Mark-Recapture: An Alternative Method for Assessing Pelagic Stock Abundance

Erin Oleson & Karin Forney
NOAA Fisheries
Pacific Islands & Southwest Fisheries
Science Centers

False killer whale TRT meeting #3: June 17, 2010- Turtle Bay HI

Mark-Recapture

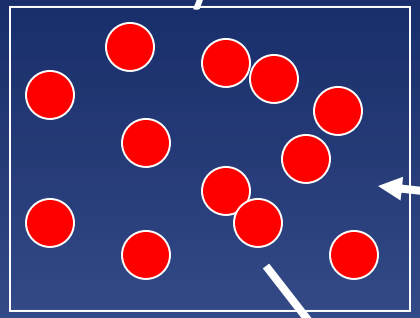
- **Mark and recapture** is a method commonly used in ecology to estimate population size.
- Best suited for small (< few thousand individuals) populations with restricted range, and migratory whales

- In its simplest form:
  - A survey is conducted and individuals are “marked” (i.e. photographed)
  - Time passes, animals redistribute
  - Another survey is conducted, individuals are “marked”
  - The proportion of animals seen during second survey that were also seen on the first survey provides a scaling factor for estimating abundance

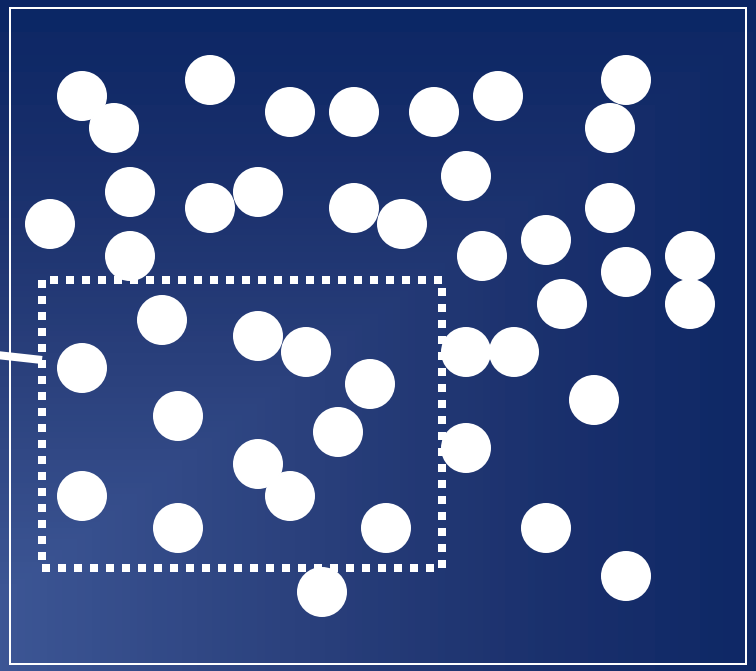
Mark Recapture

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

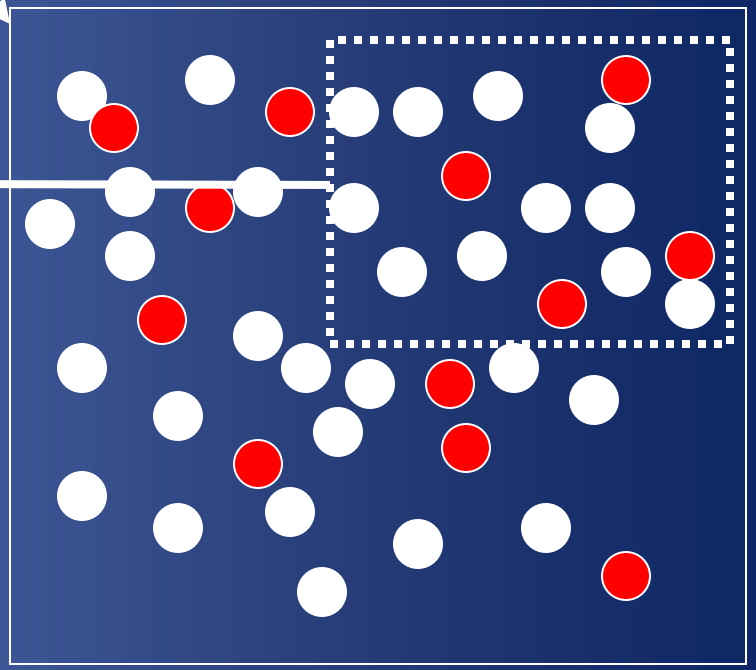
Survey 1:



M = marked



Survey 2:



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

C = captured

R = recaptured

✓Sampling considerations

HIPc138 -Dec 31, 1988

HIPc138 - Mar 3, 2005

HIPc115 - Feb 1, 1998

HIPc115 - Apr 11, 2006

Individuals are distinctive and can be followed over years using the markings on the dorsal fin

Photos © Cascadia Research Collective

Applying MR to Pelagic FKWs

- Use fishery to obtain photographs on individual whales

Photos: PIRO Observer Program

Applying MR to Pelagic FKWs

- Successive samples from fishery (e.g. year-to-year) will estimate abundance of animals that interact with the fishery
- Independent sample needed to estimate total pelagic stock population size

Photos © Cascadia Research Collective

Sampling considerations

- Fishery sample should come from as many vessels as possible.
- Skipper & crews will need training - consider photographic angles, sun glare, distance to animals
  - ID photos need to be clear enough to see details of the dorsal fins to distinguish individual animals
- An estimate entirely from the fishery will still provide useful comparison to line-transect estimate

Line-Transect vs. Mark-Recapture Example: Humpback Whales

1991: 1st line-transect survey off US west coast
-10 sightings -> **N = 626** (**CV = 0.41**)

1992-93 mark-recapture estimate
200-300 photos -> **N = 596** (**CV = 0.07**)

- CVs are dependent on sample size
- For some species, it is easier to get larger set of photographs than more systematic survey sightings

2005: line-transect
191 sightings -> **N = 1761** (**CV = 0.16**)

2004-05 mark-recapture
200-300 photos -> **N = 1516** (**CV = 0.09**)

Questions?