

HICEAS 2010: Overview & Analysis Update

Erin Oleson & Amanda Bradford
Pacific Islands Fisheries Science Center



HICEAS 2010



Goal: Updated abundance estimates for all Hawaiian cetaceans

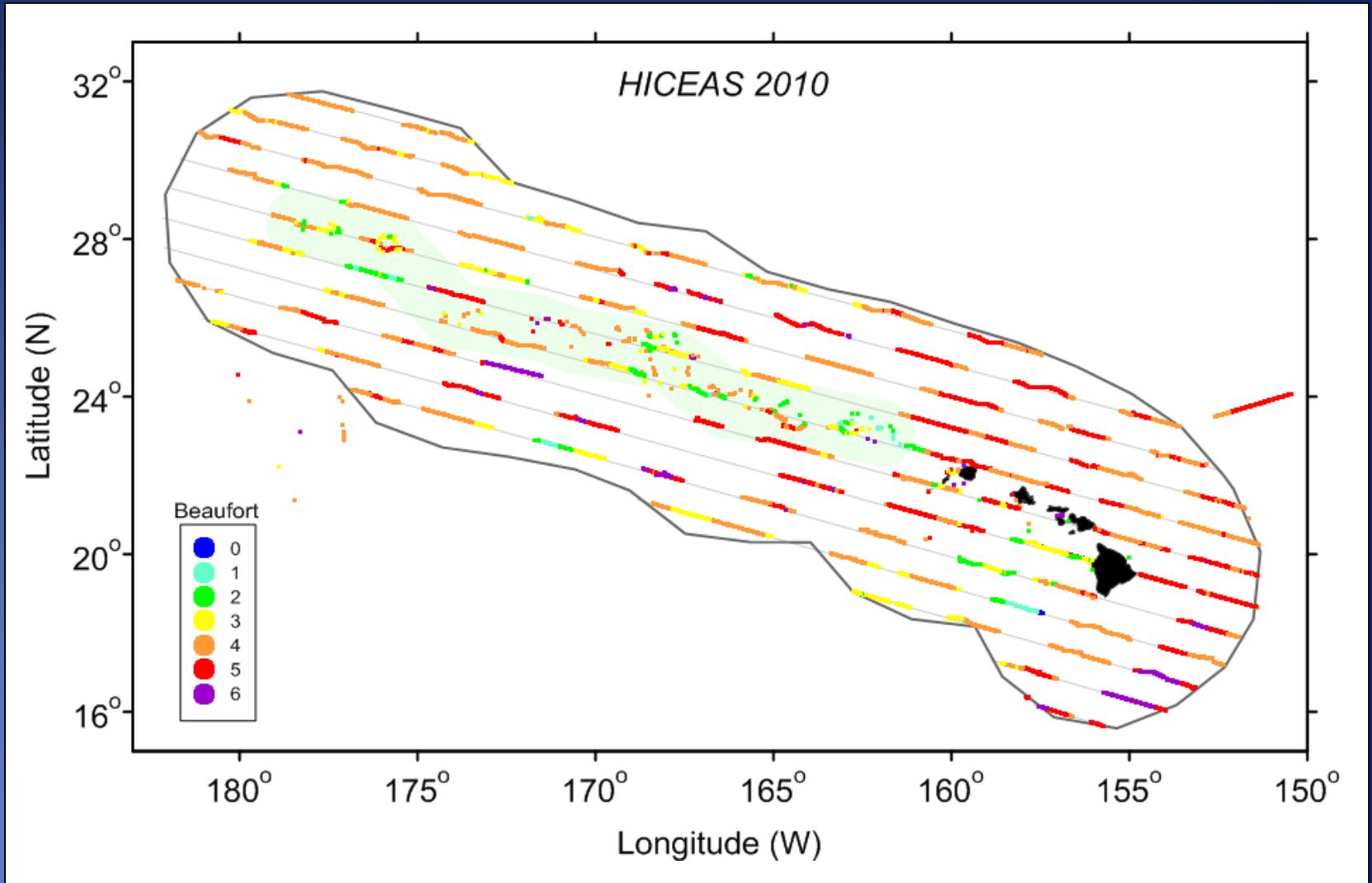
- Two ship collaborative survey (PIFSC & SWFSC)
 - 120 days on R/V *McArthur II*, 55 days on R/V *Sette*
- Multi-faceted survey:
 - Line-transect visual and acoustic observations
 - Ecosystem studies- CTD/XBT profiles & surface temp + chl sampling, Seabird observations
 - Photo-ID, biopsy, satellite 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
TOTAL	212	421	154

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

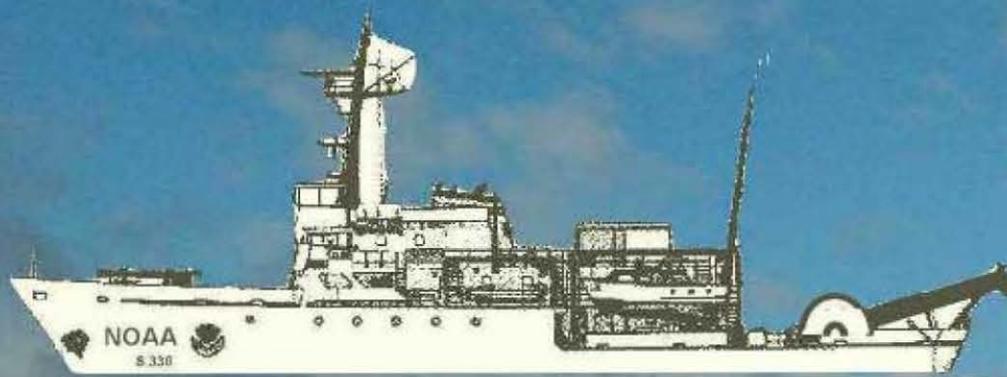
Common Name	On-Effort	TOTAL Sightings	2002 On-Effort
Minke whale	0	1	0
Bryde's whale	18	30	10
Sei whale	12	19	4
Bryde's/Sei whale	6	12	0
Blue whale	1	1	0
Fin whale	1	2	2
Humpback whale	1	1	1
Unid. Beaked whale	11	39	1
Unid. cetacean	46	78	23
TOTAL	212	421	154

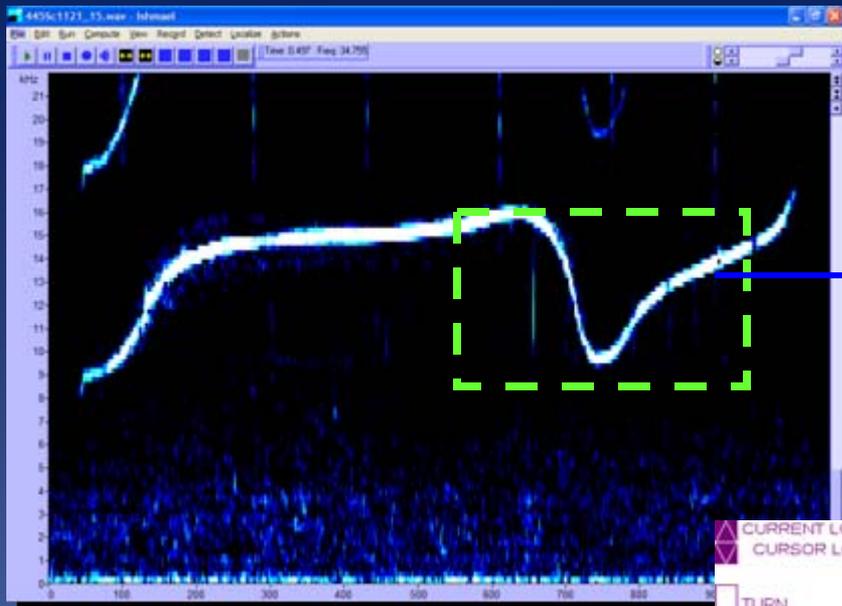
Biopsy samples:

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

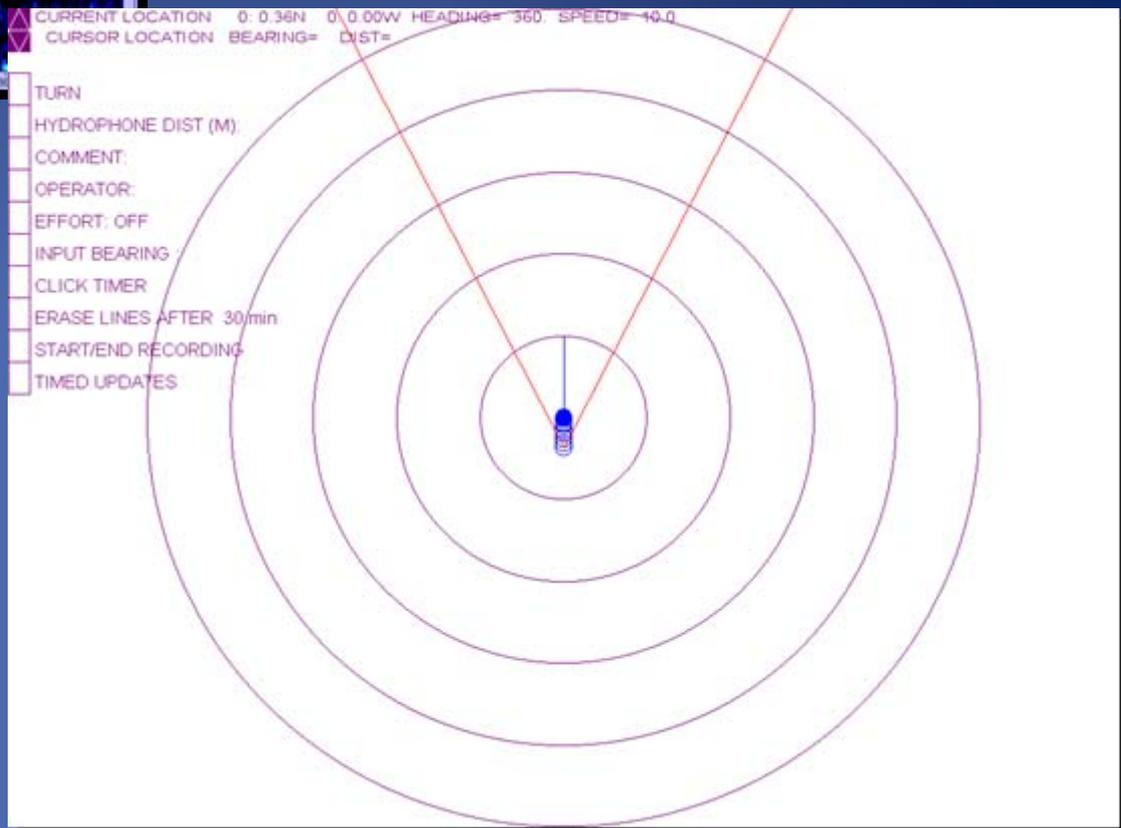
Focus: Passive Acoustic

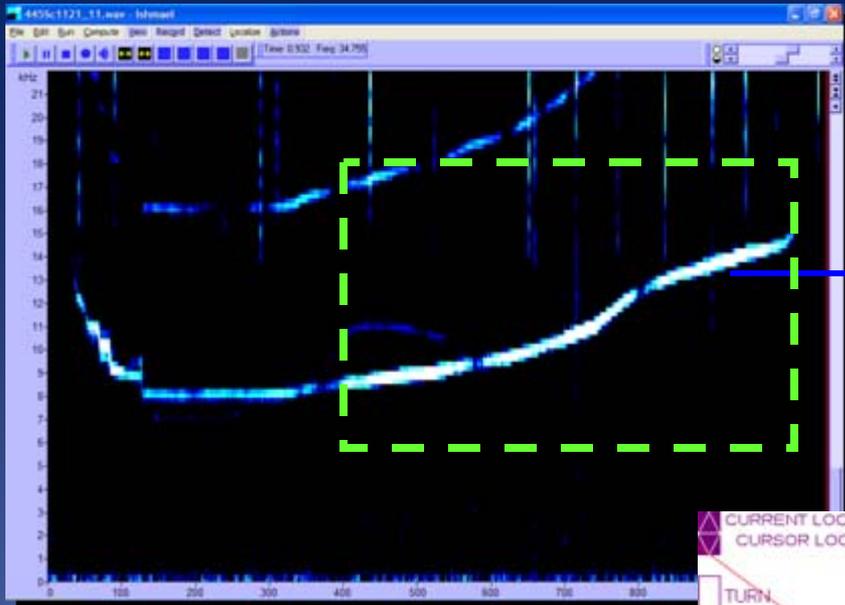
- Combination of visual and acoustic detections can provide an alternative estimate of abundance
 - Vocal animals can generally be heard at greater distance than they can be seen = larger search area
- Acoustic detections can provides an estimate of the number of groups missed by visual team
- Acoustic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



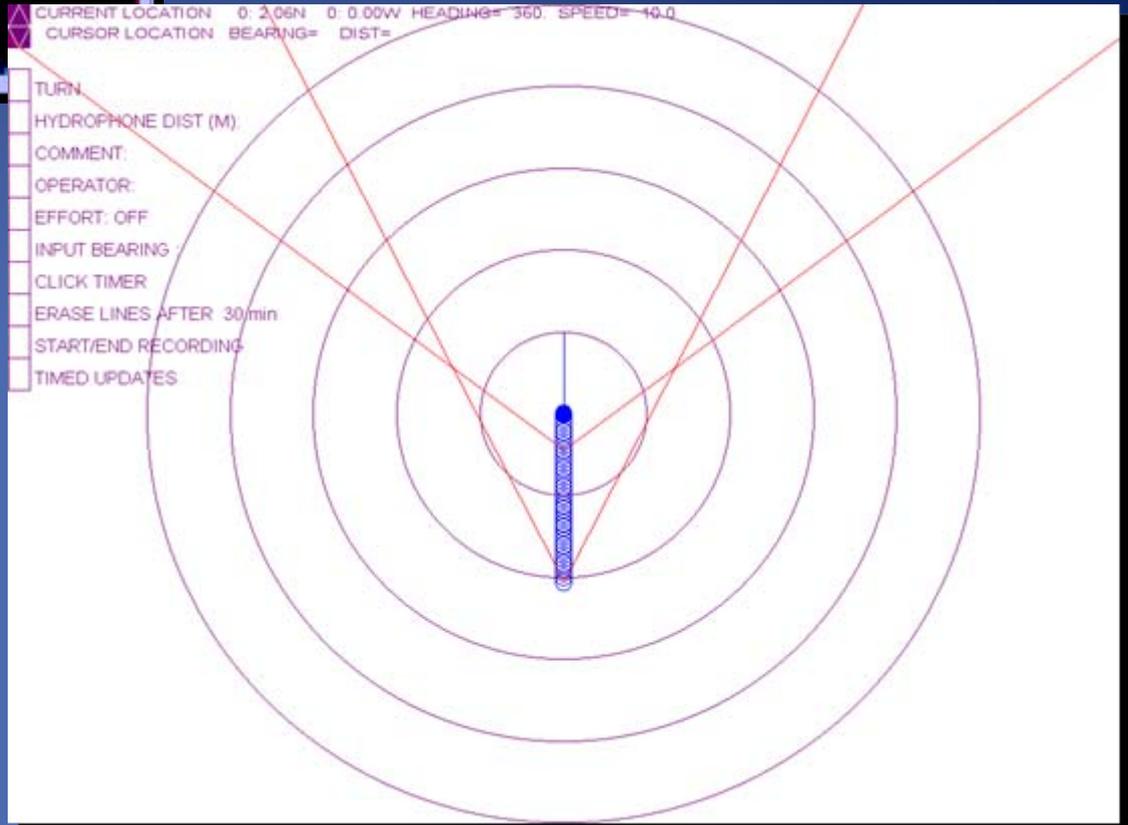


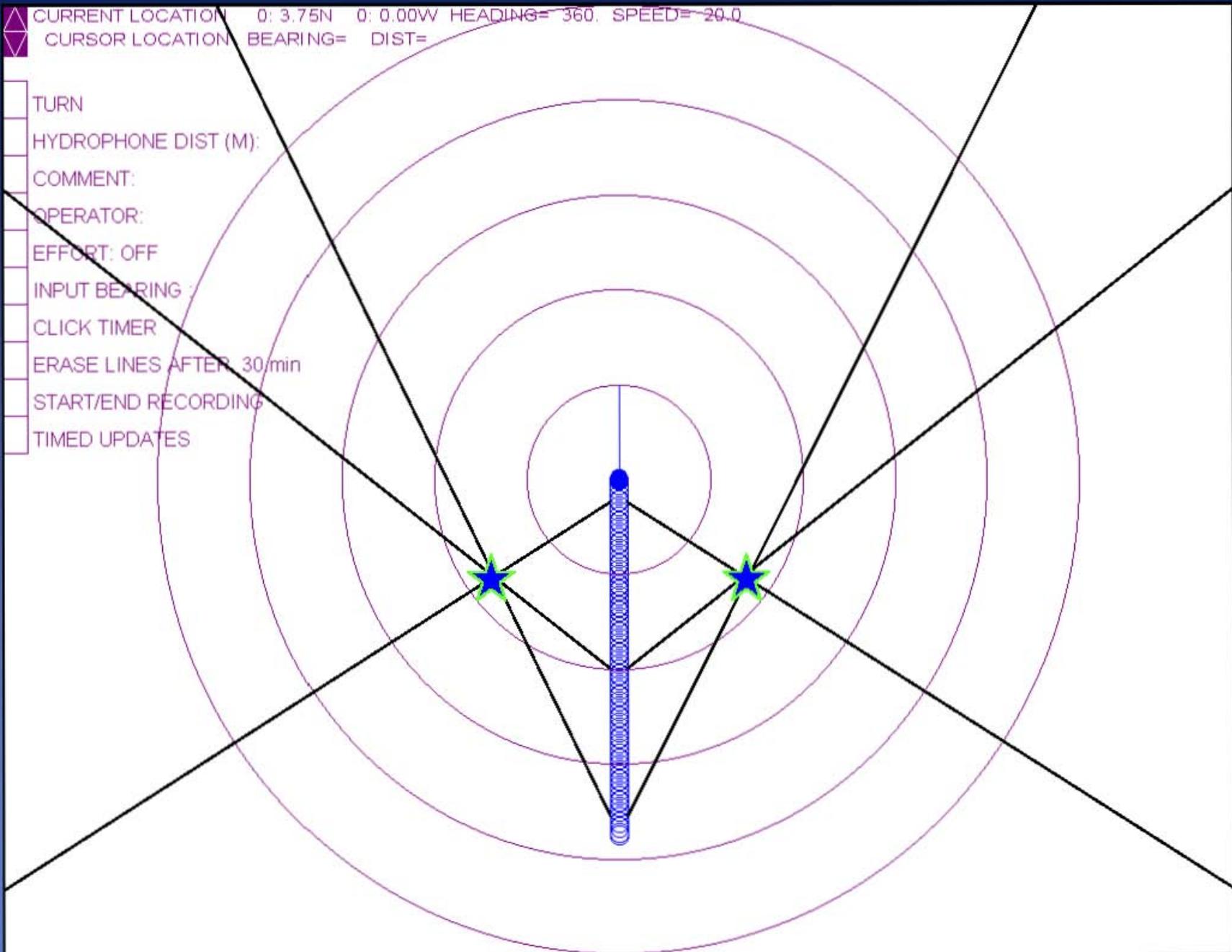
27°





53°

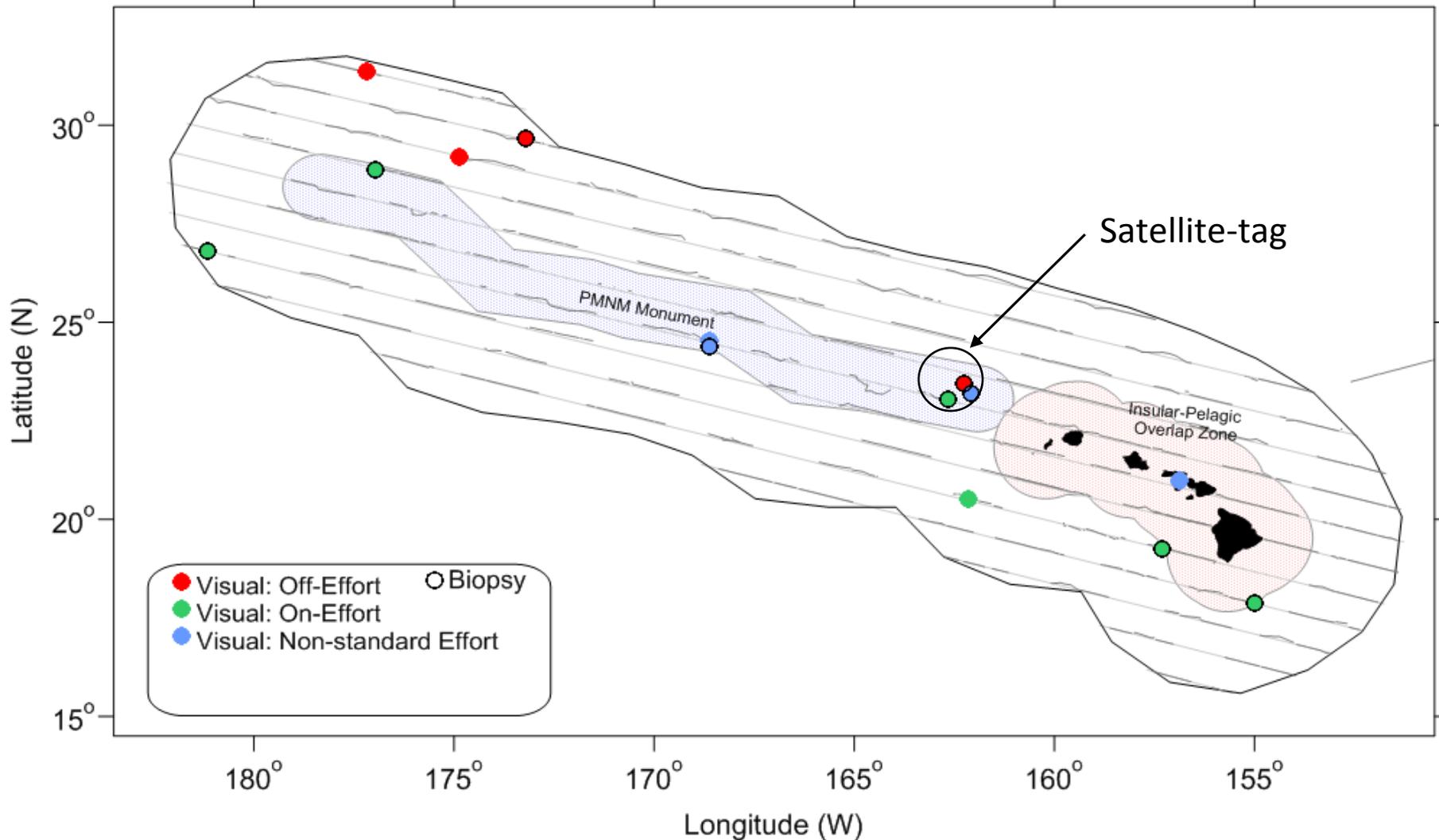




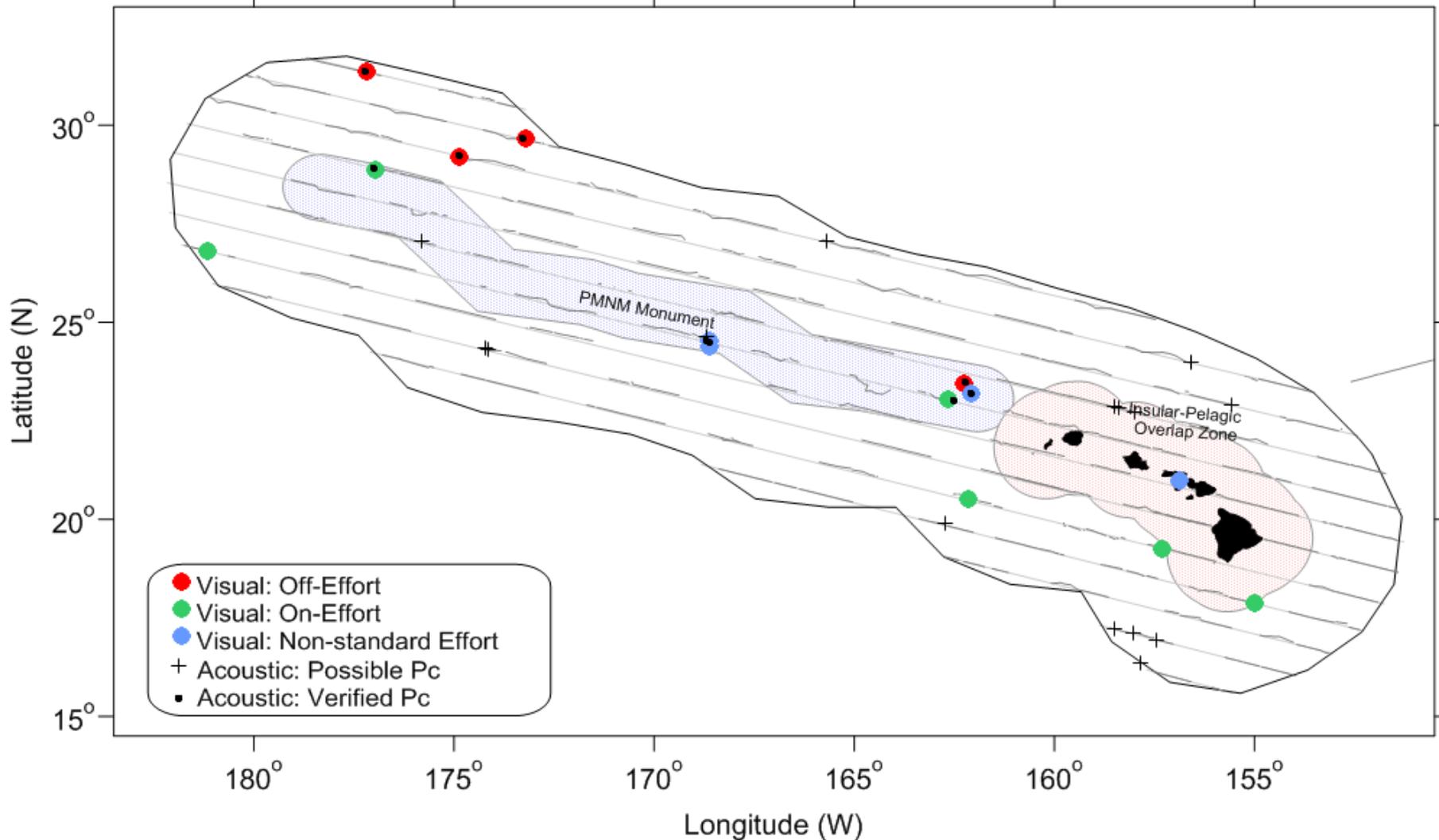
Acoustic Detection

- 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



HICEAS False Killer Whale Sightings

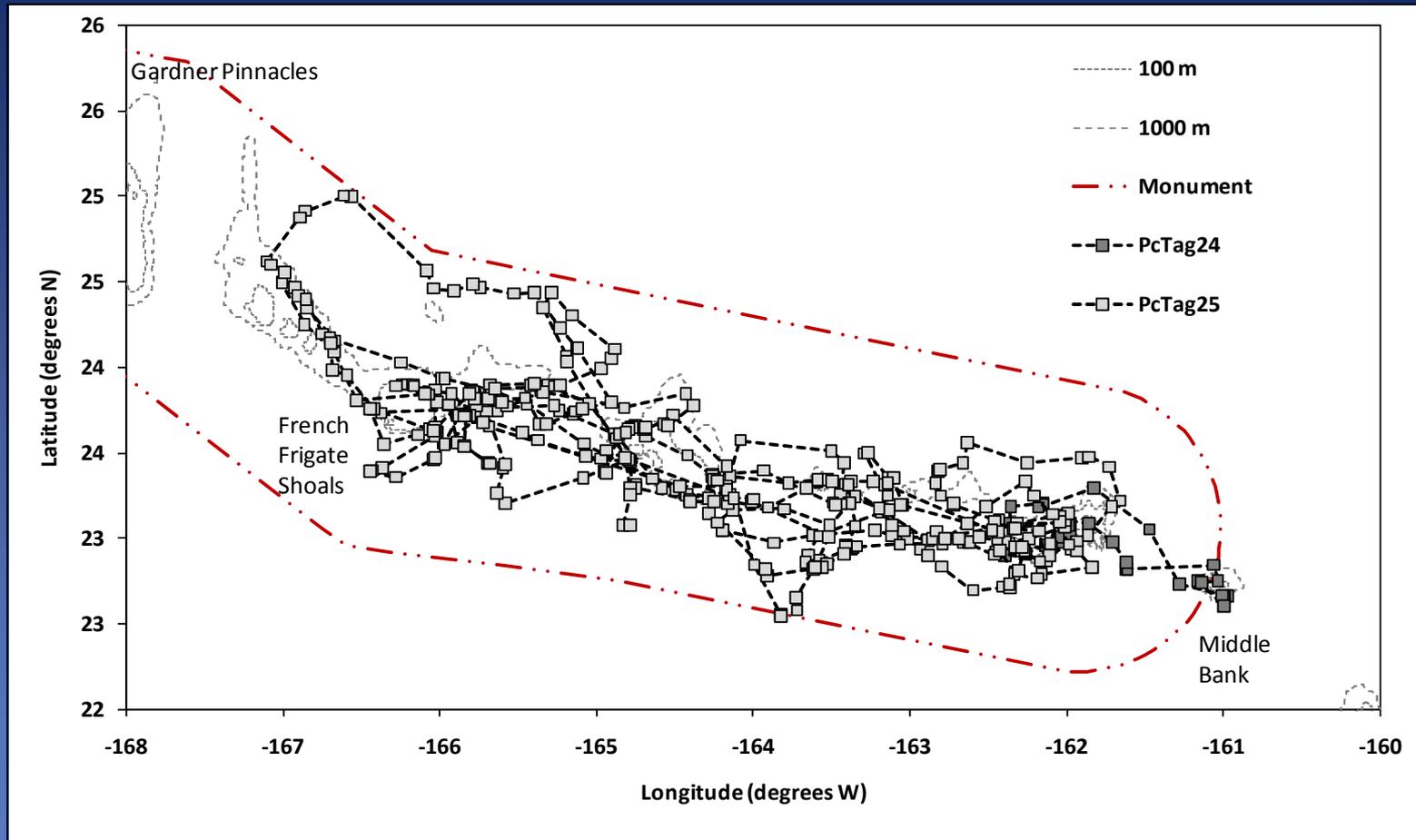


HICEAS Photo-ID

- 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

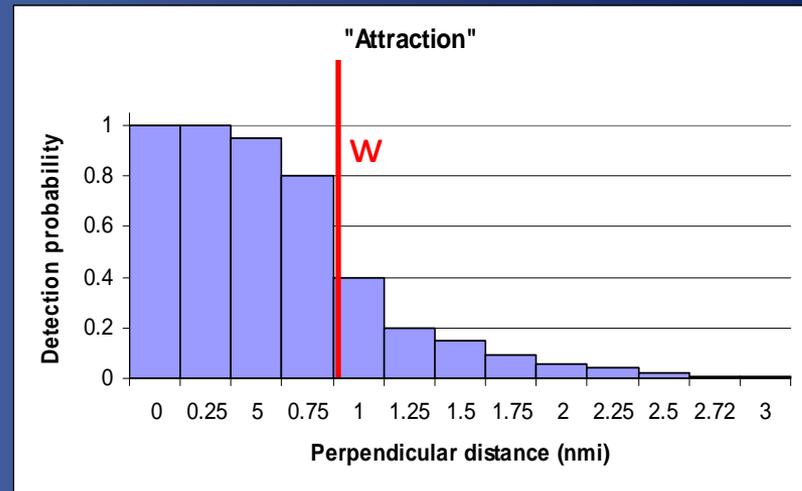
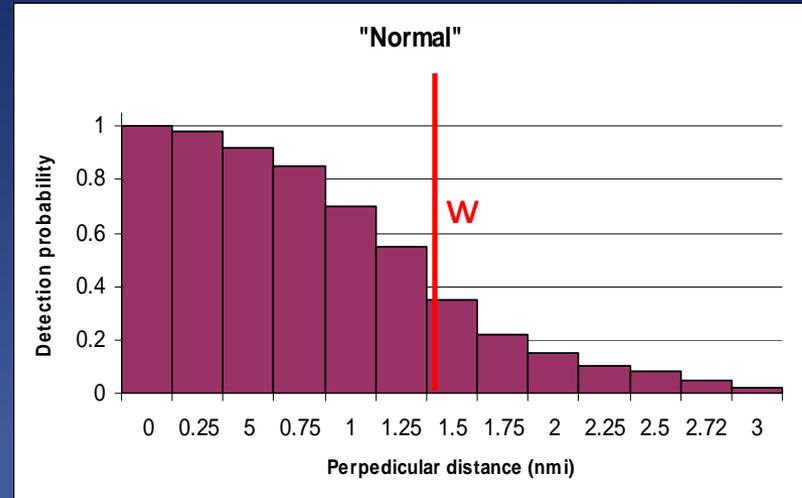
Acoustics:

- 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



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

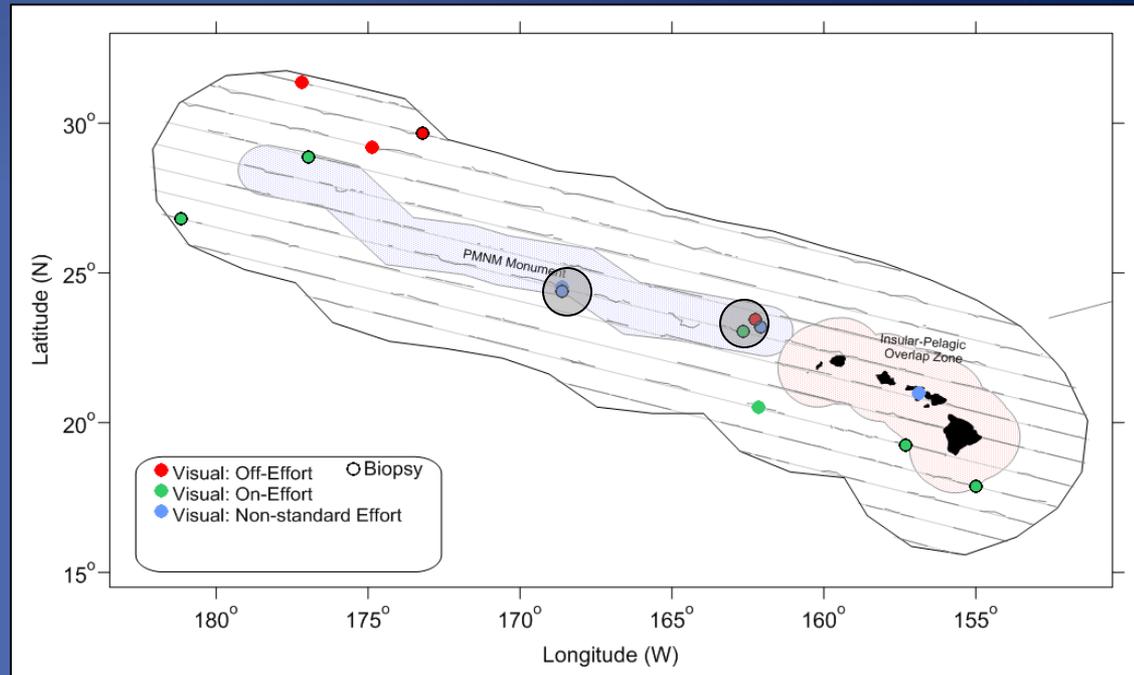
Analysis Update

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:

- Satellite-derived: SST, CHL, SSHrms, Primary Prod.

- Latitude, longitude, distance to land

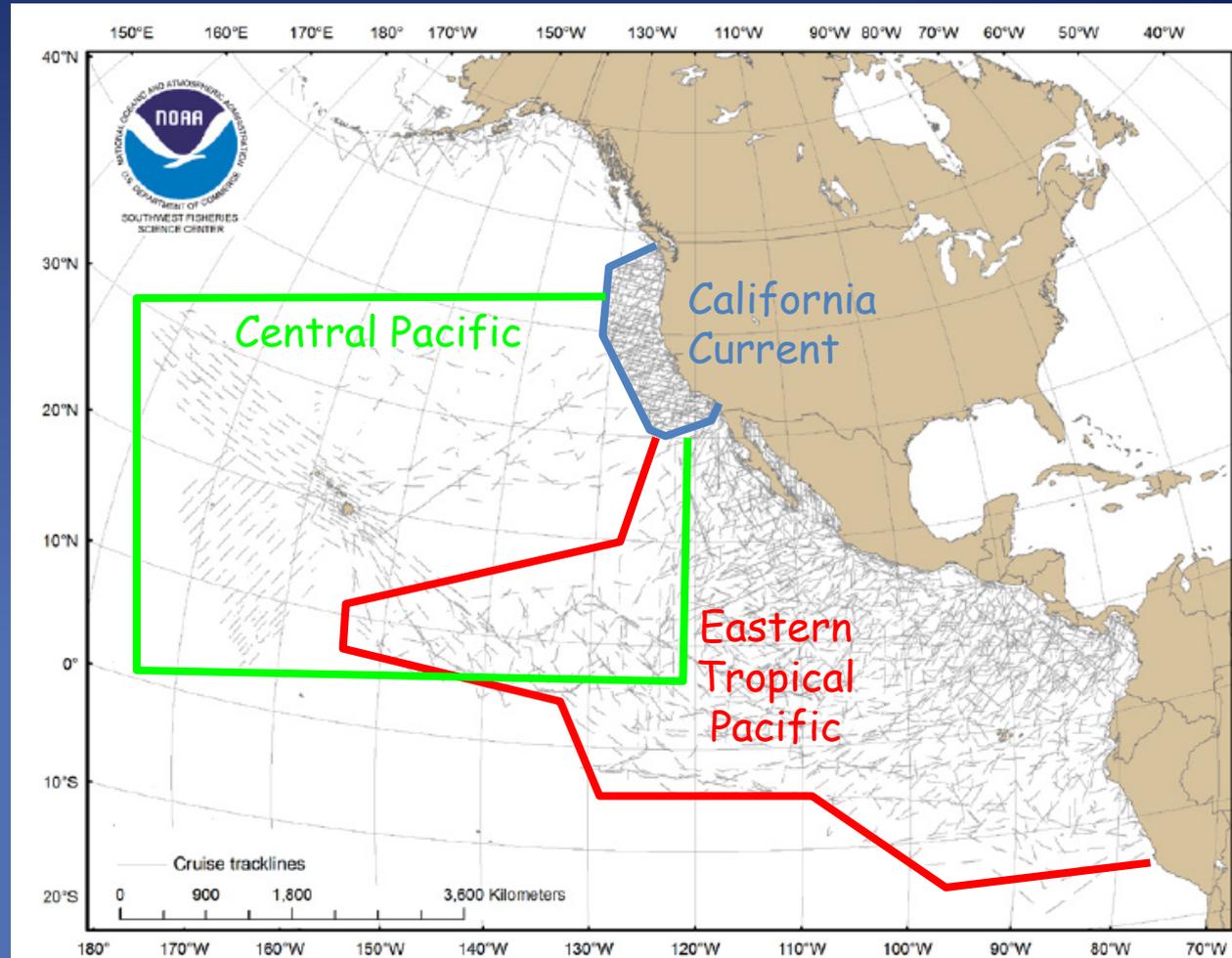
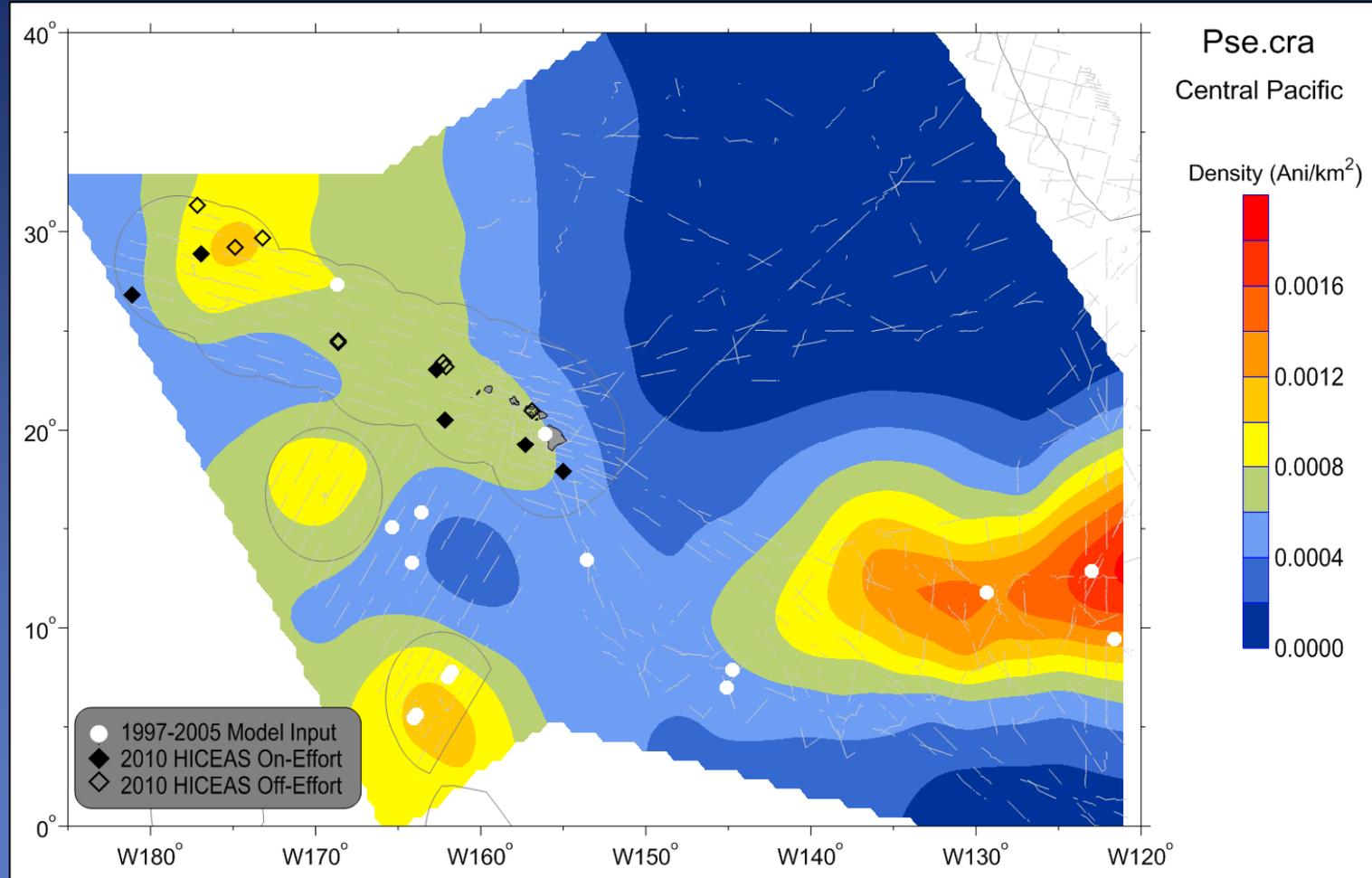


Figure 1. Cruise tracklines surveyed by the Southwest Fisheries Science Center, 1986-2005.

The Future...



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

