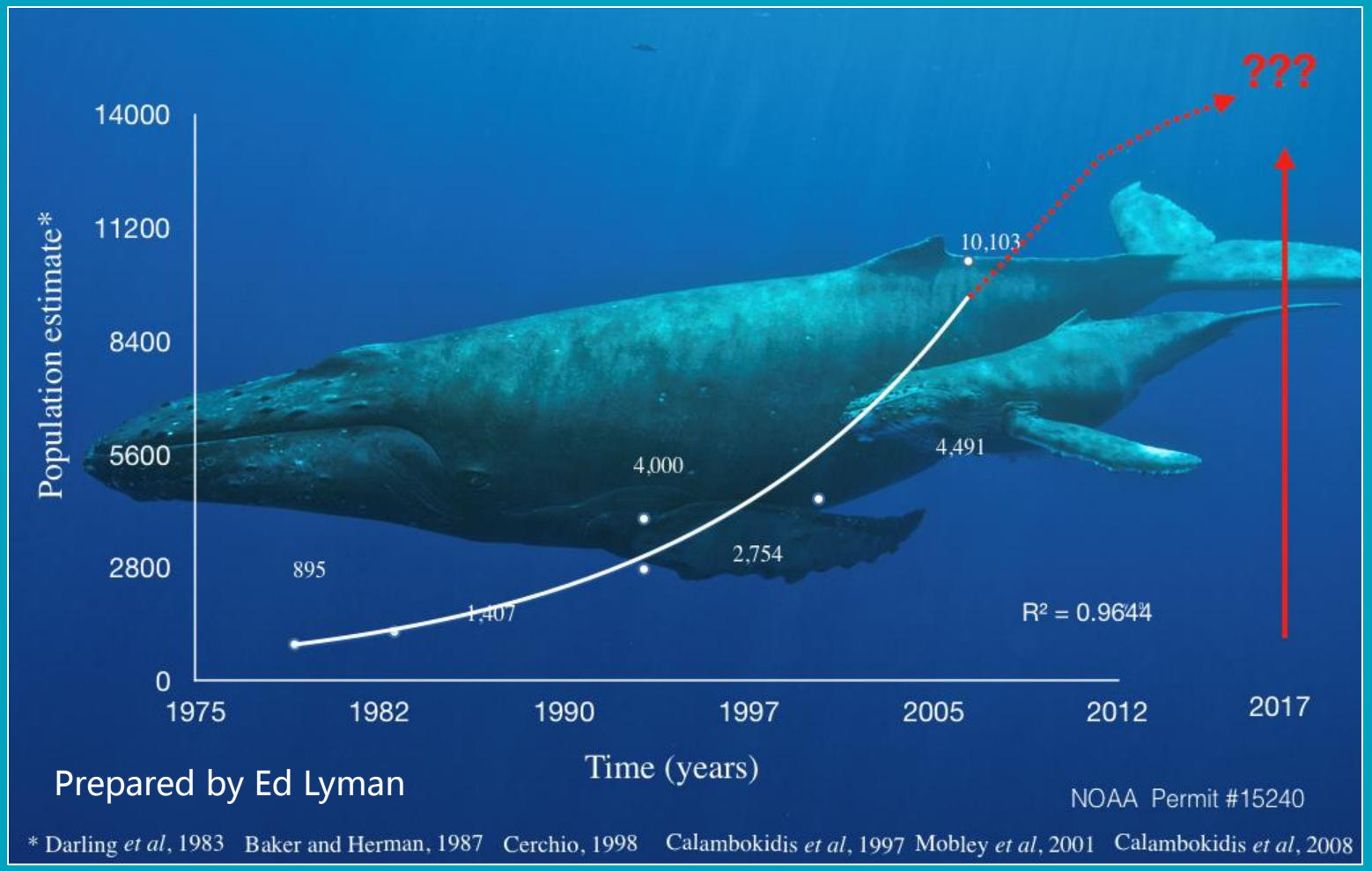
Assessing recent trends in Hawaii's humpback whale population

Marc Lammers

NOAA Fisheries permit #782-1719

Historical trends in the number of whales wintering in Hawaii



The 2015/16 whale season

- February 2015: 1,488 whales

HIHWNMS/UH/OSI acoustic monitoring

Average RMS SPL (dB re 1uPa)

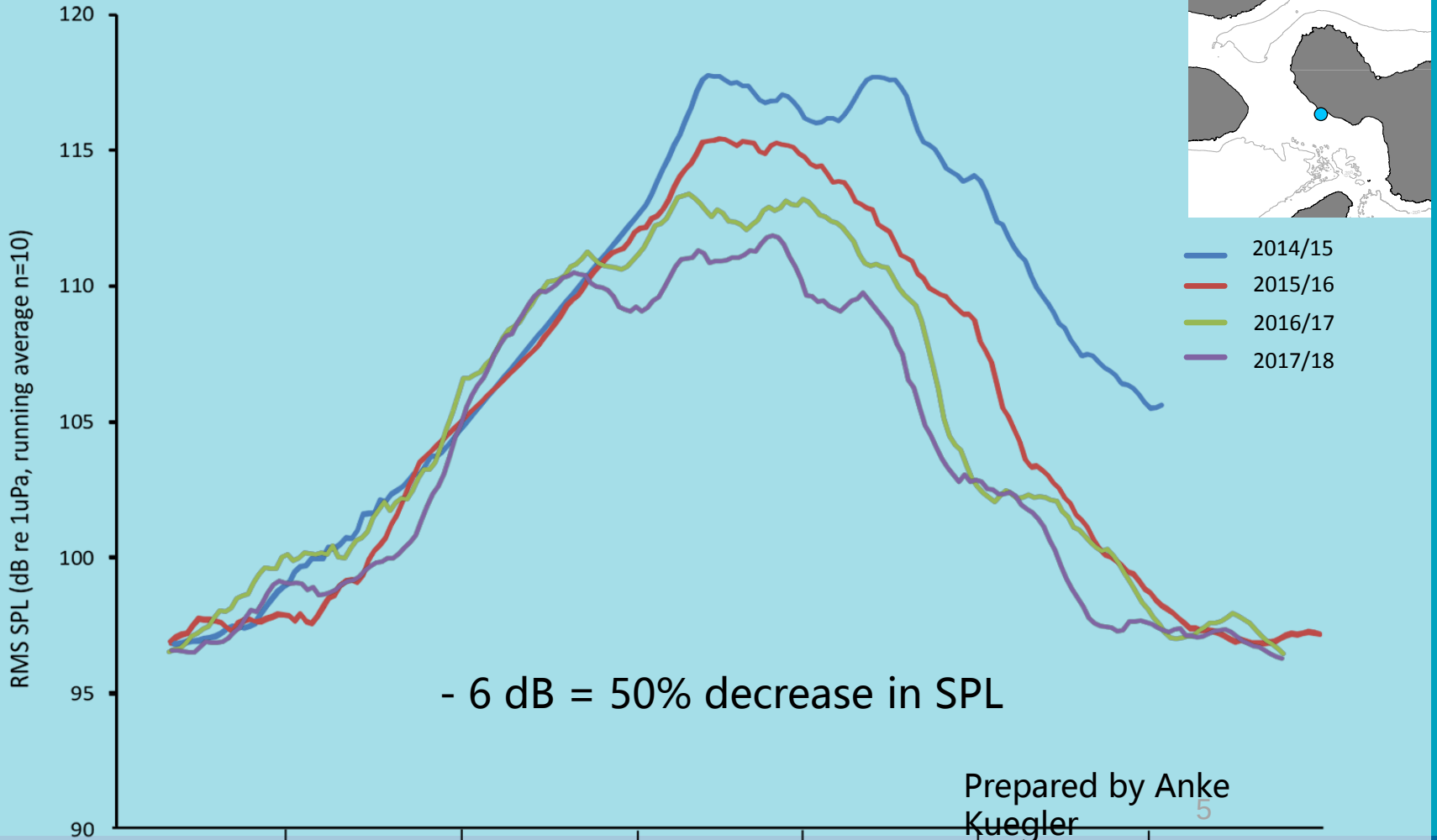
120
115
110
105
100
95
90

November | December | January | February | March | April | May

2014/15
2015/16

Prepared by Anke Kuegler

HIHWNMS/UH/OSI acoustic monitoring



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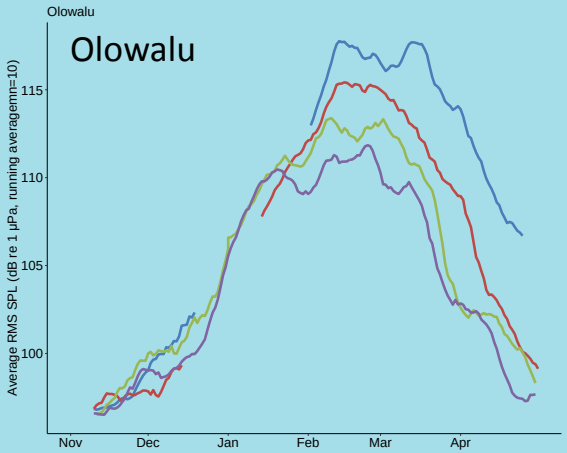
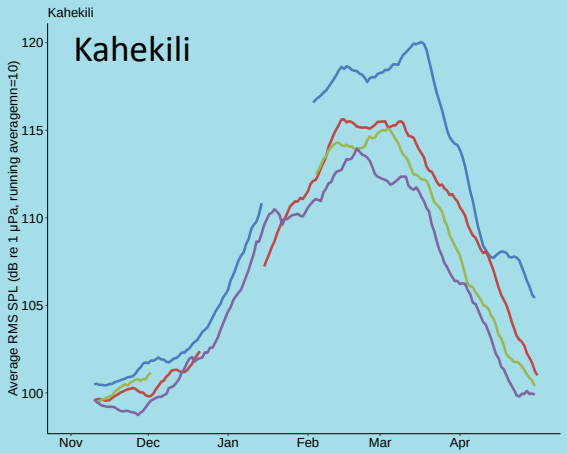
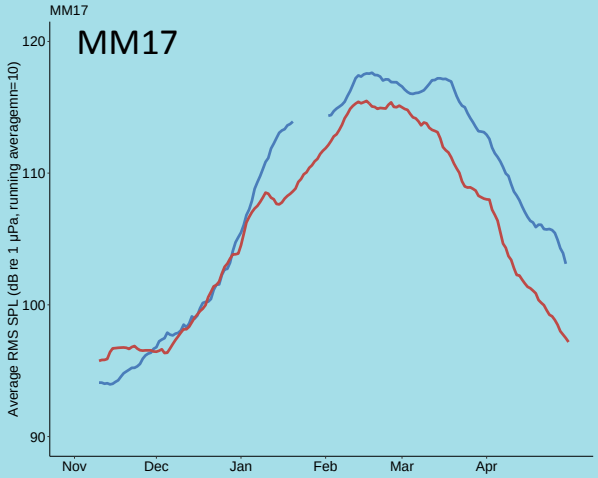
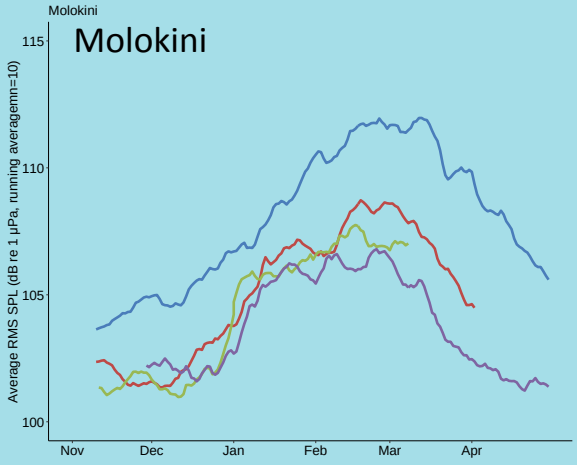
HIHWNMS/UH/OSI acoustic monitoring





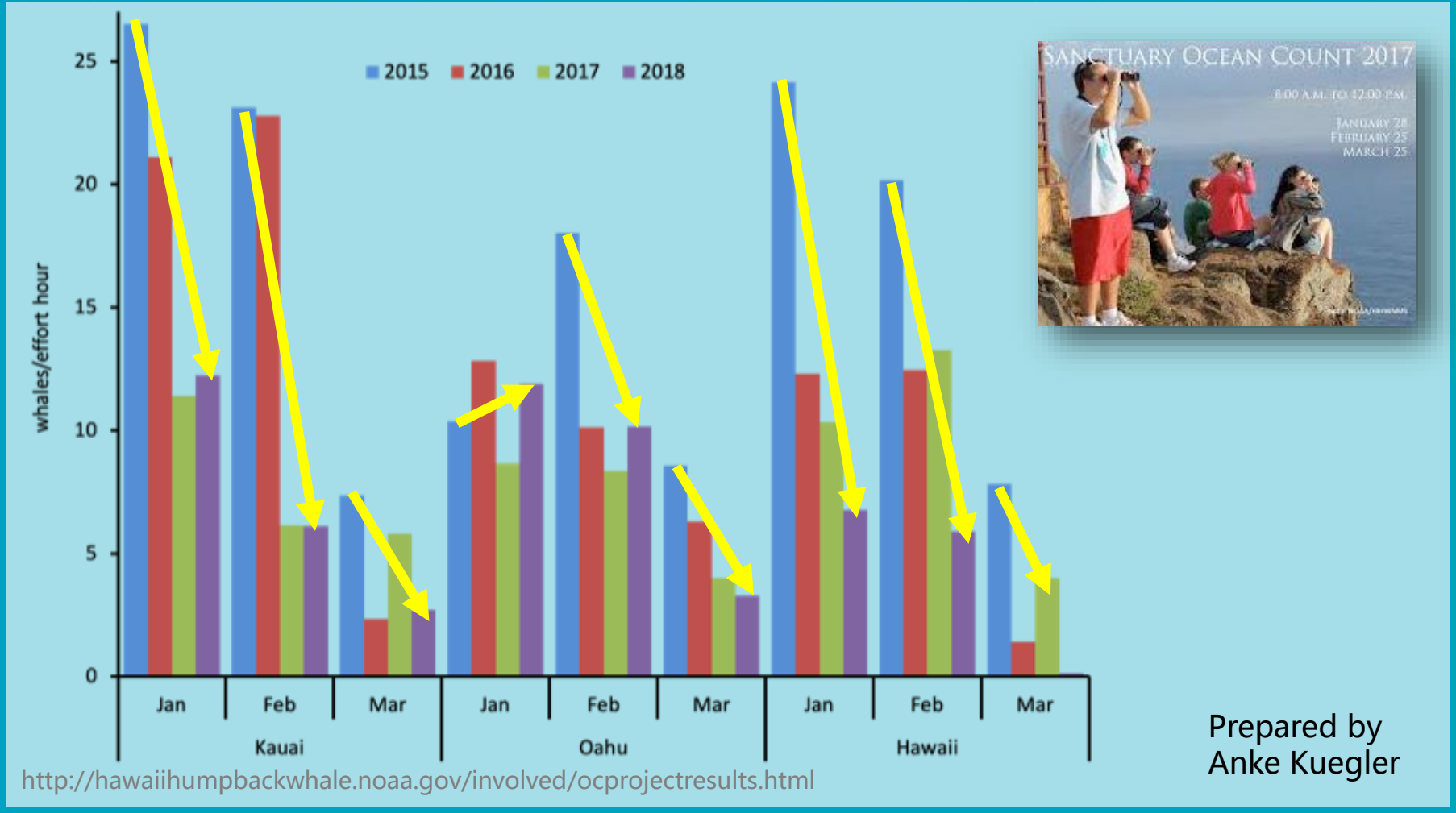




2014/15
2015/16
2016/17
2017/18

Prepared by
Anke Kuegler

Sanctuary Ocean Count



http://hawaiihumpbackwhale.noaa.gov/involved/ocprojectresults.html

Prepared by
Anke Kuegler

A path forward…

Expert workshop on recent trends in humpback whale occurrence

- Organized and hosted by NOAA's HIHWNMS & PIRO
- Held in Honolulu November 27-28, 2018
- Included >30 researchers and resource managers from Hawaii and Alaska representing 17 institutions & agencies

Workshop on humpback whale trends objectives

Workshop objectives:

- Present data on reported changes in humpback whale sighting rates over the past 3-4 years
- Consider potential explanations for the observed trends
- Identify knowledge gaps and establish research priorities for filling those gaps
- Evaluate strategies and establish a consensus on a way forward

Workshop on humpback whale trends meeting agenda

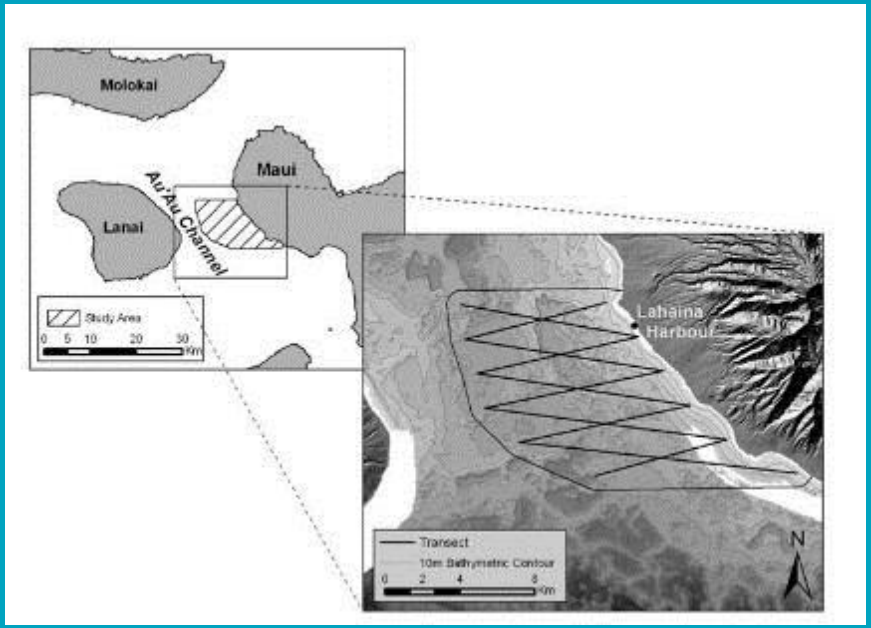
AGENDA: DAY 1 - November 27th	
Time	**Agenda item**
9:00am HST	*Welcome and Background* • Welcome participants, introductions, present the purpose of the meeting and review agenda – Marc Lammers • Provide background – Ed Lyman/Susan Pultz
9:15am HST	*Presentations from Hawaii Researchers* • 15 min each - 10 min presentation and 5 min for *clarifying* Q&A ○ Rachel Cartwright – Keiki Kohala ○ Adam Frankel - HMMC ○ Jens/Stephanie Currie - PWF ○ Anke Kuegler - University of Hawaii ○ Ed Lyman - HIHWNMS
	10:30 HST – Break (15 minutes)
10:45am HST	*Presentations from Hawaii/Alaska Researchers* ○ Erin Oleson/Ann Allen - PIFSC ○ Lars Bejder – HIMB ○ Bruce Mate/Dan Pelacios – OSU ○ Chris Gabrielle – NPS ○ Jan Straley – UAS
12:00pm HST - Lunch (1 hour)	
1:00pm HST	*Guided discussion / Brainstorming session on potential hypotheses to explain observed trends* • List all viable hypotheses to explain observed trends • Which are supported by the available data? • Which are unsupported by the available data? • Which need additional data to be resolved? • Are observed trends a concern?
	2:45 HST – Break (15 minutes)
3:00pm HST	*Guided discussion / Brainstorming session to identify knowledge gaps and prioritize research needs* • Where do knowledge gaps currently exist? • Which knowledge gaps are of highest priority to be resolved? • What types of research efforts are needed to address these gaps? • Rank potential research efforts based on need, logistics, costs, etc.
5:00pm HST	*Day 1 Wrap-up and Adjourn*

AGENDA: DAY 2 – November 28th	
:00am HST	*Welcome* • Welcome participants, review agenda.
:05am HST	*Recap* • Overview of the knowledge gaps and research needs identified on Day 1 • Group to discuss any overnight reflections or edits
:30pm HST	*Guided discussion / Brainstorming session on strategies to meet identified research needs* • Should research efforts be coordinated? If so, how? • Identify potential collaborations and/or synergistic efforts • Are there data sharing opportunities?
	10:45 HST – Break (15 minutes)
1:00am HST	*Guided discussion / Brainstorming session on ways to move forward* • Where will funds come from to implement research priorities? • Should a follow-on meeting take place on this topic?
12:30pm HST - Lunch (1 hour)	
1:30pm HST	*Summary/Wrap-up* • Revisit any outstanding discussion topic(s) • Review the major conclusions from the meeting • Review responsibilities for meeting report
3:00pm HST	*Day 2 Adjourn meeting*

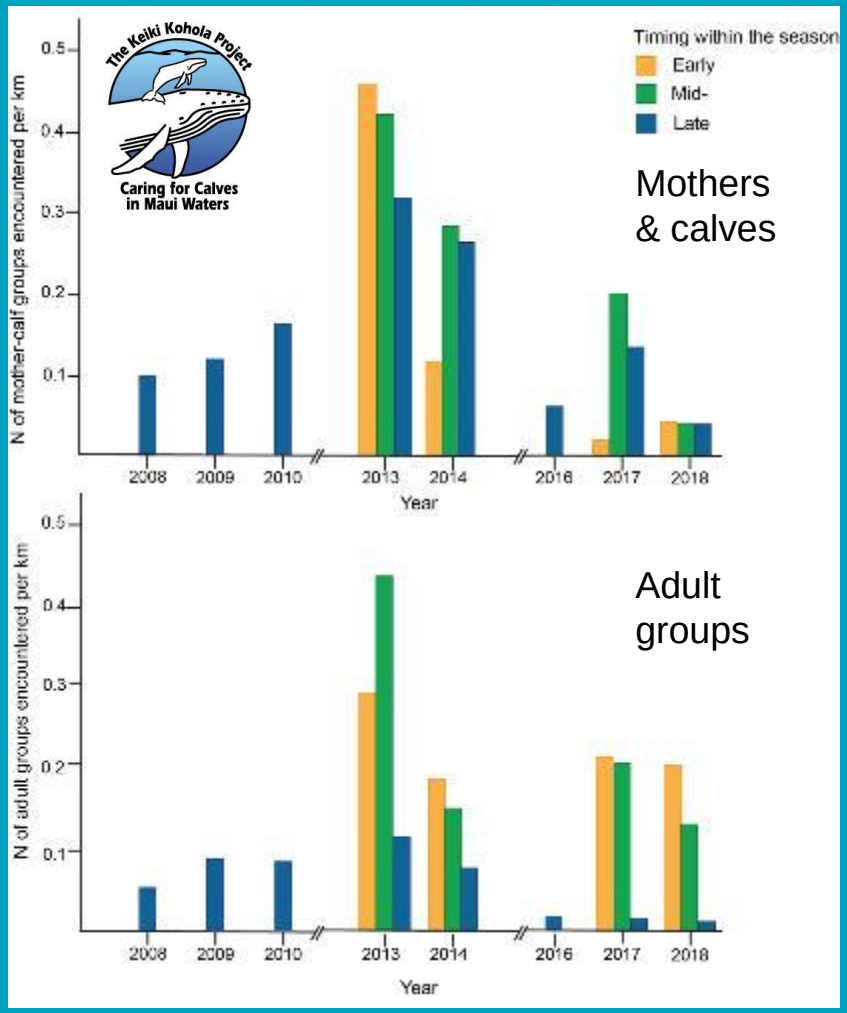
Presentations

Brainstorming discussions

Keiki Kohola Project data

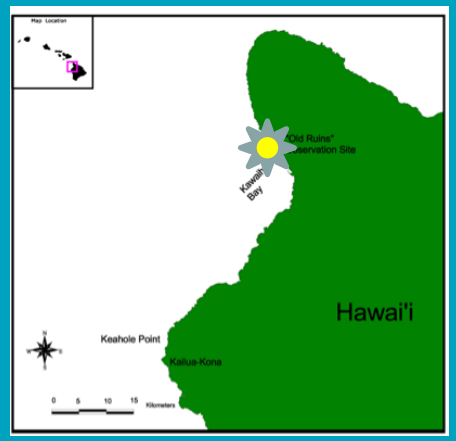


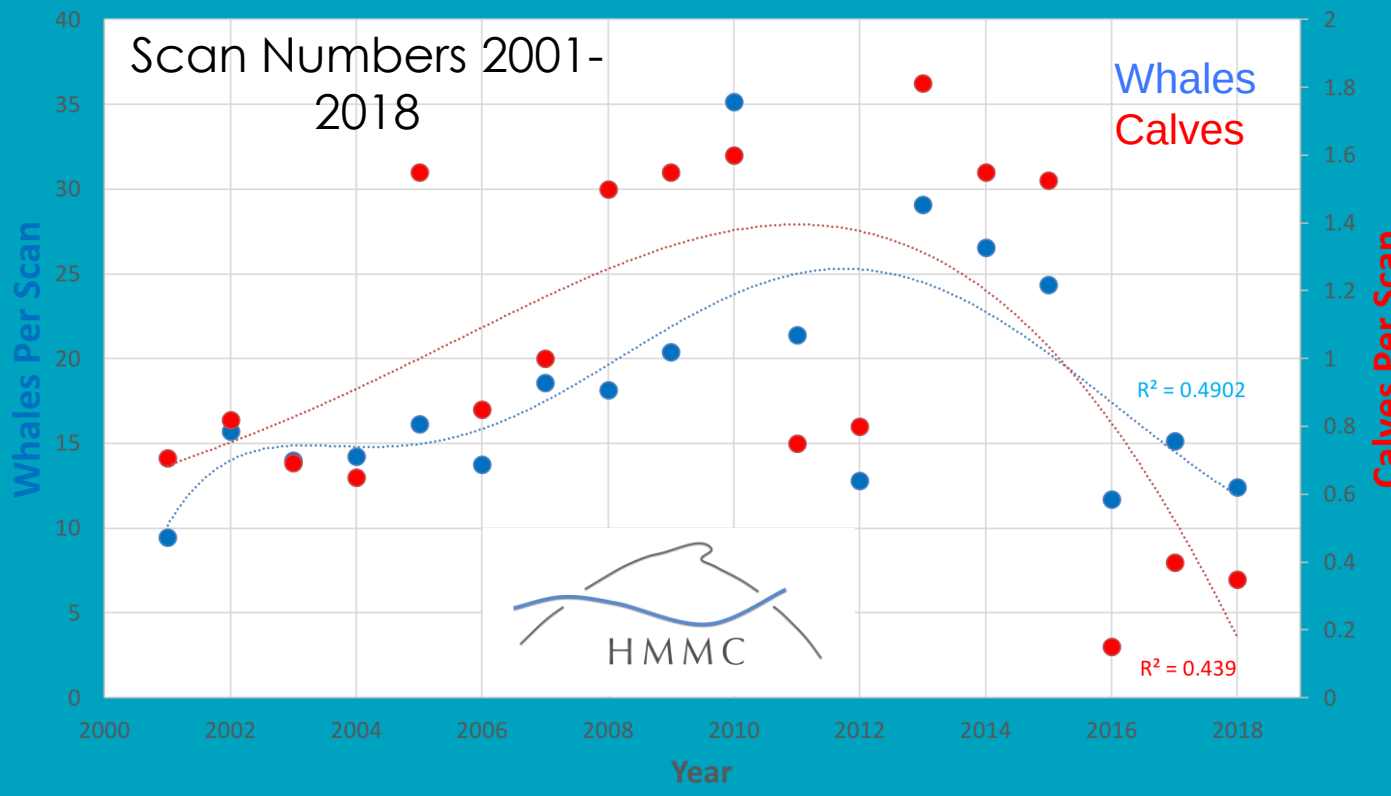
Courtesy of Rachel Cartwright



Cartwright, R., A. Venema , V. Hernandez, C. Wyels, J. Cesere, D. Cesere. 2019. Fluctuating reproductive rates in Hawaii's humpback whales, *Megaptera novaeangliae*, reflect recent climate anomalies in the North Pacific. Royal Society Open Science; 6: 181463.

Hawaii Marine Mammal Consortium data





Courtesy of Adam Frankel

Alaska Researchers

Chris Gabrielle – SEAK

Jan Straley/John Moran – PWS

Workshop on humpback whale trends meeting outcomes

Workshop conclusions:

- Whale counts from SEAK and Prince William Sound, HI island, and Maui all show strong decreases in sighting rates over the last 4-5 years. This affects both adults and calves
- Trends in other parts of the Pacific are still unclear
- Changes in prey abundance/distribution are suspected to be playing a role
- Unknowns that need to be resolved:
  - Are decreases in whale numbers reflecting changes in habitat use or a decline in the population?
  - Does this reflect a broader trend across the central N. Pacific population?
  - Are these changes linked to declines in other species and/or oceanographic changes?

Workshop on humpback whale trends meeting outcomes

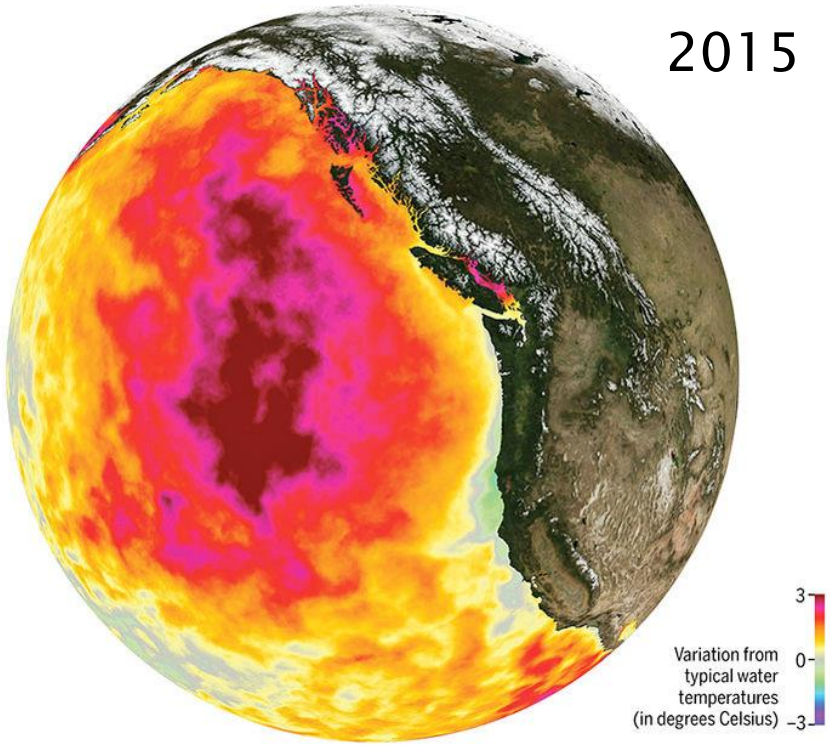
SHARE

A fin whale found on an Alaskan beach in 2015 might have been among the victims of The Blob. BREE WITTEVEEN

Ocean heat waves like the Pacific's deadly 'Blob' could become the new normal

By Warren Cornwall | Jan. 31, 2019 , 8:00 AM

Google: "sciencemag blob"



Gentemann, C., *et al. Geophysical Research Letters* 44.1, 312, (2017)

Workshop on humpback whale trends meeting outcomes

Identified top research priorities:

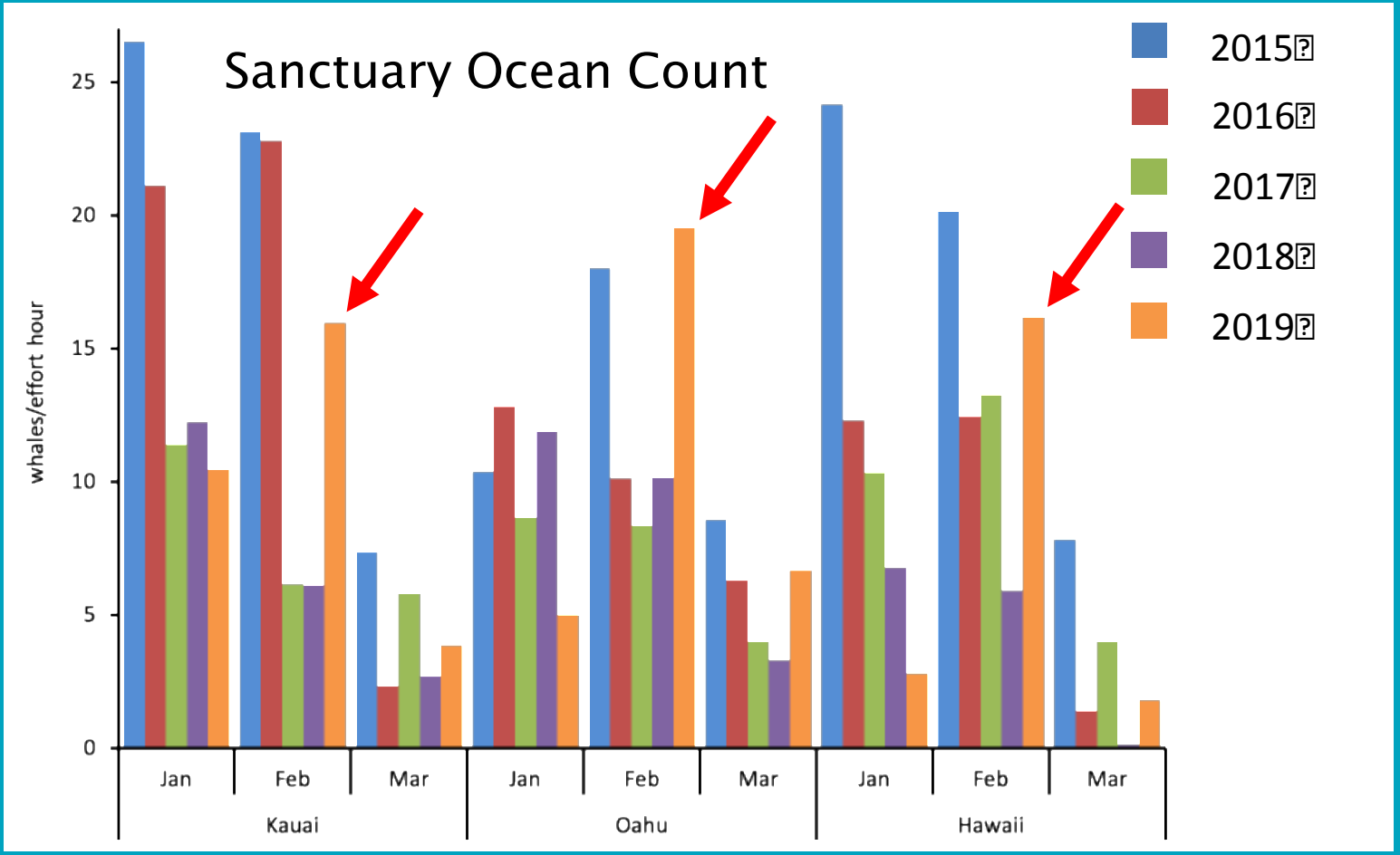
- Investigate whether whales are going somewhere else to breed or feed
- Assess body condition to establish whether health is a factor in decreased sightings
- Determine whether reproductive rates, abundance, and survival have changed over time
- Identify possible changes in quality, quantity, and distribution of food resources
- Investigate the role of environmental and anthropogenic factors in all of the above

Workshop on humpback whale trends meeting outcomes

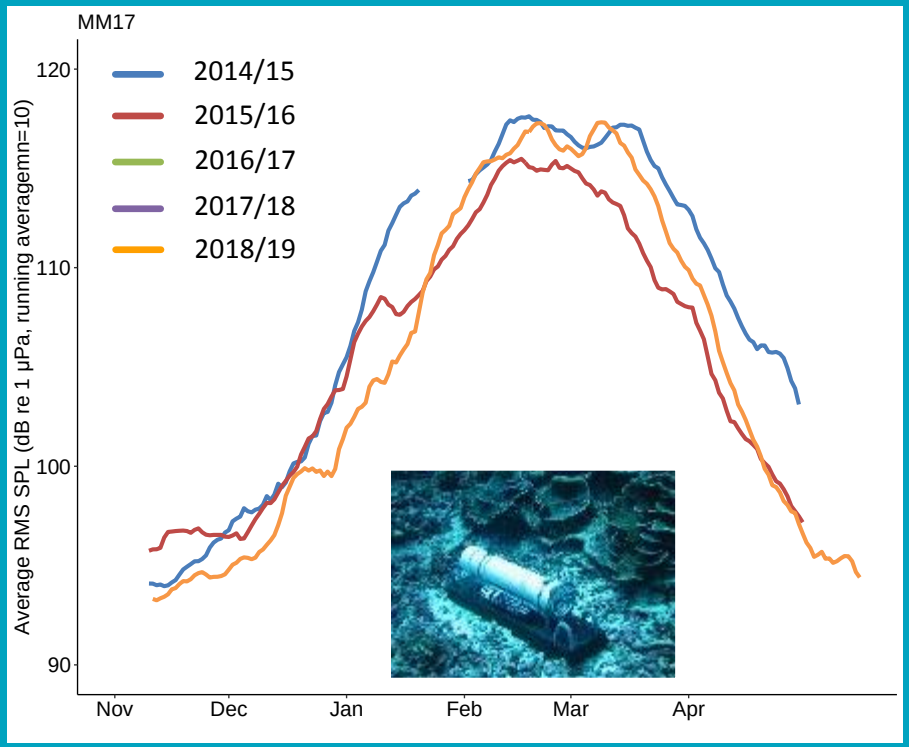
Direct outcomes of workshop to date:

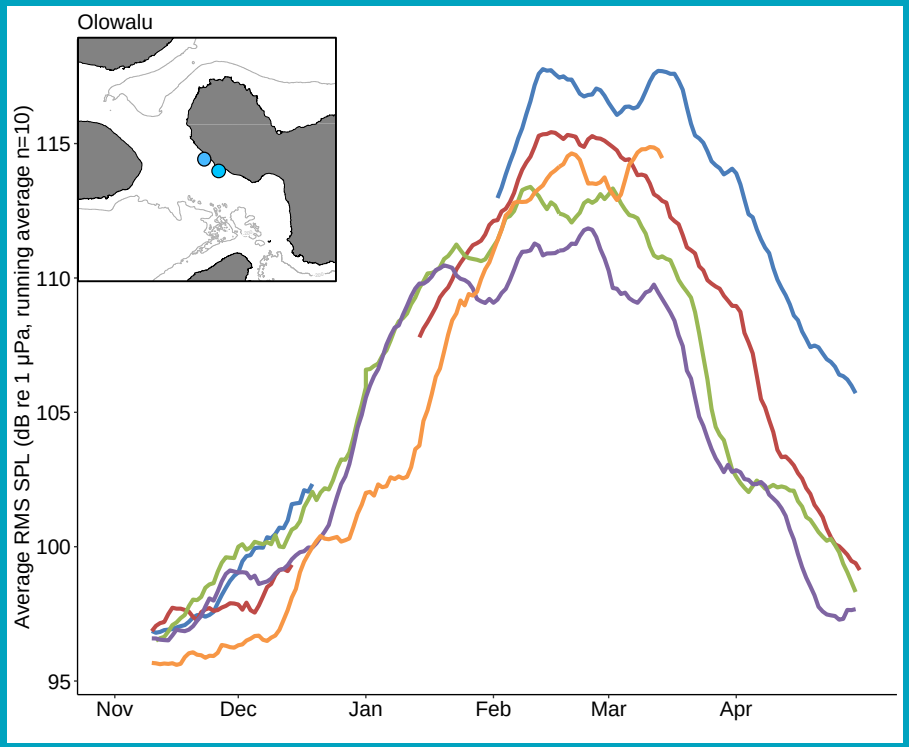
- 8 working groups have been formed among participants to formulate research plans and partnerships
- Coordinated aerial, vessel, shore-based & acoustic surveys took place this season
- A collaborative AUV effort is underway in HI and AK to examine trends in body condition
- Acoustic monitoring is occurring across the Hawaiian archipelago (including NWHI)
- Discussions have started across management agencies

Epilogue: 2019 season

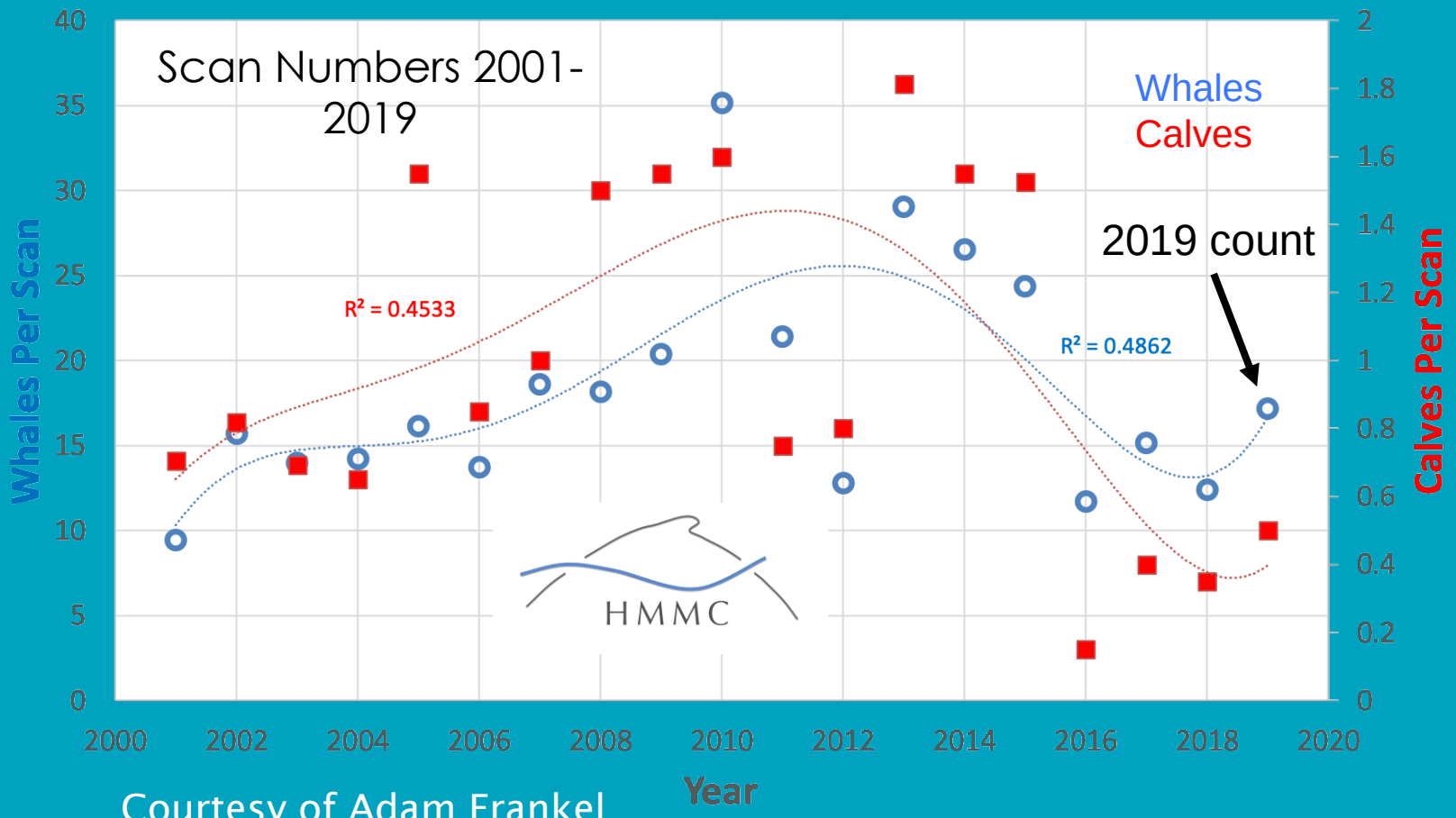


Epilogue: 2019 season



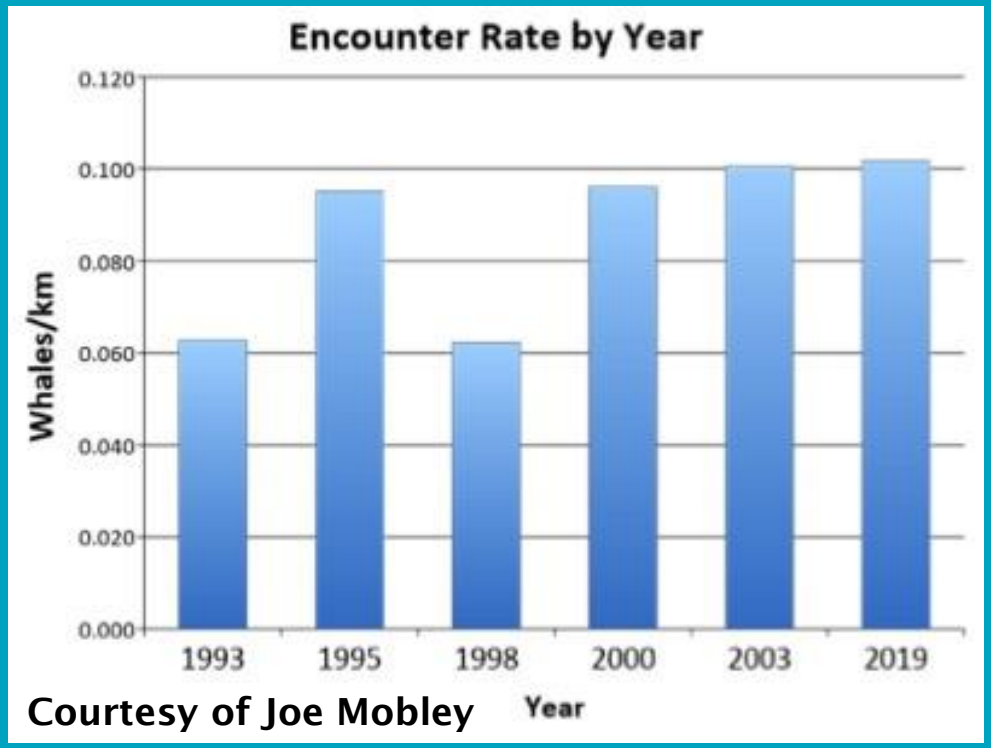


Epilogue: 2019 season

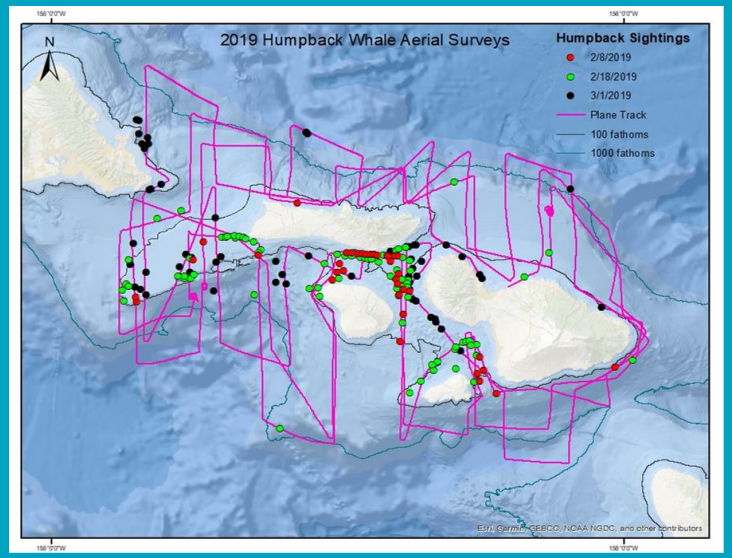


Courtesy of Adam Frankel

Epilogue: 2019 season

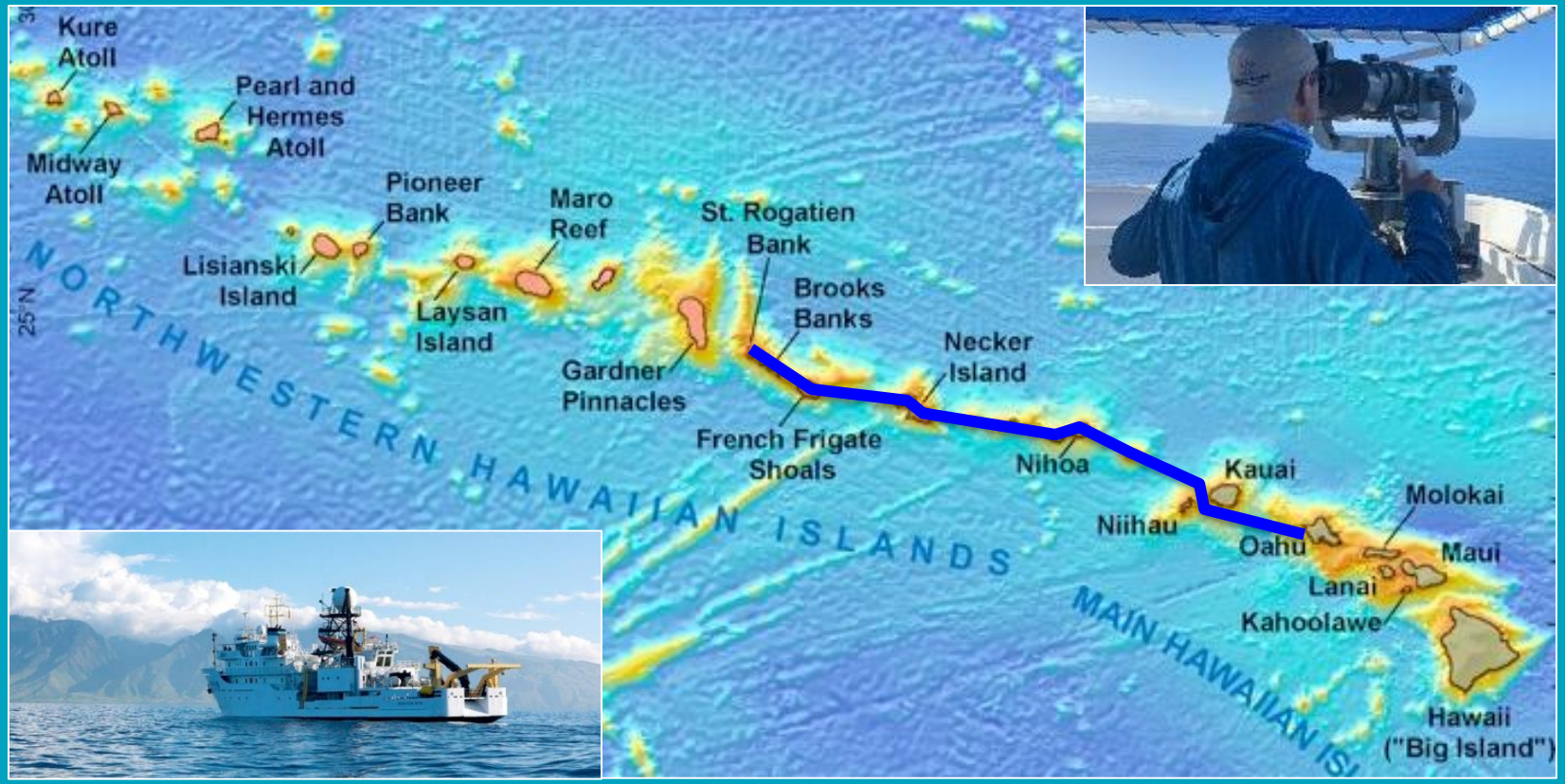


Courtesy of Joe Mobley



Encounter rate whale counts are comparable to 2003 levels (about half of what would be predicted based on 7% annual increase)

Epilogue: 2019 season



- Approximately 180 whales sighted, including at least 13 calves
- 47 fluke IDs and 10 biopsy samples were collected

Summary

- The Hawaii DPS has experienced notable fluctuations in whale distribution and/or numbers since de-listing in 2016
- The proximate causes of these fluctuations are still TBD, but changes in prey availability and ocean warming are strongly implicated
- Discussions among Hawaii and Alaska researchers and resource managers have identified research priorities and resulted in efforts to better understand the situation

ACKNOWLEDGEMENTS

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Fabien Delarue (HIMB)
Adam Frankel (HMMC)
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Ed Lyman (HIWHNMS)
Bruce Mate (OSU)
Joe Mobley (UHM)
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Erin Oleson (PIFSC)
Adam Pack (UHH)
Shannon Yee (NMSF)
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