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# Demography of green turtles in southern California

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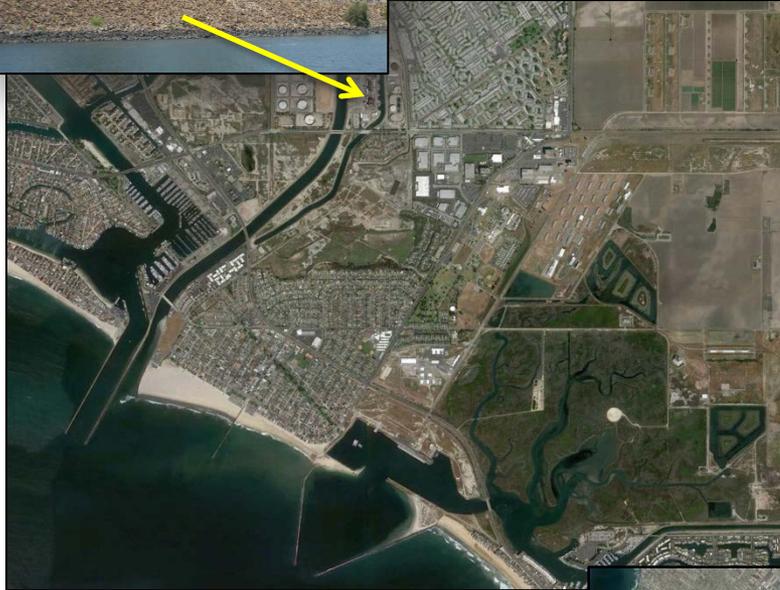
Review of NOAA Fisheries' Science on Marine Mammals & Turtles

Southwest and Northwest Fisheries Science Centers

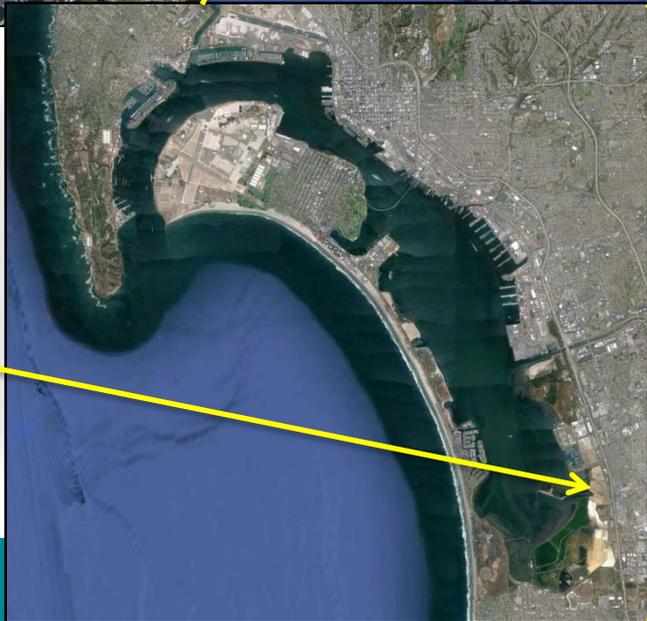
27-31 July 2015

La Jolla, CA

# Green turtles in southern California



Los Alamitos Bay – San Gabriel River – Seal Beach



San Diego Bay

Data LDEO, Columbia, NSF, NOAA  
Image Landsat  
Data USGS  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

# Green turtles in southern California



E. Maher



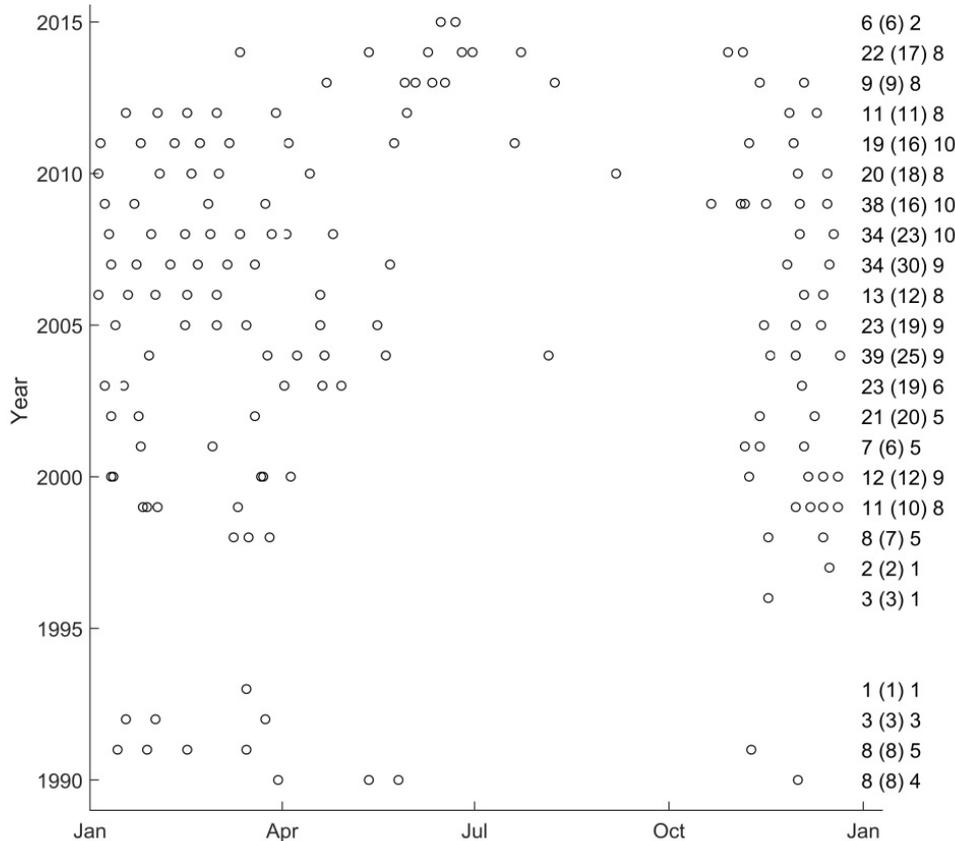
San Diego Bay

Data LDEO-Columbia, NSF, NOAA  
Image Landsat  
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# Long-term study of green turtles in San Diego Bay

Capture dates over 25 yrs

# caught (# unique) # days (with at least 1 turtle)



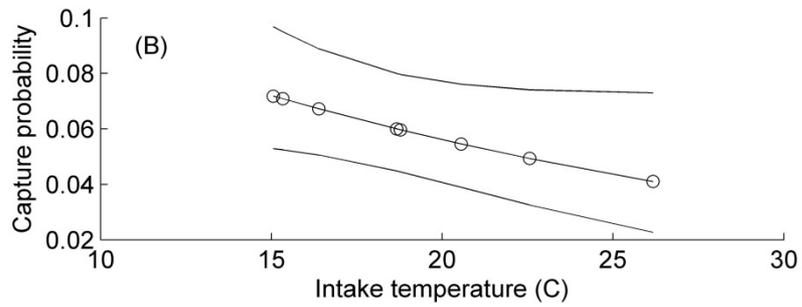
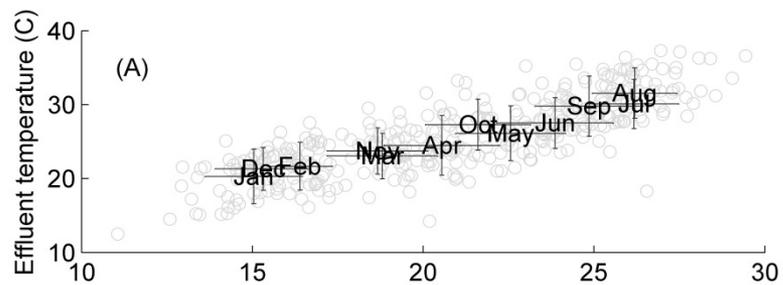
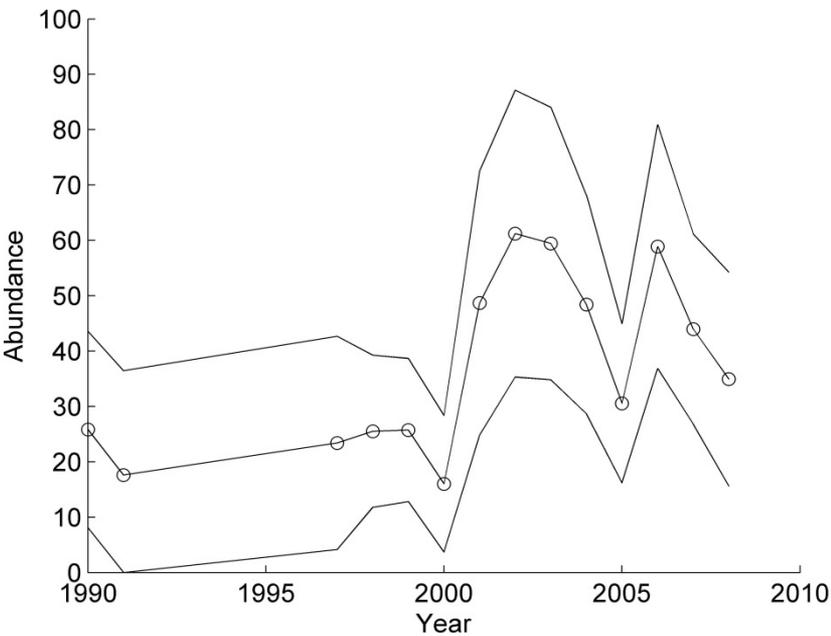
# Capture-recapture analyses of green turtles in San Diego Bay

## “Huggins robust-design” capture-recapture models

- Assumed closed “population” (foraging aggregation) in winter but open between them
- Time-, age-, and size- independent survival rates (not-enough within-season recaptures to estimate time-varying survival)
- Abundance as a derived parameter – not explicitly in the likelihood function
- Constant capture probability within a season
- Mixing of individuals within the bay during within a season
- Time-independent  $\Pr(\text{absent for two consecutive yrs})$  and  $\Pr(\text{present for two consecutive yrs})$



# Demographic study of green turtles in San Diego Bay



Annual survival = 0.861 (95%CI: 0.34-0.99)

Pr(Absent in two consecutive years) = 0.13  
(95%CI: 0.025-0.479)

Pr(Present in two consecutive years) = 0.85  
(95%CI: 0.61-0.95)

Eguchi et al. 2010

# Demographic studies of green turtles in southern California

## Future

- Continue sampling effort
  - Possibly increase sampling effort at the Long Beach area for collecting sufficient data to estimate demographic parameters – currently not enough recaptures
  - Sustain sampling effort at the San Diego area
  - Stranding responses for recovering carcasses (small juveniles have been injected with oxytetracycline for validation in skeletochronology)
- Update parameter estimates periodically
  - Determine possible effects of change in the thermal environment due to the power plant decommission