

PIFSC Assessment Research

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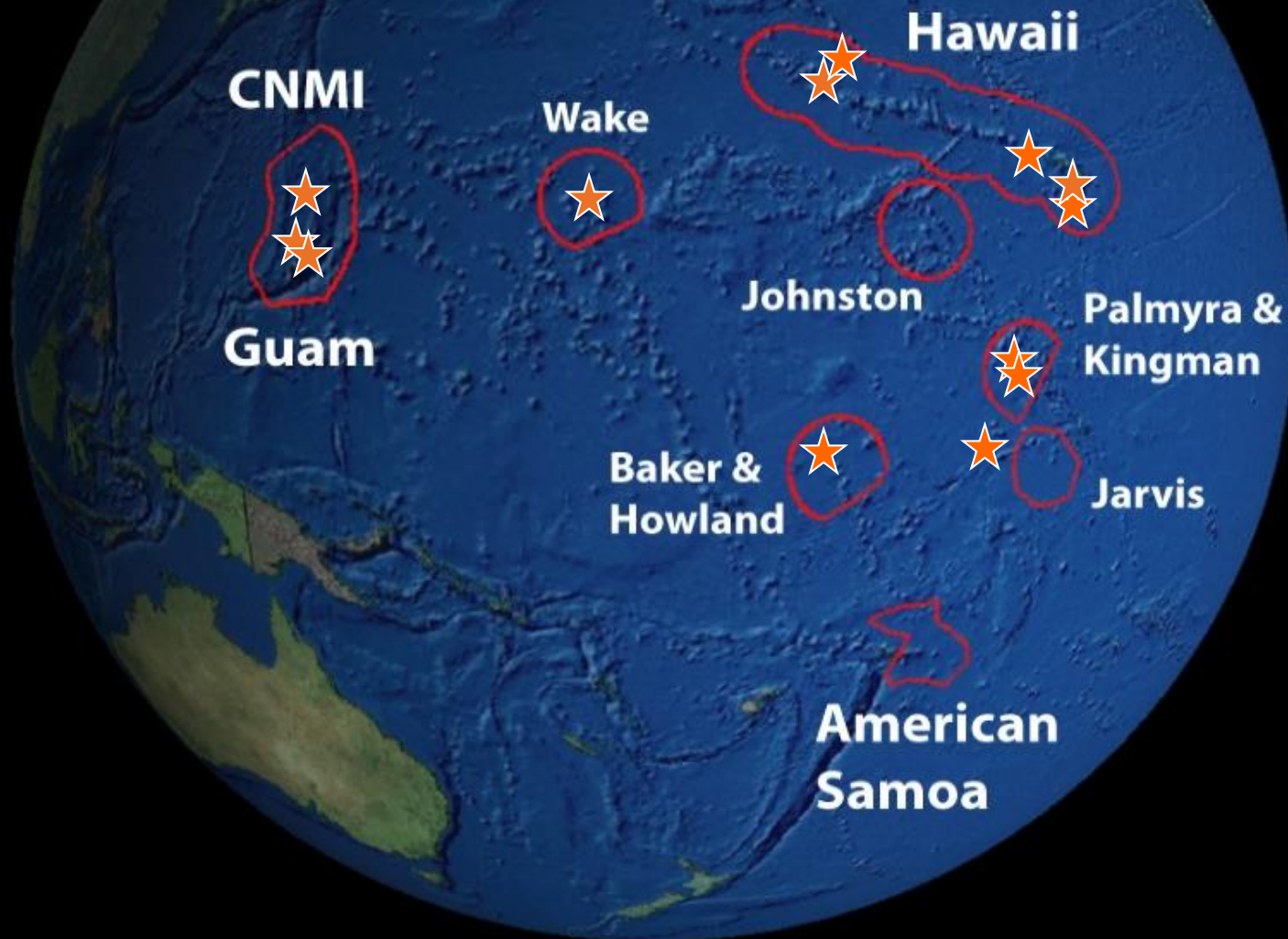
Marine Mammal Commission, Kailua-Kona, HI, 23 May 2019

PSRG- March 6, 2019- Olympia, WA

1. Passive acoustic monitoring and R&D
 - Machine learning and “big data” with Google.
Step 1: humpbacks
 - Geographic variation in Blainville’s beaked whales echolocation clicks
 - New gear- Trident tetrahedral towed array
2. Cetacean survey efforts in the Mariana Archipelago

Pacific Islands Passive Acoustic Network:

Long-term monitoring across the central & western Pacific



Google AI listens to 15 years of sea-bottom recordings for hidden whale songs

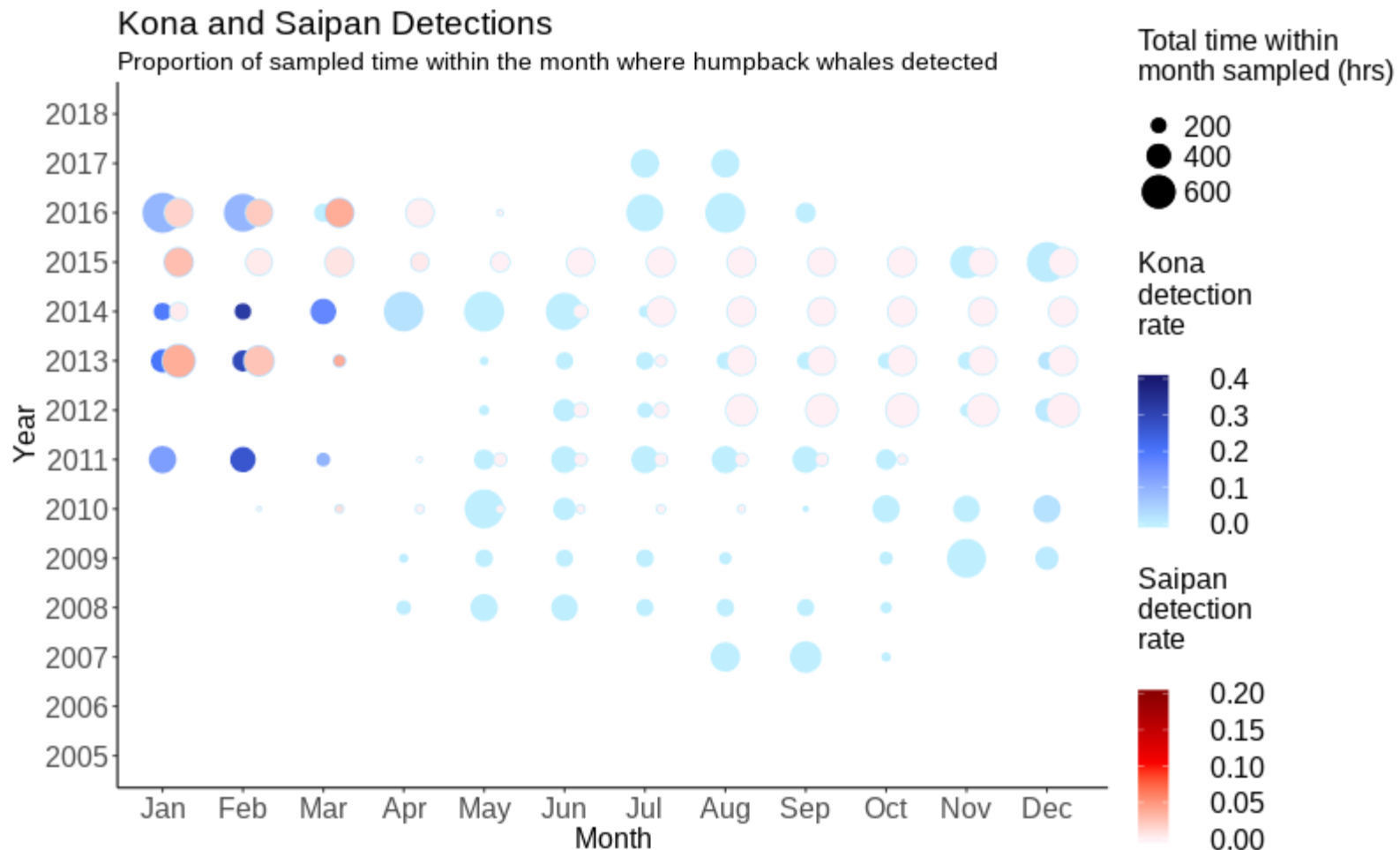
Devin Coldewey @techcrunch / 4 months ago

Comment



Google and a group of game cetologists have undertaken an AI-based investigation of years of undersea recordings, hoping to create a machine learning model that can spot humpback whale calls. It's part of the company's new "AI for social good" program that's rather obviously positioned to counter the narrative that AI is mostly used for facial recognition and ad targeting.

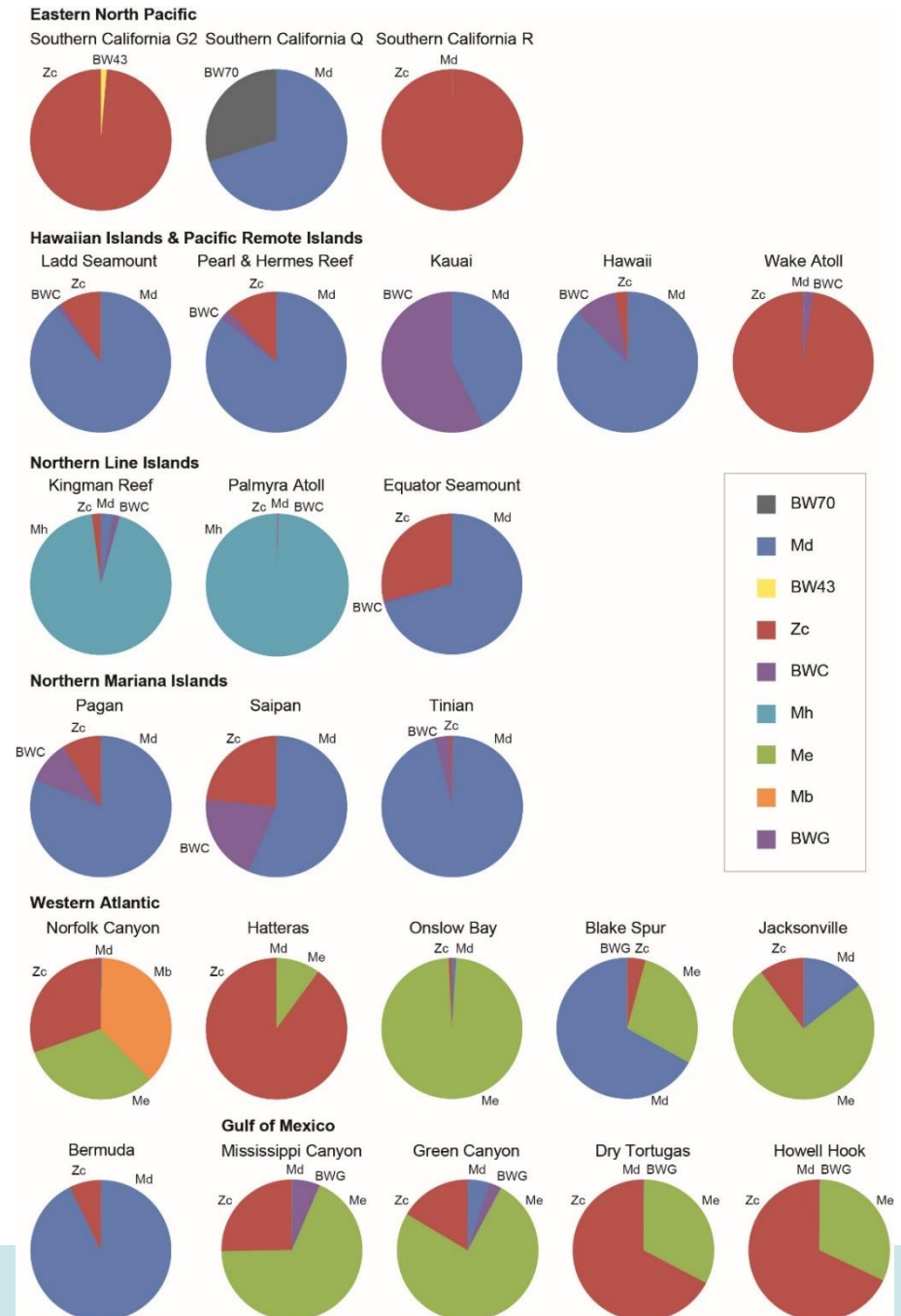
Google works fast and has already processed about 19 years of data.



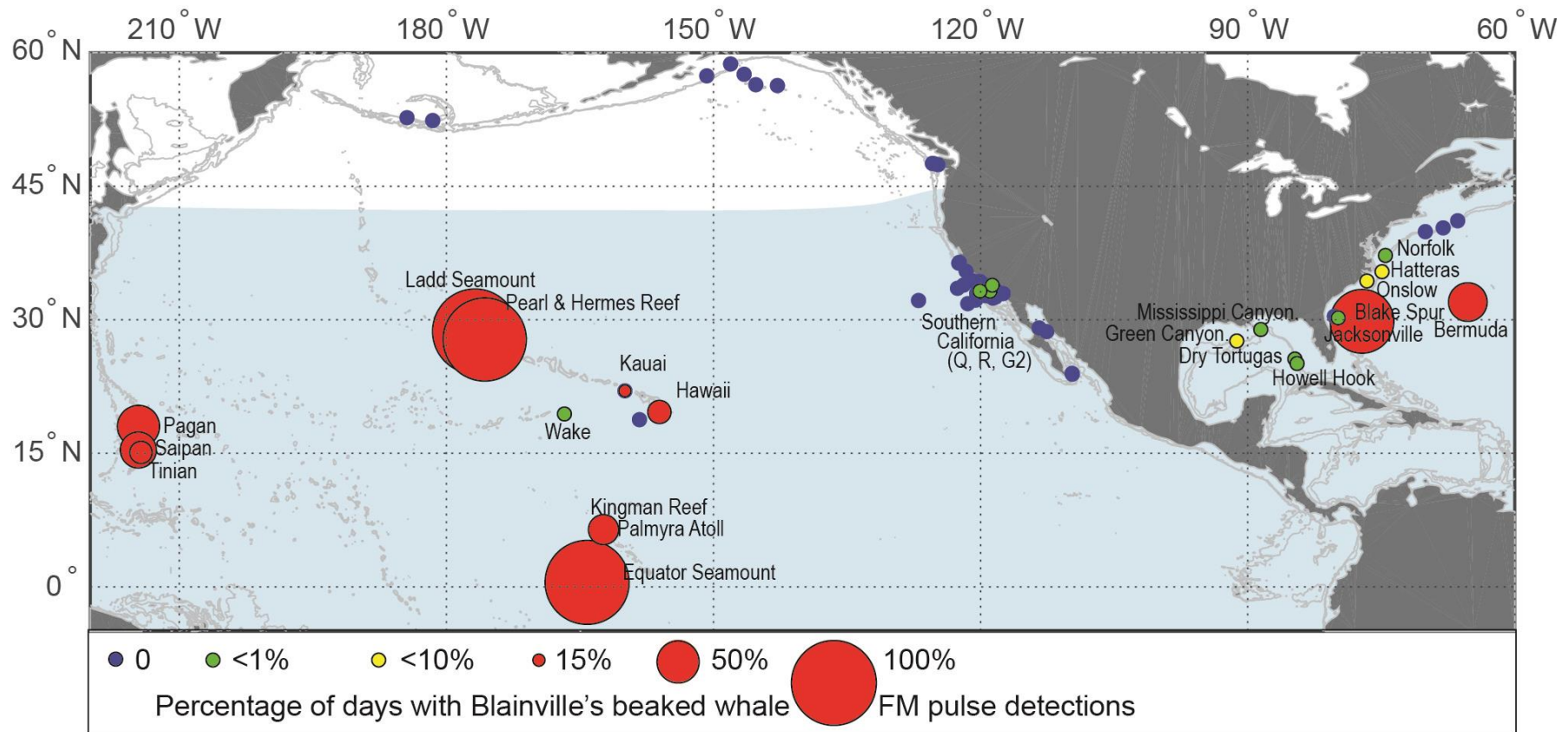
Beaked whales!

Most beaked whale species can be identified to species using the characteristics of their echolocation clicks.

SIO partnership: Simone Baumann-Pickering,
Jenny Trickey, Kaitlin Frasier



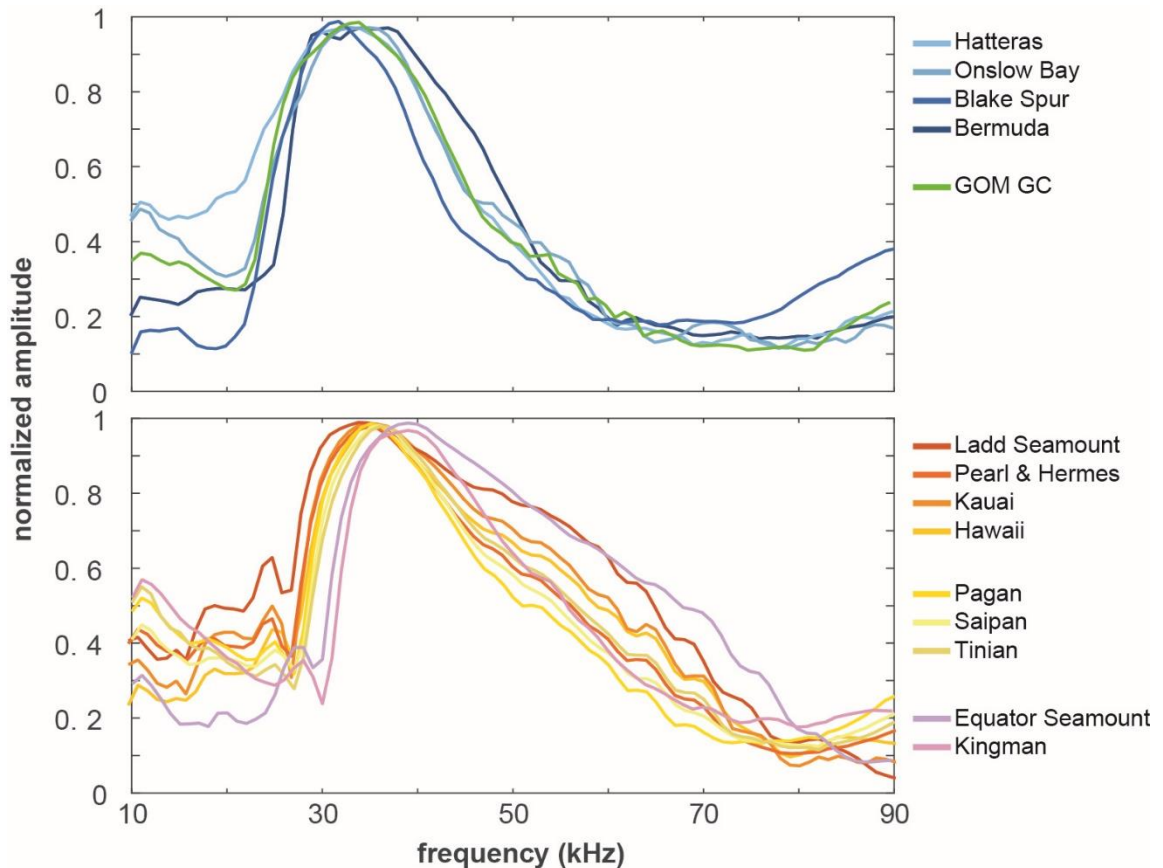
Occurrence of Blainville's across the network



Differences in peak frequency across sites

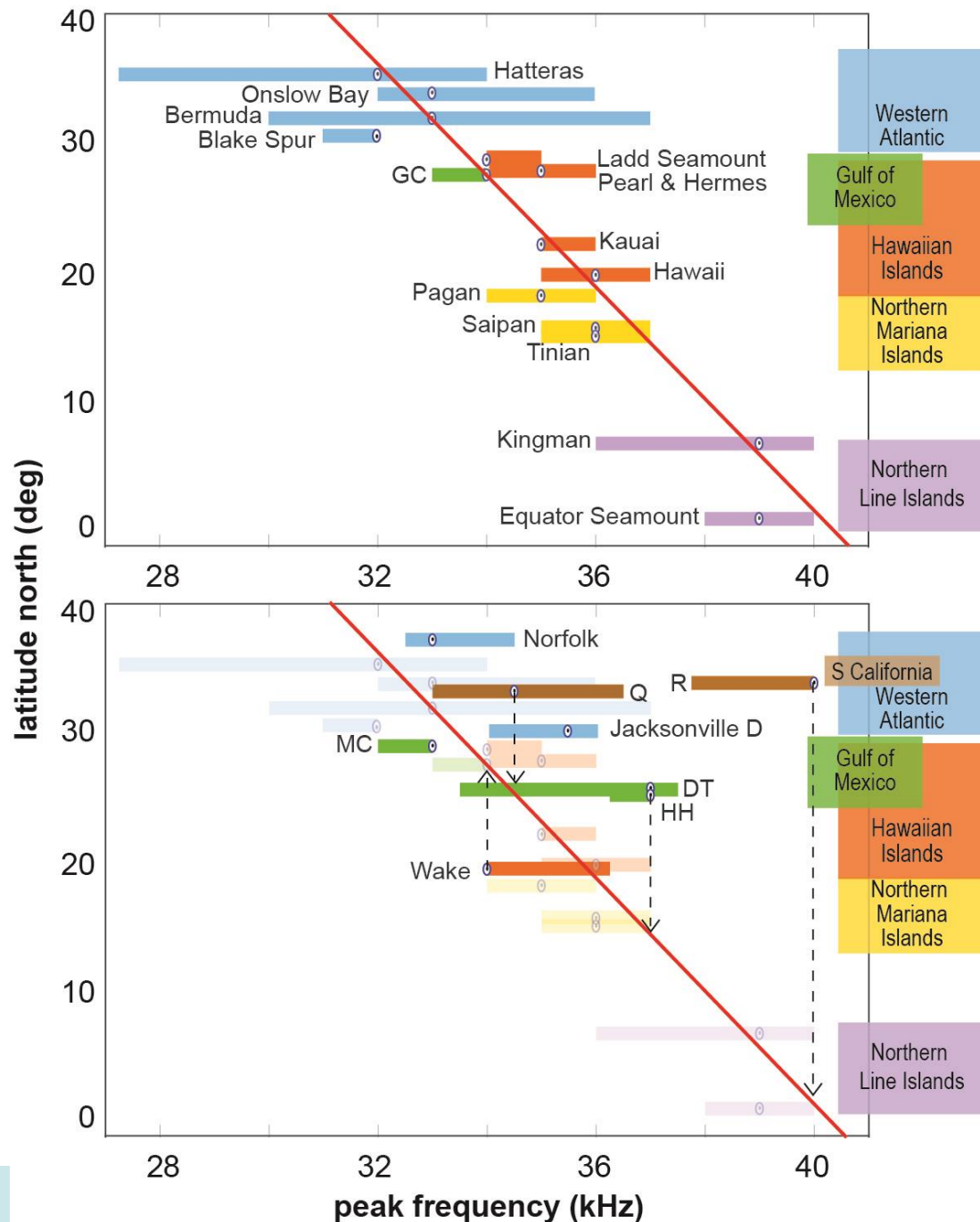
Peak frequency and ICI are common indicators of species-ID for beaked whales

Variants in Blainville's signals may be potential indicator of population structure.



Strong relationship in increase in peak frequency with lower latitude at sites with regular Blainville's presence

Relationship breaks down at sites with low Blainville's presence
 - Potentially suggests migratory whales and locations of interest for additional analyses

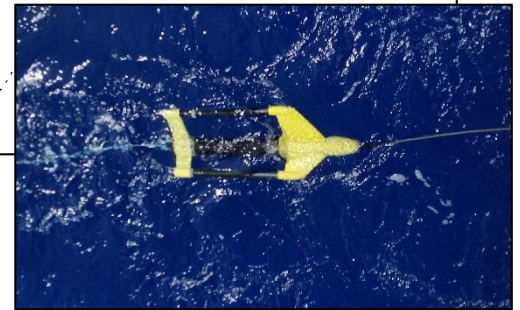
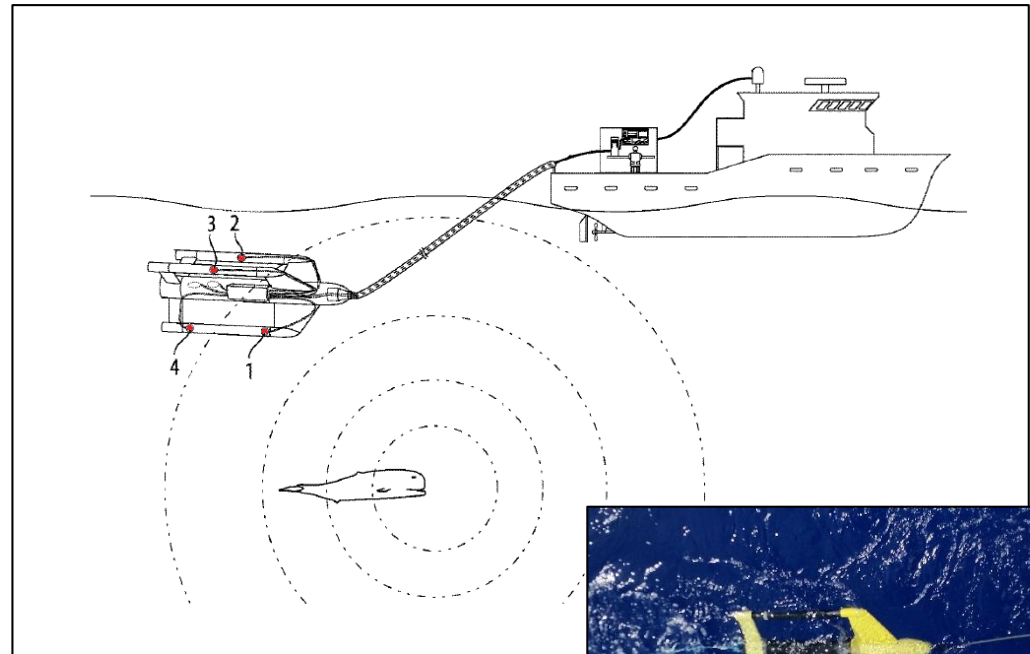


Volumetric Towed Array “Trident”

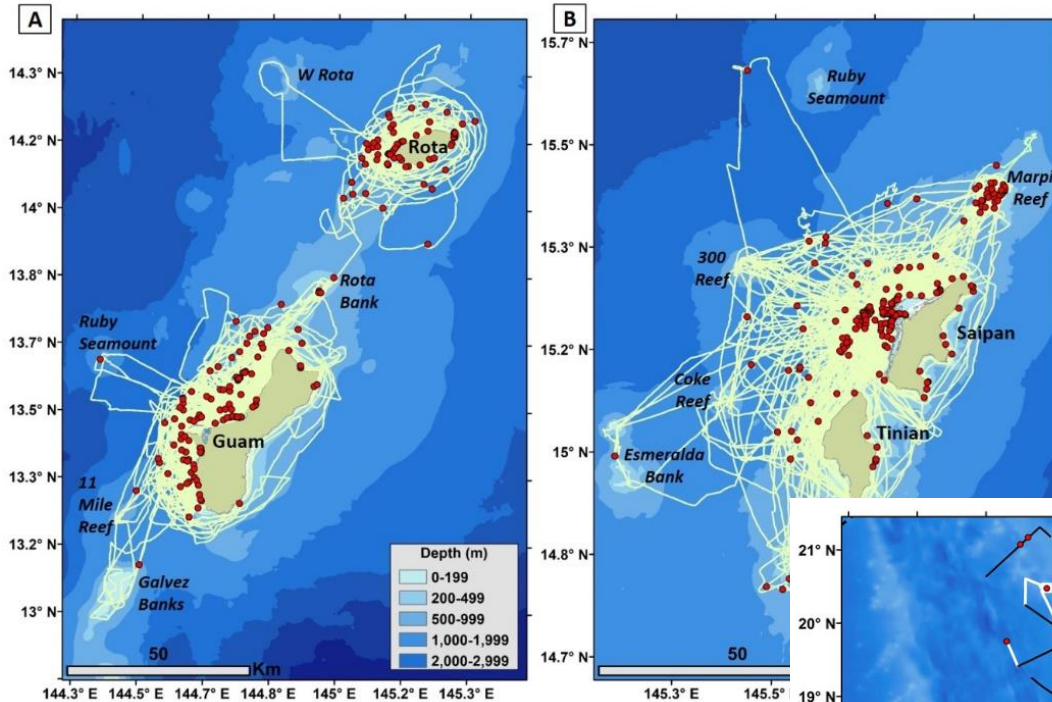
- Interchangeable “In Line” array for NMFS modular system
- 4 Hydrophones



- Towable at 10 knots for abundance surveys
- Improvement still needed with user assembly and flow noise below 12 kHz



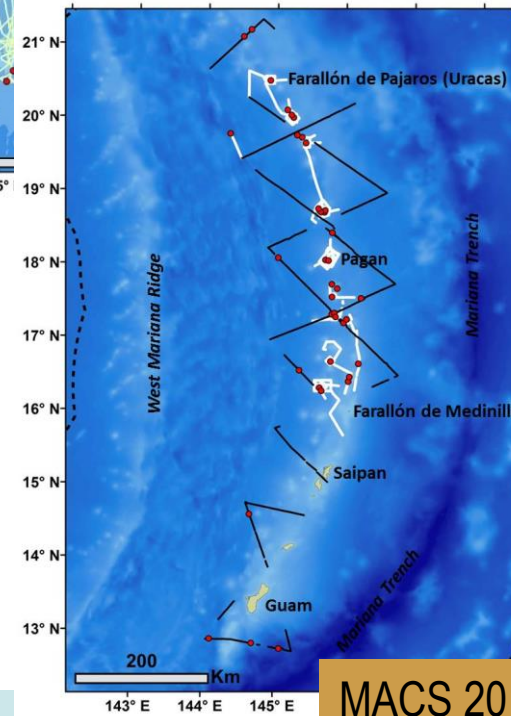
Cetacean Surveys in the Mariana Archipelago



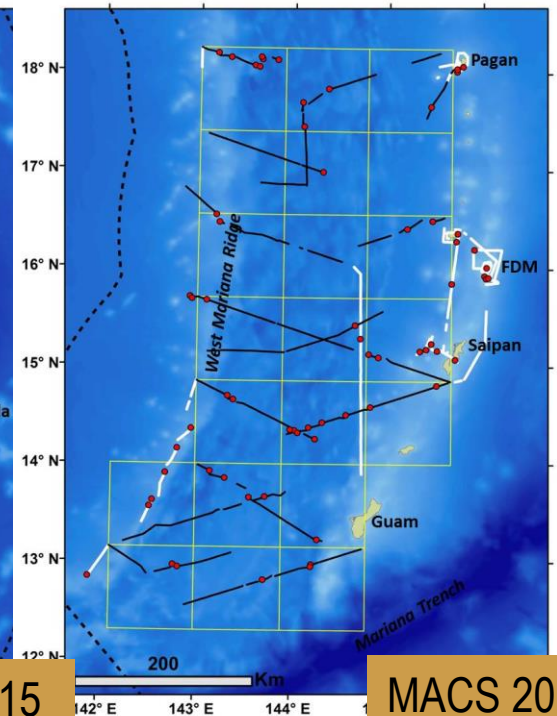
Small vessel surveys

- Winter surveys for humpback whales near Saipan (since 2014)
- Southern islands small boat surveys (since 2010)

- MACS 2015- ship-based survey of northern islands
- MACS 2018- ship-based survey pelagic waters west of the archipelago, including drifting acoustic recorders



MACS 2015



MACS 2018

Species	Encounters	# Photos	# Biopsy Samples	# Satellite Tags	# Visually-Verified Acoustic Recordings
Spinner dolphin	176	46,721	113		13
Pantropical spotted dolphin	64	12,718	70	1	7
Bottlenose dolphin	45	8,383	43	6	4
Short-finned pilot whale	23	21,453	111	23	3
Bryde's whale	18	3536	5		12
Rough-toothed dolphin	14	3,196	14	1	5
Sperm whale	12	3,746	18	2	4
False killer whale	8	7,992	36	9	1
Melon-headed whale	8	10,867	62	3	5
Dwarf sperm whale	6	986	1		2
Pygmy killer whale	6	2,086	5		1
Blainville's beaked whale	4	481	1		1
Risso's dolphin	3	8			1
Cuvier's beaked whale	2	320			
Striped dolphin	1	97			
Mesoplodon beaked whale	10	79			
Sei/Bryde's	2	3			
Dwarf/pygmy sperm whale	1				
Unid. Dolphin	17	28			
Unid. Whale	14				
Unid. Beaked whale	3				
Total	476	140,825	509	45	59



The Highlight Reel

Spinners-

- Photo, genetic, and habitat data suggest demographically-independent Guam and Rota/3-Islands populations
- Robust re-sight data for mark-recapture abundance analyses of these groups once cataloging is complete.



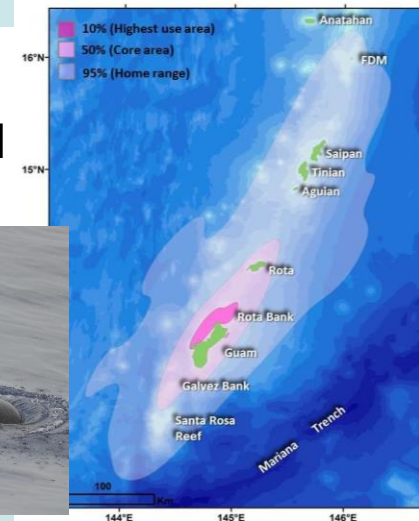
Bottlenose-

- All processed bottlenose samples have some degree of Frasier's dolphin ancestry
- Photo-ID, genetic, and tag data suggest no structure within the southern islands.



Short-finned pilot whales-

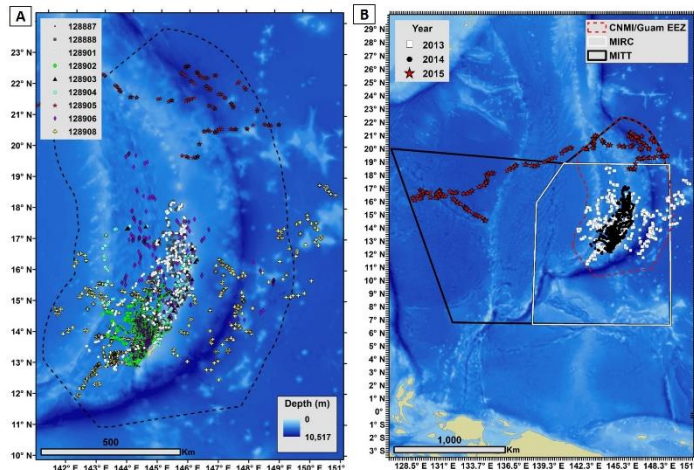
- Photo-identification, satellite tag, and genetic data provide a complicated picture of potential population structure in Mariana Archipelago short-finned pilot whales.
- Evidence of fisheries interactions



The Highlight Reel

Bryde's Whales-

- High sighting rate in summer 2018, including several mom-calf pairs
- [“Biotwang”](#) is Bryde's whales! Biotwangs are present year-round but peak in summer.
- Evidence of fisheries entanglement.



False Killer Whale-

- Only 8 sightings, but rich photo and tag datasets suggest site-fidelity and affinity for the archipelago.
- Analysis of existing samples a high priority for assessing possible structure between northern and southern archipelago animals.

Coming soon...

PacMAPPS 2021

- Ship-based visual and passive acoustic survey of the Guam & CNMI EEZs
- Stratified design for greater sampling in the northern islands
- Including Drifting Acoustic Spar Buoy Recorders (DASBRs) for sampling deep-divers



NOAA FISHERIES