Cetacean Research in the Mariana Islands

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APASEEM

June 20, 2012- American Memorial Park, Saipan, CNMI

Cetacean Research in the Central & Western Pacific

Goals:

- Understand distribution, abundance, and threats to cetaceans in U.S. waters
  - Species inventory (who is here?)
  - Seasonal occurrence (when are they here?)
  - Movements patterns (where do they go?)
  - Population structure (how many populations are there and how do they organize themselves?)

24 species (and counting!) in the central & western Pacific

Cetaceans in Pacific Islands

- 24+ species - most virtually unstudied!
- Mix of odontocete (toothed whales) and mysticetes (baleen whales)
  - Some “resident” in behavior
  - Some migratory
  - Some broadly distributed pelagic species

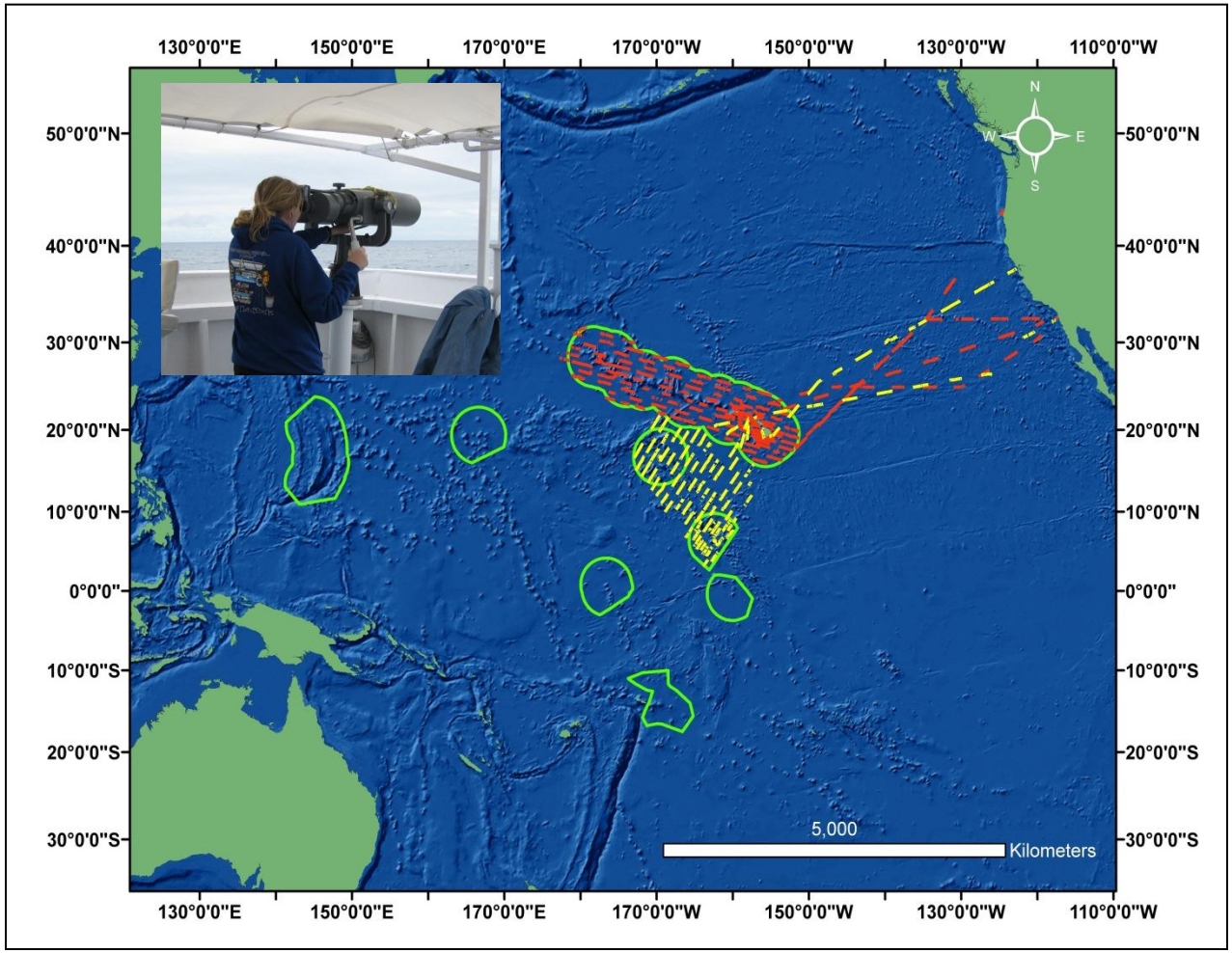
Common methods for studying cetacean populations

Shipboard visual & acoustic surveys

Aerial surveys

Small boat-based studies

Large-scale Ship Surveys in the central & western Pacific



- **HICEAS 2002 & 2010**

  - 180 days Hawaiian EEZ

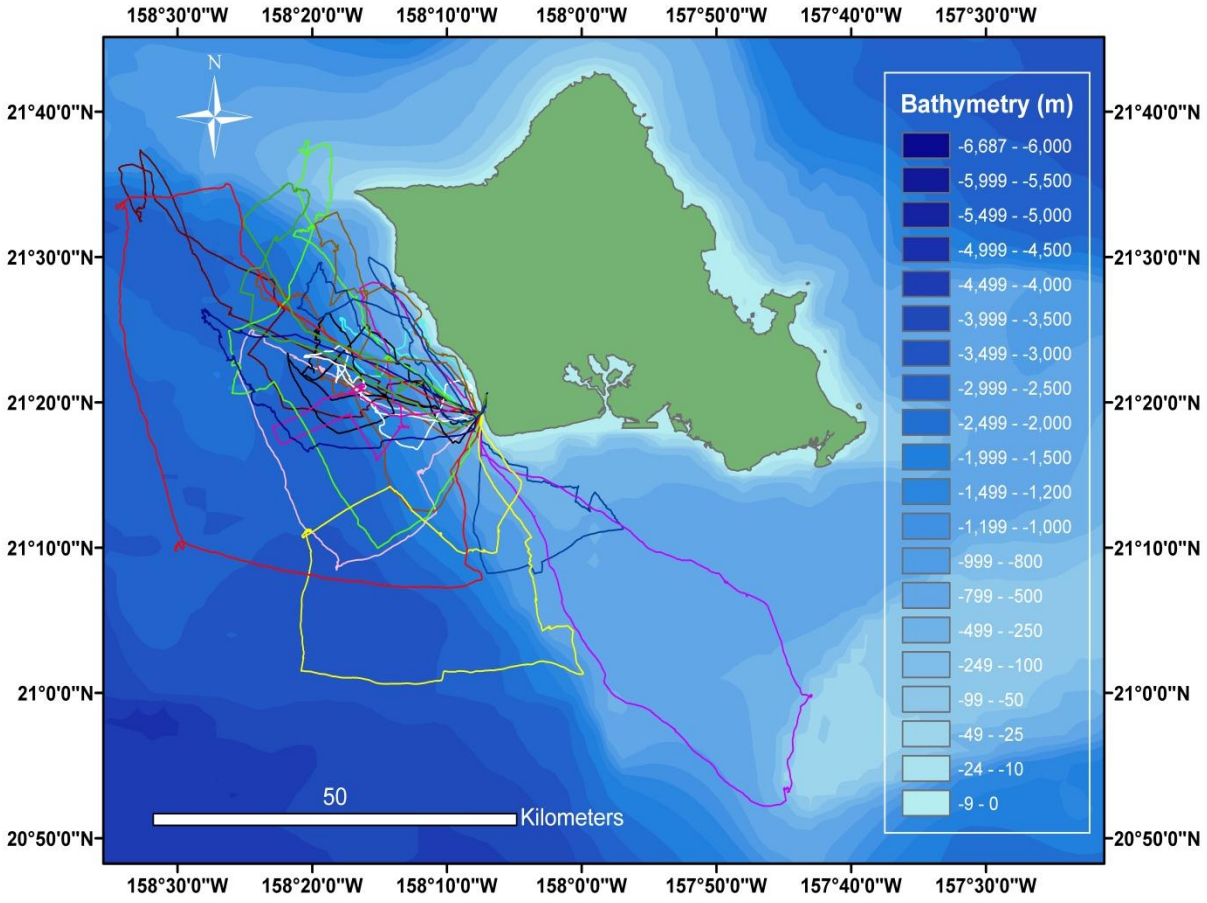
  → abundance estimates for 19 species

- **PICEAS 2005 & 2011-12**

  - 120 days Palmyra + Johnston EEZs + high-seas

  → abundance for false killer whales

Small vessel-based surveys



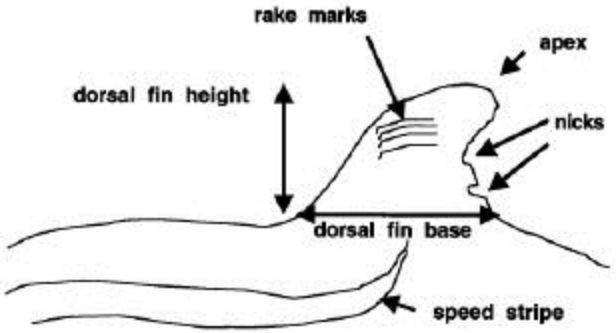
Comparison of Survey Methods

- Ship surveys
  - Pros:
    - Large scale
    - Visual & acoustic detection
    - In situ environmental data
  - Cons:
    - Expensive
    - Poor seasonal coverage
- Aerial survey
  - Pros:
    - Broad seasonal coverage
    - Variety of scales
  - Cons
    - Weather-dependant
    - No environmental data
    - Not always cost-effective

Small boat surveys

- Pros:
  - Broad seasonal coverage
  - Fine scale
  - Opportunity for other studies
- Cons:
  - Small study area
  - Limited detection capability

Photo-identification

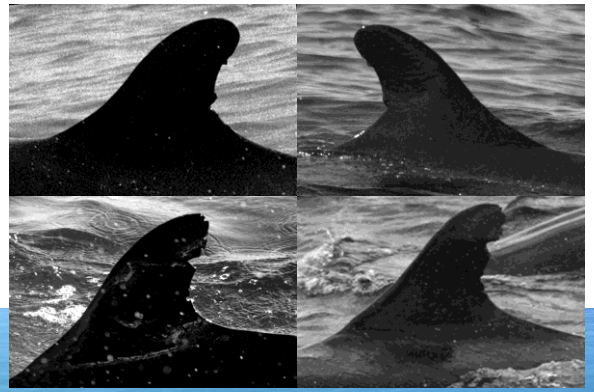


How it works:

- The dorsal fin and flukes of some species contain marking that are specific to each individual

Catalogs of photos tell us about:

- population size
- movements & range
- population & social structure



Tissue sampling

How it works:

- Small skin & blubber samples are collected using a projectile dart
- Each sample provides the genetics and history of the animal that it came from

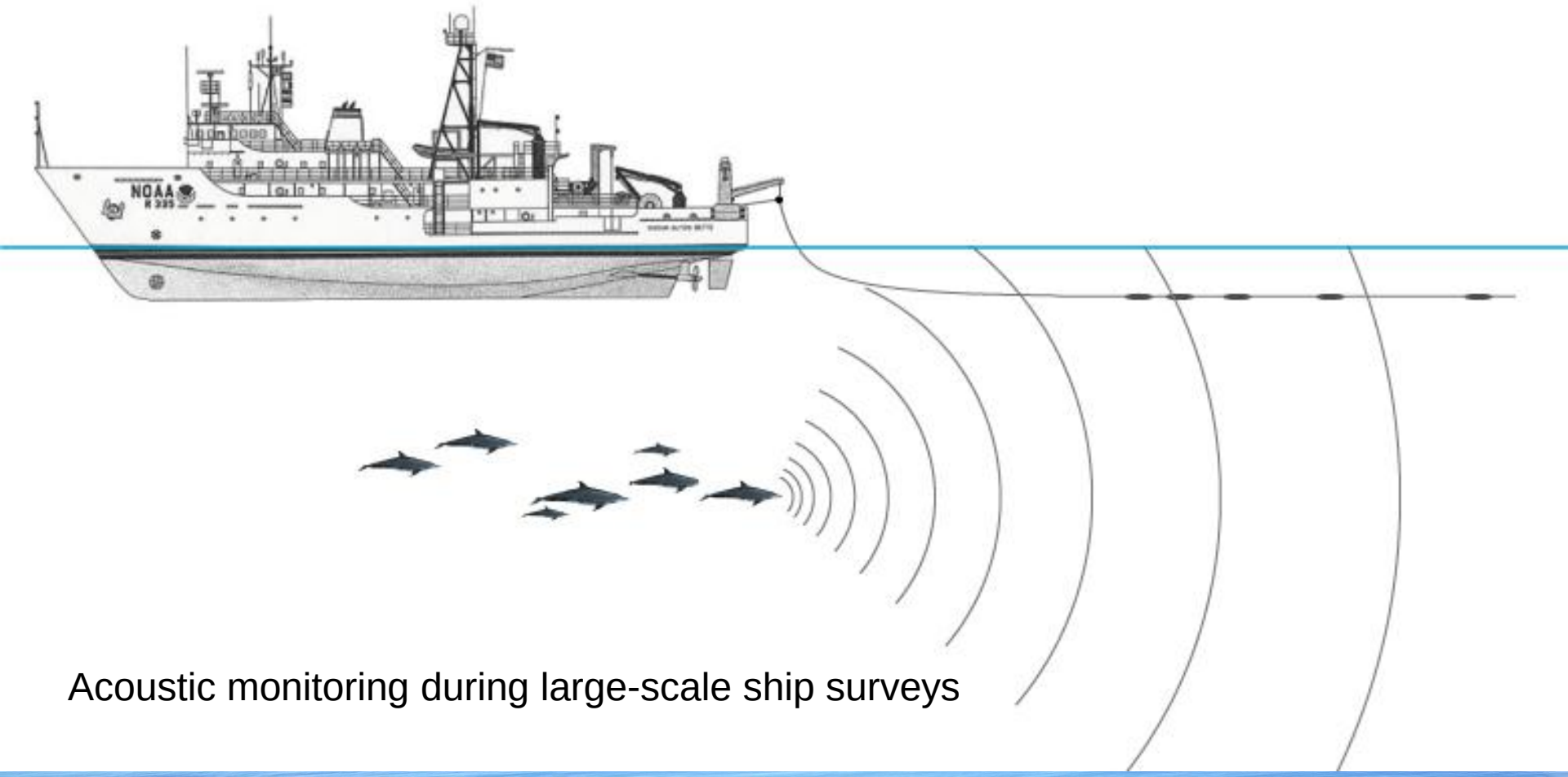
Collections of tissue samples teach us about:

- Population structure
- Contaminants
- Natural isotopes ratios

Passive Acoustic Studies

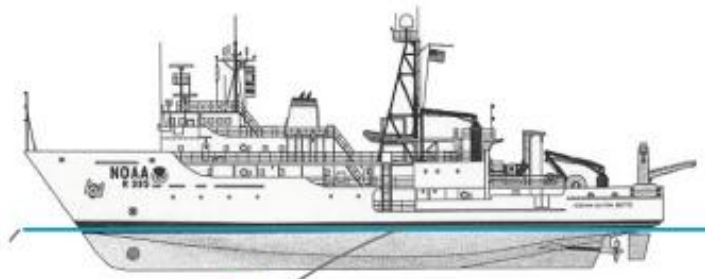
- Some whales spend little time at the surface and a lot of time vocalizing
- Acoustic instrument can monitor for long periods of time
- Some acoustic systems are very low cost
- Instruments can be placed in relatively inaccessible regions

Towed hydrophone arrays



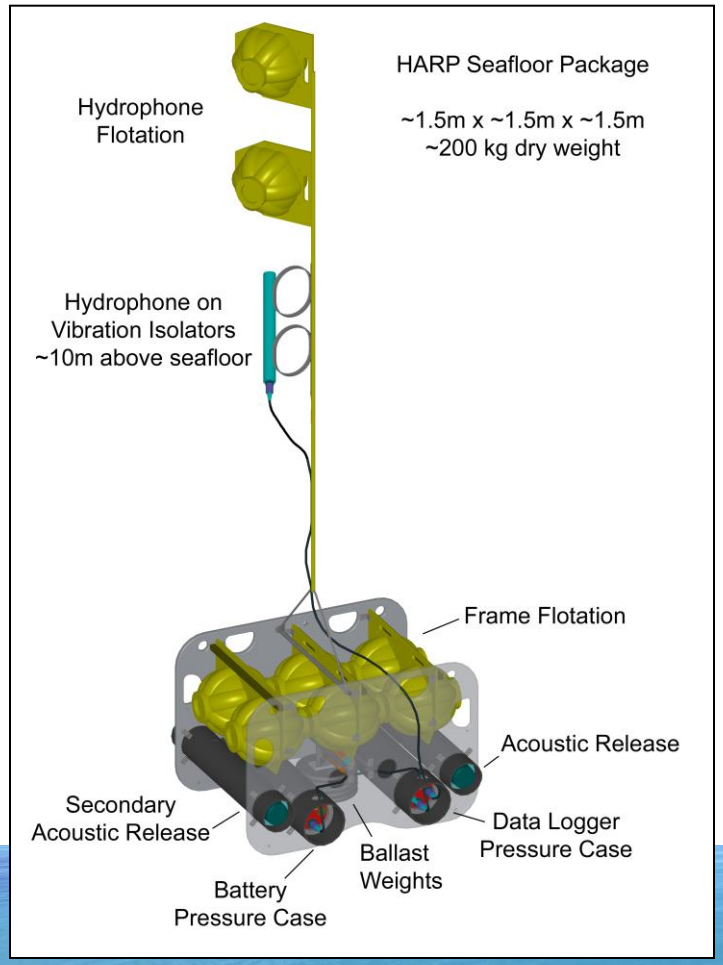
Acoustic monitoring during large-scale ship surveys

Autonomous recorders



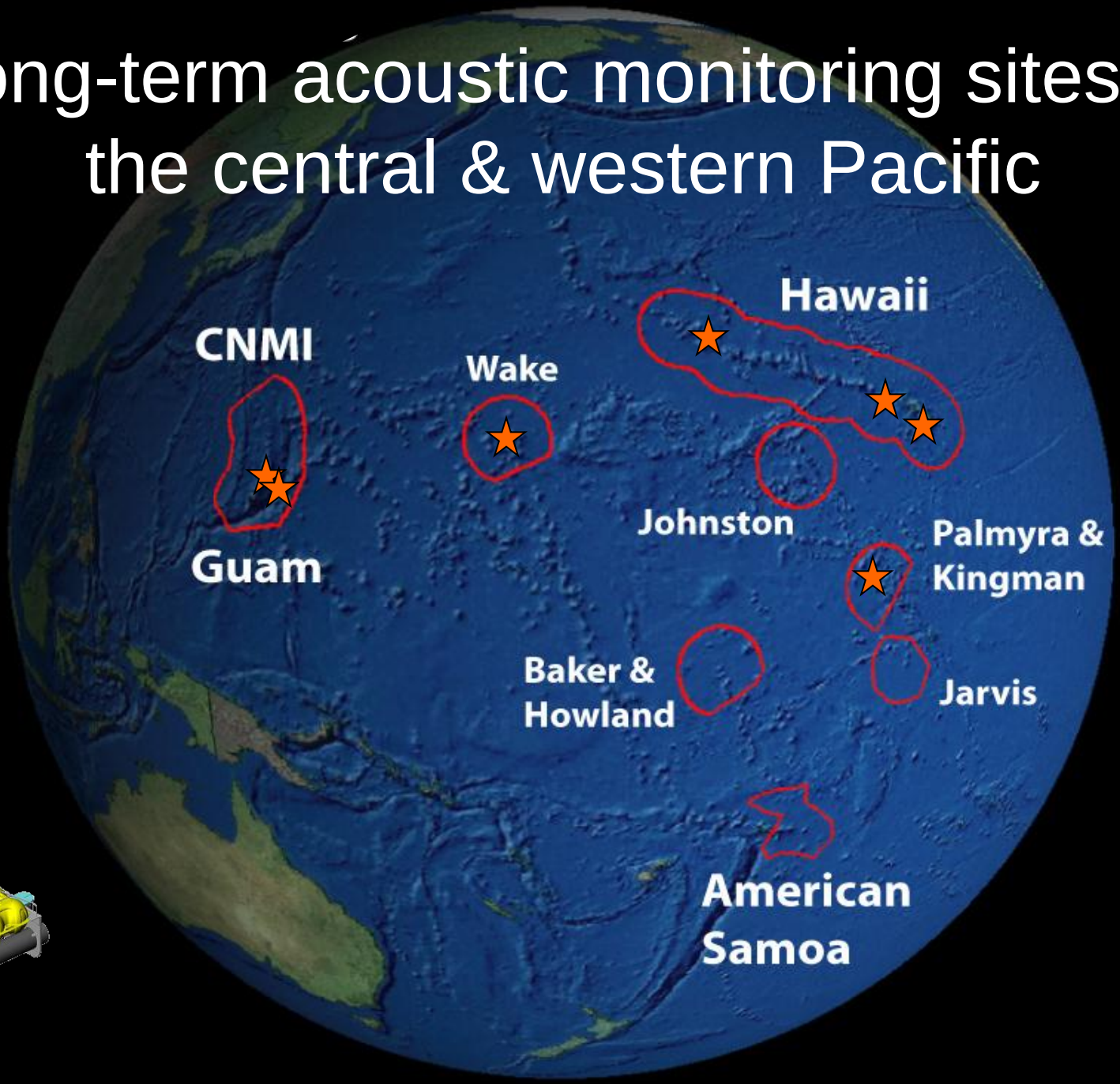
Long-term monitoring for seasonal occurrence

High-Frequency Acoustic Recording Packages (HARPs)



- Acoustic sensing from 10 Hz to 100 kHz
- Can record acoustic data for up to 1 year
- Retrieved using acoustically-triggered releases
- Different configurations based on vessel used for deployment

Long-term acoustic monitoring sites in the central & western Pacific



Visual vs. Acoustic Methods

Visual Methods:

Advantages:

Whales must surface to breathe.

Sightings can be followed by photo-ID and biopsy

Limitations:

Observers must see the whale at the surface

Limited by weather and time at sea

Acoustic Methods:

Advantages:

Whales can be monitored when underwater

Instruments can monitor for very long periods

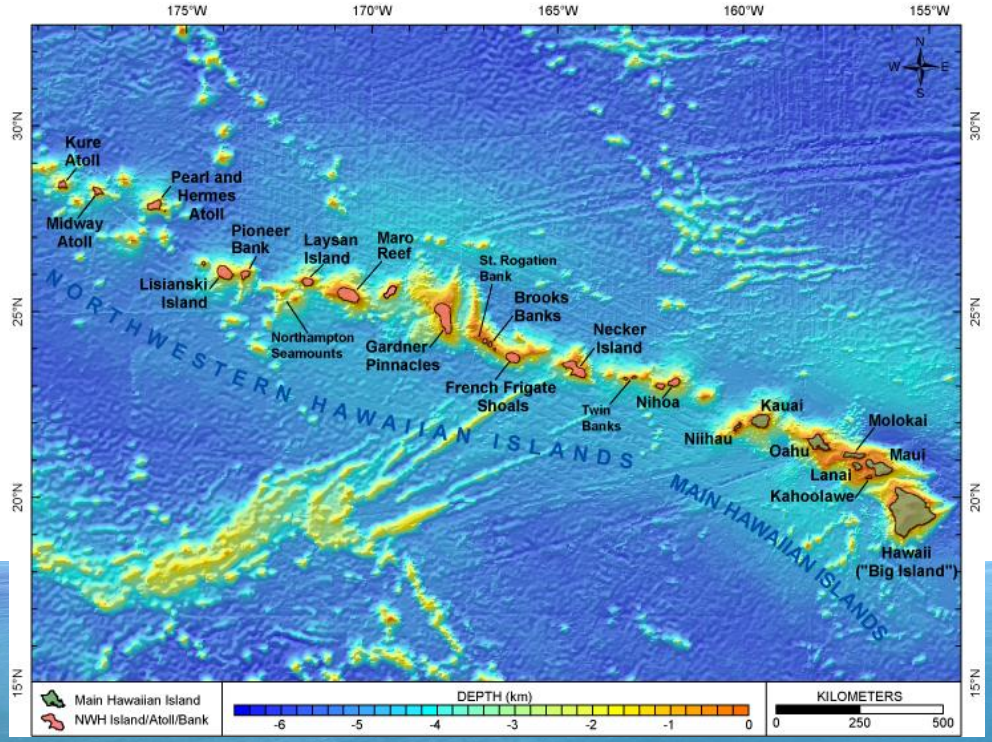
Limitations:

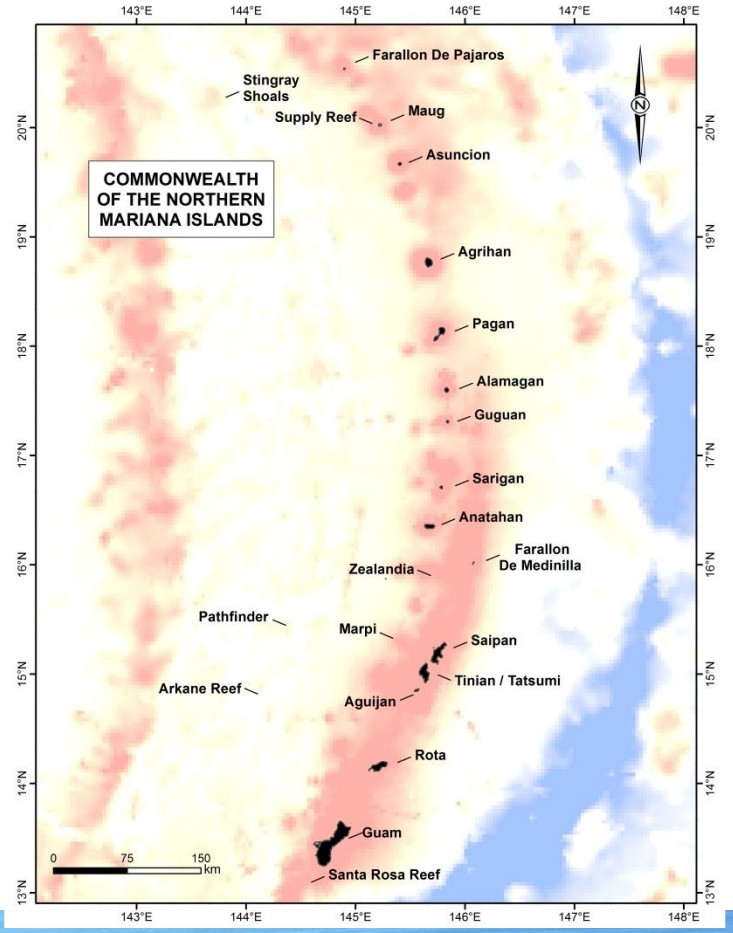
Whales must be calling to be heard

We don’t know what some whales sound like

A comparison of two archipelagos

Cetacean population structure may be similar between Hawaii and the Mariana Islands





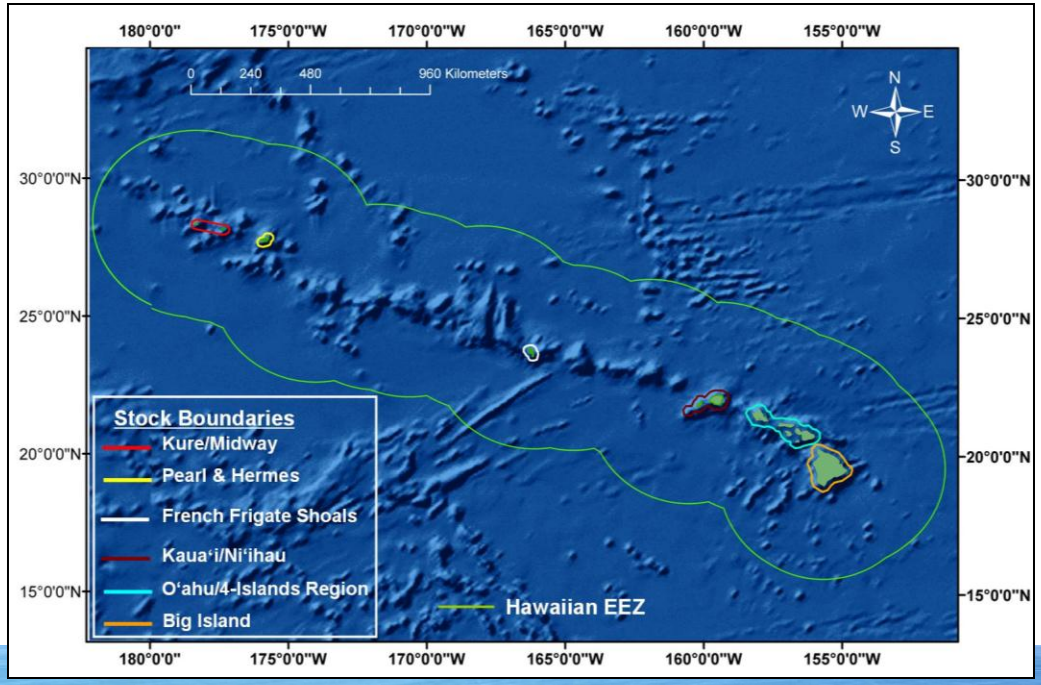
What we've learned in Hawaii:

Many otherwise pelagic species also maintain island-associated populations

Species with island-associated & pelagic populations near Hawaii:

- Spinner dolphins
- Spotted dolphins
- Rough-toothed dolphins
- Bottlenose dolphins
- Pilot whales
- Melon-headed whales
- False killer whales
- Cuvier's beaked whales
- Blainville's beaked whales
- Dwarf sperm whales

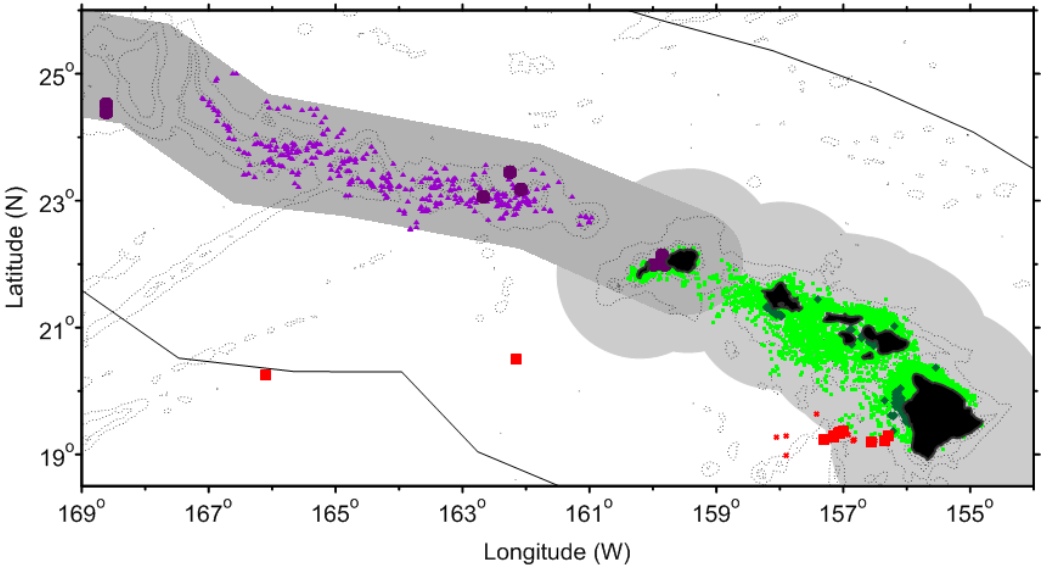
Hawaiian spinner dolphin populations



What we've learned in Hawaii:

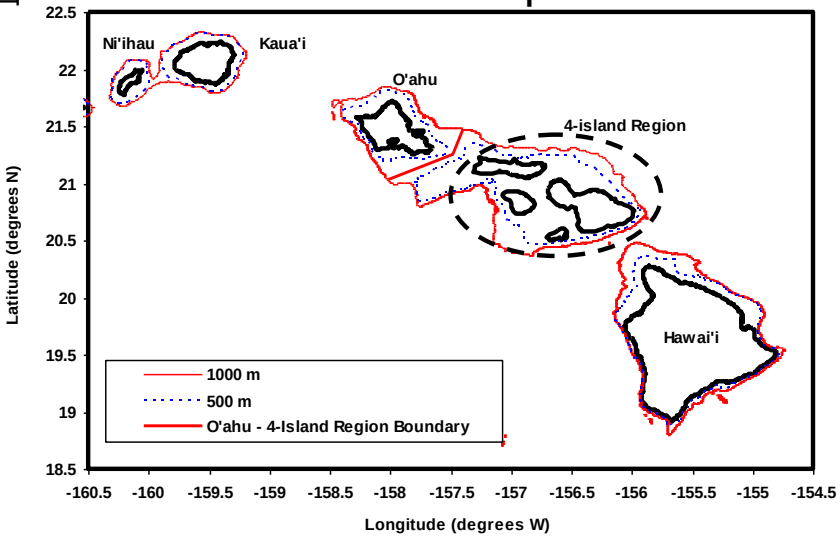
Each population is doing something different

False killer whales



Some island-associated populations travel between islands
- False killer whales and pilot whales

Bottlenose dolphins

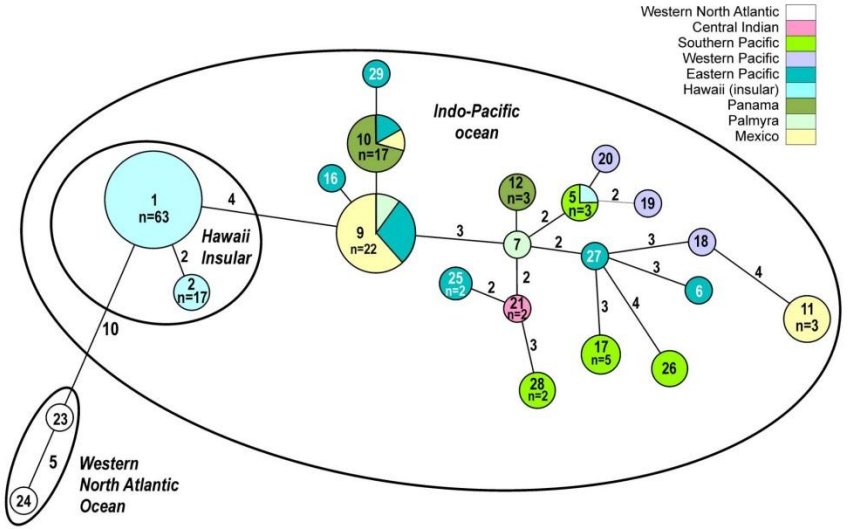


Others are closely associated with an individual island or island-group without movements between islands
- Bottlenose, spinner, and rough-toothed dolphins

What we've learned in Hawaii:

There are many more populations out there than we knew a decade ago

- The combination of photo-ID, genetics, acoustics, and other techniques have identified over 33 different populations of 20 species



False killer whale genetic structure

Cetacean Surveys in the Marianas

Goals:

- Understand species occurrence, seasonality, range, movements, and population structure

How?

- Small boat-based surveys
- Long-term acoustic recordings
- From you

Previous Cetacean Research in the Marianas:

Information from whaling & other sightings

- Whaling operations took “a few” humpbacks in the Marianas in the 1800s
- Sei whales tagged in the Marianas in the early 1900s were later whaled in the Aleutian Islands, indicating long distance migrations

- Sightings of Bryde’s, sei, humpback, and sperm whales, Dwarf and pygmy sperm whales, Cuvier’s beaked whales, melon-headed, killer, and pilot whales, and spinner and striped dolphins are reported from local researchers and strandings on Guam (Eldredge, 2003)

Previous Cetacean Research in the Marianas:

Spinner sightings throughout CNMI

Micronesica 34(2):249-260, 2002

Incidence and strandings of the Spinner Dolphin, *Stenella longirostris*, in Saipan Lagoon

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Table 1. Verified sightings of spinner dolphins in the CNMI by Division of Fish and Wildlife staff (1996 – 2000). All island sightings within 3 km of shore.

Date	Location	No.# of animals in school
July 19, 1996	Marpi Reef	100
August 22, 1997	Marpi Reef	30
February 1, 1998	Sarigan	8-10
June 11, 1998	Marpi Reef	5
August 5, 1998	Farallon de Medinilla	10-15
July 12, 1999 July 14, 1999	Farallon de Medinilla	10-12
August 26, 1999 August 28, 1999	Pagan	30
April 13, 2000	Tanapag Harbor, Saipan	11-13
July 4, 2000	Sarigan	15-20
July 25, 2000	Tanapag Harbor, Saipan	1
September 25, 2000	Farallon de Medinilla	5
September 24, 2001	Farallon de Medinilla	120

Previous Cetacean Research in the Marianas:

Strandings near Saipan & Tinian

Micronesica 43(1): 1 – 13, 2012

Summary of recorded cetacean strandings in the Commonwealth of the Northern Mariana Islands

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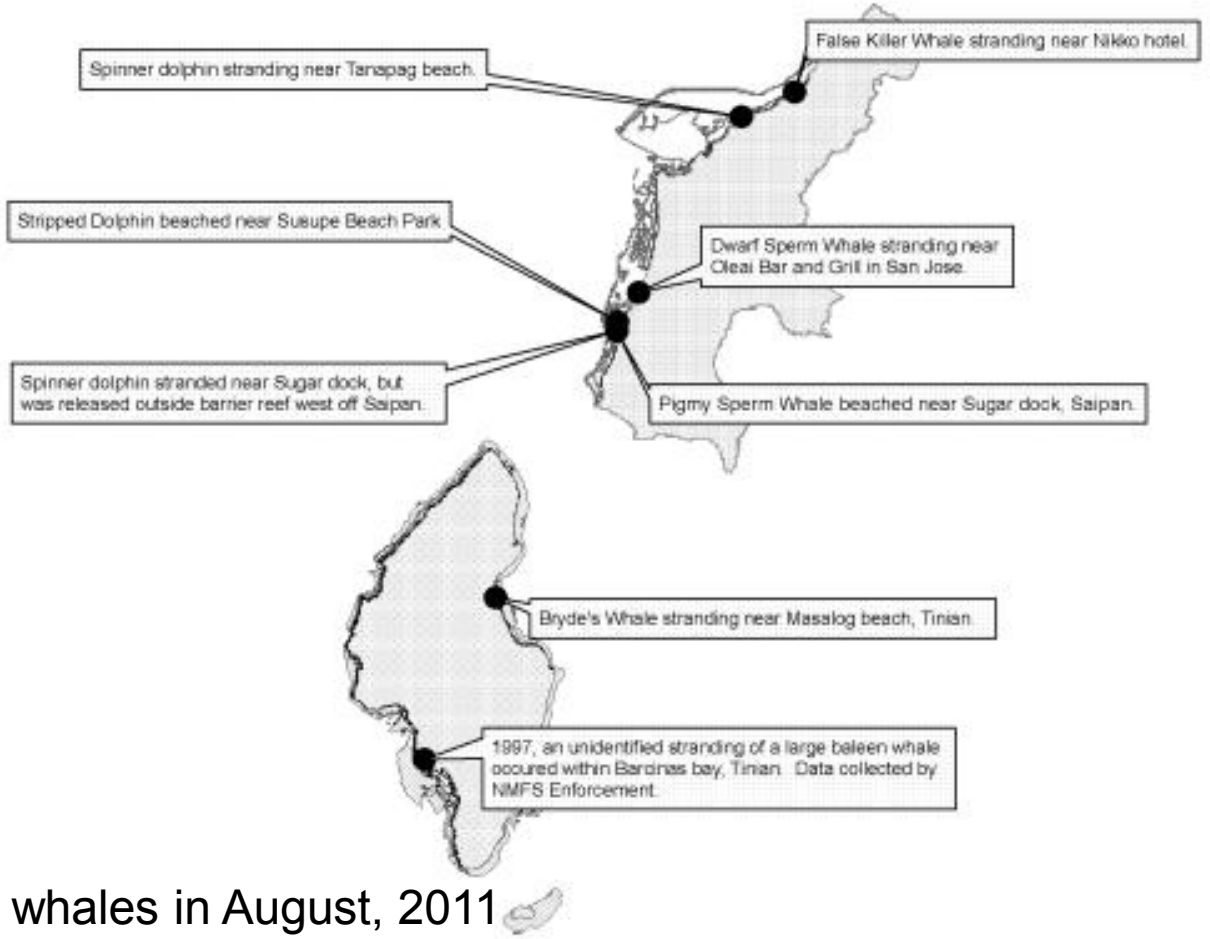
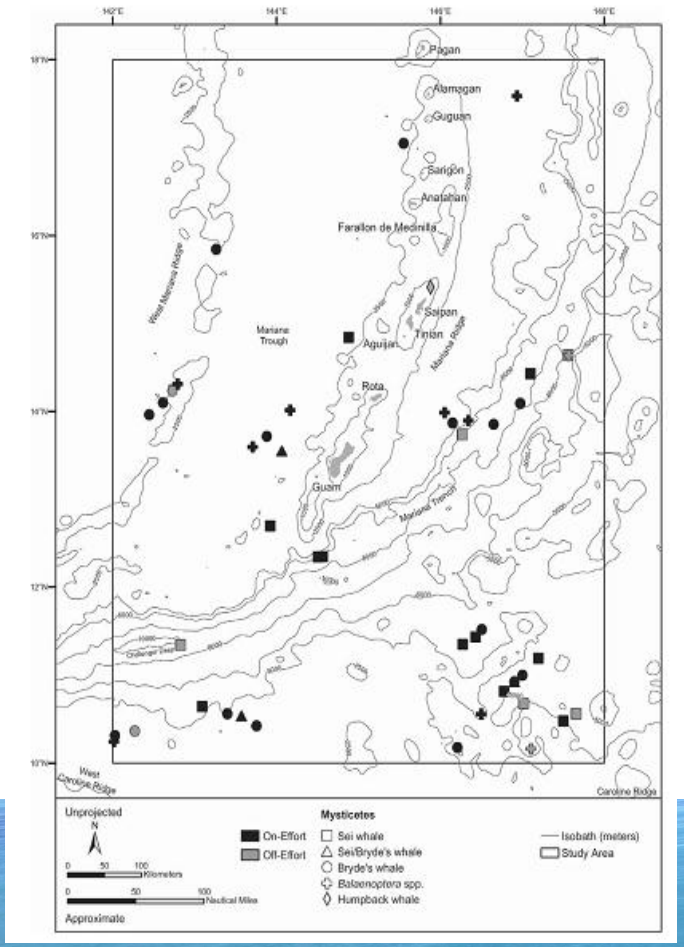
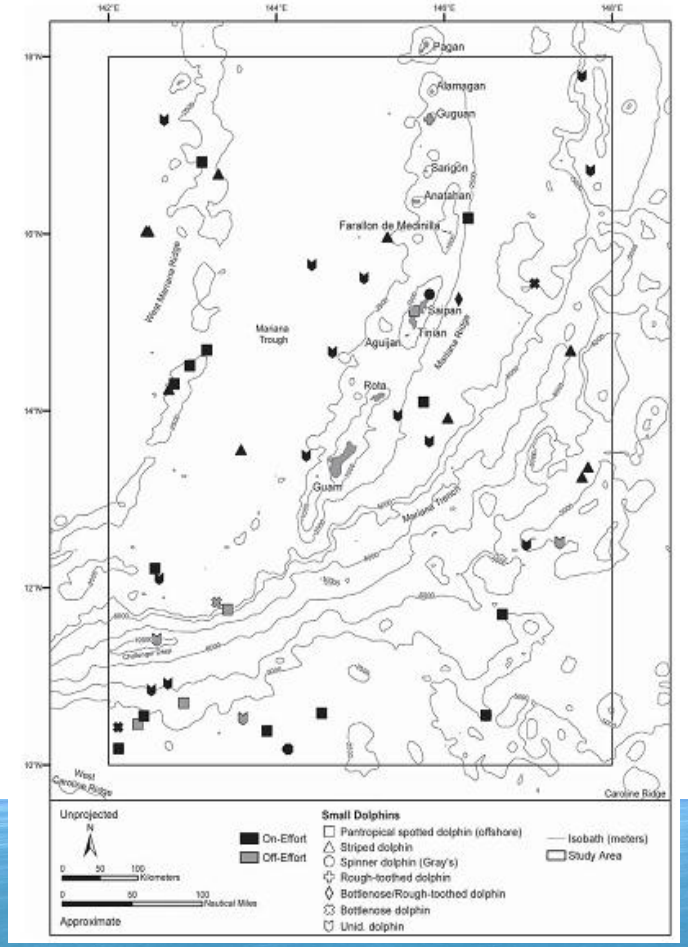


Also, two Cuvier's beaked whales in August, 2011

Previous Cetacean Research in the Marianas:

Large-scale Navy survey



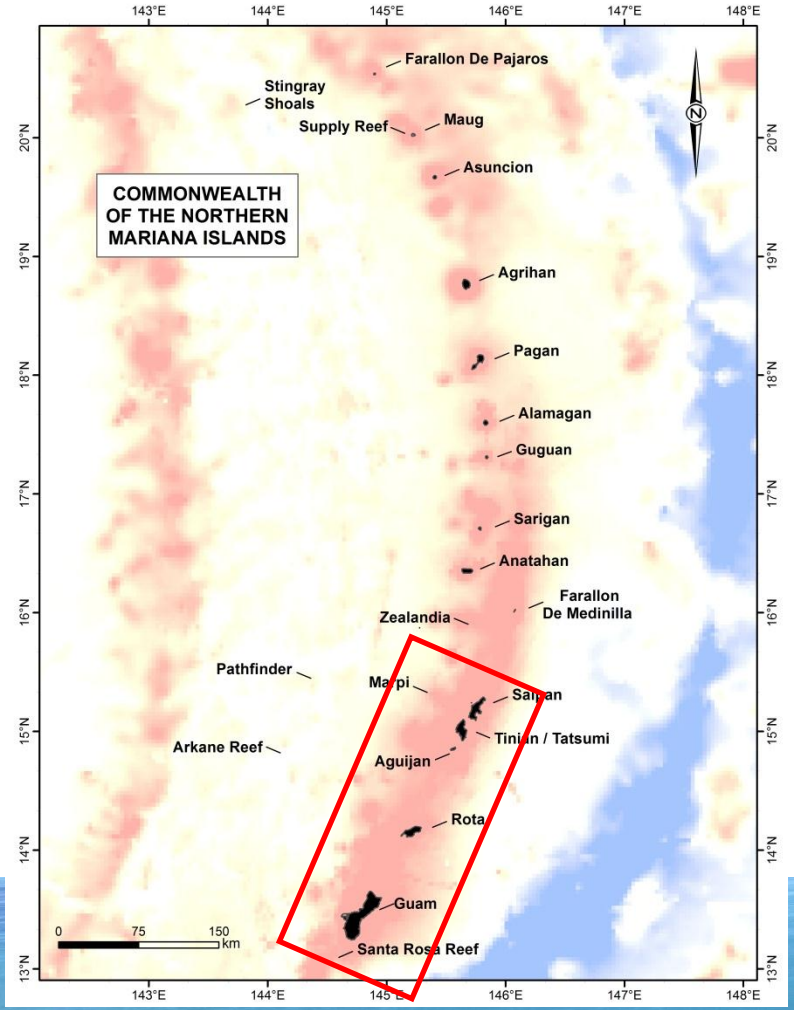


4 month survey: Jan-Apr, 2007

153 sightings of 12 cetacean species

Abundance estimates for all 12 species, ranging from 78 pygmy killer whales to 12,981 spotted dolphins

Guam & CNMI Surveys



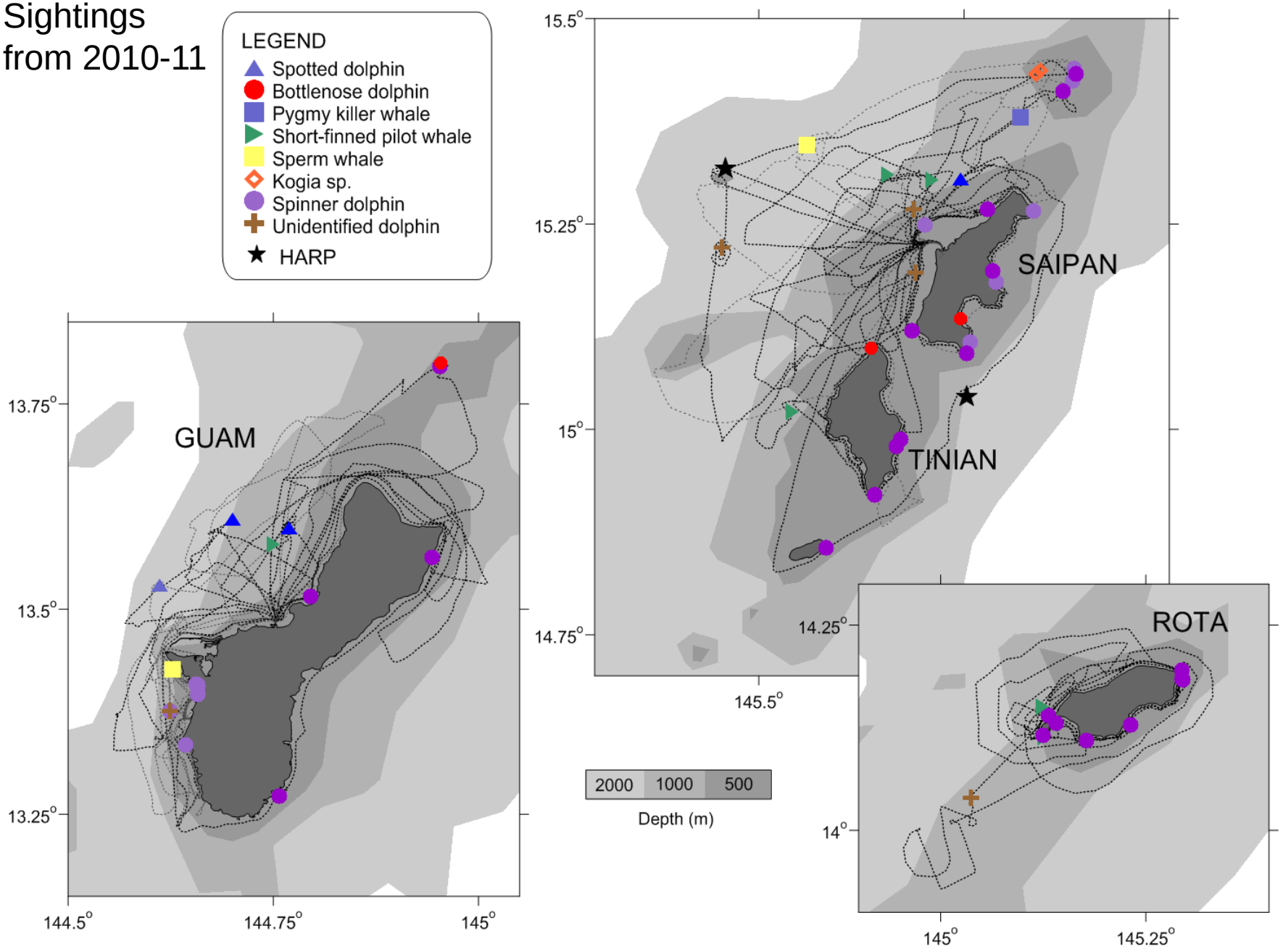
- Small vessel surveys focused in southern islands:
  - February-March, 2010
  - August-September, 2011
  - May-June, 2012
  - February-March, 2011*
  - March, 2012*

  *conducted by HDR, with data contributed to this project
- Focus on photo-ID & biopsy, involvement of local researchers & the public

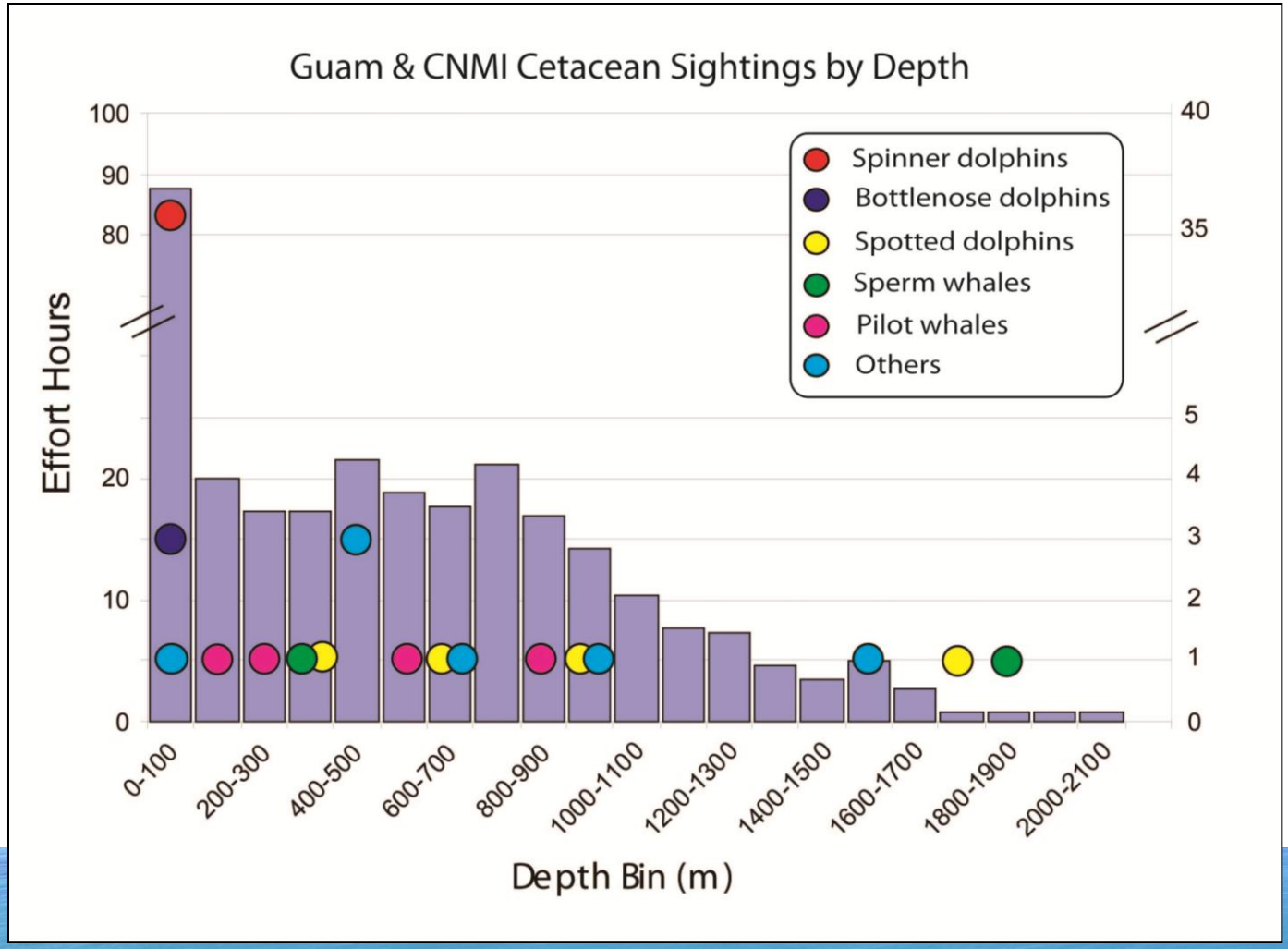
Data collected 2010 – Today!

Species	Total sightings	Encounters w/ ID photos	Biopsy samples
Spinner dolphin	47	46	71
Spotted dolphin	10	10	21
Short-finned pilot whale	7	7	37
Bottlenose dolphin	5	5	7
Sperm whale	2	2	5
Pygmy killer whale	1	1	0
Kogia sp.	1	1	0
Mesoplodon sp.	1	1	0
Unid beaked whale	1	0	0
Unid dolphin	5	0	0
	80	**73**	**141**

Sightings from 2010-11

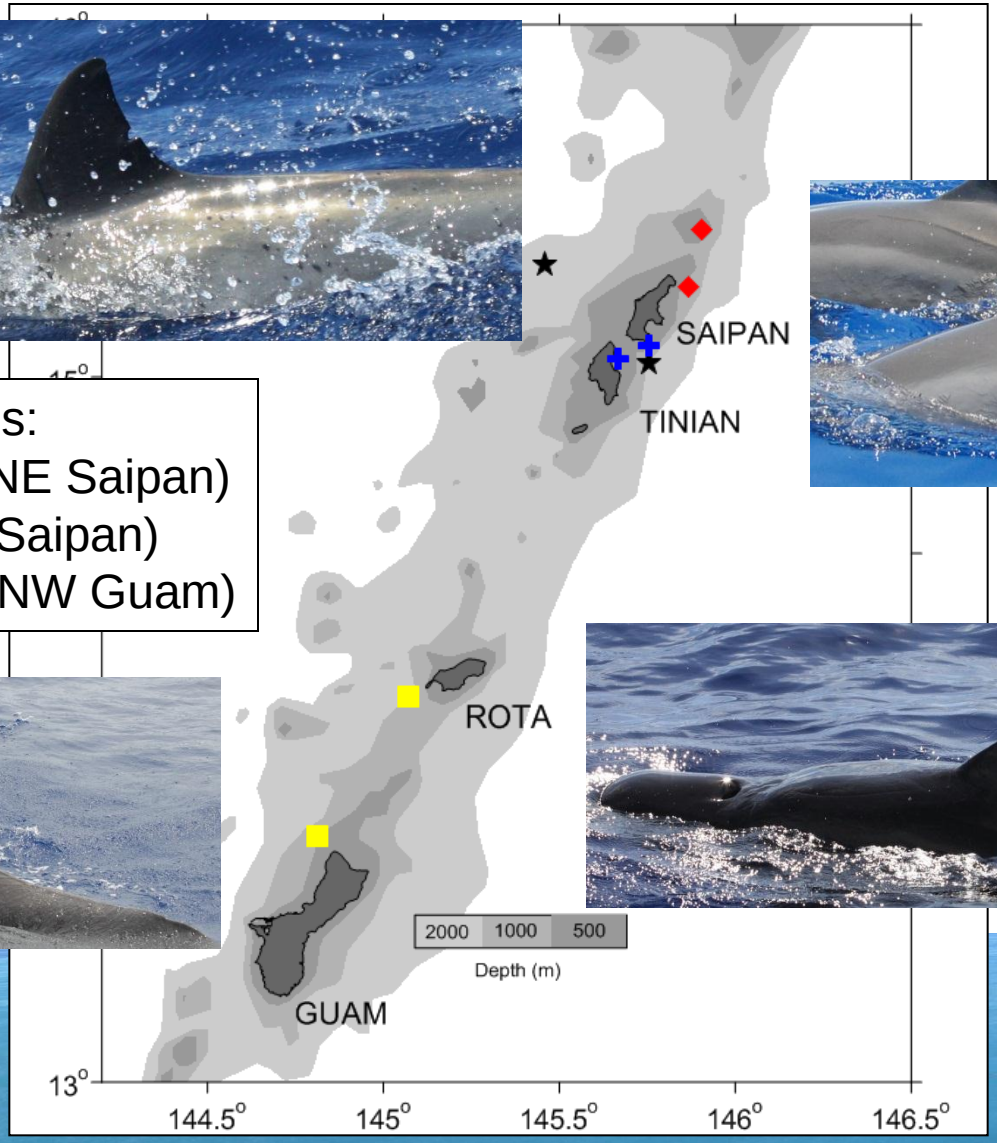


Evaluating Habitat

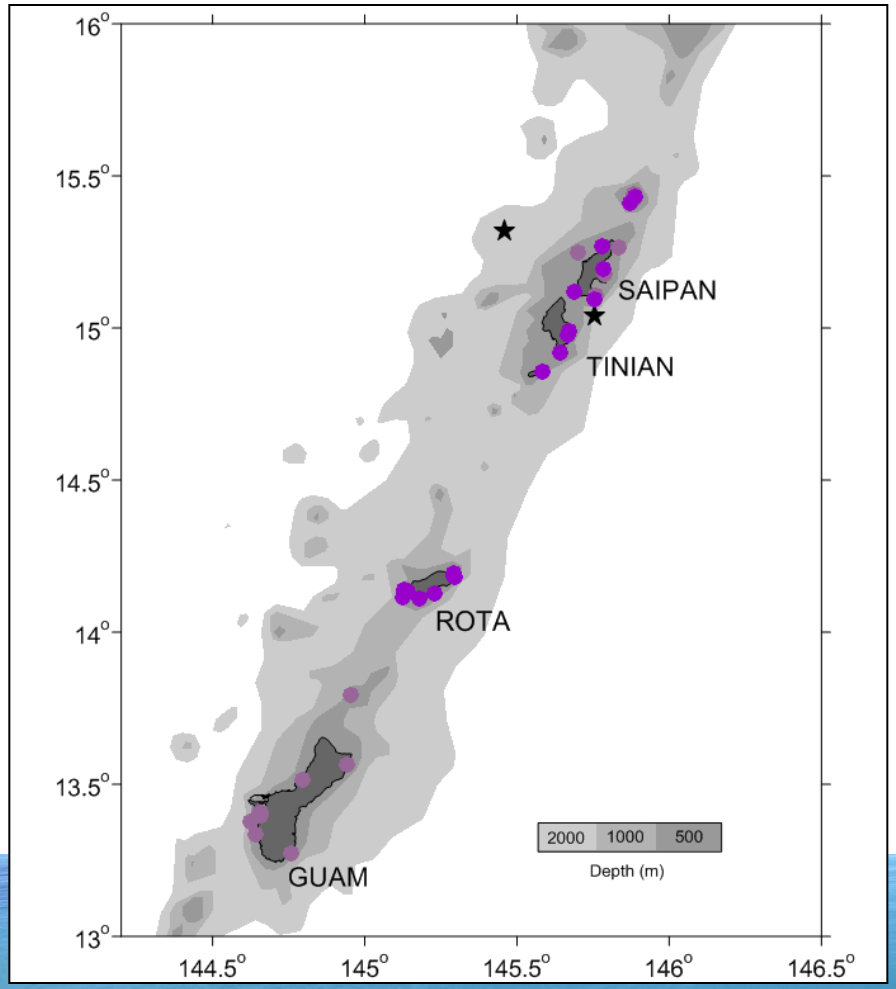


Inter-Island Matches

Inter-island matches:
Spinners (Marpi – NE Saipan)
Bottlenose (Tinian-Saipan)
Pilot whales (Rota-NW Guam)



Spinner dolphins



With large sample from spinner dolphins, we've just initiated some detailed studies:

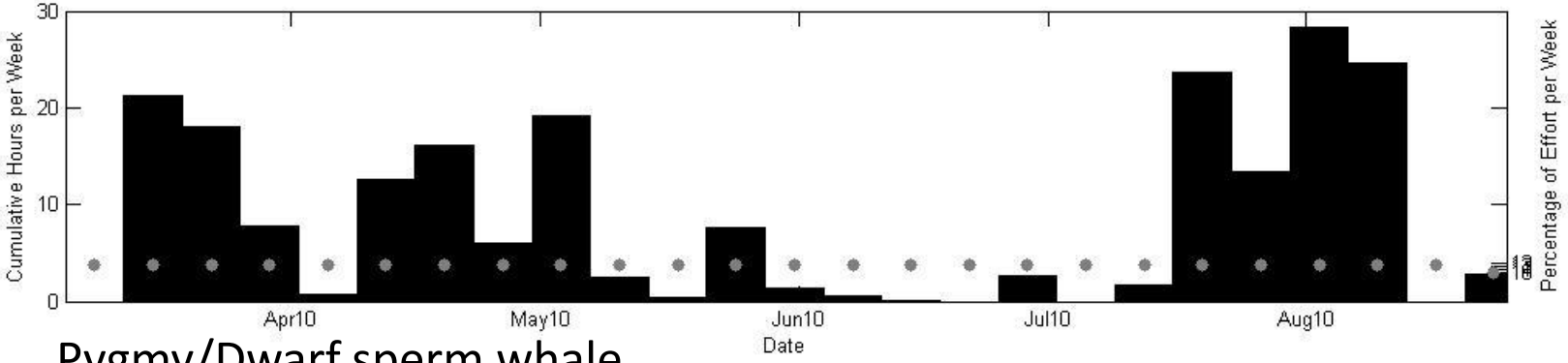
- Photo-ID catalog to assess population size and movements
- Genetic analysis of population structure
- Contaminant analysis
- Stable isotope analysis

HARPs in CNMI

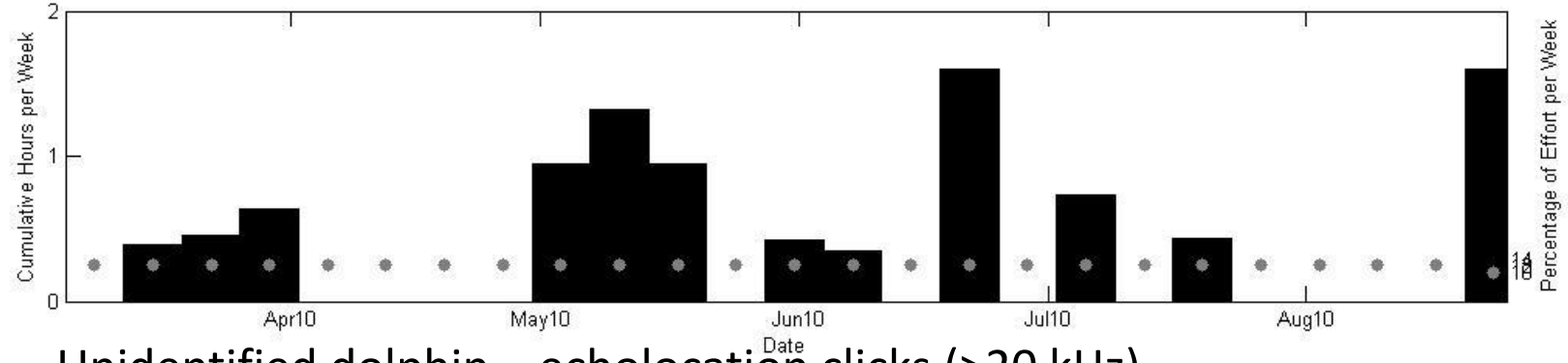
Two HARPs currently record cetacean sounds near Saipan and Tinian

- First record: Saipan March –August 2010
- Second record: Saipan & Tinian March – October 2011
- Third record: Saipan & Tinian June 2012 – June 2013

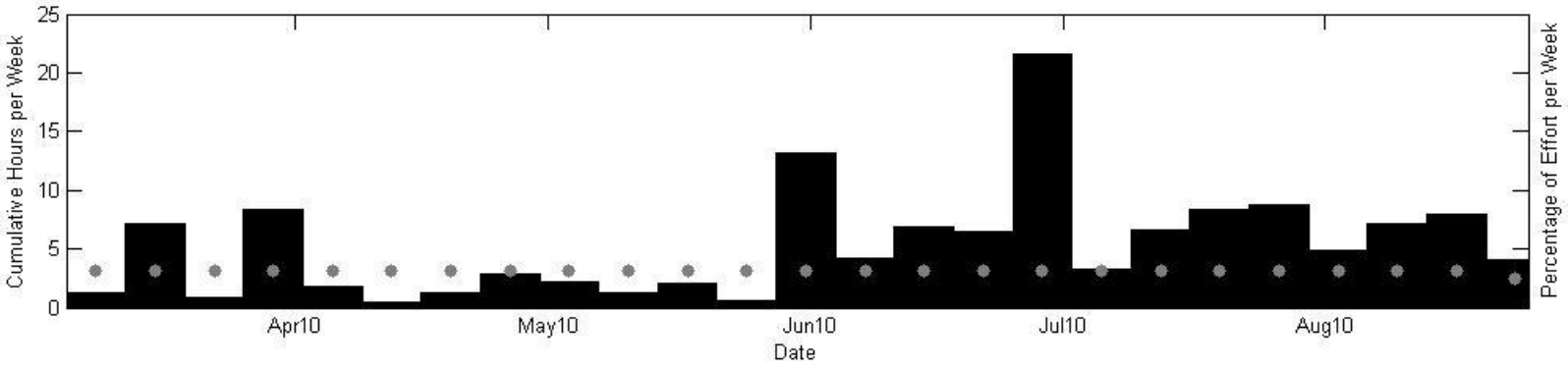
Sperm whale



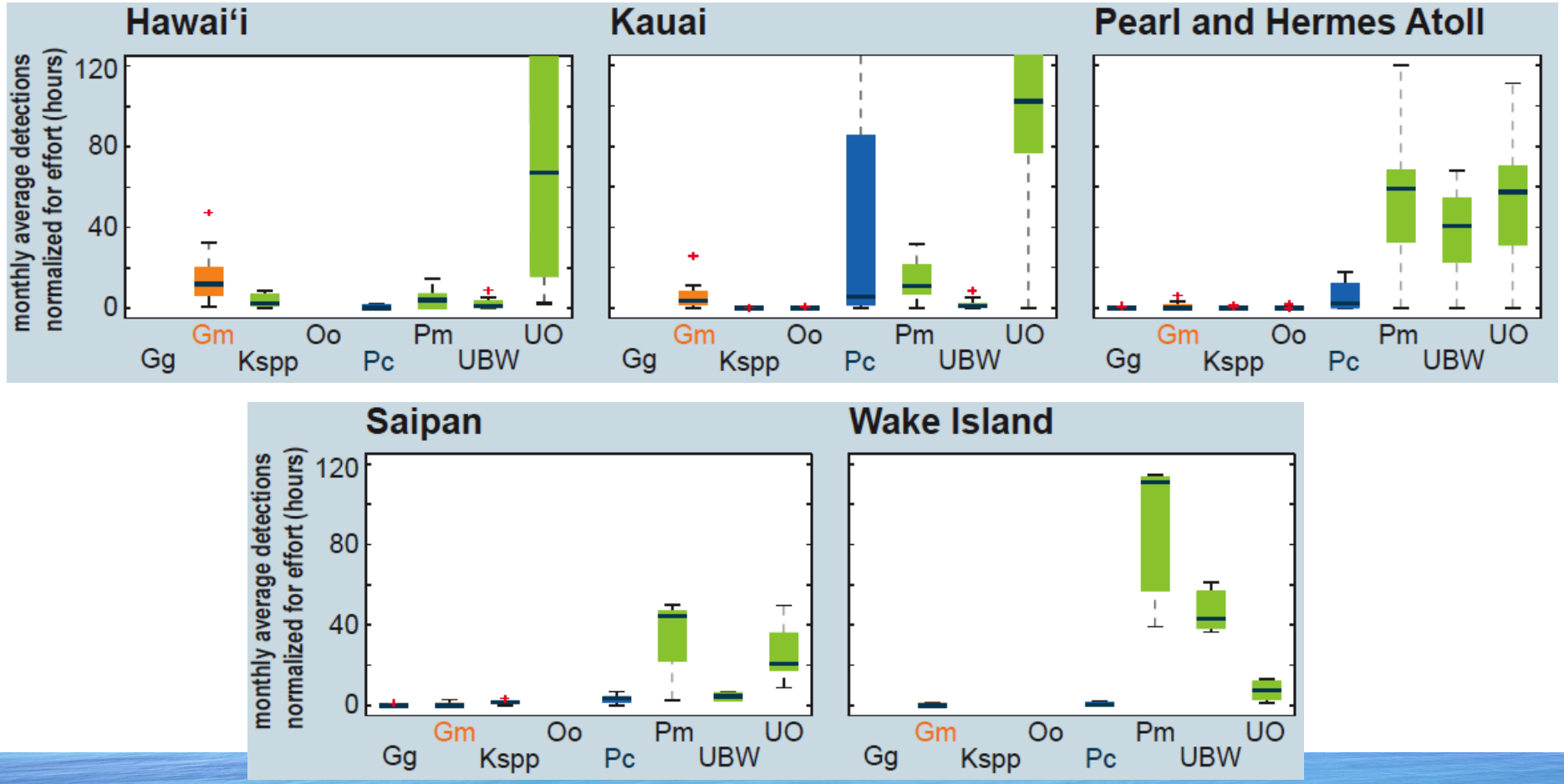
Pygmy/Dwarf sperm whale



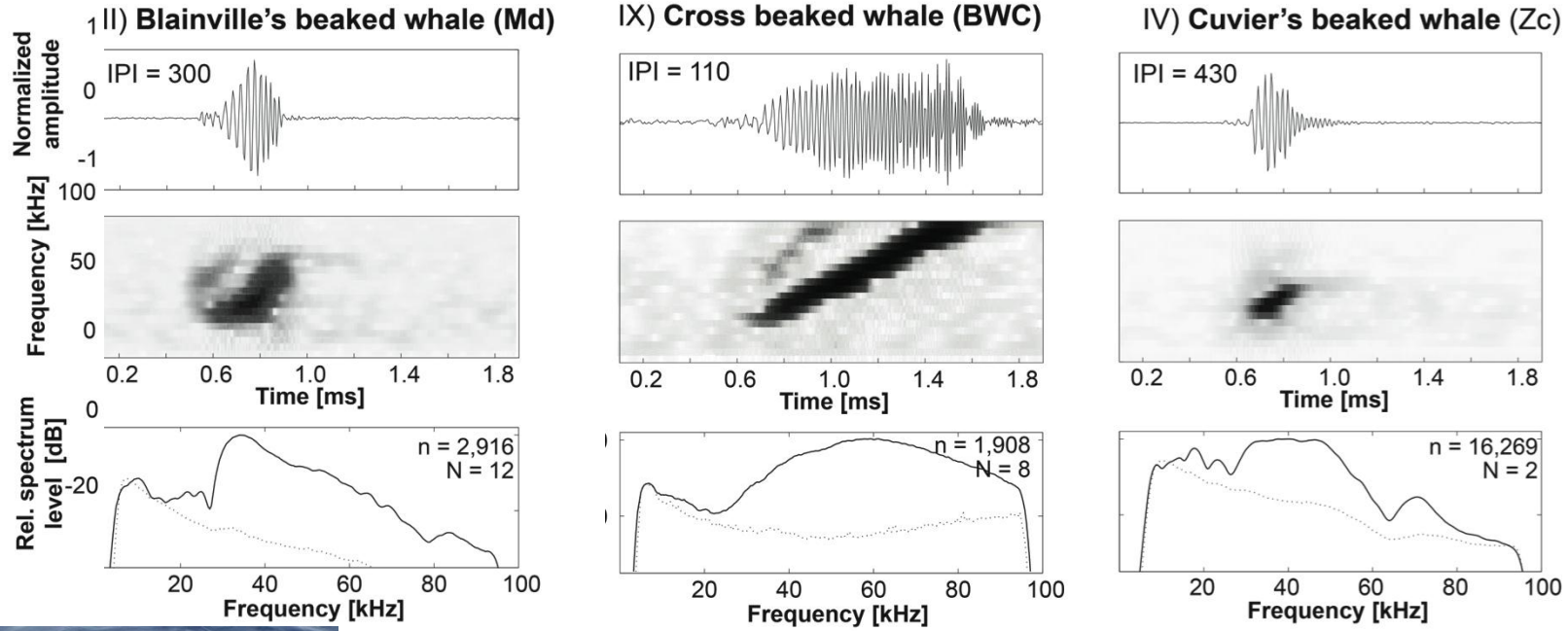
Unidentified dolphin – echolocation clicks (>20 kHz)

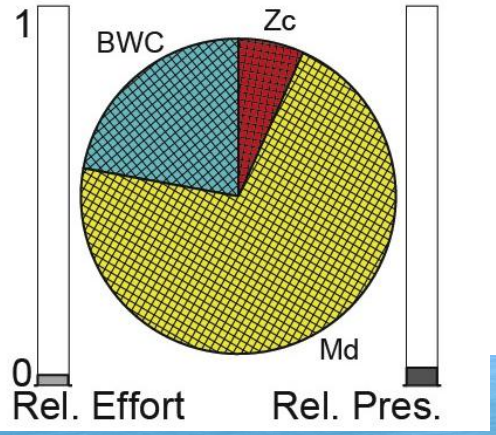


Species composition throughout the central & western Pacific



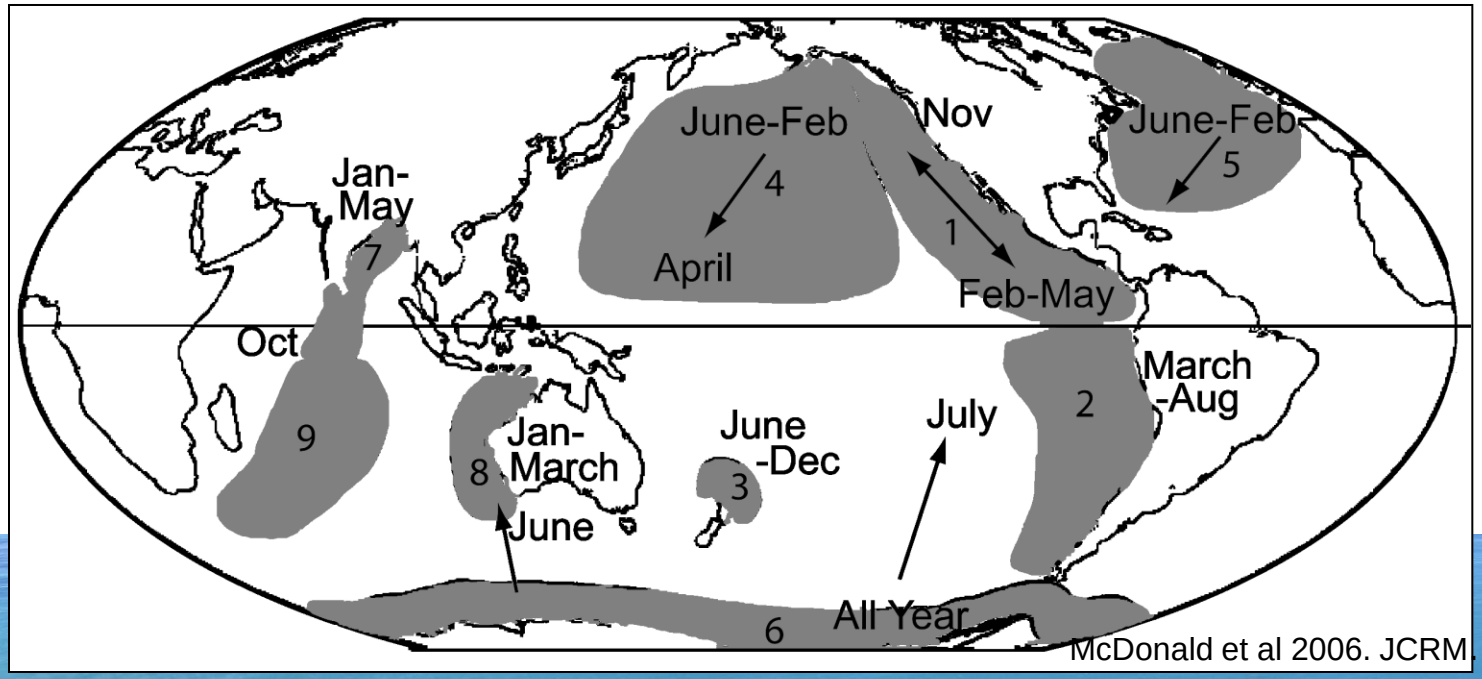
Beaked whales!





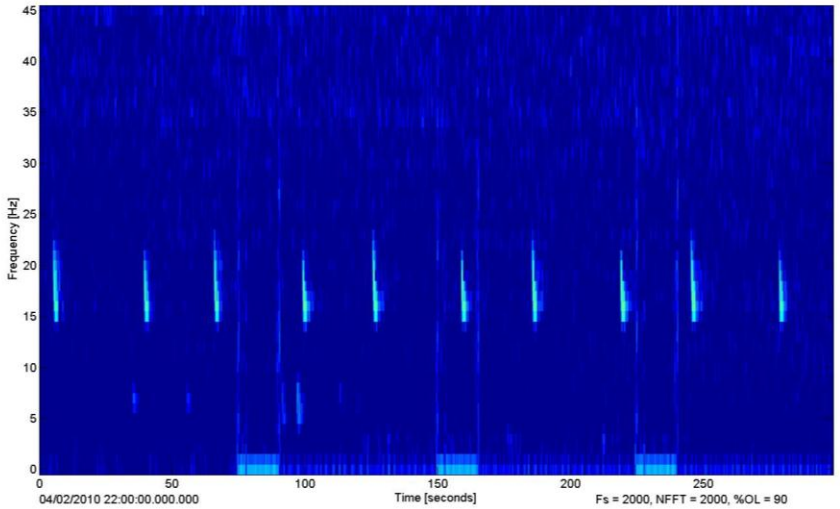
Baleen Whale Song and Stock Structure

Blue, humpback, and minke whale songs vary geographically and are thought to coincide with separate populations



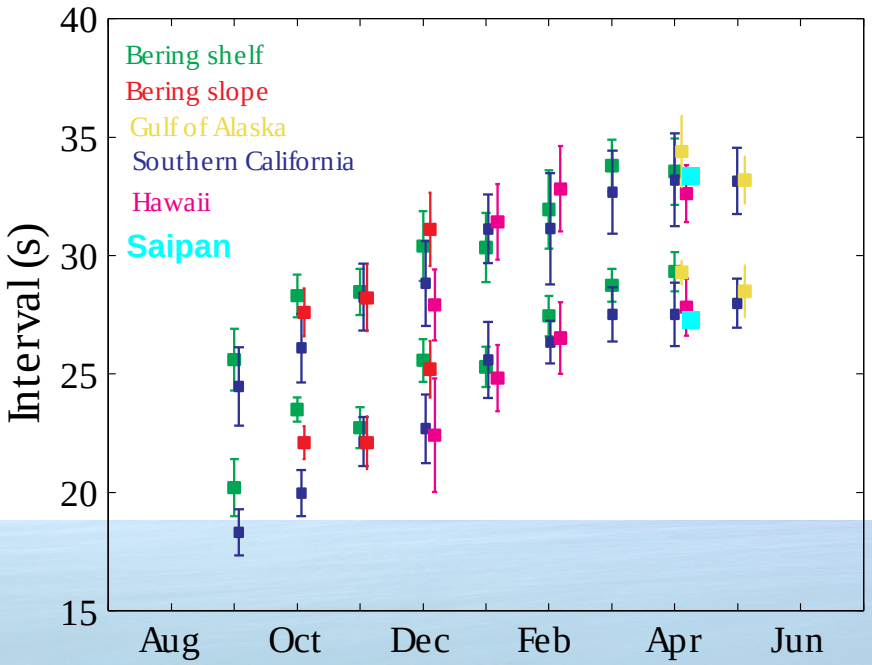
McDonald et al 2006. JCRM.

A hint at fin whale population structure

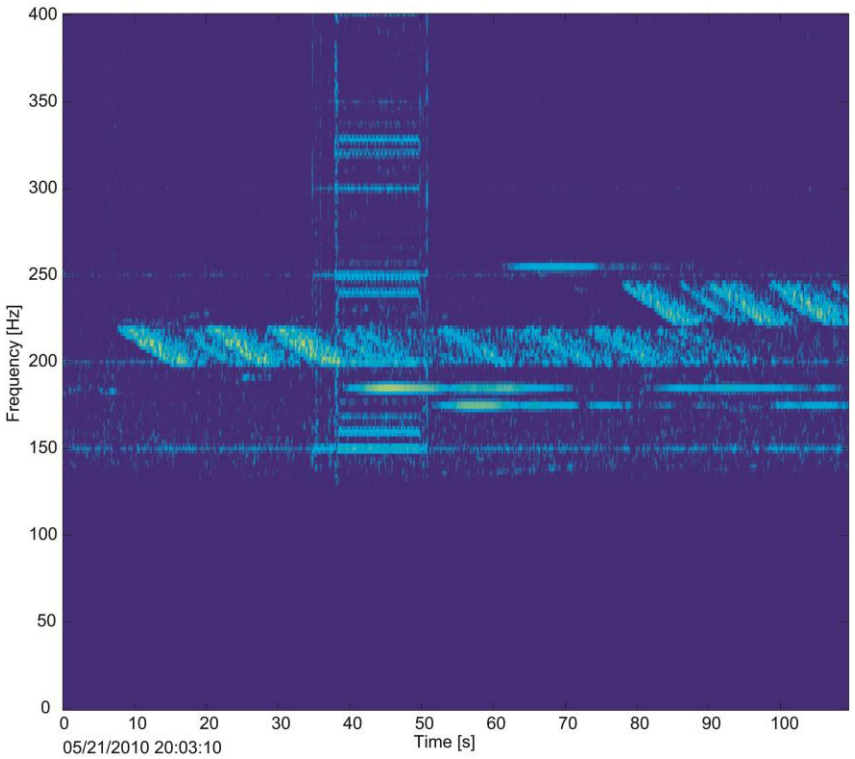


Fin whale populations can be distinguished through patterns in their song

A single pan-Pacific population, appears to also be present at Saipan



Low-frequency active (LFA) sonar in the western Pacific



- Low-frequency sonar, produced by the U.S. Navy can also be heard in Saipan.
- Mid-frequency sonar wasn’t heard from Mar-Aug, 2010, but is likely occurring here as well.

We want to learn from you…

- We are making great progress, but are sure you each have stories and information that we could learn from.
- Please see me after the talk or send me an email: erin.oleson@noaa.gov
- Go to: cnmicoralreef.net -> ‘Monitoring’ for cetacean species-ID guides
- And please, come out on the water with us

Many Thanks

- Vessels & captains
  - Saipan: Ben Sablan, Manny Blas, Sam Markos, Elano Blas Valdez Jr., Rick Seidler, Clare Sablan, Ben Sablan Jr., Oscar Sablan
  - Rota: Ray Castro, Inas Lizama, & Fidel Mendiola
  - Guam: John Eads, Tim Hanley, Masao Tenbata, Todd & Monique, Genereux, Jackey Wang
- Local Agencies
  - DFW, CRM, DEQ, NMFS, UoG, NPS
- Others: Eric Cruz, Mike Trianni, Steve McKagan, Dana Okano, Mike Tenorio, Valerie Brown, Mark Michael, Bruce Bateman, & Karri Fischer
- Funding: U.S. Navy, NMFS
- Permits: NMFS 14097 & 15024, CNMI DFW 01721-10 & 02260-11
- And You!


Questions?