

# HICEAS 2010: Overview & Analysis Update

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# HICEAS 2010



Goal: Updated abundance estimates for all Hawaiian cetaceans

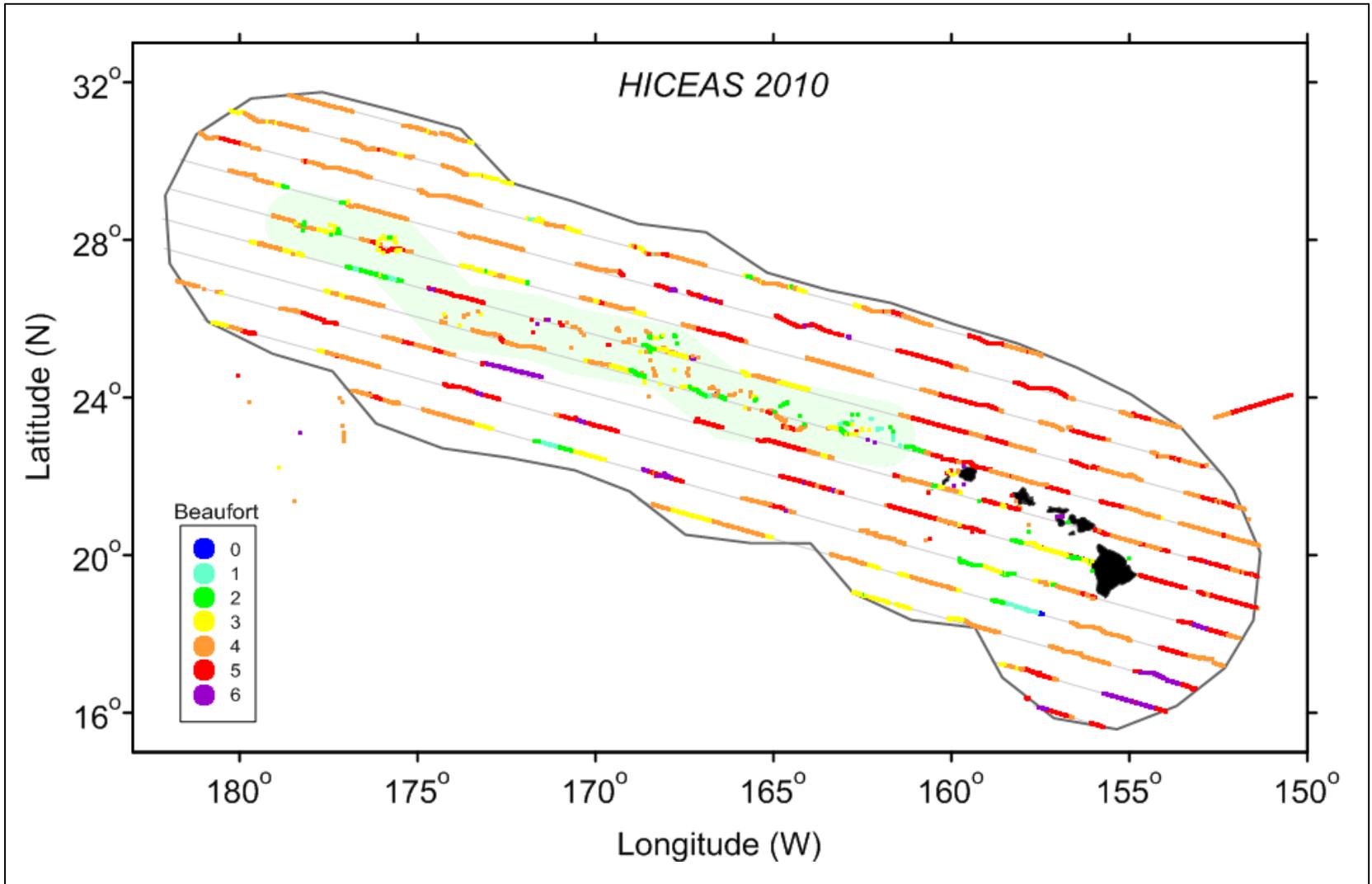
- Two ship collaborative survey (PIFSC & SWFSC)
  - 120 days on R/V *McArthur II*, 55 days on R/V *Sette*
- Multi-faceted survey:
  - Line-transect visual and acoustic observations
  - Ecosystem studies- CTD/XBT profiles & surface temp + chl sampling, Seabird observations
  - Photo-ID, biopsy, satellite tagging
- New protocol for false killer whales-
  - visual and acoustic detections chased
  - acoustics tracks subgroups and leads the visual team for complete enumeration
- HLA provided fishery rep to observe methods & participate in observer team

# Improving the precision & accuracy of abundance estimates for FKWs

$$D = \frac{n * s}{2w * L * g(0)}$$

- Improve school size estimates ( $s$ ):
  - Before turning the ship, acoustic team determines spread and number of sub-groups
  - All observers called to flying bridge for tracking/estimating sub-group sizes
- Improve trackline detection probability ( $g(0)$ ):
  - Compare acoustic detection vs. visual sighting rates
  - Assess vessel attraction
    - Animal orientation at initial detection
    - Acoustic assessment of movement
- Find more groups ( $n$ ):
  - Integrated acoustic observations – acoustic detections get same treatment as visual observations (turn for group size, launch small boat, etc.)
    - More detections = better precision

# Survey Effort by Beaufort Wind State



# HICEAS 2010 Sightings

Common Name	On-Effort	TOTAL Sightings	2002 On-Effort
False killer whale	6	14	1
Spotted dolphin	12	14	8
Striped dolphin	24	29	11
Spinner dolphin	0	4	5
Rough-toothed dolphin	8	25	14
Bottlenose dolphin	6	20	9
Frasier's dolphin	4	6	2
Risso's dolphin	9	10	5
Melon-headed whale	1	1	1
Pygmy killer whale	4	5	2
SF Pilot whale	13	36	16
Killer whale	1	1	2
Sperm whale	24	33	28
<i>Kogia</i> sp.	0	2	5
Blainville's BW	0	1	1
Cuvier's BW	2	22	2
Longman's BW	3	4	1

Common Name	On-Effort	TOTAL Sightings	2002 On-Effort
Minke whale	0	1	0
Bryde's whale	18	30	10
Sei whale	12	19	4
Bryde's/Sei whale	6	12	0
Blue whale	1	1	0
Fin whale	1	2	2
Humpback whale	1	1	1
Unid. Beaked whale	11	39	1
Unid. cetacean	46	78	23
<b>TOTAL</b>	<b>212</b>	<b>421</b>	<b>154</b>

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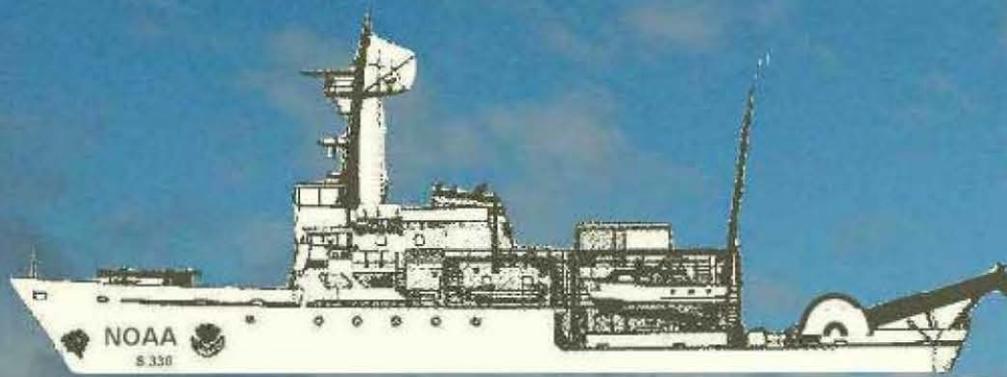
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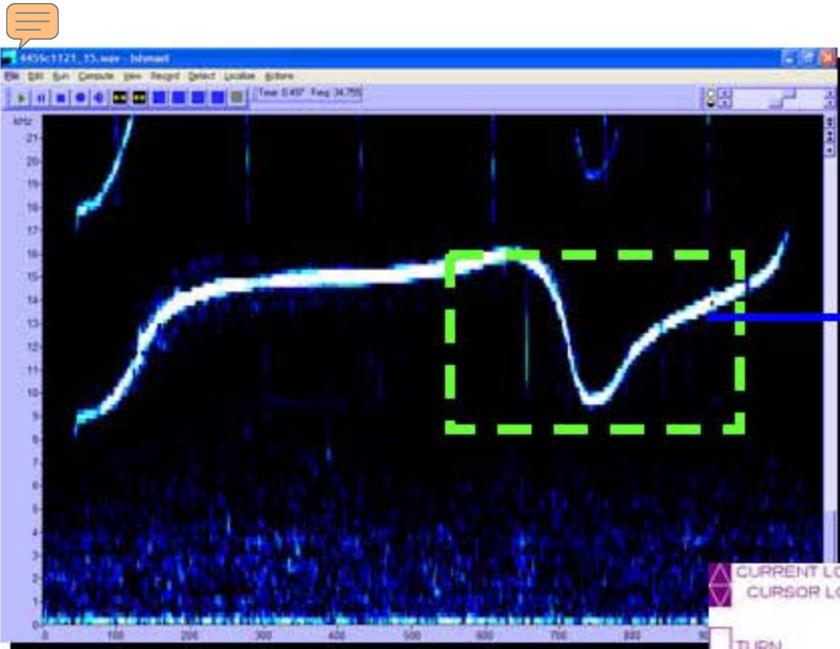
Biopsy samples:

FKWs- 40 samples from 8 encounters  
(34 unique individuals)

# Focus: Passive Acoustic

- Combination of visual and acoustic detections can provide an alternative estimate of abundance
  - Vocal animals can generally be heard at greater distance than they can be seen = larger search area
- Acoustic detections can provides an estimate of the number of groups missed by visual team
- Acoustic tracking provides movement of animals relative to the ship

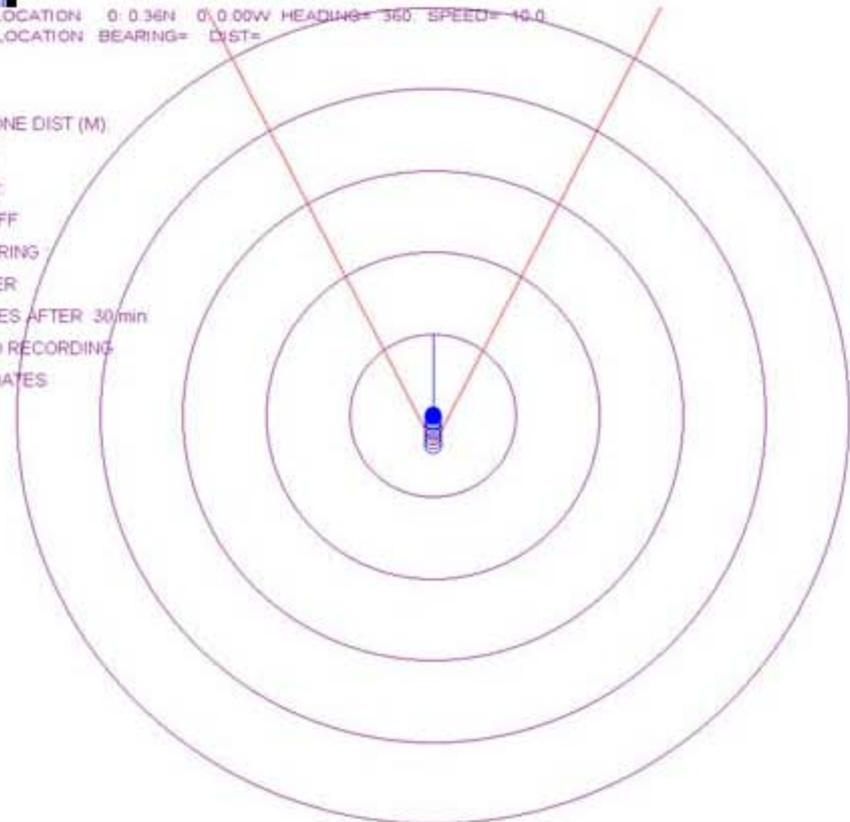


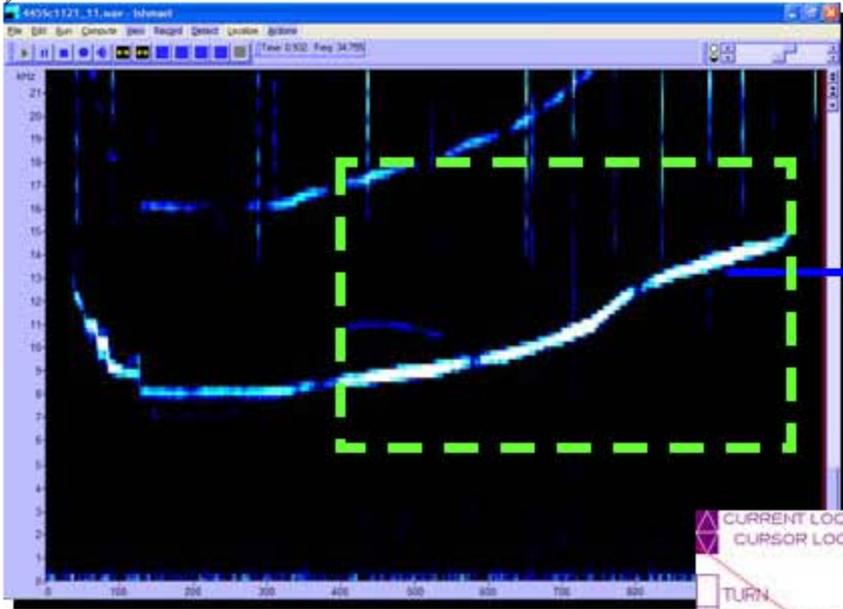


27°

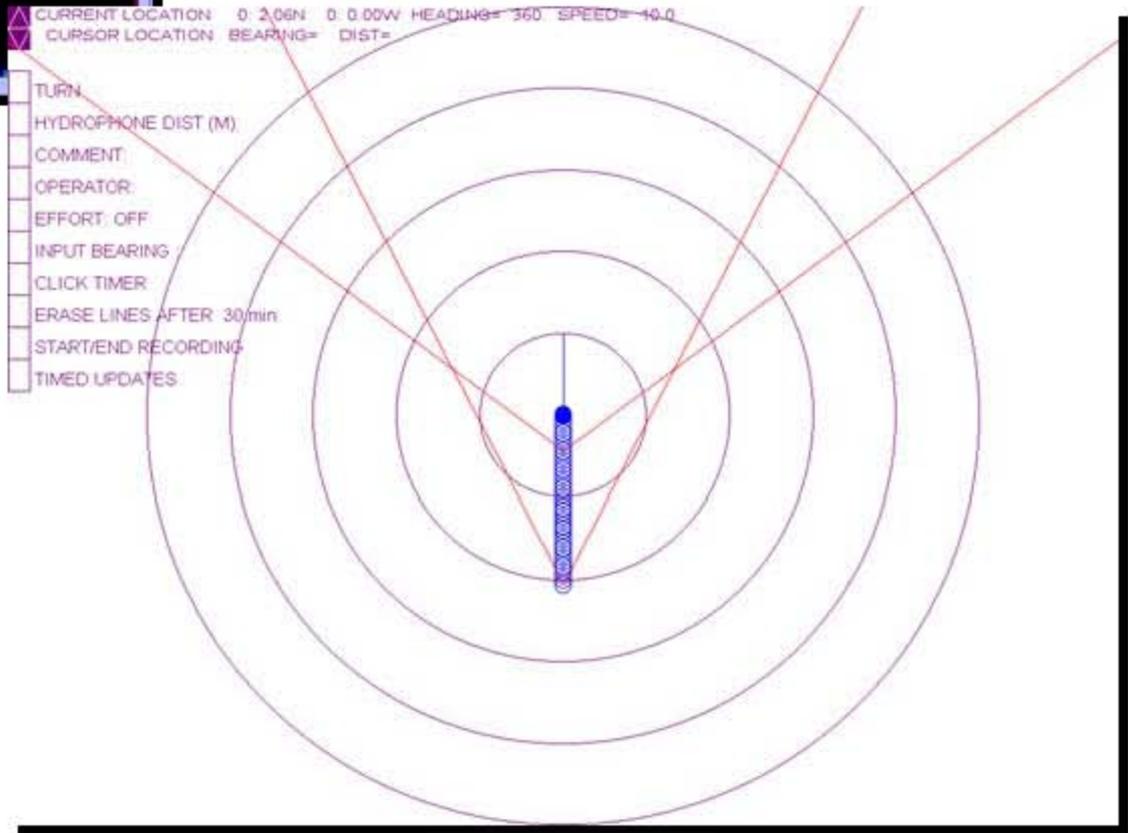
△ CURRENT LOCATION 0 0.36N 0 0.00W HEADING= 360, SPEED= 10.0  
 CURSOR LOCATION BEARING= DIST=

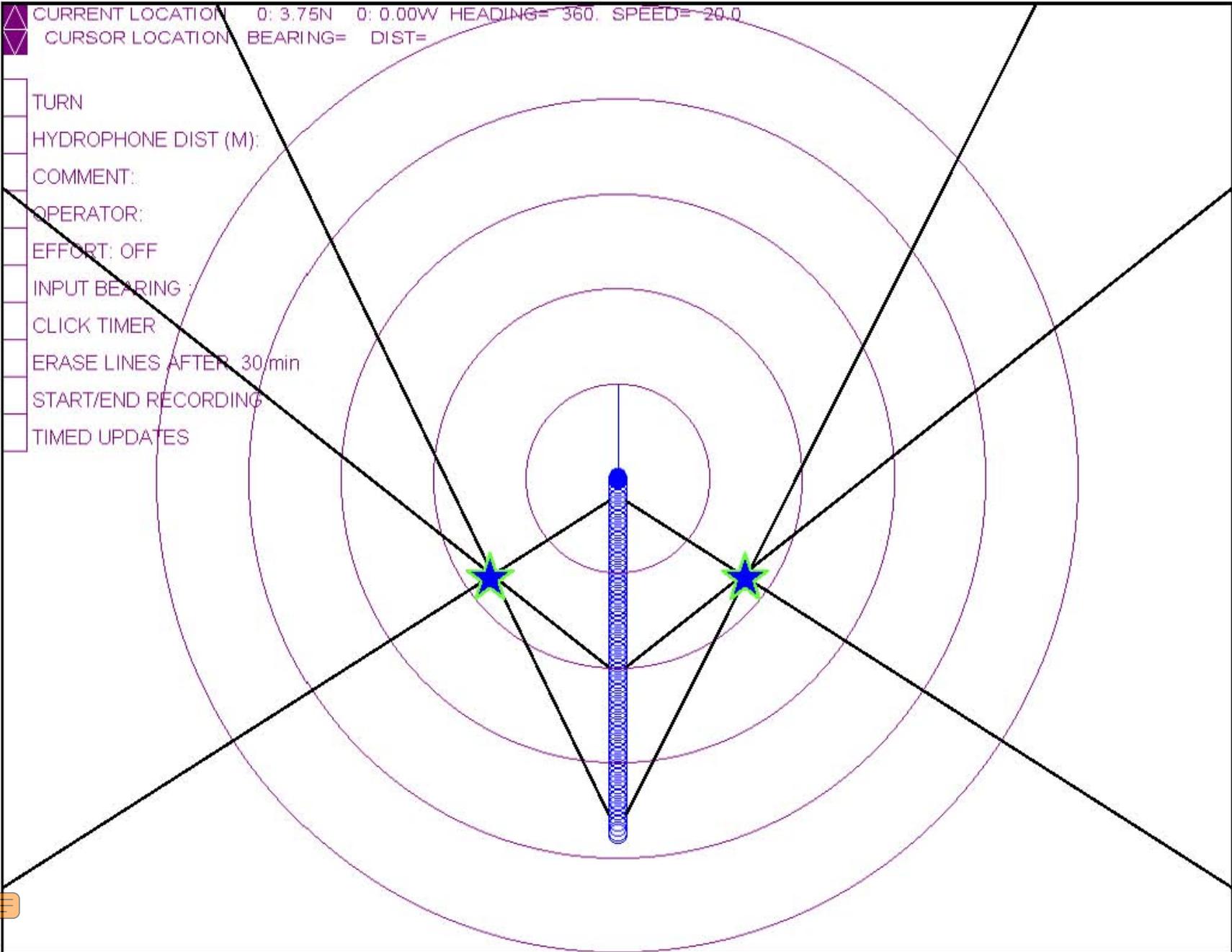
- TURN
- HYDROPHONE DIST (M)
- COMMENT
- OPERATOR
- EFFORT: OFF
- INPUT BEARING
- CLICK TIMER
- ERASE LINES AFTER 30/min
- START/END RECORDING
- TIMED UPDATES





53°

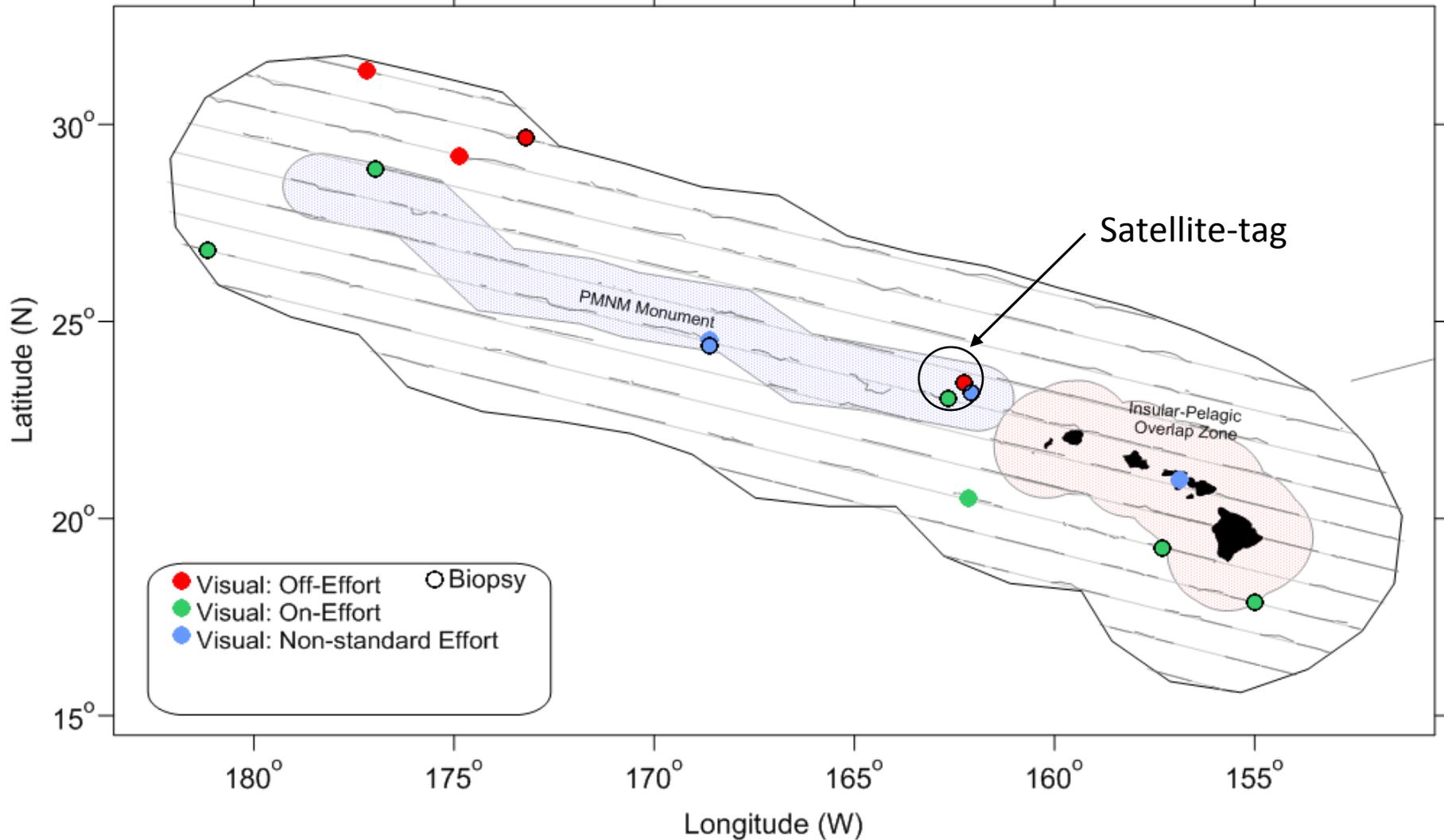




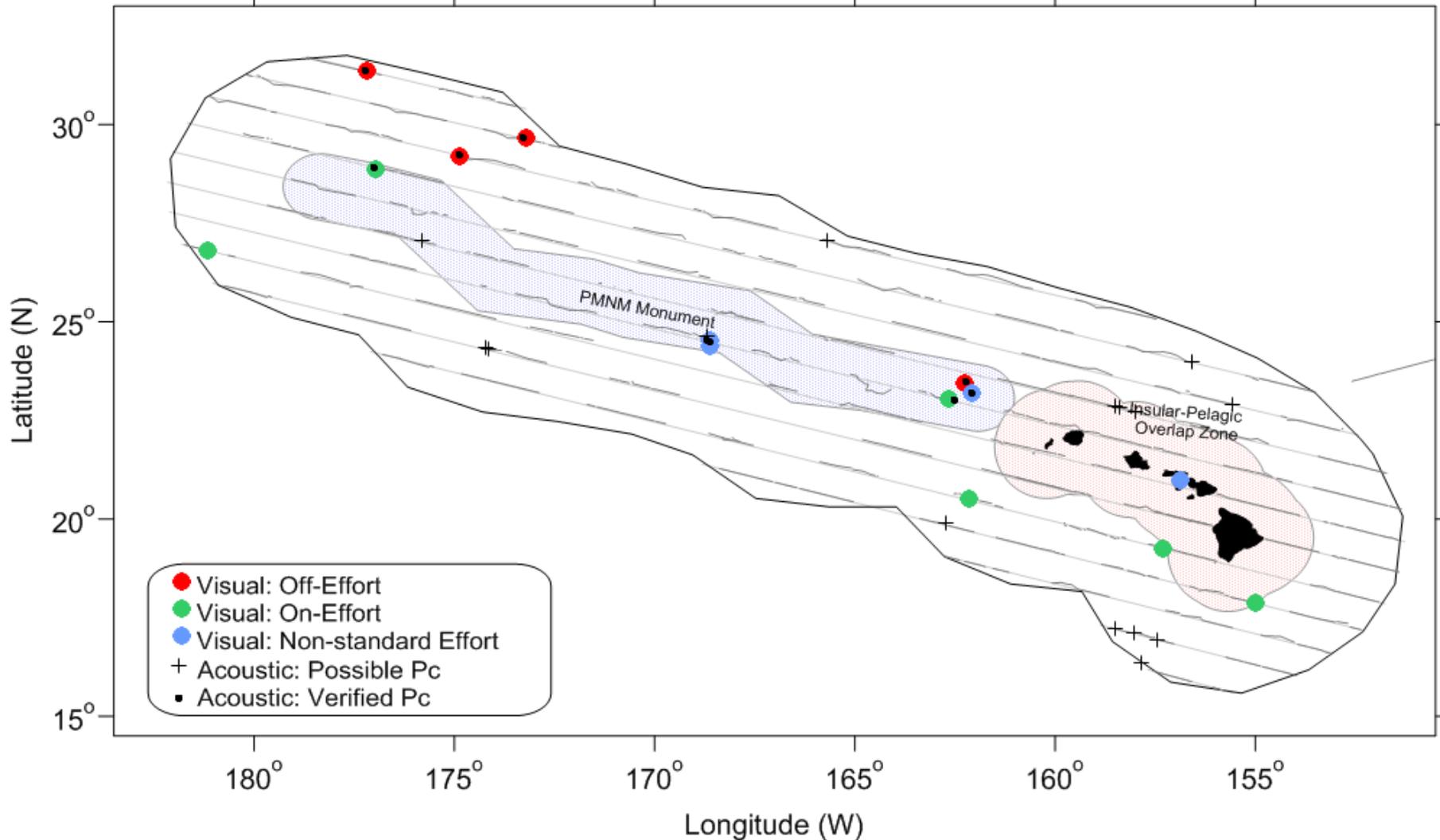
# Acoustic Detection

- 10 of 14 visual encounters were detected acoustically
  - Acoustics heard each group before they were seen, likely due to greater detection distance
- 4 visual encounters not heard. Group sizes 1 or 2.
- 13 additional possible false killer whale acoustic detections
- Detection distances 0.5-16.7nmi (mean 5.5 nmi).  
Beam distances 0.1-10.5nmi (mean 3.3nmi).

# HICEAS False Killer Whale Sightings



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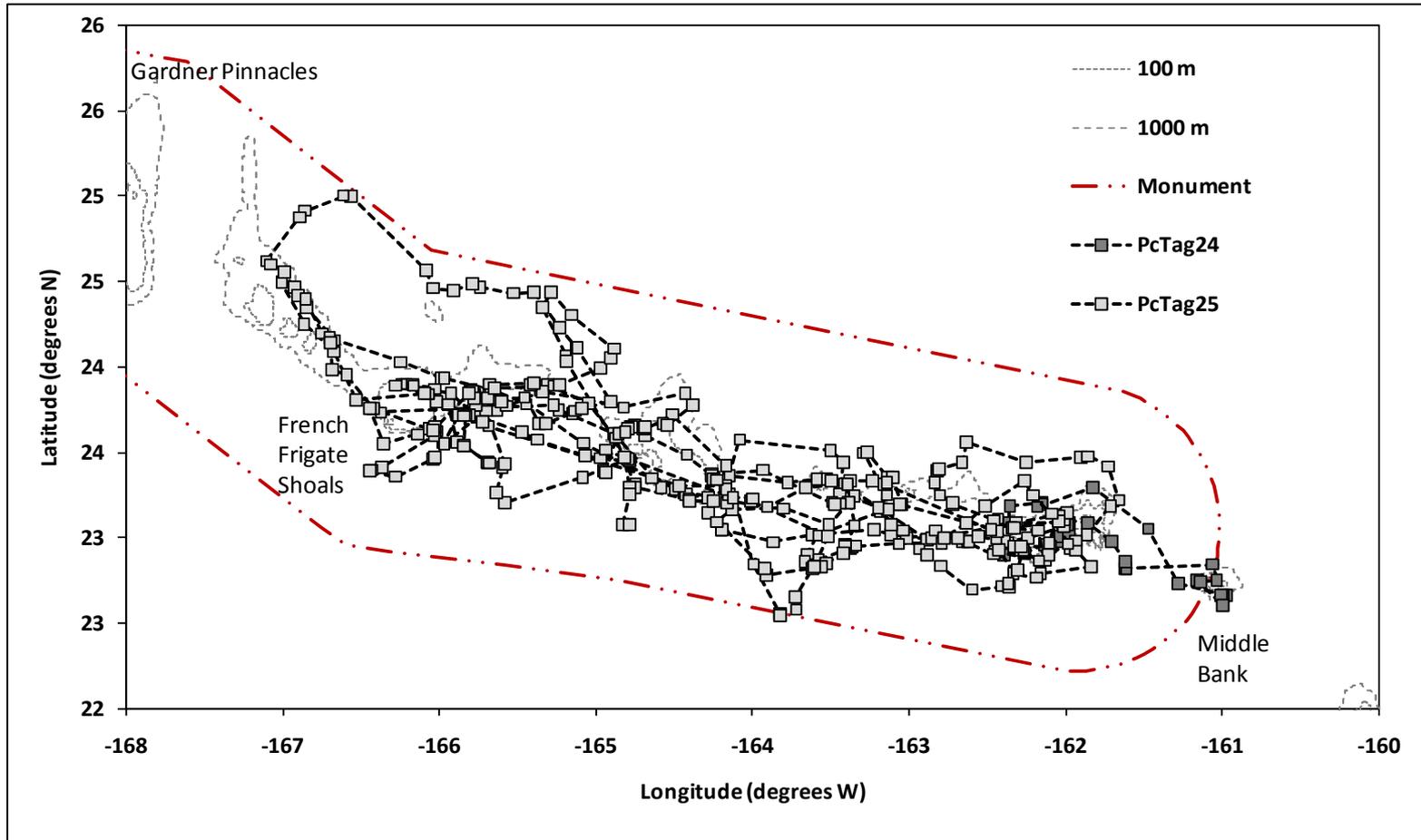


# HICEAS Photo-ID

- 49 individuals identified
- 7 within-HICEAS re-sightings
- No matches to Hawaii insular catalog
- 4 matches to Kauai



# False Killer Whale Movements



## Two false killer whales satellite-tagged on 9/26/10:

- PcTag25 both darts in fin but boot on tag

No transmissions first 3 days

52 day span of locations

- PcTag24 - 1 dart in fin,

4.6 days of transmissions only

# Analysis Update

## Abundance:

- Visual line-transect analysis is on-going based on 6 on-effort sightings
- Preliminary estimates will be available for the 2012 draft SAR
  - Will include:
    - Qualitative evaluation of possible biases, for example, due to new groups size counting methods & vessel attraction
  - Will *not* include:
    - Acoustic-only detections
    - Correction for animal movement

# Analysis Update

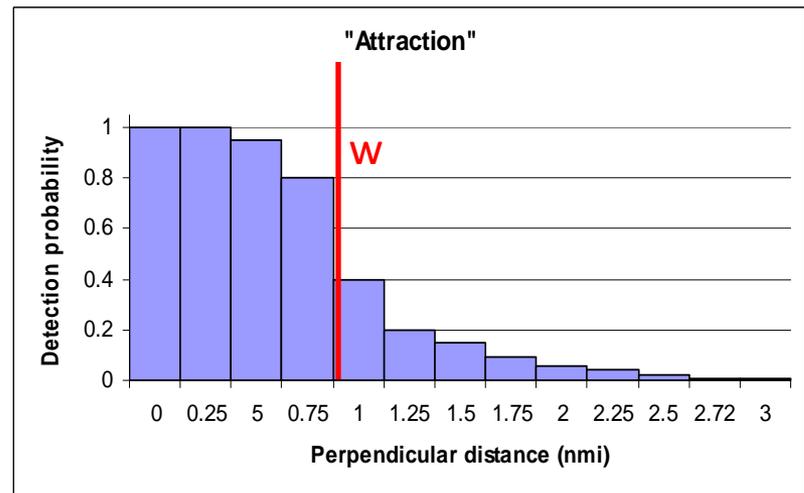
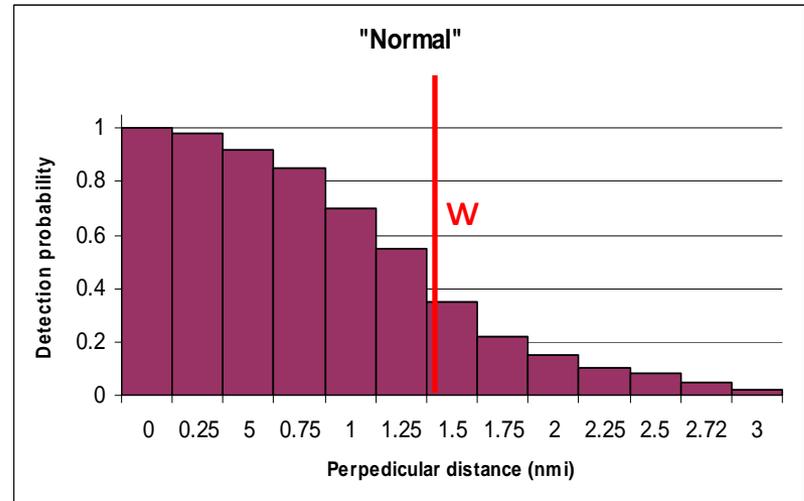
## Acoustics:

- Lots of hardware & software problems complicated data collection and analysis
- Complete:
  - Assessment of acoustic effort & documentation of method changes
  - Initial assessment of a sub-set of detected whistles for some detections for species ID and sub-group location

# Analysis Update

## Vessel attraction:

- Is a problem, for visuals and acoustics
  - Complicating analysis of acoustics as animals move quickly toward or travel alongside the ship
- Preliminary analysis indicates vessel attraction in 9 of 14 sightings, including 5 of 6 on-effort sightings



$$D = (n*s) / (2w * g(0) * L)$$

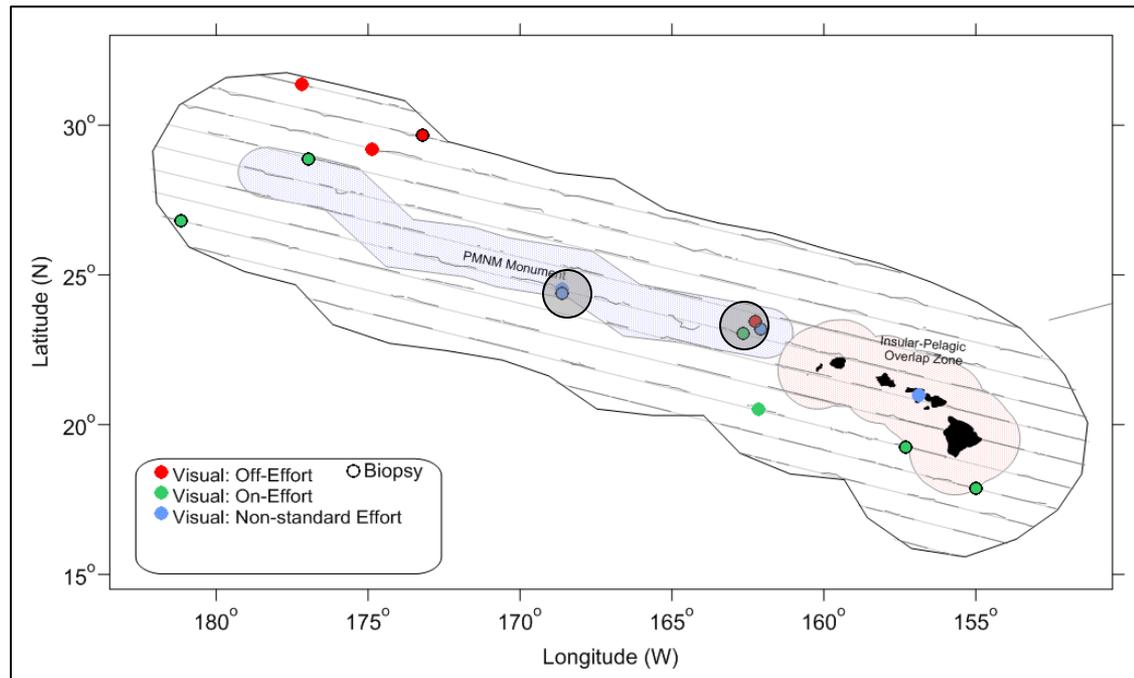
# Analysis Update

## Genetics & Photo-ID:

- All samples have been processed for analysis of mtDNA and nDNA
- Photo, genetic, and movement suggestion of separate island-associated population in NWHIs
- 34 individuals sampled:
  - 21 individuals sampled within the Monument appear have island-associated haplotypes
  - 2 animals sampled at edge of insular-pelagic overlap zone have pelagic haplotypes

# Analysis Update

- Monument samples have insular (or similar) haplotypes
- All other samples have haplotypes from broader Pacific
- Microsatellite analyses indicate significant genetic differences between Hawaii insular, Hawaii pelagic, and Monument false killer whales
- Analyses of FKW mitogenome underway.



# The Future...

## Cetacean Density Models for the C. Pacific

- Survey data from three central Pacific surveys (SWAPS 1997, HICEAS 2002, PICEAS 2005) and 1998-2006 ETP surveys west of 120W.
- Dynamic and static habitat data: Latitude, longitude, distance to land
- Satellite-derived: SST, CHL, SSHrms, Primary Prod.

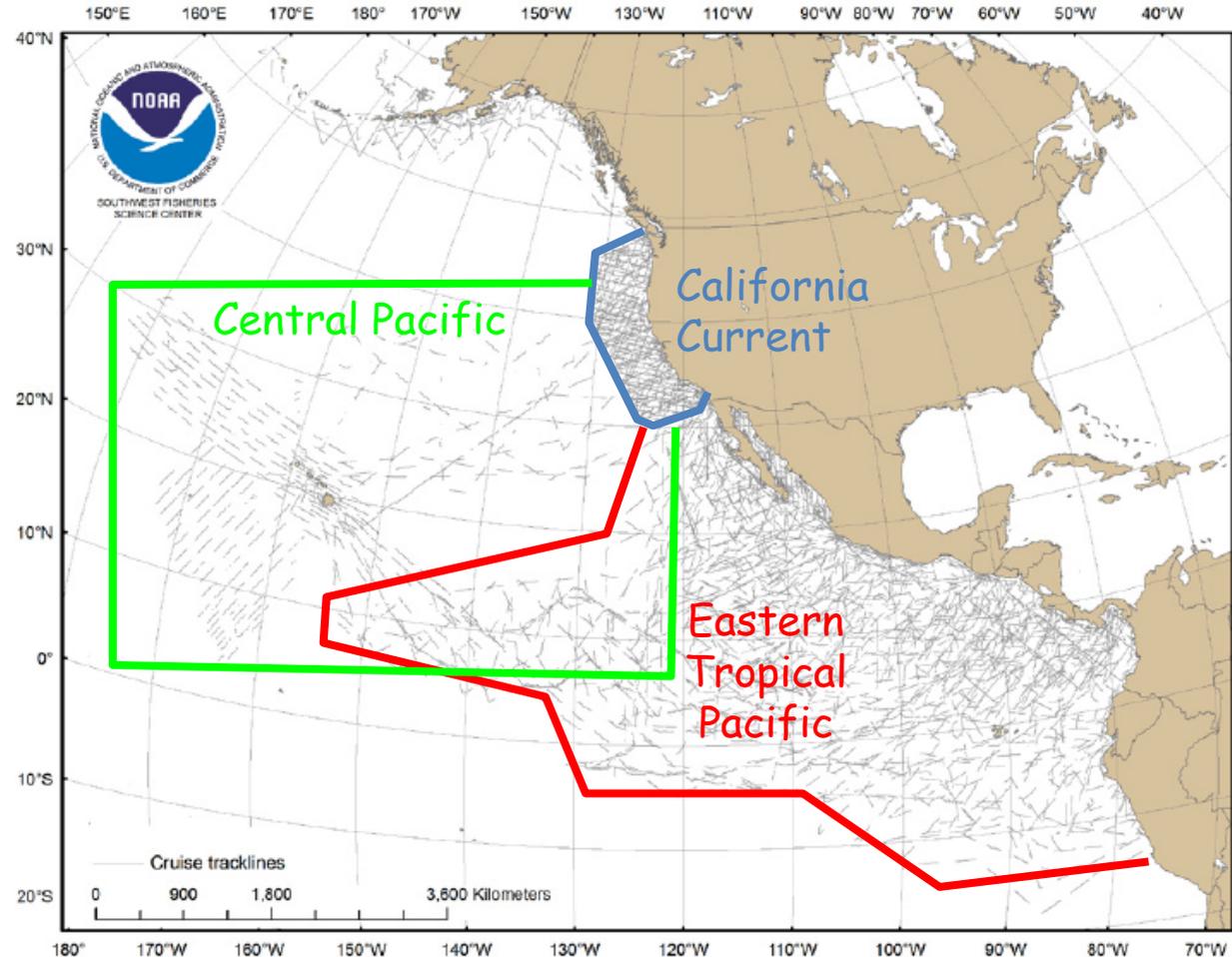
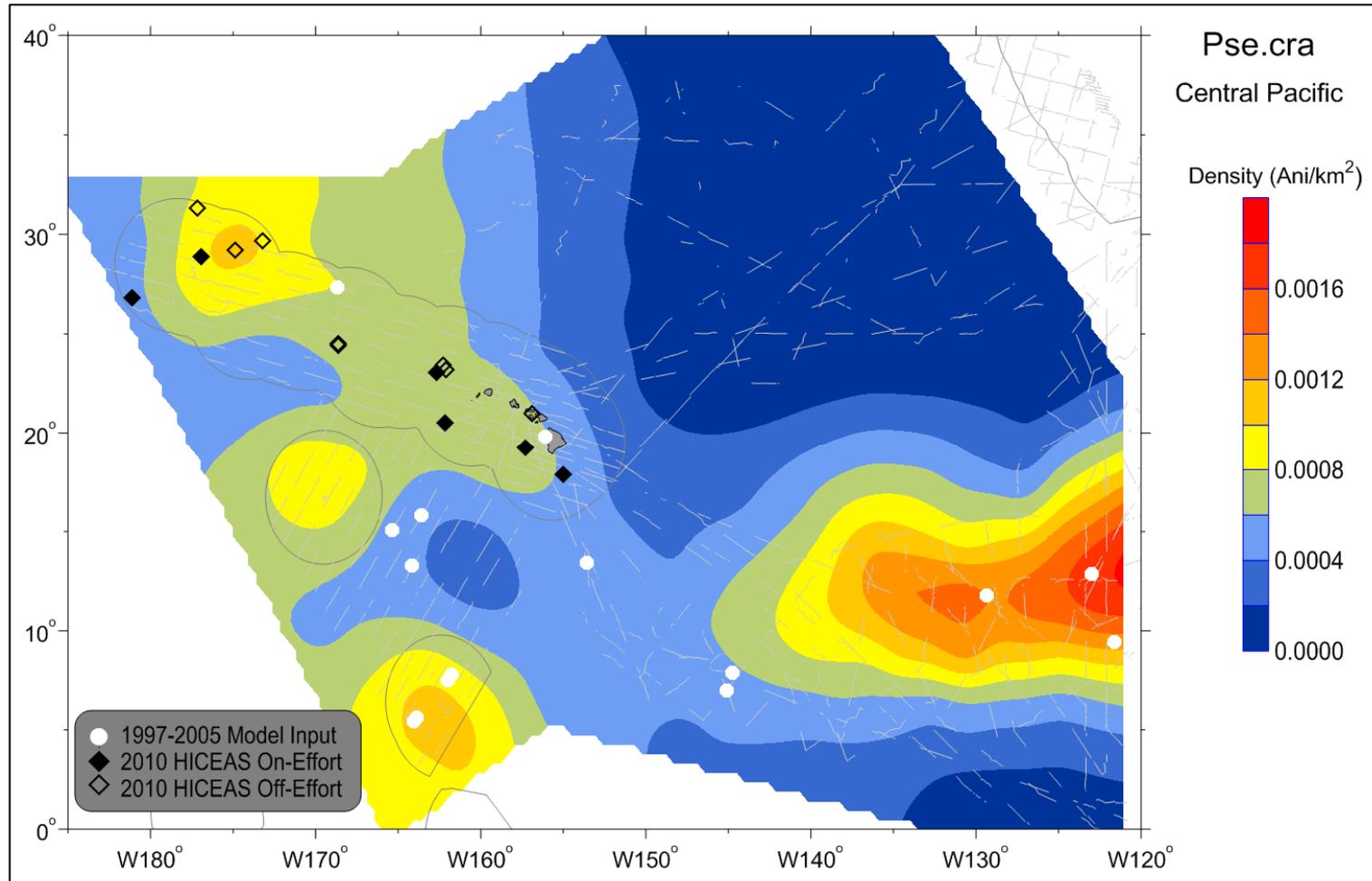


Figure 1. Cruise tracklines surveyed by the Southwest Fisheries Science Center, 1986-2005.

Becker, Forney, Barlow & Foley

# The Future...



Funding through NMFS Habitat Assessment Working Group to incorporate acoustic detections into density models

