

Pre-Take Reduction Team Meeting  
Nov 19-20, 2009 - Honolulu, Hawaii

## Stock Assessment Process - Understanding the Science



Presented by  
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# Common methods of monitoring marine mammal populations

*Shipboard visual & acoustic line-transect surveys*

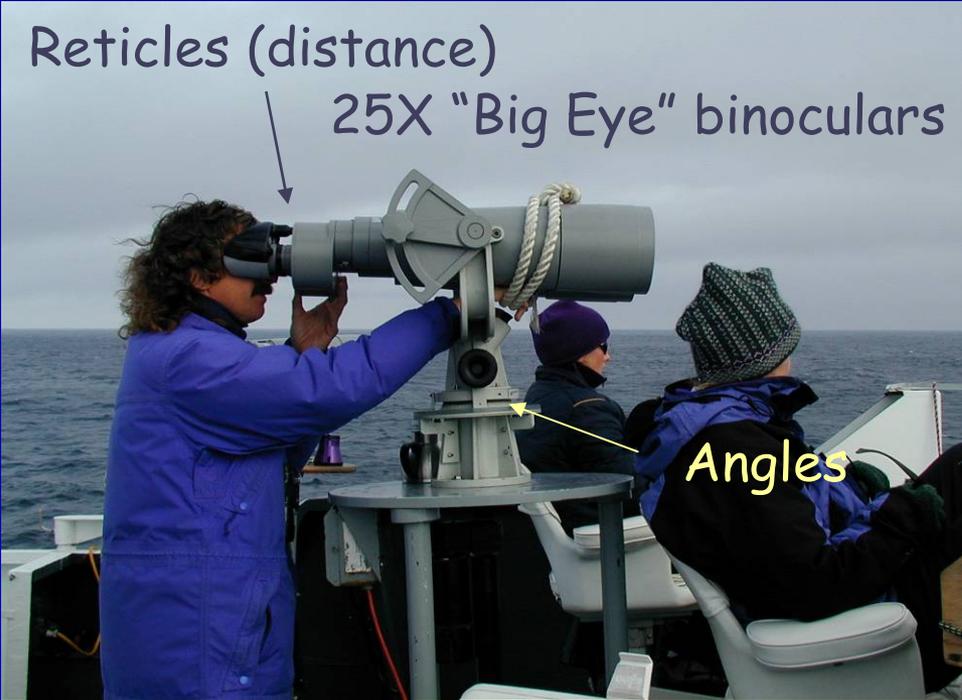


*Aerial line-transect surveys*

*Small boat based photo-identification studies*



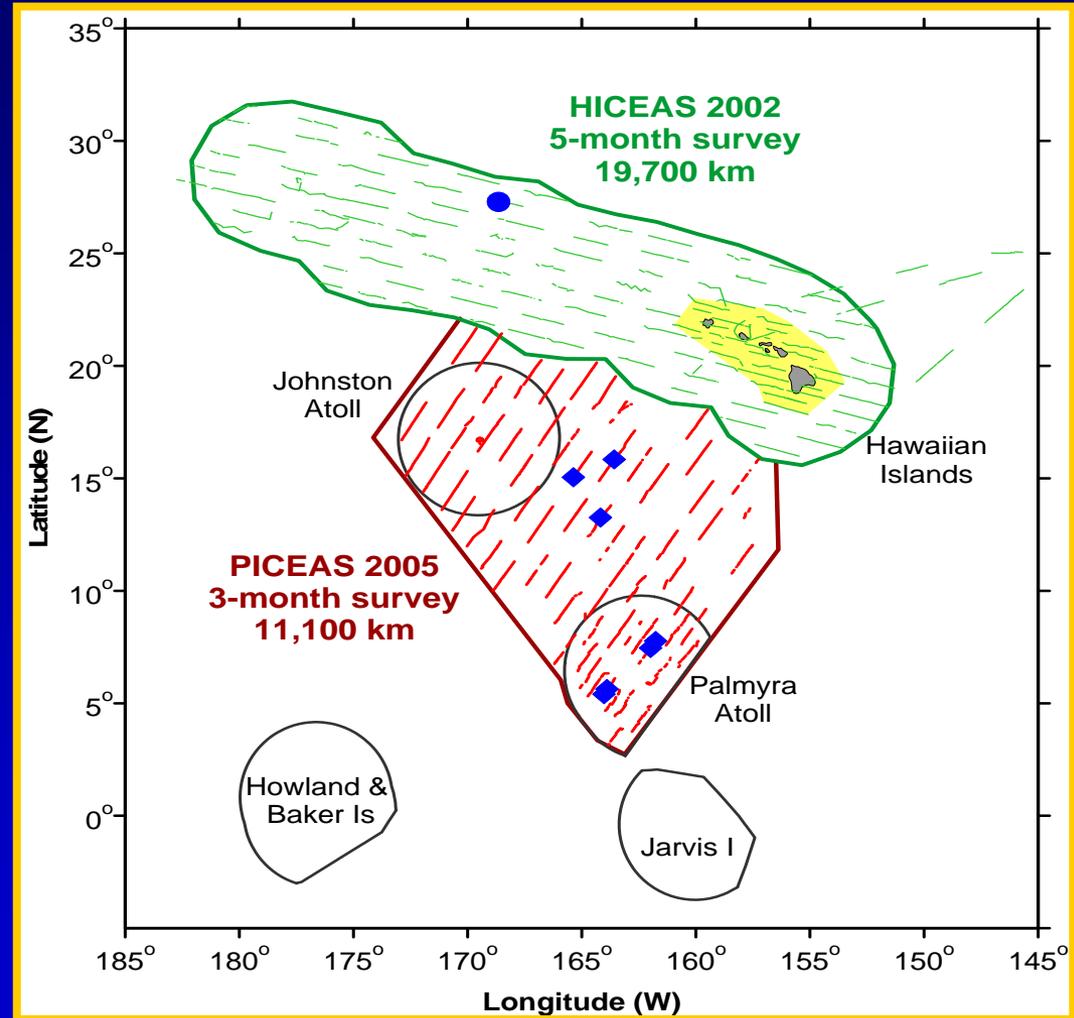
# Ship-based, Visual Line-transect Survey



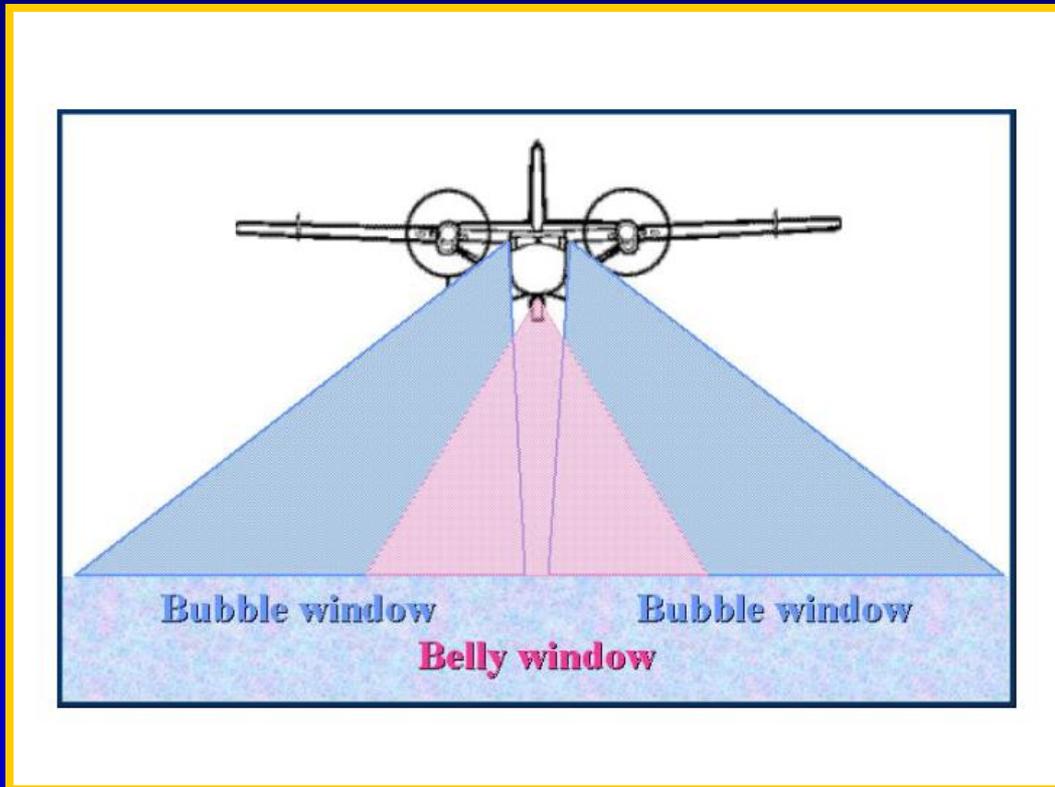
# Transect Surveys



- Established survey methods (since 1986).
- Advanced analytical techniques including correction for missed animals.
- Peer-reviewed and published in scientific journals and reports.

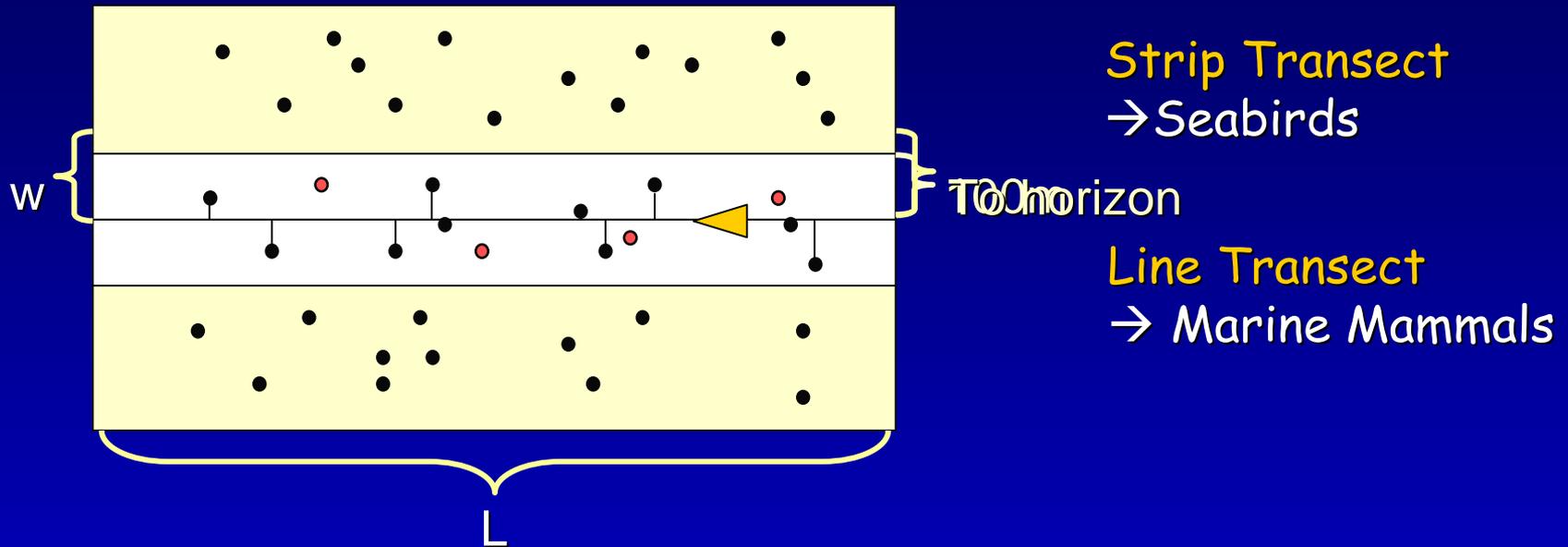


# Aerial Survey Methods



- Distance sampling (line/strip transect)
- Good to fair weather conditions (BFO-4, mostly clear skies)

# Transect Surveys



$$D = \frac{n * s}{L * 2 w}$$

D = Density

n = number of sightings

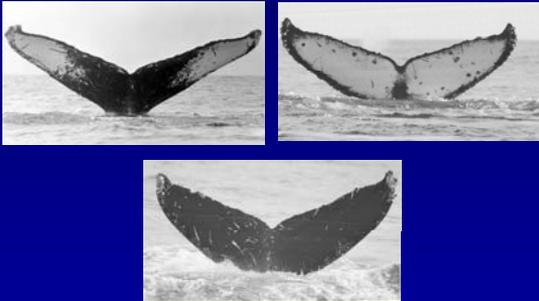
s = average group size

L = length of transect

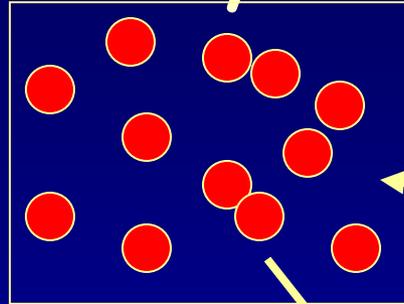
w = effective strip width

*Buckland et al. 1993*

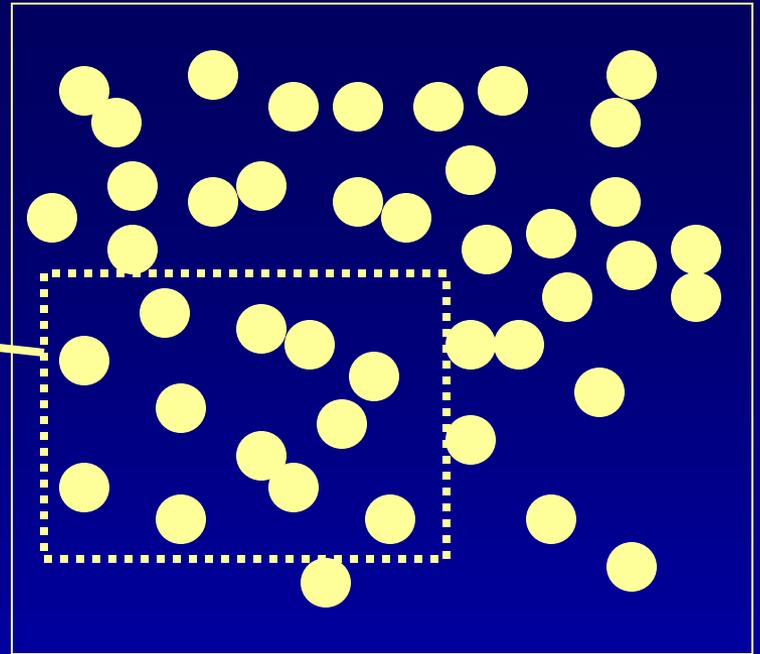
# Mark Recapture



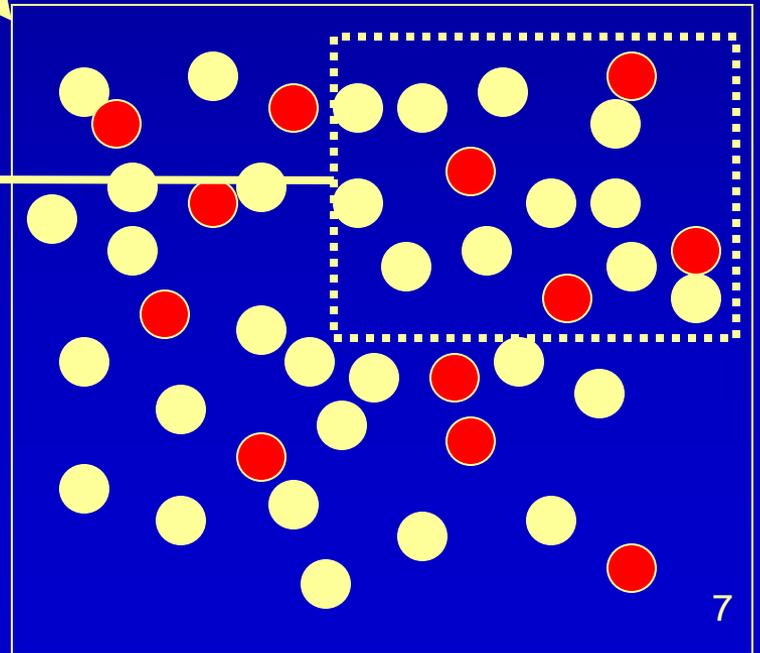
Survey 1:



$M = \text{marked}$



Survey 2:



$$N = \frac{M \cdot C}{R}$$

$$45 = \frac{12 \cdot 15}{4}$$

$C = \text{captured}$   
 $R = \text{recaptured}$

✓ Sampling considerations

# Comparison of Methods

- Ship surveys

- Pros:

- Large scale
- Two detection modes
- In situ environmental data

- Cons:

- Expensive
- Poor seasonal coverage

- Aerial survey

- Pros:

- Broad seasonal coverage
- Historic data
- Variety of scales
- Cost-effective?

- Cons

- Weather-dependant
- No environmental data



- Small boat surveys

- Pros:

- Broad seasonal coverage
- Fine scale
- Opportunity for other studies

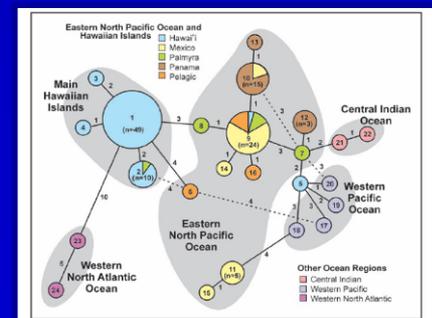
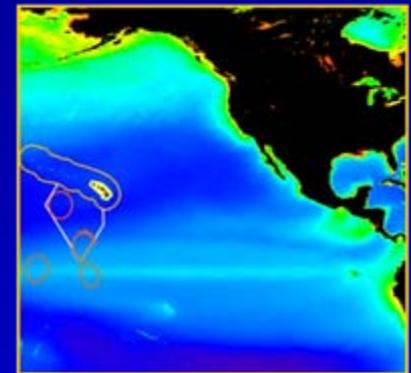
- Cons:

- Small study area
- Limited detection capability



# Stock Identification tools

- Distribution
- Movements
- Population trends
- Genetic differences
- Morphological differences
- Life history
- Contaminant loads
- Natural isotope ratios
- Parasite differences
- Habitat differences

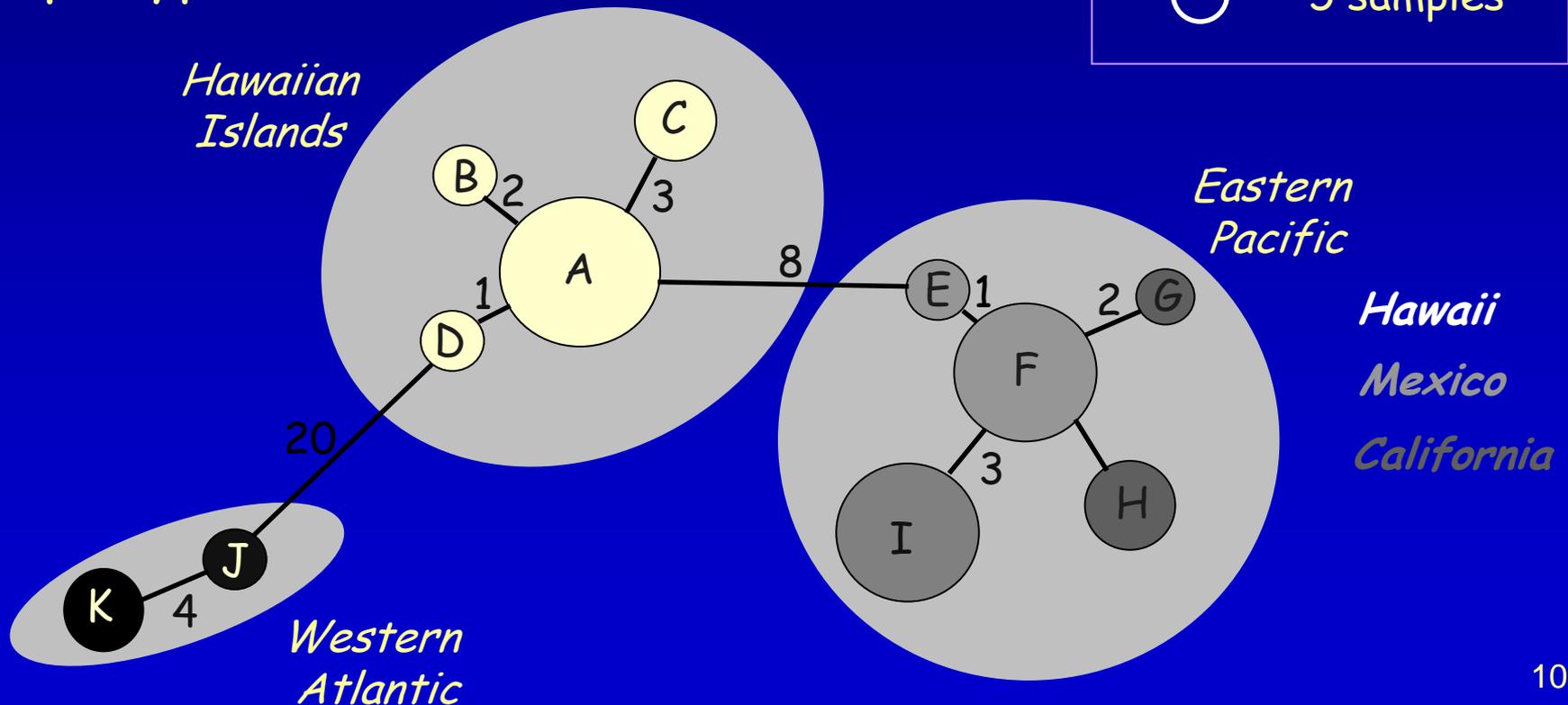
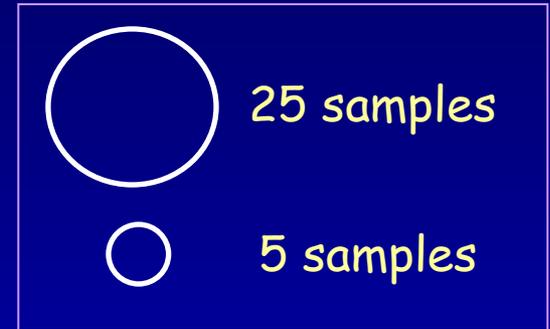


# Evaluating genetic structure

*Genetic samples from 100 individuals*

Haplotype A = ATGCGCTTTTAAGC

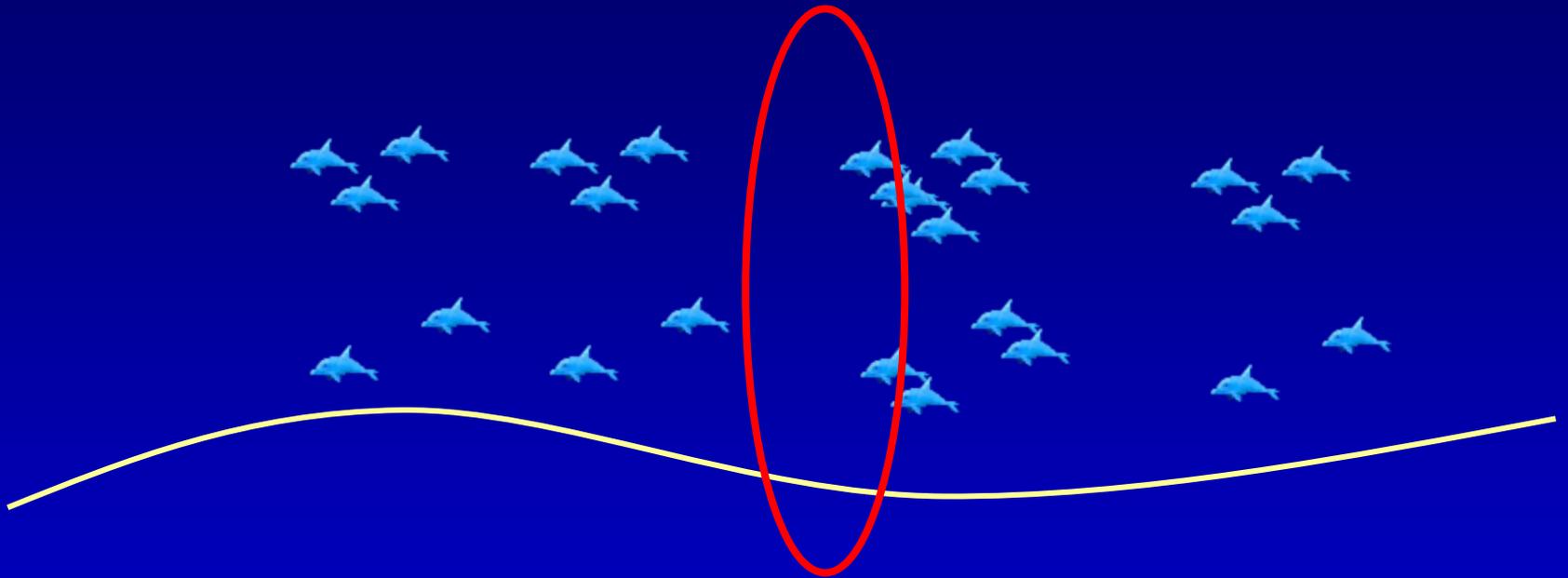
Haplotype B = ATGCGCTTAAAAGC



# Stock Identification

- Must be aware of localized impacts
- Even though distribution may appear continuous, localized reductions may eliminate undetected populations or result in reduction in range

# Stock Identification

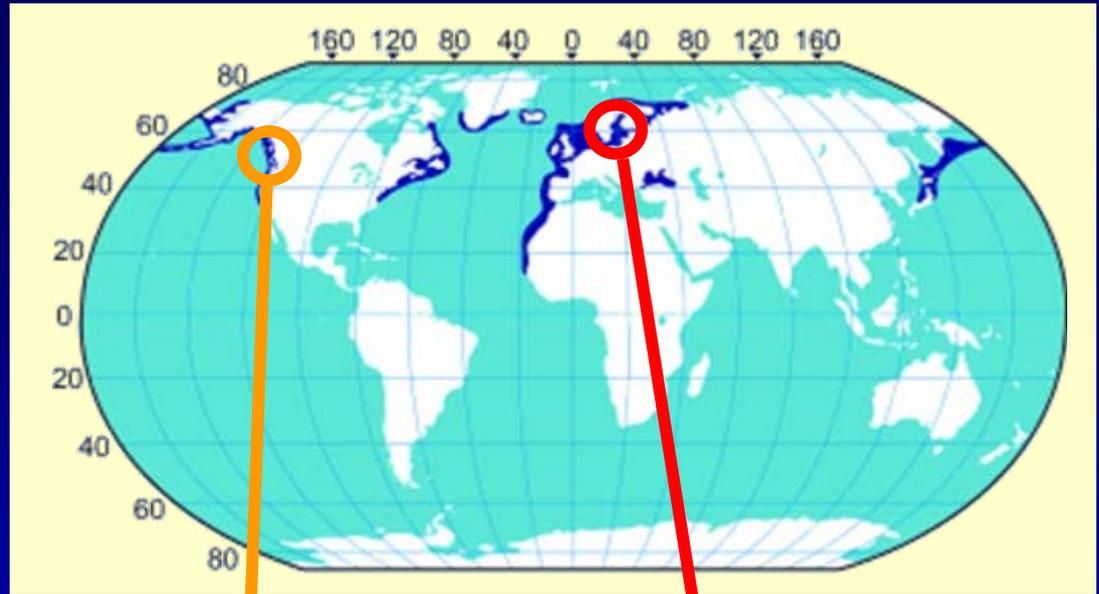


“In particular, where mortality is greater than a PBR calculated from the abundance just within the oceanographic region where the human-caused mortality occurs, serious consideration should be given to identifying an appropriate management unit in this region.”

- NMFS 2005

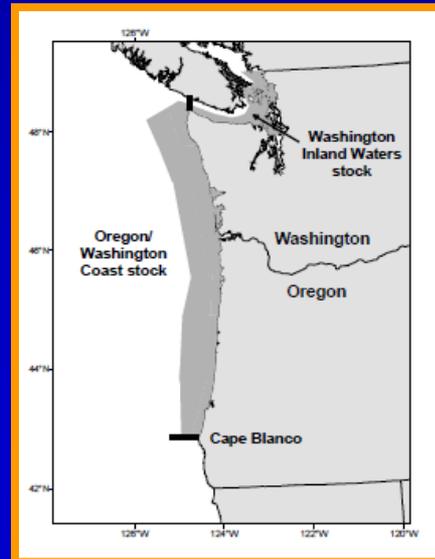
**Case Study:**  
**Harbor Porpoise**  
*Phocoena phocoena*

*Continuous  
distribution in  
coastal temperate  
waters of northern  
hemisphere*



- *Puget Sound:*

*Harbor porpoise were  
abundant prior to ~1940s  
Extensive gillnet fishing  
activity (unmonitored)  
In recent decades harbor  
porpoise are rare  
No recolonization from  
waterways to north*



- *Baltic Sea*

*Harbor porpoise  
have been virtually  
eliminated by  
fishery bycatch  
(documented).  
No recolonization  
from adjacent  
North Sea*

# Stocks that Span International Boundaries

- Ideally manage entire range of population through international agreements
- If have bycatch estimates and abundance estimates throughout range, manage based on PBR for whole stock
- For false killer whales, we do not have abundance estimates outside of US waters
  - Estimate PBR based on portion of stock in US waters
  - Estimate bycatch within US waters

# Transboundary Stocks Example

## US EEZ, US fleet

$N_{\min} = 200$

PBR = 2

M&SI = 3

## All waters, All fleets

$N_{\min} = 500$

PBR = 5

M&SI = 9

PBR = 5; M&SI = 4

## Intl waters, US fleet

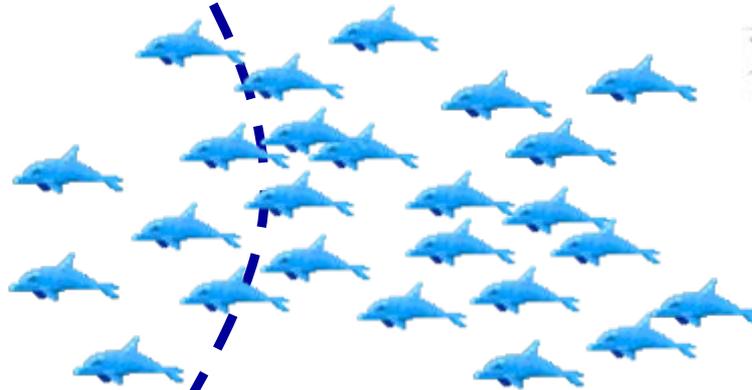
$N_{\min} = 300$

PBR = 3

M&SI = 1

U.S. EEZ

Foreign/International waters



# Stock Assessments in the Pacific Islands

- Two large scale surveys
  - 10 total months effort
  - Abundance estimates for 20 species
  - Established line-transect methods
- Genetic evidence of stock structure in several species
- No information on M&SI from international fishing fleets
  - Managing based on abundance and bycatch within US EEZ

Questions?