

# Cetacean Research in the Marianas

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**Cetacean Research Program**

NOAA Fisheries, Pacific Islands Fisheries Science Center

JIMAR

2015 External Review: Protected Species

# Project Partners

## Federal Government:

Commander, U.S. Pacific Fleet (funding)

Pacific Islands Fisheries Science Center (PIFSC) – Honolulu (funding)

PIFSC-Guam & Commonwealth of the Northern Mariana Islands (CNMI)

Pacific Islands Regional Office (PIRO) – Guam and CNMI

NOAA R/V *Oscar Elton Sette*

Southwest Fisheries Science Center

Northwest Fisheries Science Center

Naval Facilities Engineering Command - Pacific

## Local Government:

CNMI-Department of Land and Natural Resources-Division of Fish and Wildlife

CNMI-Coastal Resources Management

CNMI-Department of Environmental Quality

CNMI-Public School System

Guam Department of Agriculture

Marianas Visitors Authority

## Universities and Colleges:

Joint Institute for Marine and Atmospheric Research, University of Hawaii

Scripps Institution of Oceanography, University of California San Diego

University of Guam

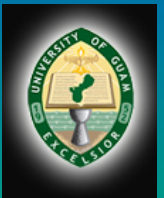
Northern Marianas College

## Other:

Independent contract observers and volunteers

Owners and crew of chartered vessels

HDR



# Cetacean Research in the Marianas

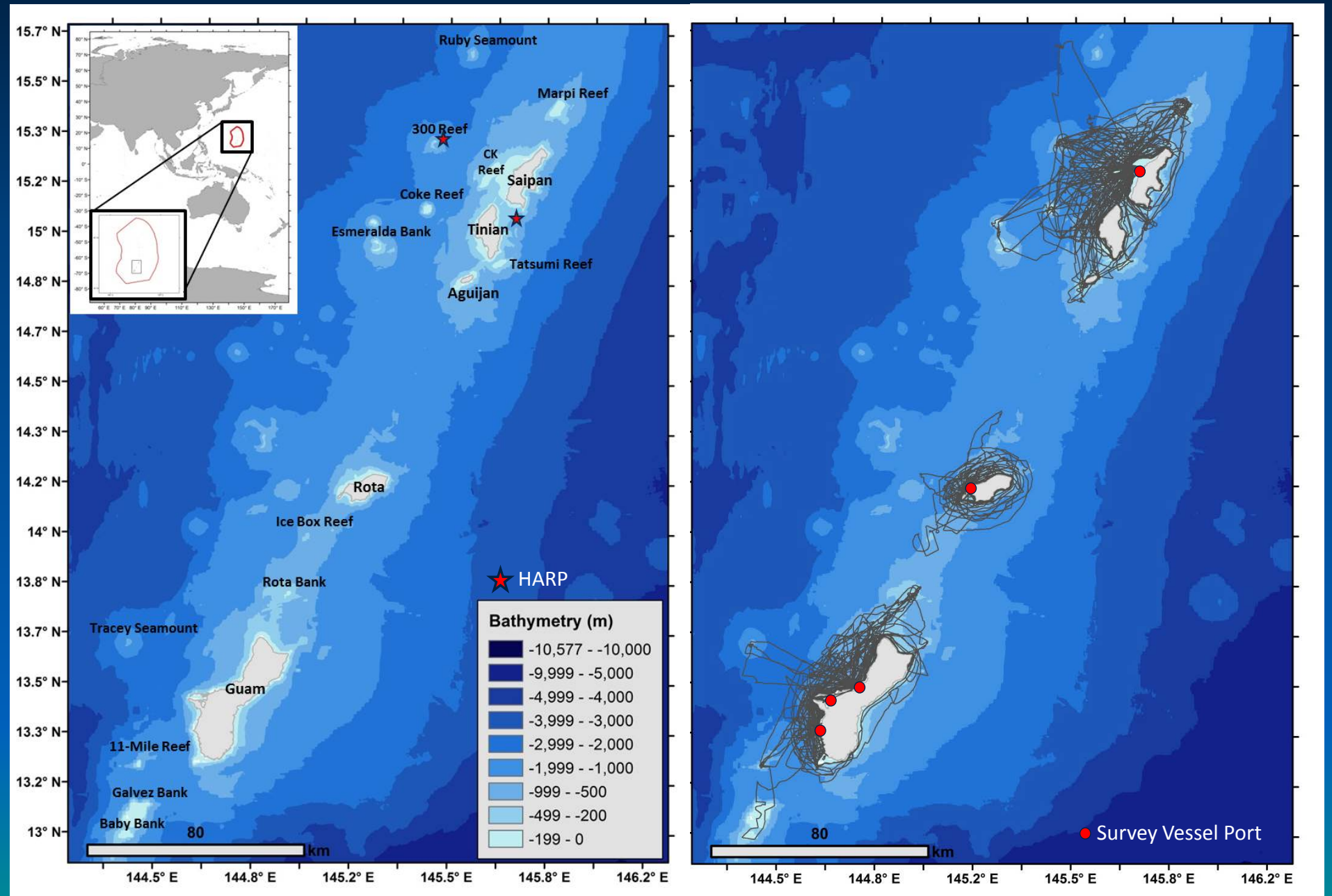
A group of dolphins is captured in mid-leap from the surface of the deep blue ocean. The dolphins are dark grey or black, and their bodies are arched as they move through the air. The water around them is splashing, creating white foam and droplets. The background is a vast expanse of blue water with some ripples and light reflecting off the surface.

## Goals:

- Understand species occurrence and distribution
- Determine the population structure and abundance of the those species
- Study the movements and habitat use of individuals and populations

## Methods:

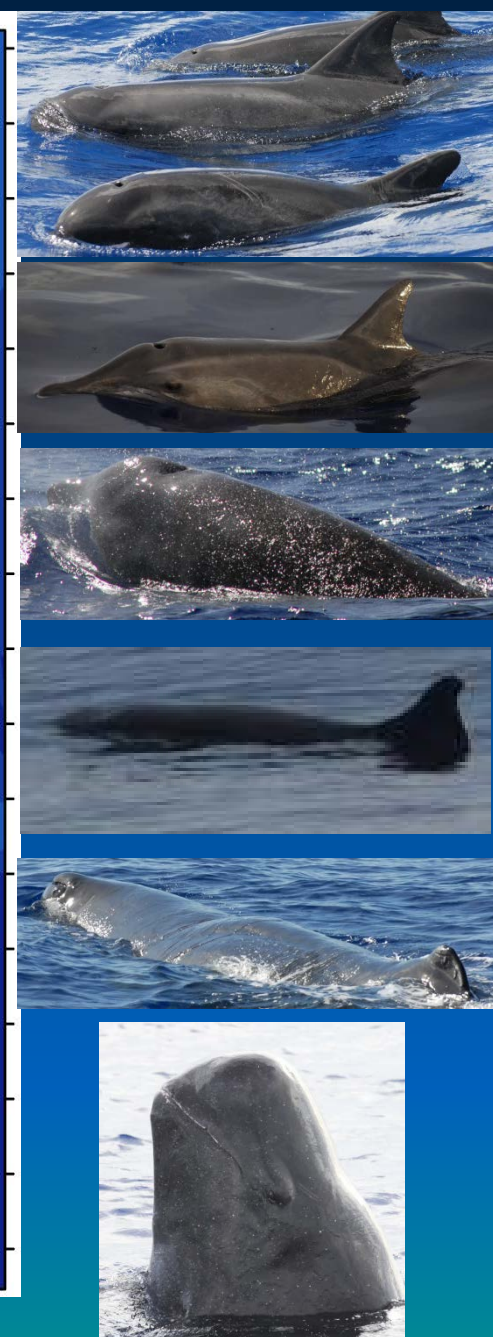
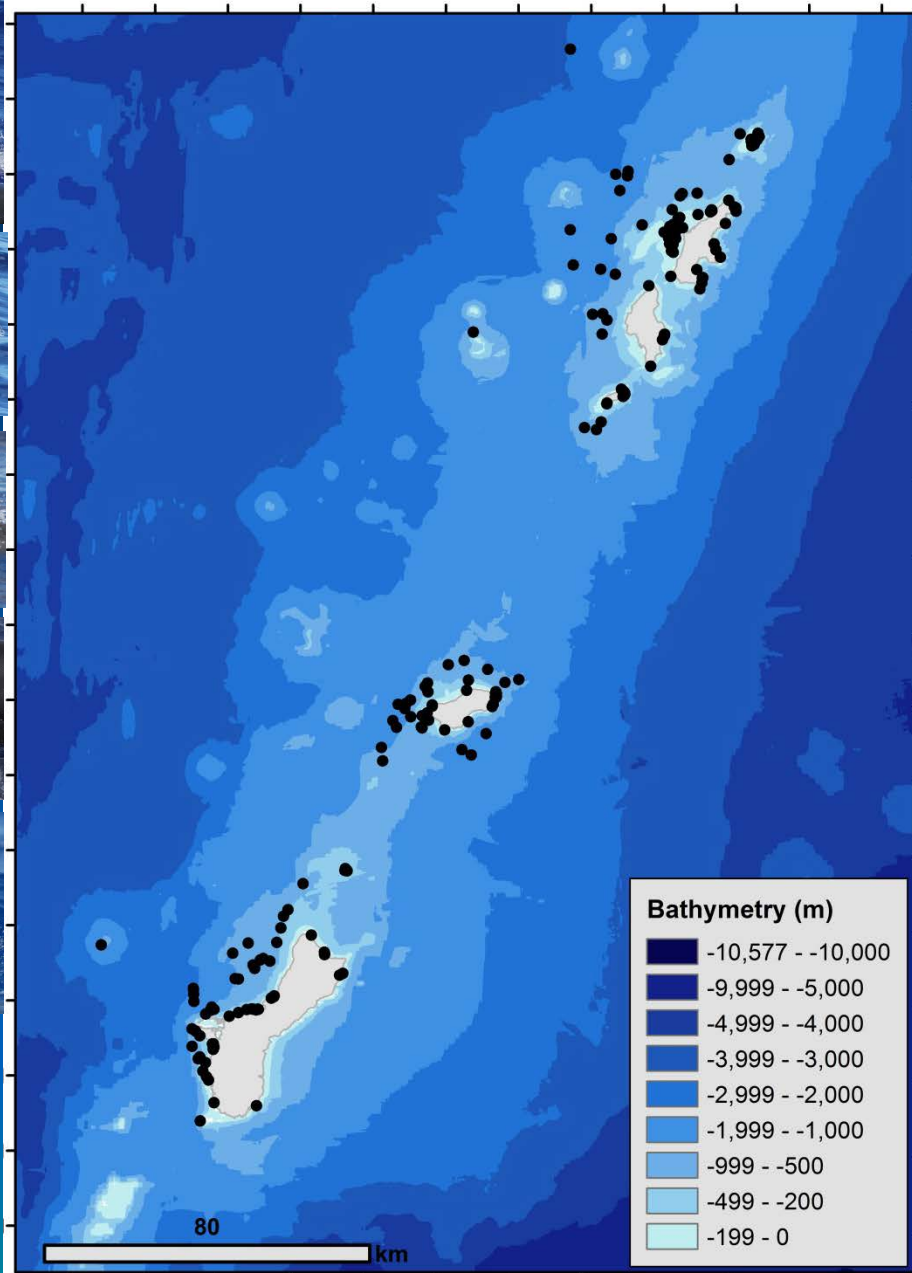
- Small boat-based and ship-based surveys
- Passive acoustic recordings (HARPs & towed array)
- Photo-ID, biopsy sampling, and satellite tagging



2010-2015

160 small boat survey days

>14,000 km trackline



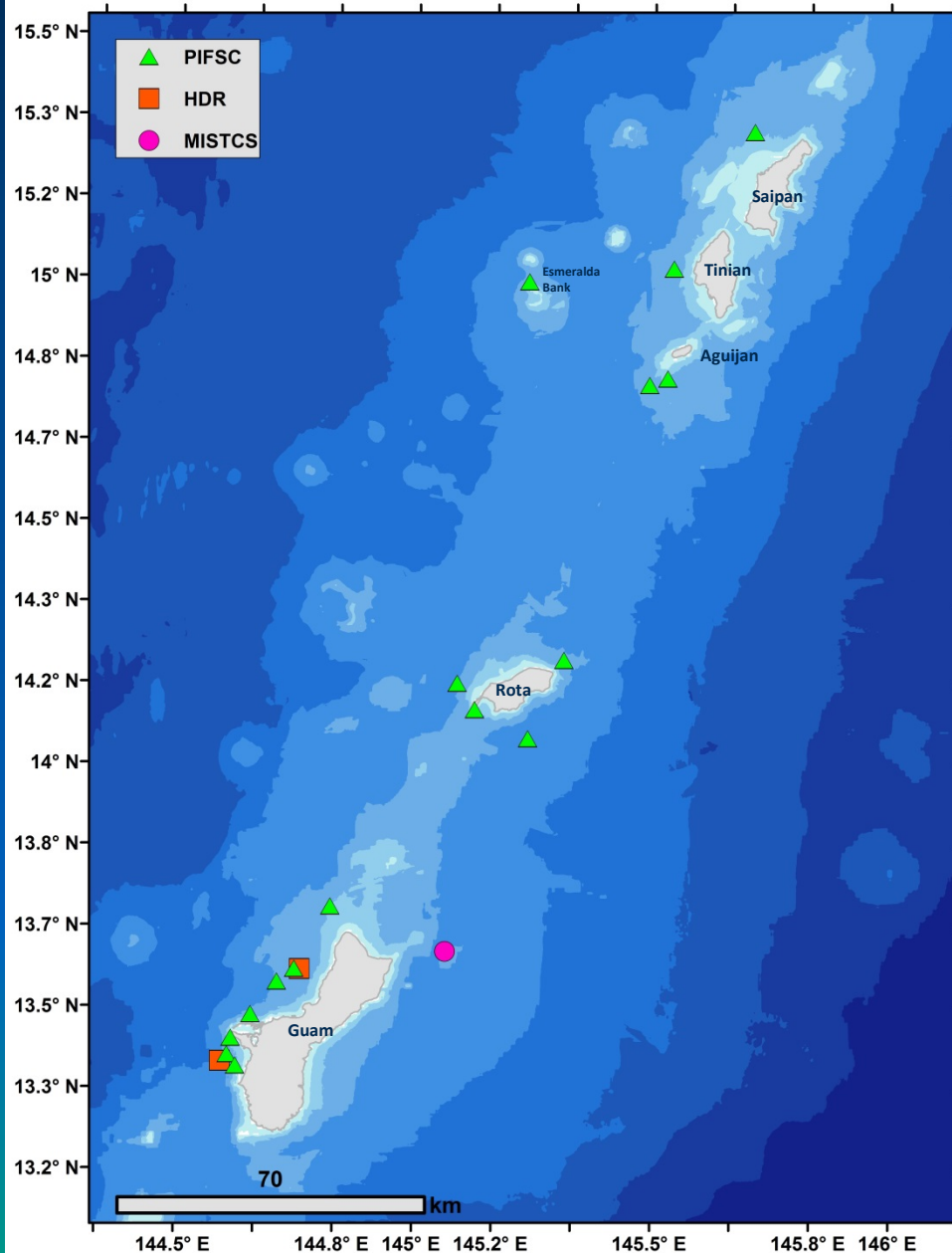
2010-2015

186 sightings of 12 odontocete species

# Odontocete Encounter Details

Species	Total encounters	Photo-ID Catalog Individuals	Biopsy samples	Satellite tags
Spinner dolphin	102	307	95	0
Pantropical spotted dolphin	27	TBD	46	0
Bottlenose dolphin	21	52	16	3
Short-finned pilot whale	16	178	64	11
False killer whale	5	40	26	7
Pygmy killer whale	4	6	4	0
Rough-toothed dolphin	3	6	2	1
Sperm whale	3	2	6	0
Melon-headed whale	2	TBD	19	2
Dwarf sperm whale	1	0	0	0
Blainville's beaked whale	1	0	0	0
Cuvier's beaked whale	1	0	0	0
<b>Total:</b>	<b>186</b>	<b>591</b>	<b>278</b>	<b>24</b>

# Short-finned Pilot Whales



- 16 PIFSC sightings (2011-2014)
- 3 sightings contributed from other research (HDR & MISTCS)
- 178 individuals in photo-ID catalog
- 63% resighted



# Short-finned Pilot Whales

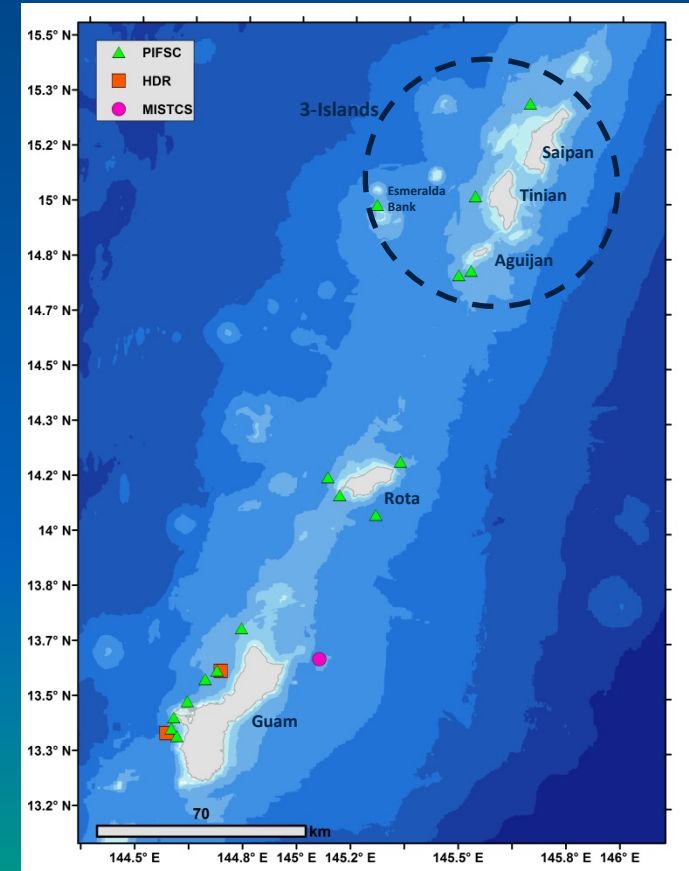
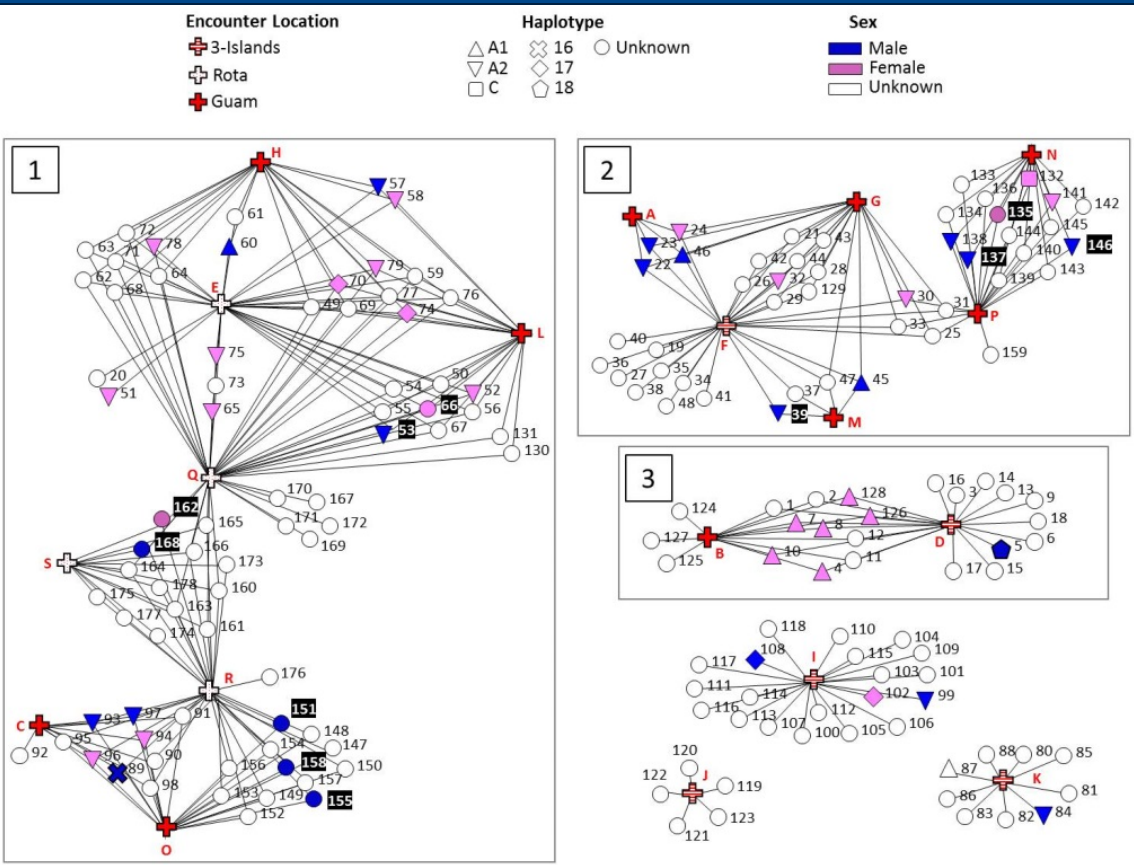
## ➤ Three Social Networks (at least)

- Network 1 : 75 indiv. → Hap A1,A2,16,17
- Network 2 : 45 indiv. → Hap A1, A2, C
- Network 3 : 23 indiv. → Hap A1,18

## ➤ 47 of 64 biopsy samples analyzed

(Martien *et al.* 2014)

- 6 Haplotypes
- Genetic differentiation between 3-Islands & Guam/Rota





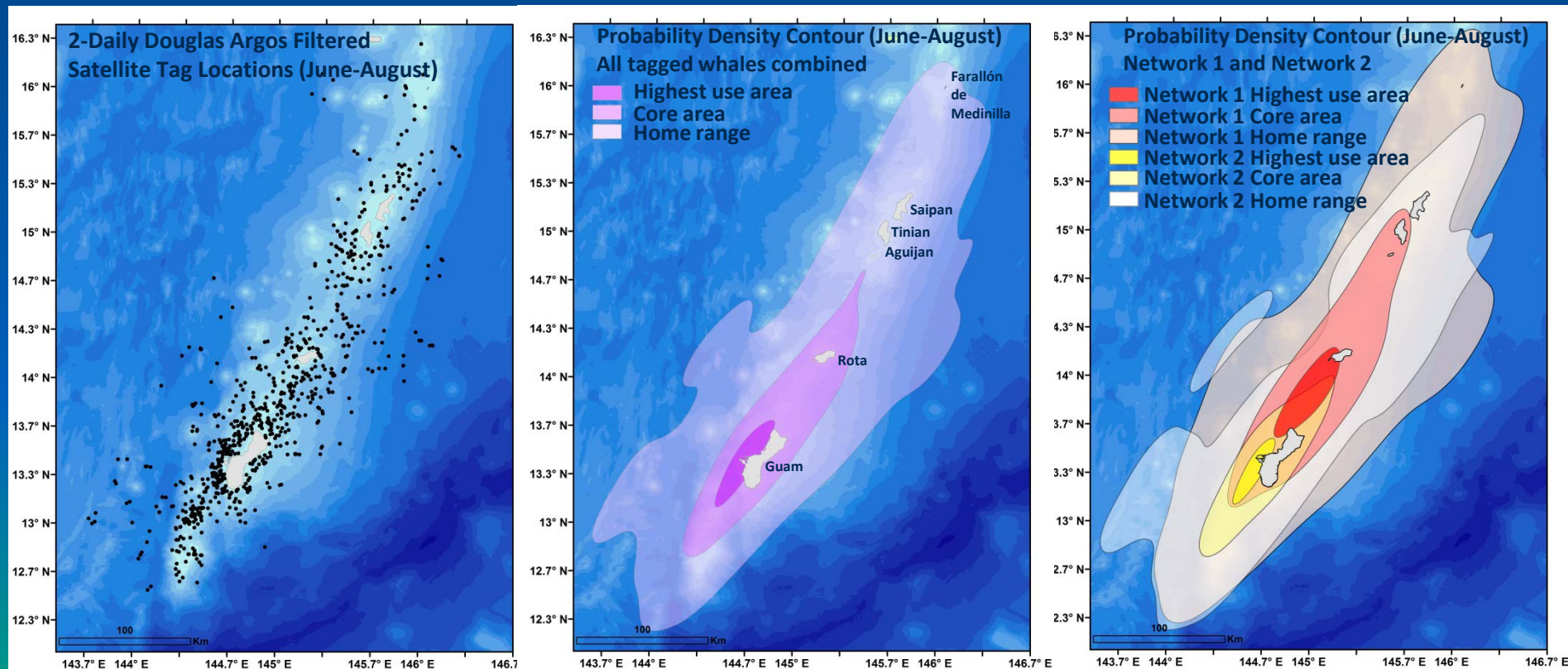
# Short-finned Pilot Whales

## ➤ 11 satellite tags (2013-2014)

- Network 1: 7 (4 males/3 females)
- Network 2: 4 (3 males/1 female)
- Tag durations 10.5-234.7 days
- 16 km median distance from shore

## ➤ Kernel density estimation

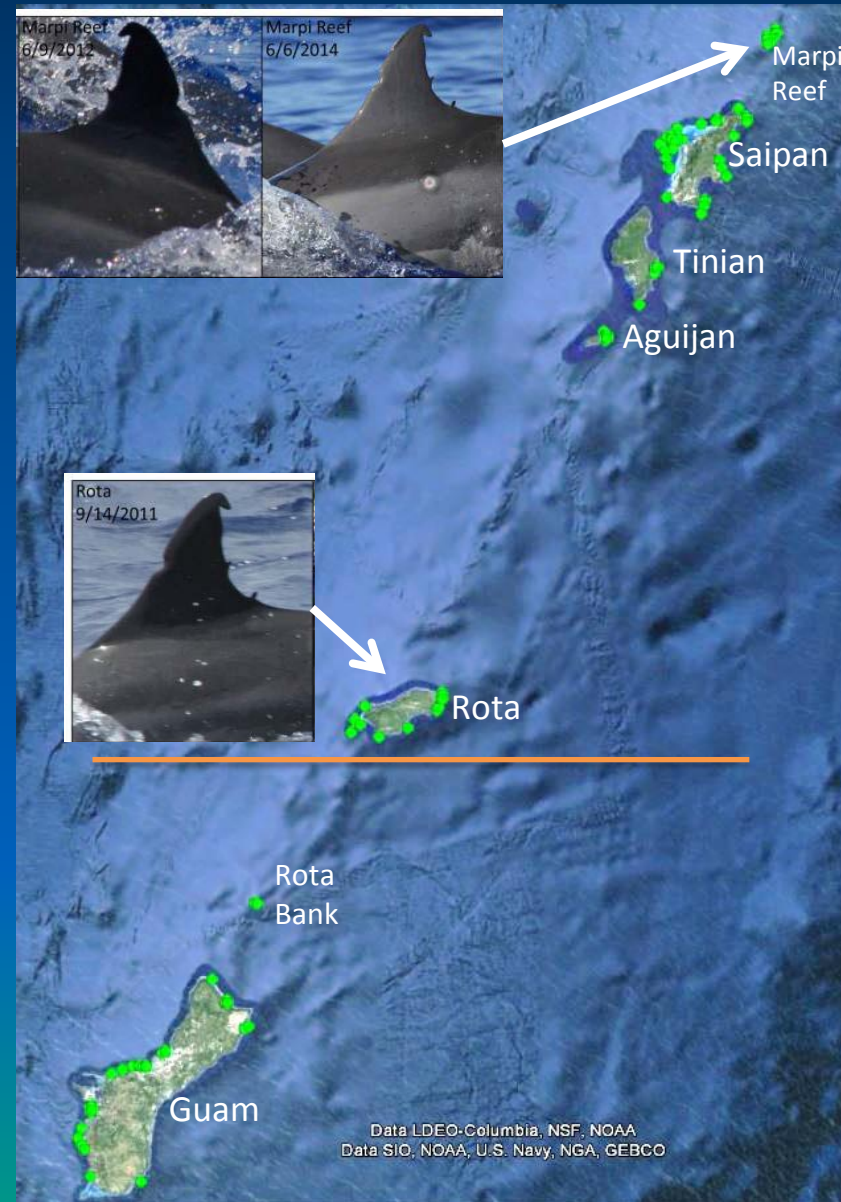
- Summer (June-August)
- 2 daily Douglas Argos Filtered locations
- Areas of use (highest, core, home range)
- Highest use areas
  - All tags combined: west of Guam
  - Networks 1 & 2 separated: No overlap



# Spinner Dolphins

- 102 PIFSC sightings (2010-2014)
- 6 HDR sightings (2011-12)
- 307 cataloged individuals (and counting)
  - 57% resighted
  - No matches between Guam and other islands
- 95 biopsy samples collected and analyzed (Martien *et al.* 2014)
  - High genetic diversity (23 haplotypes)
  - No structure within the southern islands

- Studies in progress
  - Habitat analysis (with Erik Franklin, UH)
  - Contaminant analysis (with Gina Ylitalo, NWFSC)

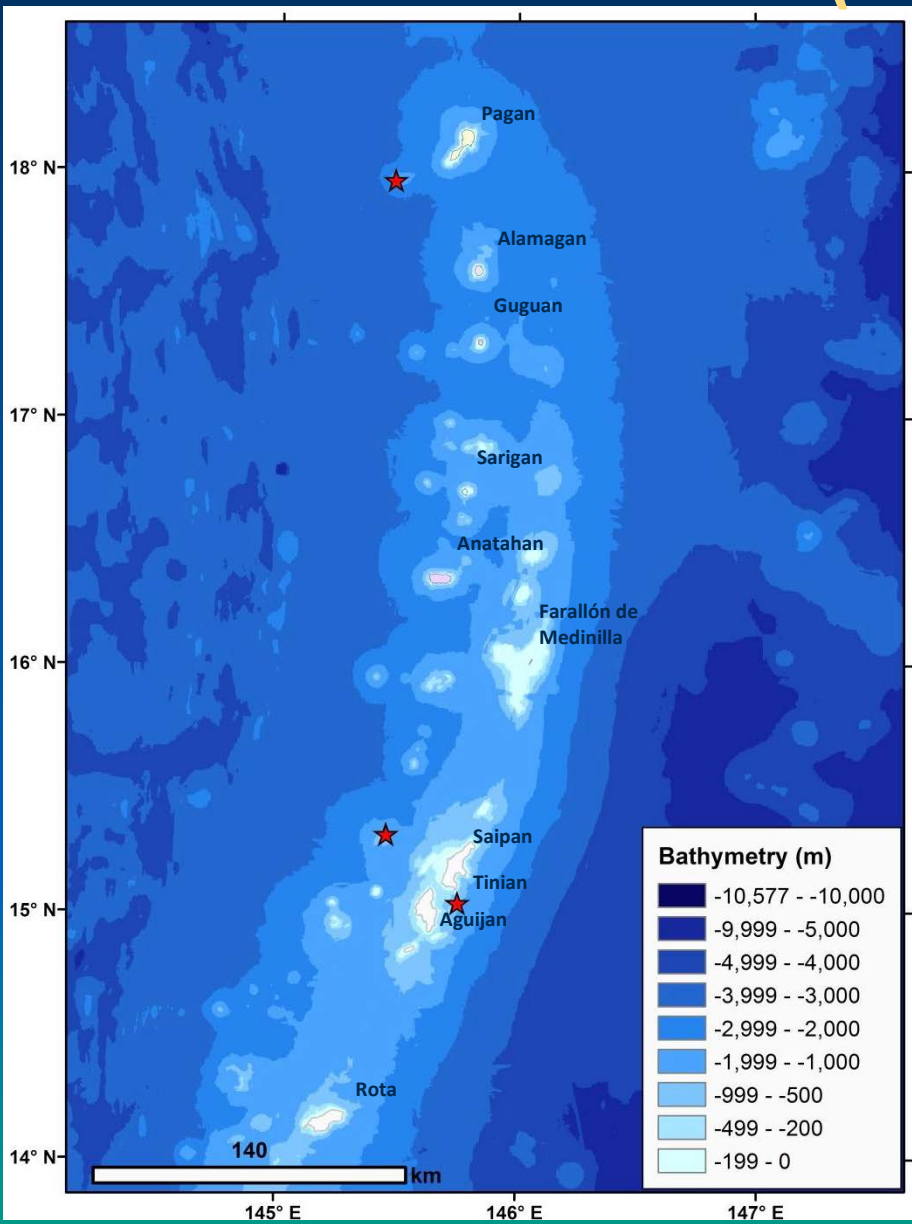


# Bottlenose Dolphins

- 21 PIFSC sightings (2011-2015)
- 2 HDR sightings (2011-2012)
- 52 cataloged individuals
  - 62% resighted
  - Matches between all islands
- 15 biopsy samples analyzed (mtDNA/nDNA) (Martien *et al.* 2014, 2015)
  - Low genetic diversity compared to other populations suggests they are a small genetically isolated population
  - Nearly all dolphins biopsy sampled have 5%-50% Fraser's dolphin ancestry



# High-frequency Acoustic Recording Packages (HARPs)



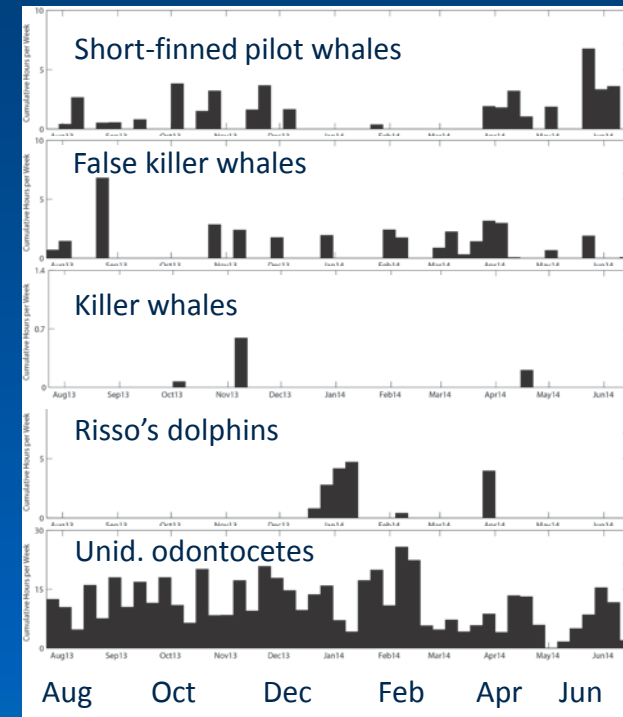
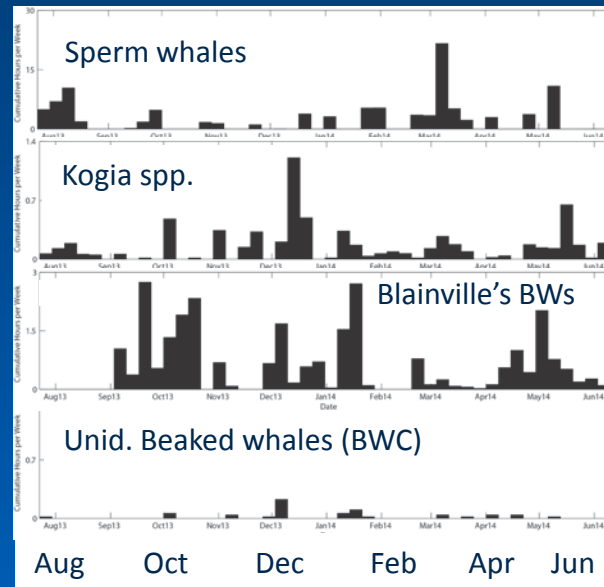
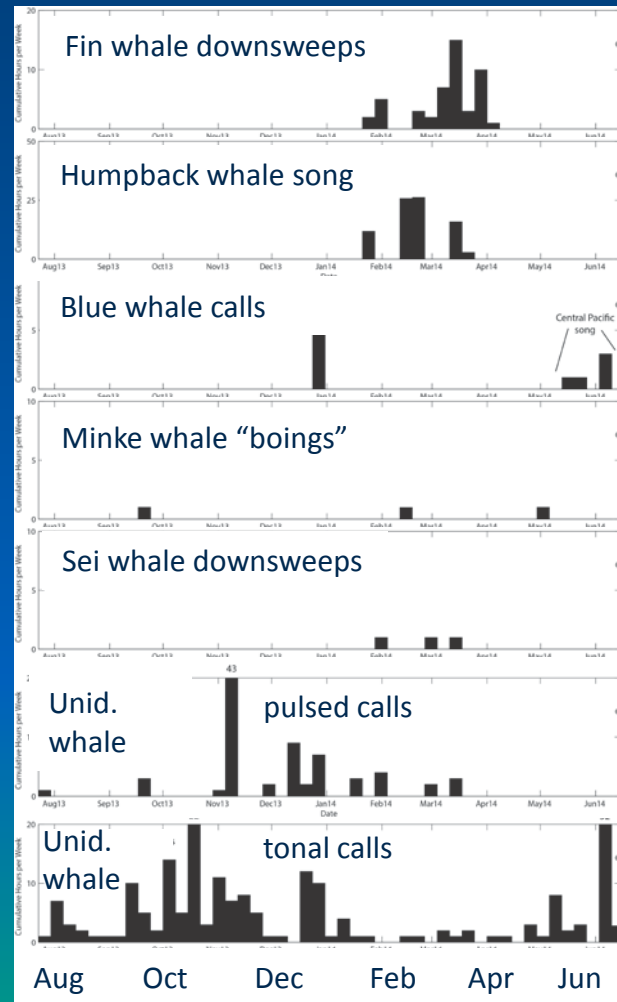
- Three HARPs currently deployed near Saipan, Tinian, and Pagan (May 2015)
- 2010 Saipan
- 2011 Saipan and Tinian
- 2012-ongoing year round at all sites

# Acoustic detections of cetaceans (August 2013-June 2014)

## Baleen whales

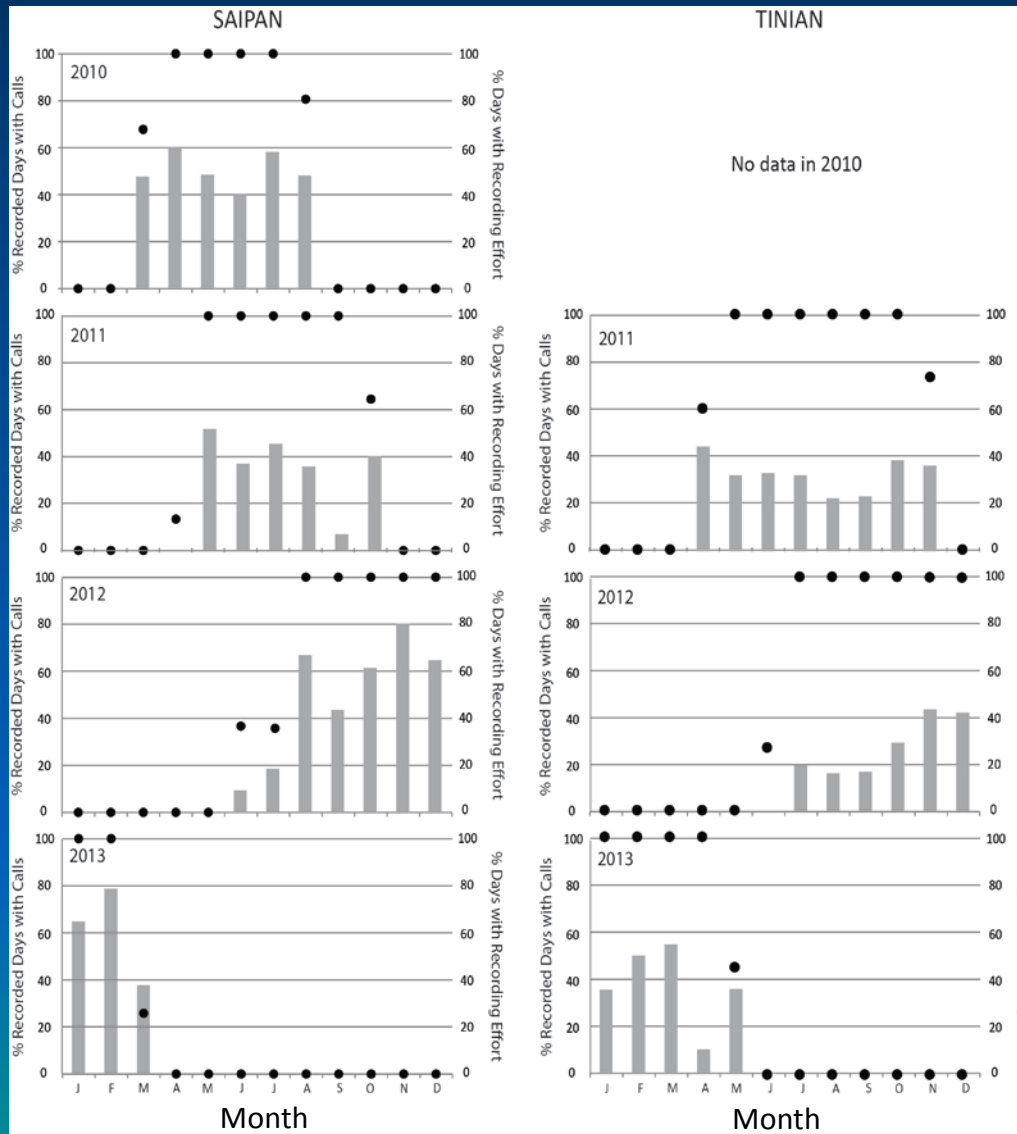
## Sperm and beaked whales

## Delphinids



**Cumulative hours/week**

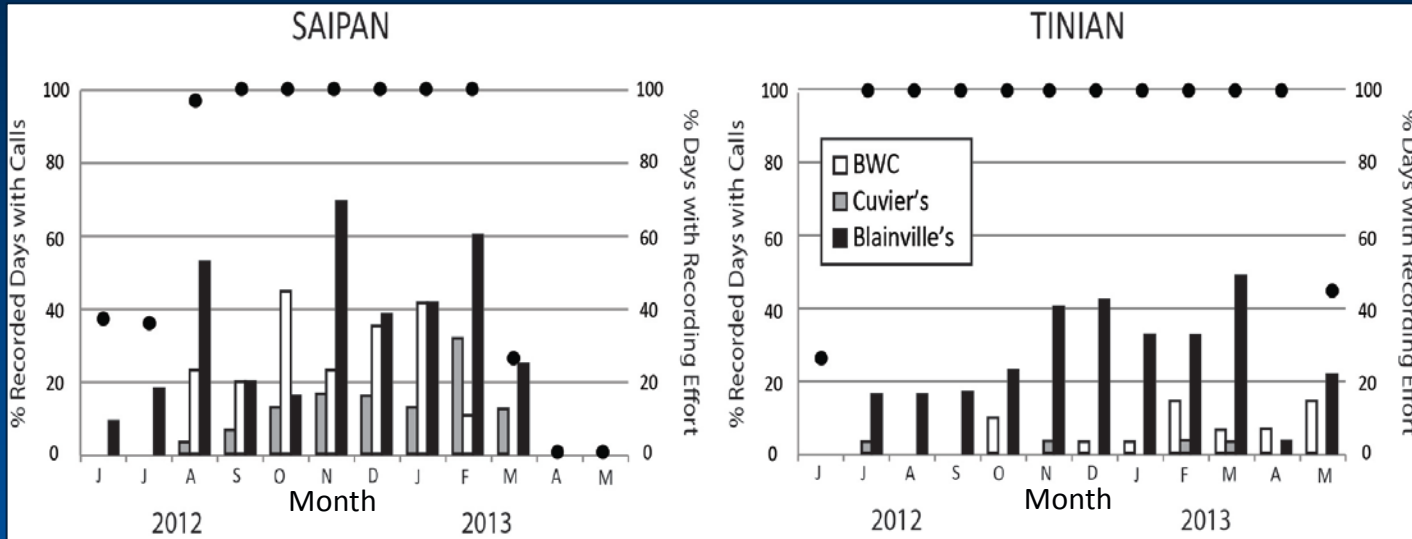
# Acoustic Detections of Beaked Whales



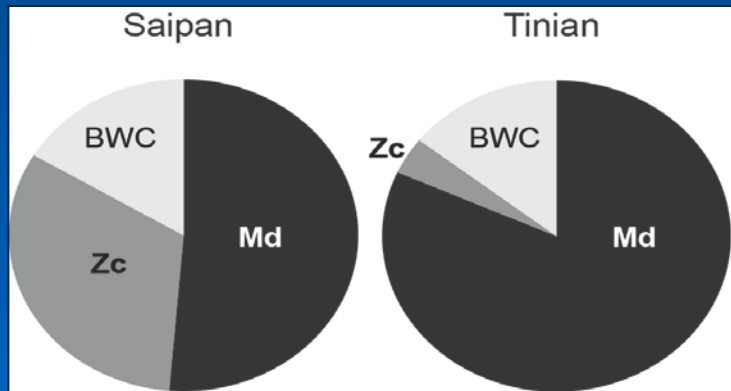
● % Days with Recording Effort  
 █ % Recorded Days with Calls

- HARP recordings off Saipan and Tinian (2010-13)
- Beaked whales heard in nearly every month for which there was recording effort

# Acoustic Detections of Beaked Whales



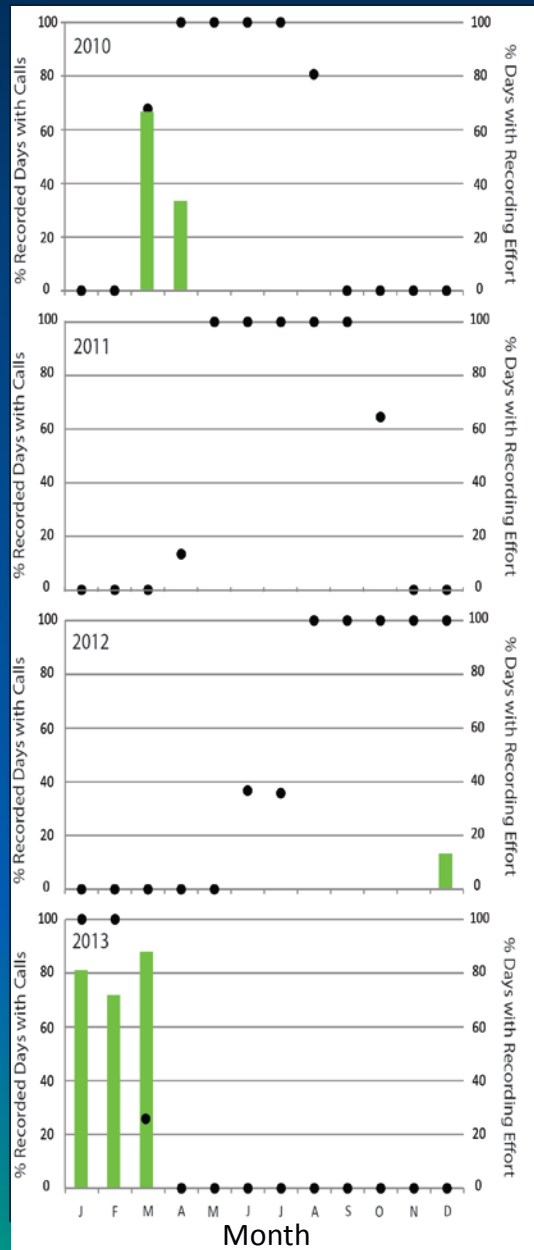
- Unknown call = same heard at Cross Seamount
  - *M. ginkgodens*?
- Blainville's represent highest proportion of calls



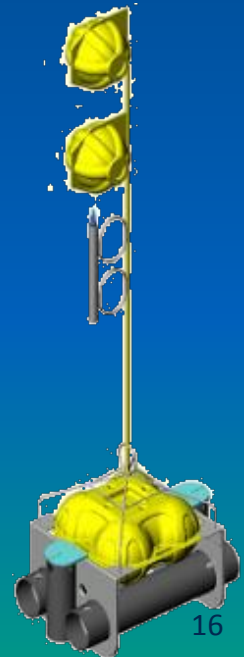
BWC = Beaked Whale Cross Seamount  
 Md = Blainville's (*Mesoplodon densirostris*)  
 Zc = Cuvier's (*Ziphius cavirostris*)



# Acoustic Detections of Humpback Whales off Saipan



- Occur December-April
- Generally heard > 60% days/mo through winter





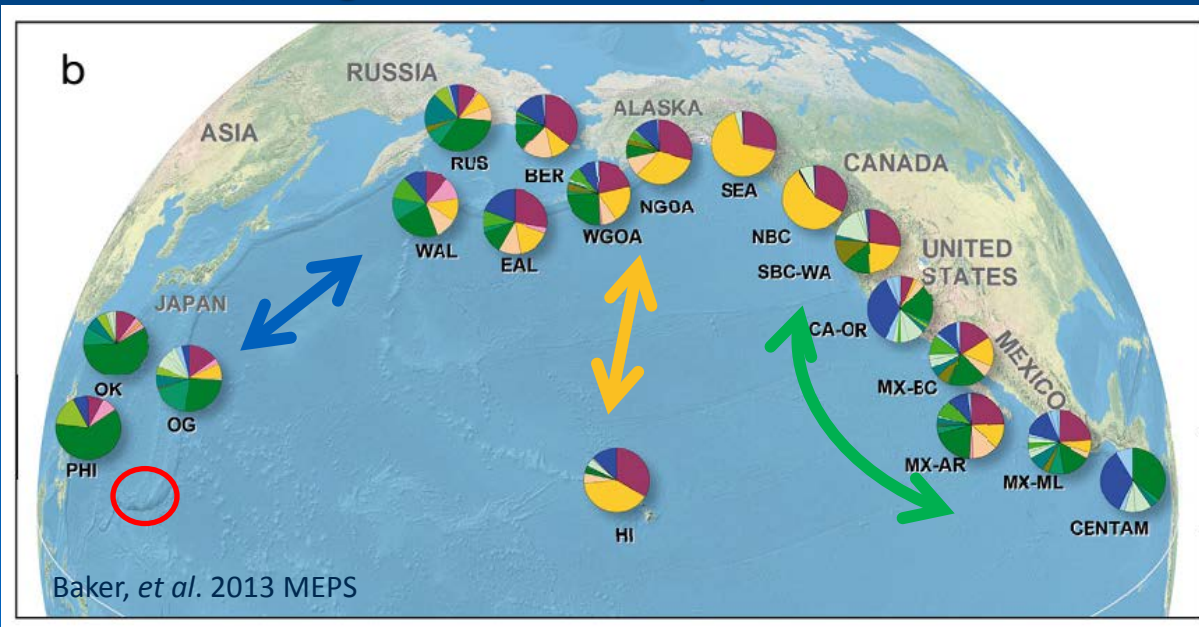
# SPLASH Background

Examining the structure of humpback whale populations in the North Pacific

➤ All known feeding and breeding areas in the North Pacific were studied for 3 years, yielding:

>18,000 quality individual identification photographs

>6,000 genetic tissue samples



➤ Population structure is complex, but in general:

- Whales breeding in **Central America** feed in waters off **North America**
- Whales breeding in **Hawaii** feed in high latitude regions of the **Bering Sea** and **Gulf of Alaska**
- Whales breeding in south **Asia** feed in water off **Russia**

➤ No effort within the Marianas during SPLASH

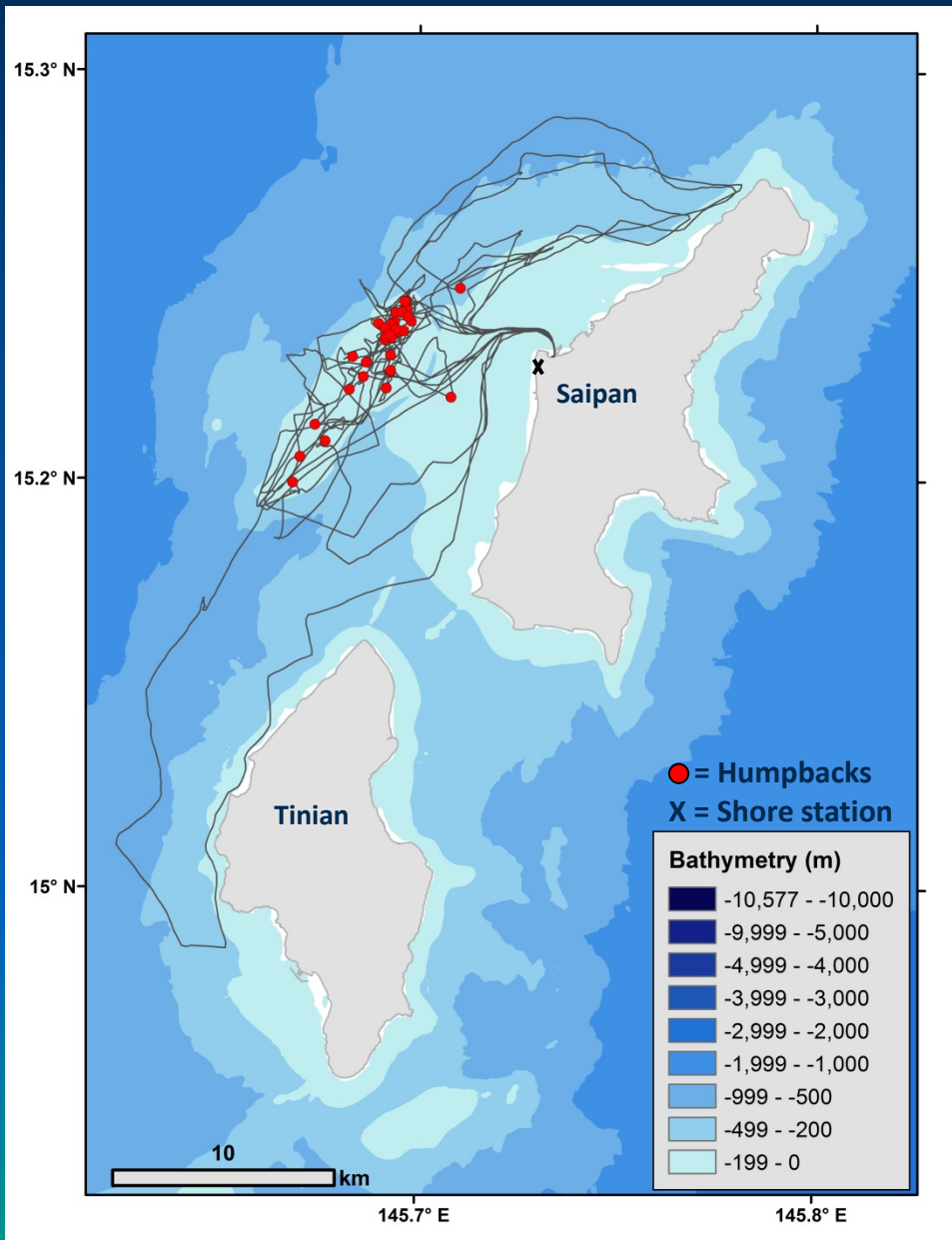
➤ Abundance estimates indicate dramatic increase from post-whaling days

- De-listing of central and eastern North Pacific populations proposed
- Down-listing of western North Pacific population to Threatened

# Visual Survey for Humpback Whales

February 26 – March 08, 2015

- Shore and small boat surveys planned
- Confined to nearshore waters because of weather conditions
- All but 2 sightings over CK Reef



# Visual Survey for Humpback Whales



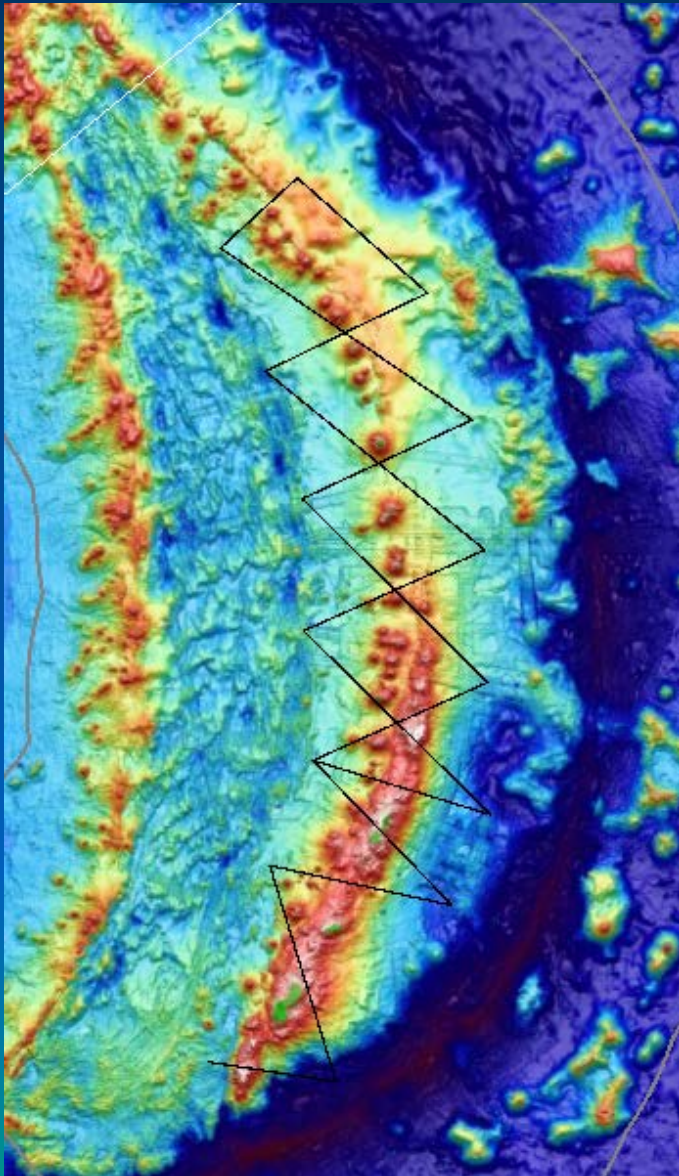
- 12 individuals identified from photos
- 4 mom/calf pairs
- 4 biopsy samples (3 from moms)
- Reaching out to other research groups to look for matches to existing photo-ID catalogs and for genetic analyses

# Mariana Archipelago Cetacean Survey (MACS)

May 8 – June 6, 2015

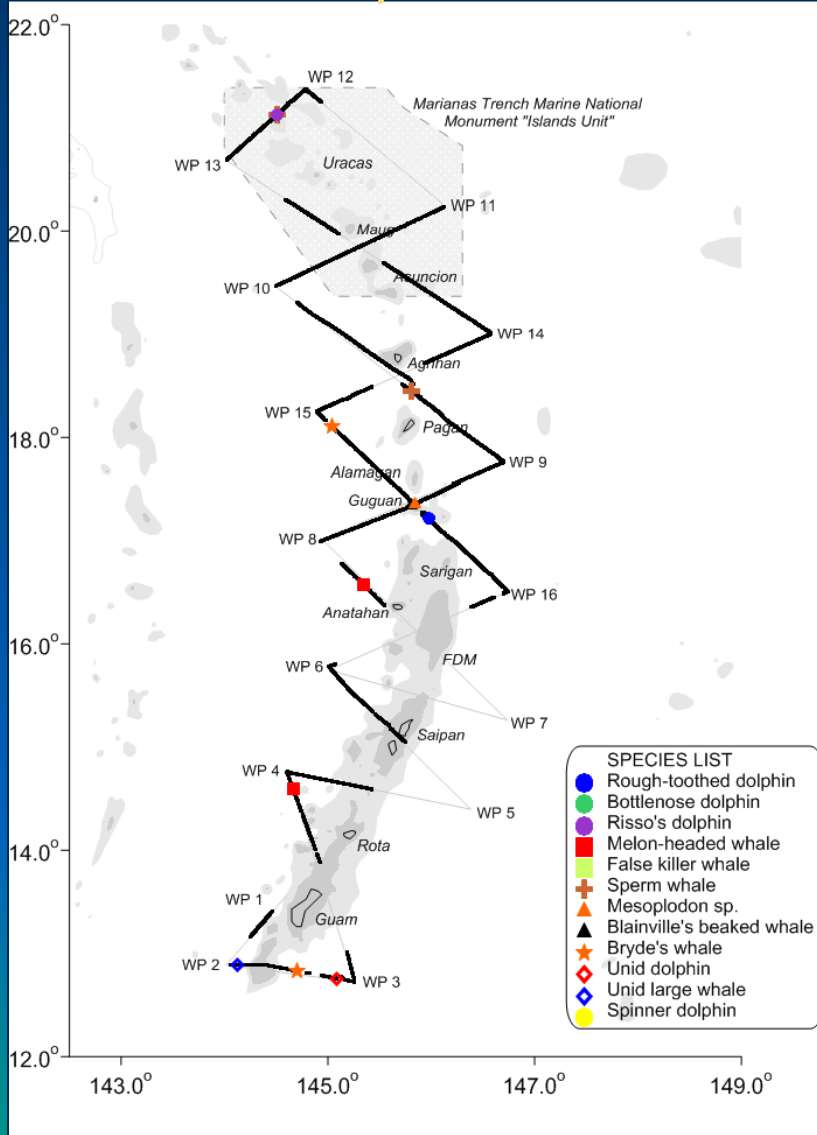
## Objectives:

1. Determine cetacean distribution throughout the archipelago using visual and passive acoustic methods
2. Collect tissue samples and photos for assessment of population structure
3. Deploy satellite tags on certain species to study movements and habitat use
4. Deploy a new HARP in the northern portion of the archipelago to listen for migratory baleen whales

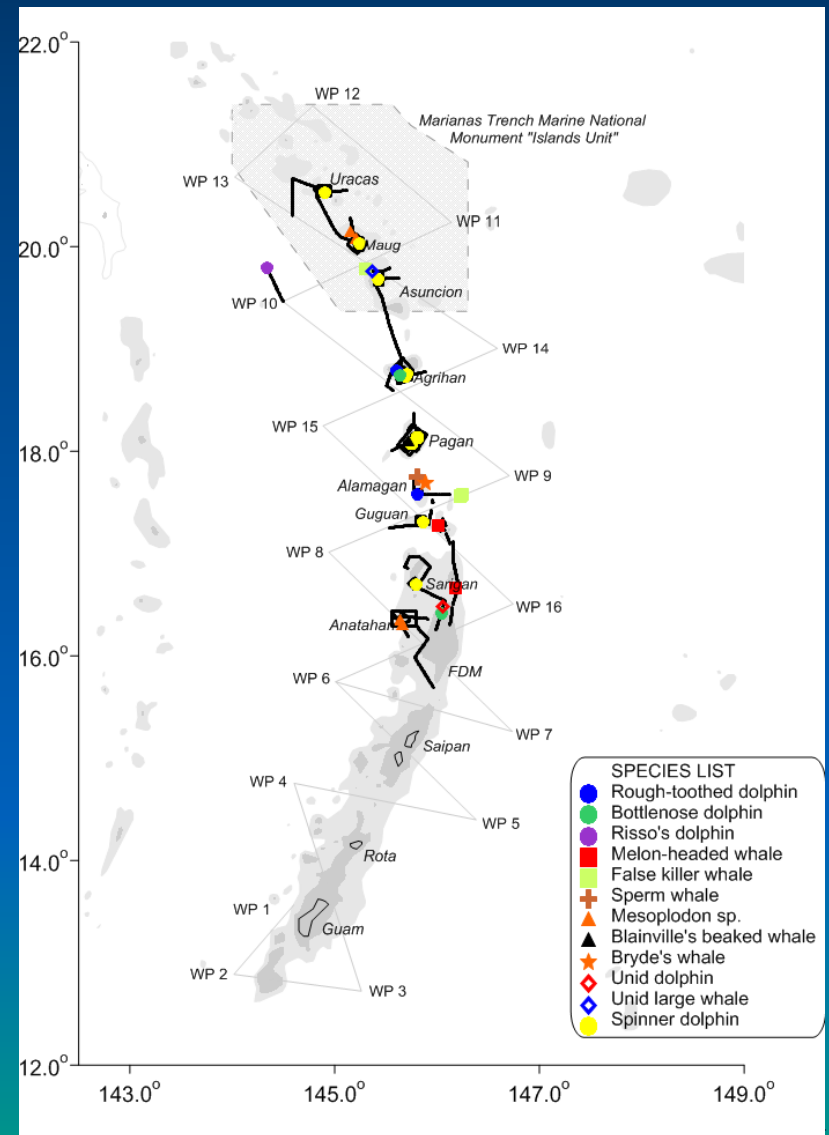


# MACS Effort & Sightings

## “Standard” systematic effort



## “Non-standard” effort



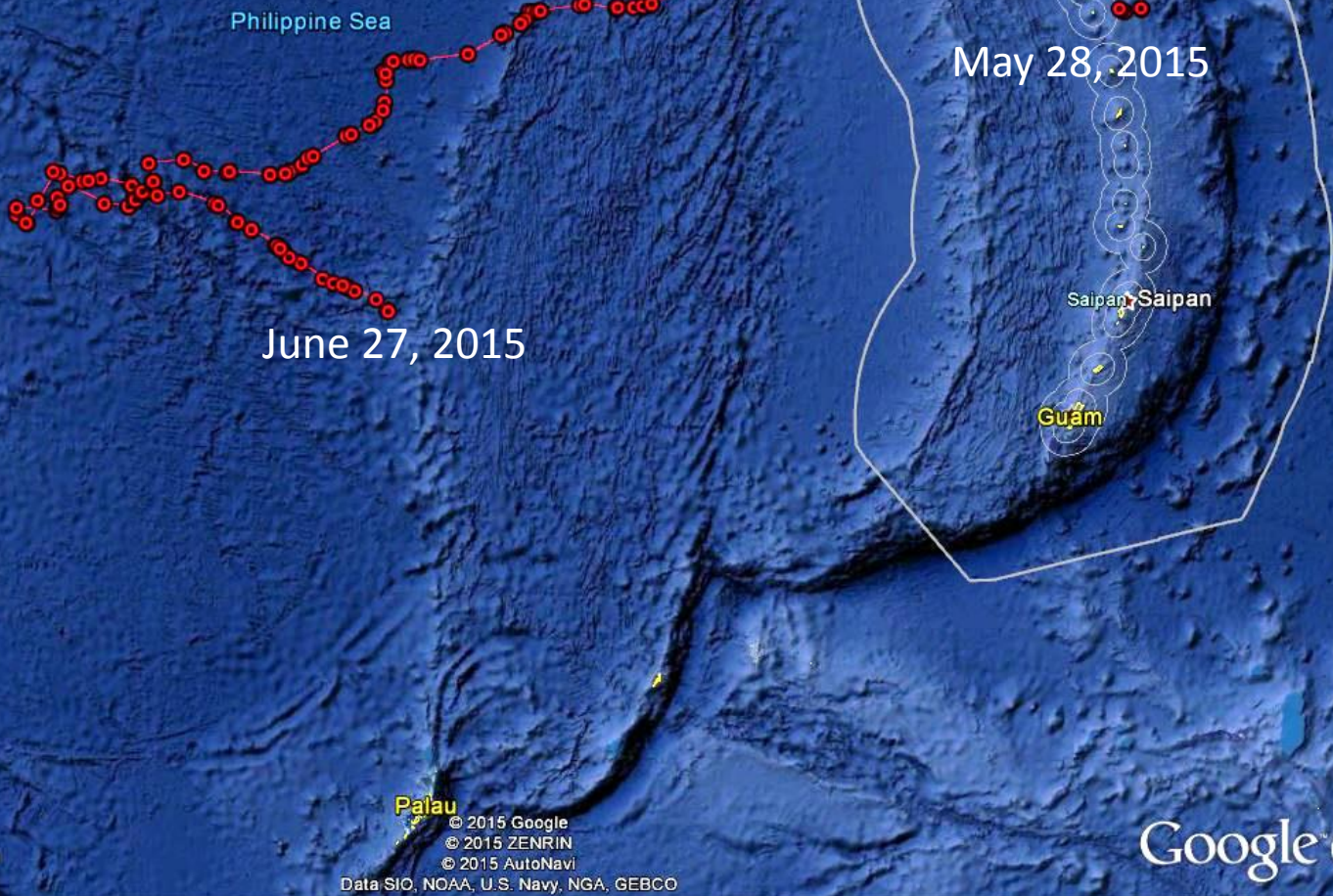
# Initial Results of MACS

- Total cetacean sightings: 42 (9 identified species)
  - Bryde's whale, sperm whale, melon-headed whale, false killer whale, Blainville's beaked whale, Risso's dolphin, rough-toothed dolphin, bottlenose dolphin, and spinner dolphin
- Acoustic detections: 47 (8 identified species)
- Photos: > 6,600
- Biopsy samples: 51 (6 species)
  - spinner dolphins, melon-headed whales, false killer whales, rough-toothed dolphins, bottlenose dolphins, and sperm whales
- Satellite tags: 1 false killer whale
- HARP deployed off of Pagan

# False Killer Whales



- Tagged off Asuncion



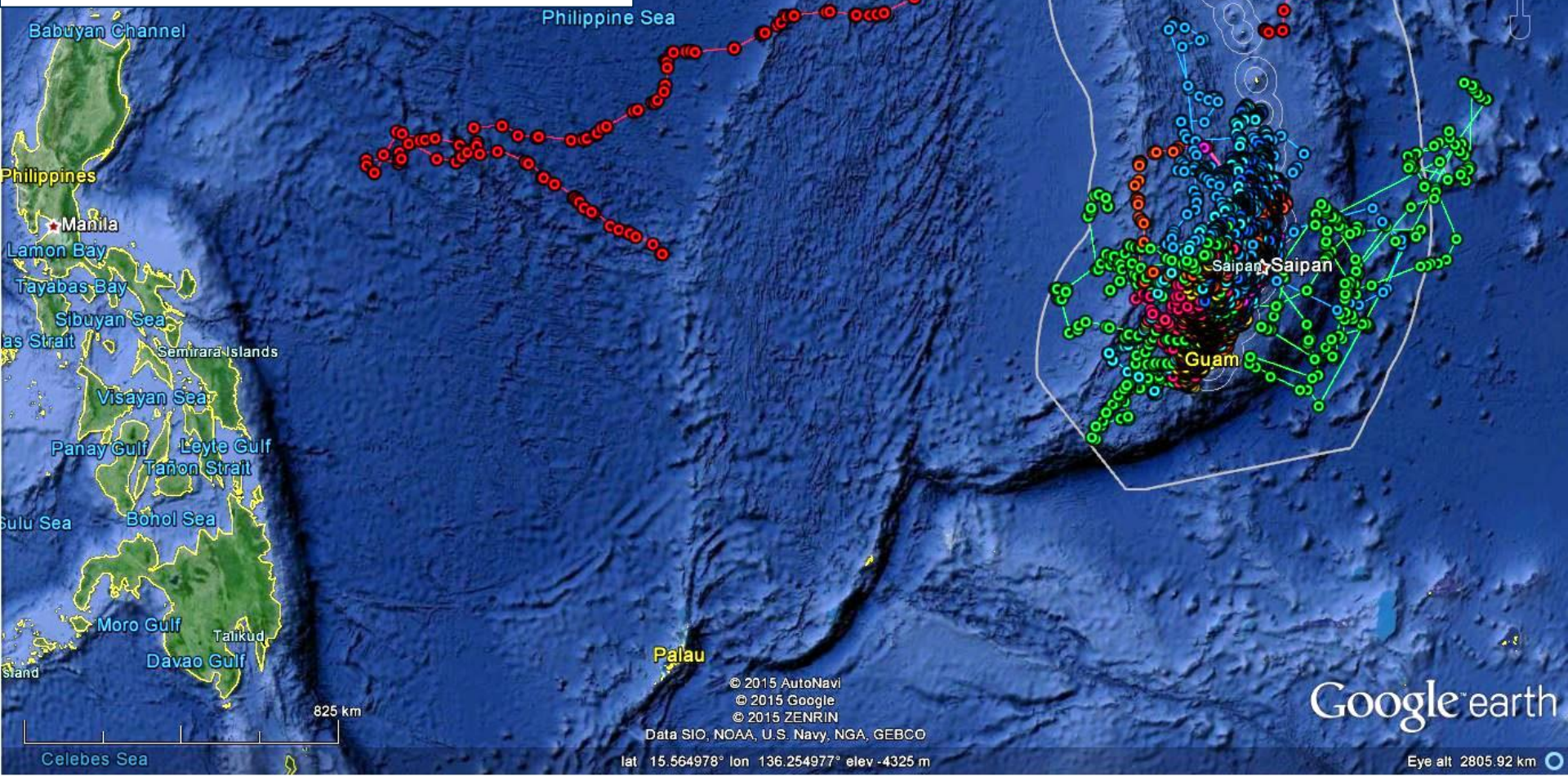
# False Killer Whales

## Prior to MACS-

- 5 sightings (2013-2014)
- 40 cataloged individuals
- 7 satellite tags (4-198 days)

## MACS-

- 2 sightings
- No preliminary matches to catalog







**Next.....**

**August 10 – September 11, 2015**

**Small boat surveys off Saipan, Tinian, Aguijan, and Guam**

# Successes and Challenges

## Successes:

- First consistent multi-year surveys
  - biopsy samples, photo-id, and satellite telemetry have begun to reveal potential population structure
- Multi-year year-round occurrence information from acoustics
- Expanding available information on western North Pacific humpback whales
- Collaboration with local government agencies and local individuals

## Challenges:

- Remote location with limited vessel options
- Weather conditions limit sampling periods
- Transportation between islands (e.g. Rota and northern islands)
- Reliance on external funding

Questions?

