

Can You Hear Me Now? Sounds & Underwater Behaviors of Hawaiian Humpback Whale (*Megaptera novaeangliae*) Calves



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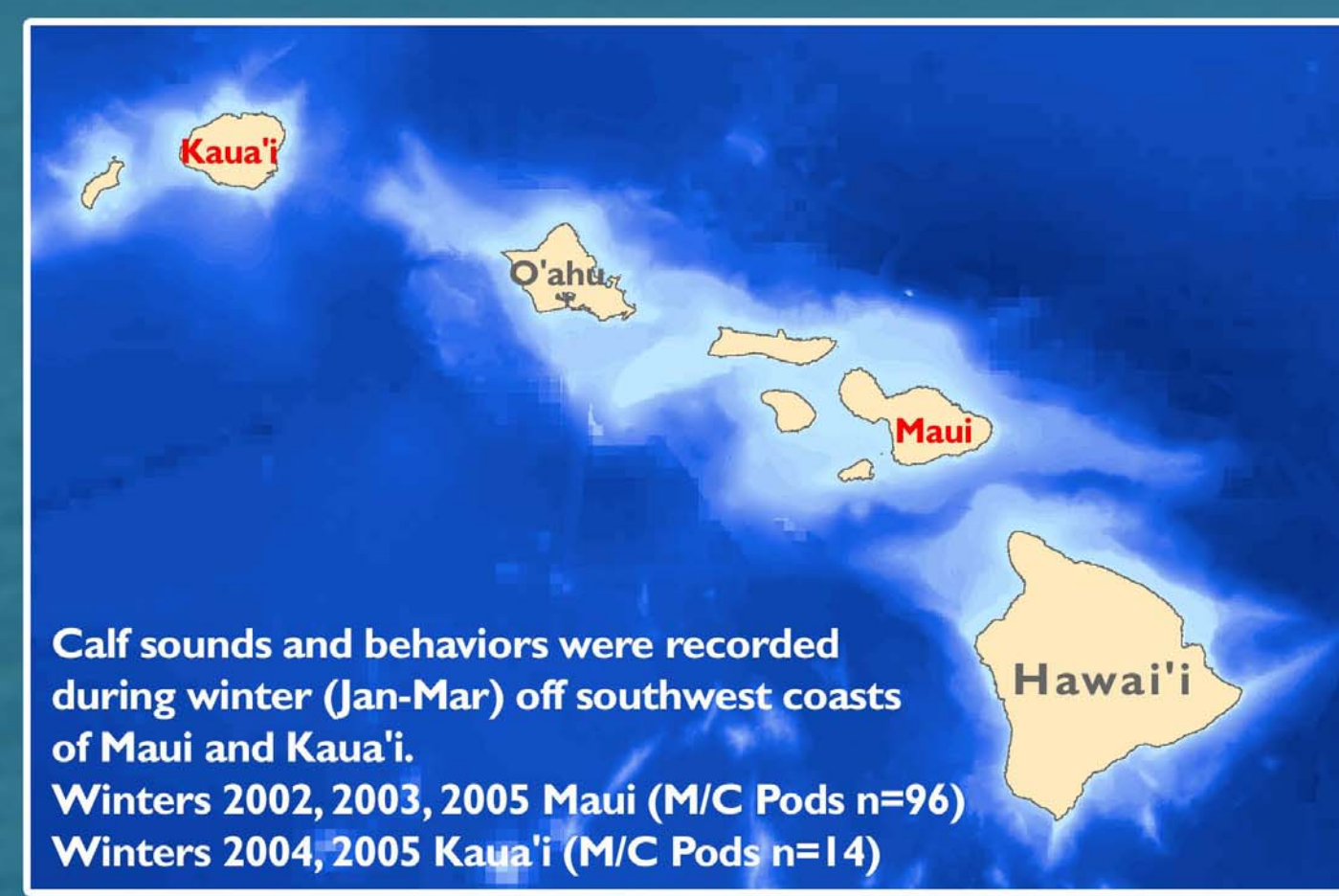
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Introduction

- Little published information exists on mother/calf behaviors underwater.
- Literature suggests mother/calf pairs do not vocalize on breeding grounds (see references below).

Purpose

- Document underwater behaviors of groups consisting of a mother/calf pair.
- Examine circumstances when vocalizations do occur.



Study Location & Period

Methods

- Data were opportunistically collected by 1-2 divers with underwater video and hydrophone.
- 110 mother/calf groups sampled; 560 minutes of video recorded.
- Video analyzed based on 15-30 second scan samples.
- Mother/calf behaviors coded and divided by at depth, at surface, and diver interactions.
- Distance between whales, behavioral state of group, and group composition noted when possible.

Underwater Mother/Calf Behaviors

What do mothers/calves do underwater?

- What activities were observed most?



Calves mostly rested & sometimes "milled-played" as shown here & below.

Activities observed:

- Calves mostly rest, followed by travel then mill/play.
- Mothers mostly rest or travel. **NO PLAY OBSERVED.**

At surface and at depth:

- Calves spent 57% of observed time < 5m below/near water surface.
- Mothers spent 63% of observed time > 10m below water surface.

Calf behaviors:

- Calf "curiosity" towards diver greatest when mom resting or not visible to diver.

Behavior Definitions:

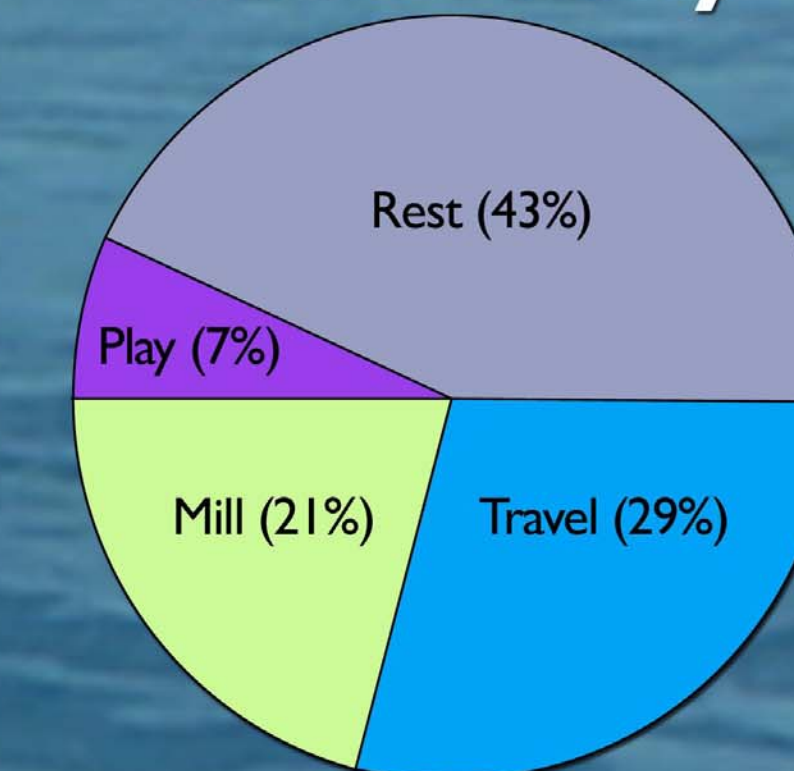
Rest: animal ≥ 30 ft. deep, no major movements except to surface to breathe

Mill: animal moving slowly at or close to the surface but not in any linear direction

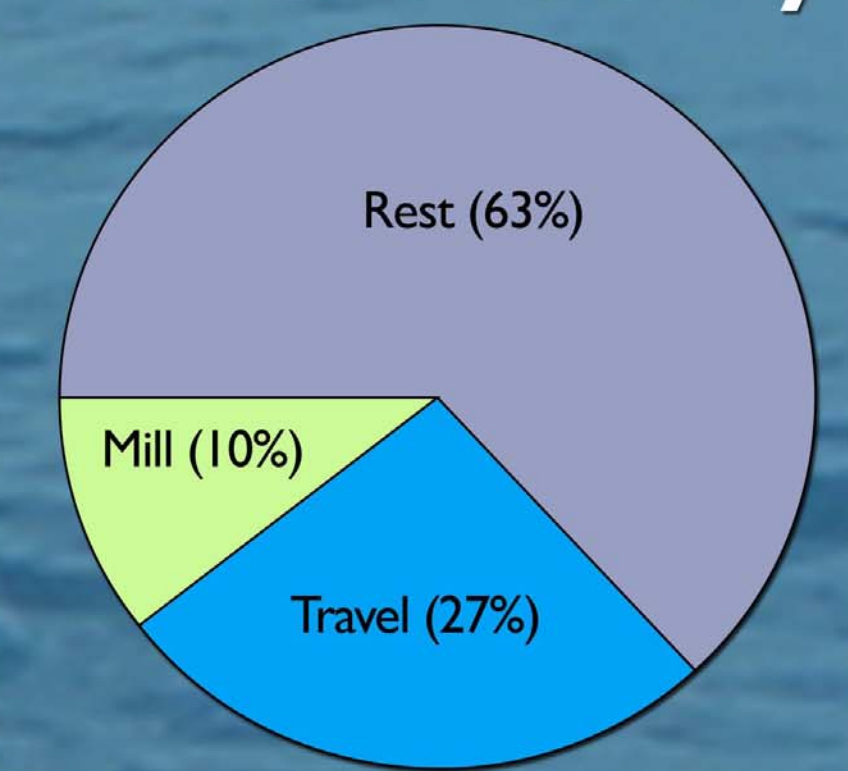
Travel: animals moving cohesively, mainly in 1 direction steadily

Play: animal rolling, arching, or twisting for minimum 1 min.; ≤ 30 ft. deep, seemingly without concern for diver

Calf Activity



Mother Activity



Percentage Time by Behavioral State

M/C n=110; Data limited to groups observed > 1 minute

Characteristics of Vocalizations

When were sounds heard from mother/calf groups?



Calf approaching and looking at diver; "curious".

Social sounds from calf were recorded in 25% (n = 28) of 110 calf groups.

All sound events (n=28) appeared to come from isolated calves. Sounds were determined to be from a calf based on the following consistent, repeated suite of factors:

- Calf near (<5m), often looking at diver
- Mother resting > 10m away
- No other whales other than mom nearby (within line of sight) or at surface
- Spectrographic qualities of calf grunt similar across years

Calf vocalized significantly more when > 10 m from mother ($\chi^2=16.6, p=0.0025$).

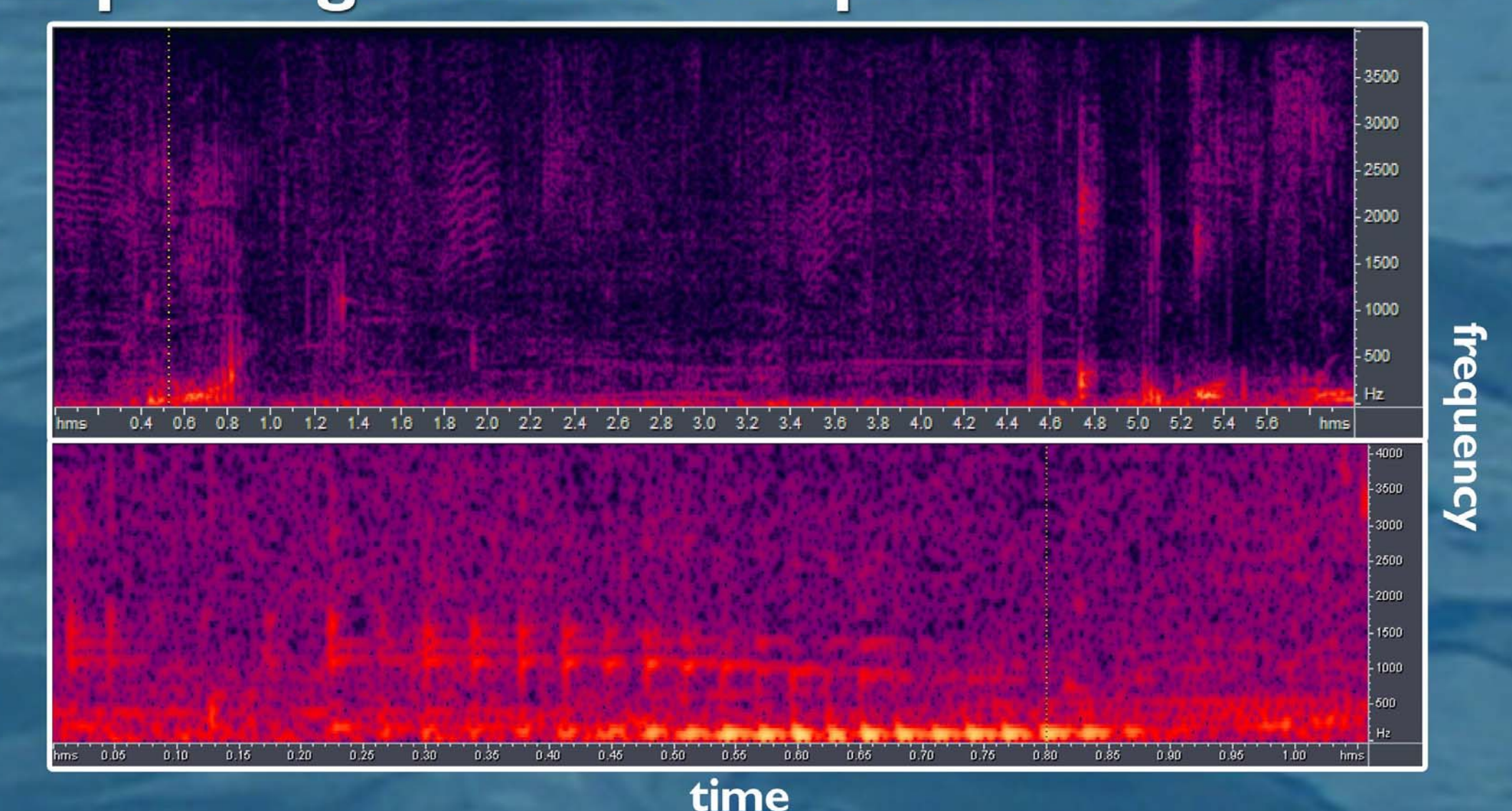
- Only 10% of calves vocalized when < 10m from mother
- Calves "grunt", "burp", "squeak" & "croak"

Sounds never recorded from mothers

Calves vocalized significantly more often when near (<5m) vs. far (>5m) from a diver ($\chi^2=49.0, p=0.002$)

Twice, repeated calf "croaks" & bubble exhalations resulted in mother rapidly surfacing and moving towards calf. This suggests possible alarm function for some calf calls.

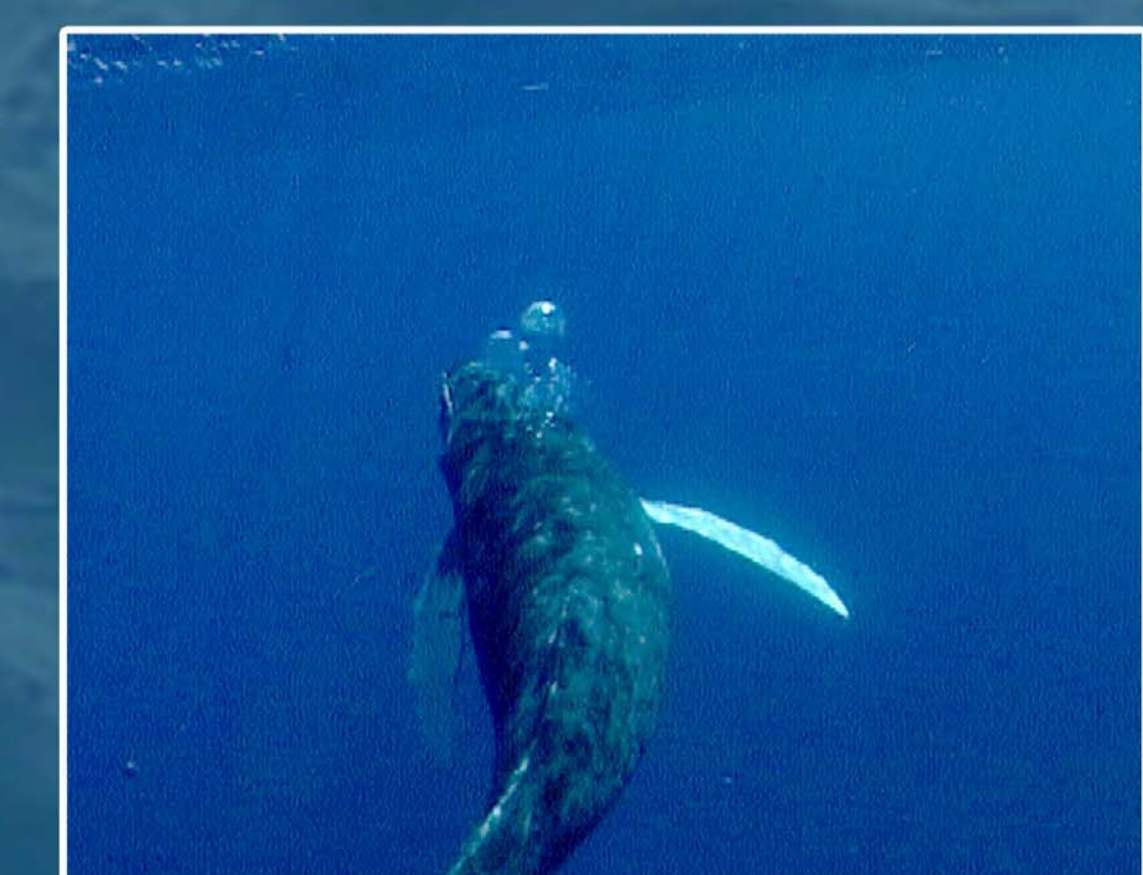
Spectrogram of a Humpback Calf Grunt



(48 kHz sample rate; 512 FFT; Blackmann-Harris Window; 80% window)

Influence on Calf Sounds

Were calf sounds influenced by proximity to diver?



Calf blowing bubbles

Will Curiosity Kill the Calf?

Management Implications:

Calves appear curious about their environment & spend > 1/2 of their time just below water surface where they're not visible from boats.

- Thus, calves are especially vulnerable to watercraft collisions & injury (see photo).

Maui calves appear more "curious" & more tolerant of divers & boats than Kauai calves (because Maui has more vessel traffic and clearer water?)

- Maui mother/calves may be more habituated to anthropogenic activities.

Our Results Suggest that Calves, Particular off Maui, are More at Risk to Injury or Mortality from Watercraft than Adults.

Recommend review of current management practices and existing watercraft regulations to enhance protections for this endangered species.



Calf photographed in March 2005 off Maui with fresh (most likely fatal) injuries clearly a result of a propeller collision.

Future Research Goals

- Quantify & describe calf sounds
- Refine acoustic localization methods
- Examine behavioral context of calf sounds and other social sounds
- Assess differences between calf behaviors in Maui and Kauai

Potential Biases and Caveats

- Observations treated independently
- May be observer effect on behaviors (animals may or may not be responding to diver)
- Can only video pods that allow approaches

Summary

- We know humpback calves make sounds based on numerous, consistent, repeated measures across years (2002-2005)
- These are among the first recordings of social sounds in calves. As equipment is refined, it may be possible to pick up more or different social sounds from calves (other calf sounds may be masked or attenuated)
- Underwater data collection yields new insights on animal behavior and activity budget
- Calves spend more time just below or just at surface than previously known
- Calves may be interested in novel objects?

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