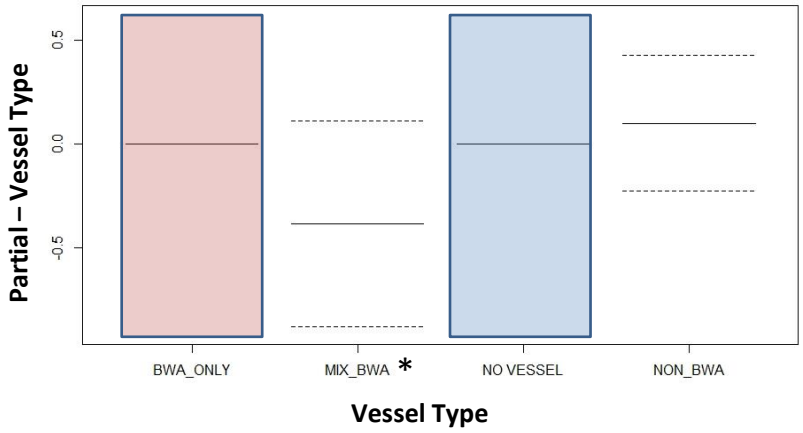
Impacts of **Be Whale Aware**

MINIMIZING BEHAVIOR CHANGE

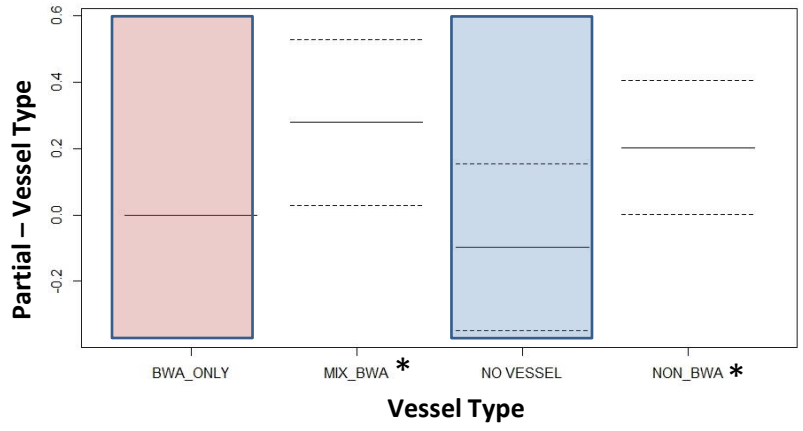
Dive Time



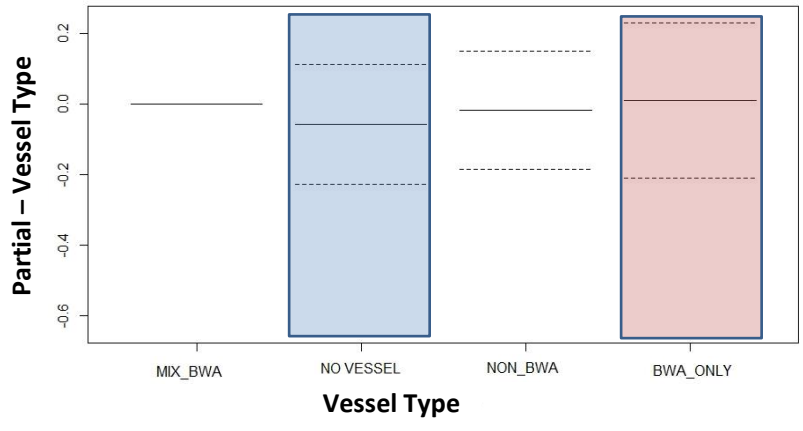
Blows Per Minute



Travel Direction



Speed



Thankyou for listening

QUESTIONS?

Acknowledgements

PacWhale Eco-Adventures for supporting this research

Members of Pacific Whale Foundation for funding this research

Pacific Whale Foundation Staff/Interns/Volunteers

Marine Mammal Commission

PACIFIC WHALE FOUNDATION