

# Population Biology of Northern Elephant Seals

## Population growth and demography

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with

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# Population biology



# Overview

## World population

- Breeding colonies

- Southern elephant seal

- Population growth

## Año Nuevo population

- Population growth and decline

- Censusing

- Carrying capacity

## Demography

- Survival

- Immigration from the south

- Lifespan

# Breeding colonies



# Breeding colonies

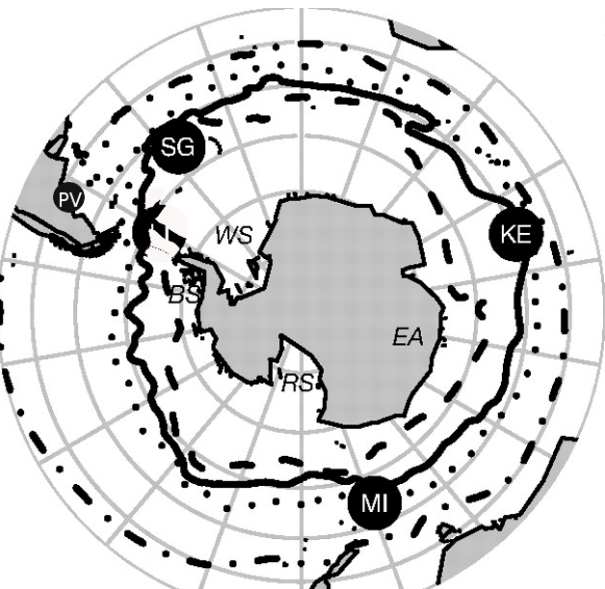


# Breeding colonies

- ▶ 20 colonies, s. Baja to Vancouver I. ( $26^{\circ}$  to  $48^{\circ}$  N. Lat)
- ▶ 7 have more than 2,000 pups born per year ( $28^{\circ}$  to  $38^{\circ}$  N. Lat)
- ▶ the largest: 16,000 pups per year at San Miguel Island
- ▶ the origin: Guadalupe Island had all survivors in 1890

# Southern elephant seals

population size = 600,000



# Mainland in Patagonia





# Mainland in Patagonia



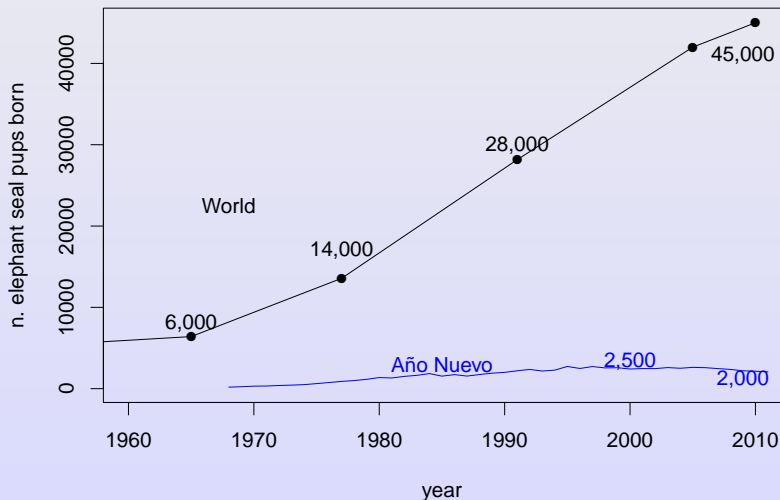
# Population of all northern elephant seals

- ▶ nearly exterminated by hunting (for oil) around 1900
  - ▶ approximately 100-500 survived
  - ▶ only at Guadalupe Island, Mexico
- ▶ expanded quickly after hunting stopped
  - ▶ 6,000 pups\* born per year by 1965, mostly still in Mexico
  - ▶ still growing through 2010
  - ▶ currently 45,000 pups and 180,000 total

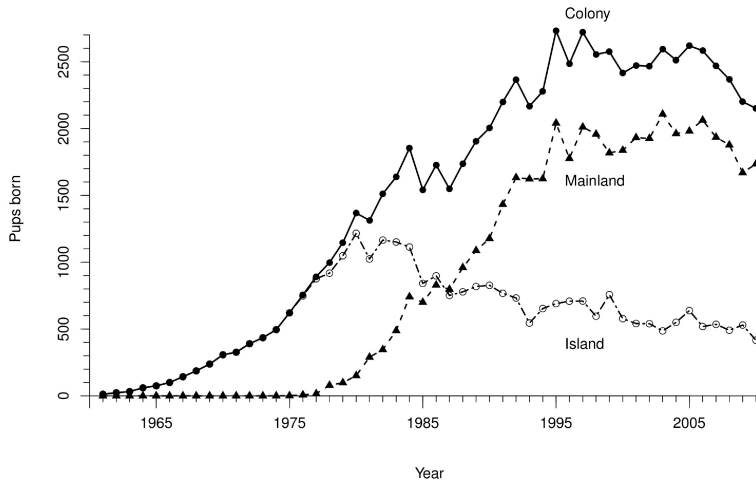
\* total population = 4 x number born

\* number born = number breeding females

# Population of all northern elephant seals



# Año Nuevo Population



# Año Nuevo Population

- ▶ Breeding first known on the island in 1961 (11 pups born)
- ▶ First pup born on the mainland in 1975
- ▶ Colony grew until 1995 when 2,500 pups were born
- ▶ No further growth through 2005
- ▶ Reduction since 2005

# Censusing elephant seals



# Censusing elephant seals



# Has Año Nuevo overshot capacity?

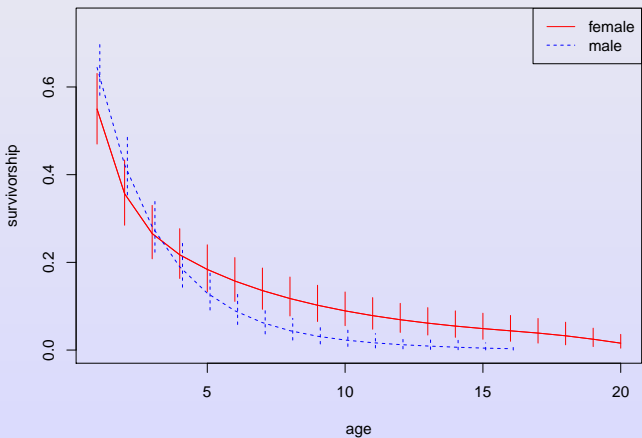




# Has Año Nuevo overshoot capacity?

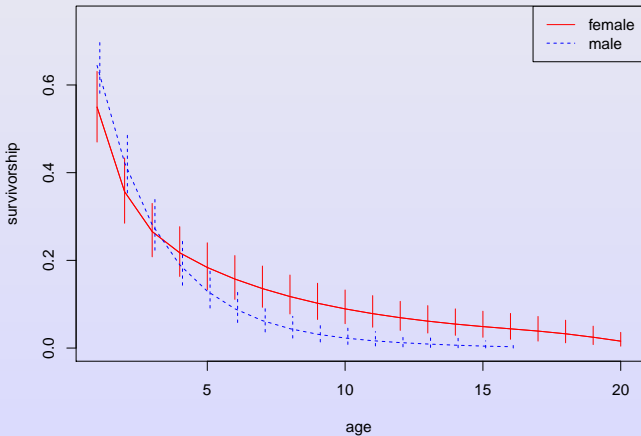


# Female survivorship



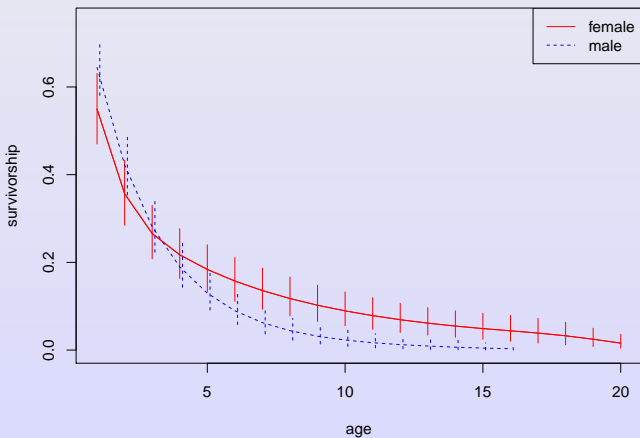
# Female survivorship

183 females permanently branded as pups in 1986-87



# Female survivorship

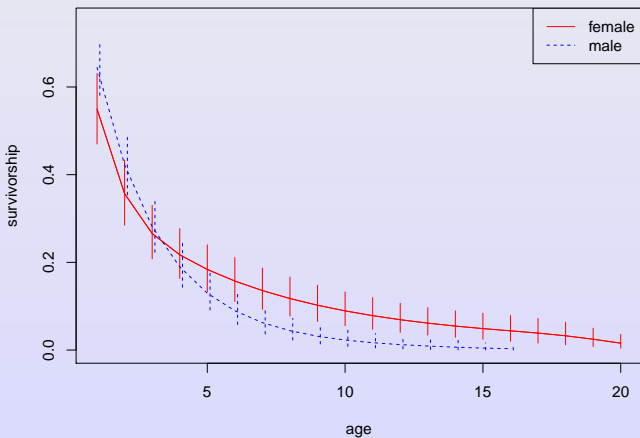
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► age 1: 97 survive

# Female survivorship

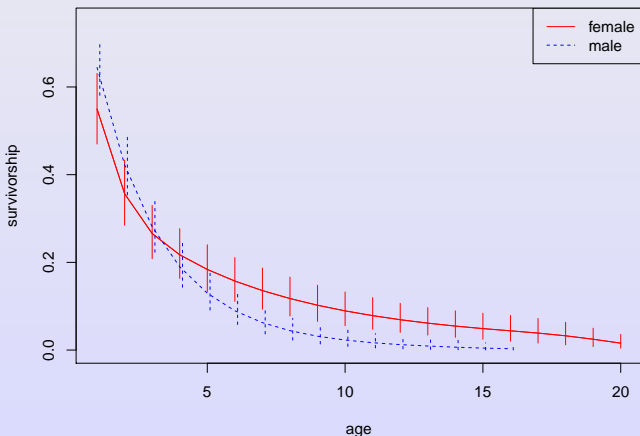
183 females permanently branded as pups in 1986-87



- ▶ age 1: 97 survive
- ▶ age 4: 36 survive

# Female survivorship

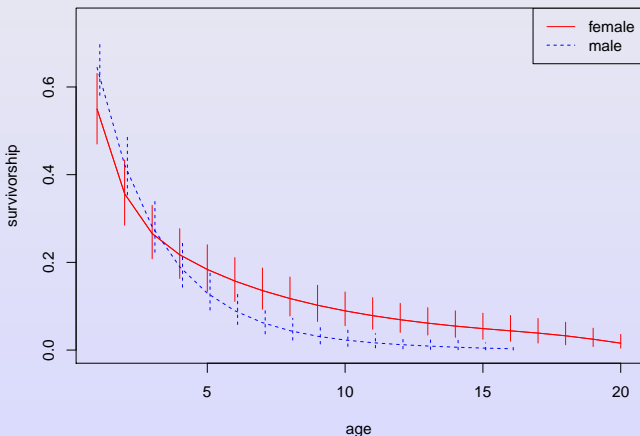
183 females permanently branded as pups in 1986-87



- ▶ age 1: 97 survive
- ▶ age 4: 36 survive
- ▶ age 9: 17 survive

# Female survivorship

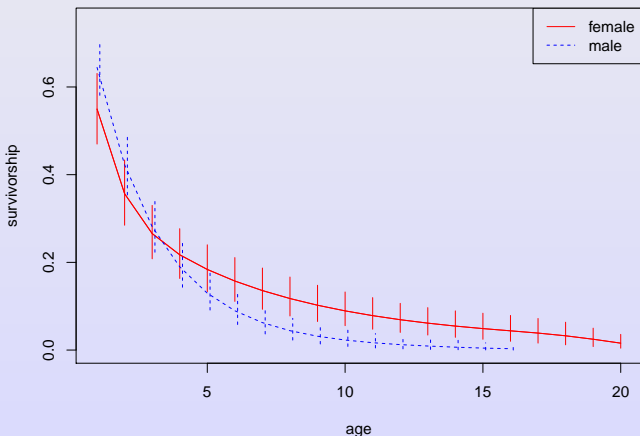
183 females permanently branded as pups in 1986-87



- ▶ age 1: 97 survive
- ▶ age 4: 36 survive
- ▶ age 9: 17 survive
- ▶ age 15: 8 survive

# Female survivorship

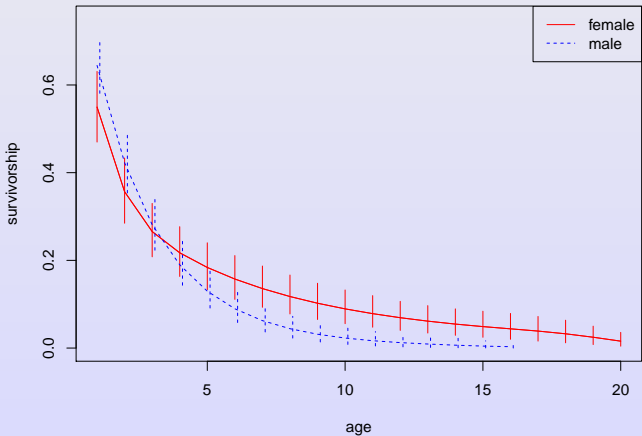
183 females permanently branded as pups in 1986-87



- ▶ age 1: 97 survive
- ▶ age 4: 36 survive
- ▶ age 9: 17 survive
- ▶ age 15: 8 survive
- ▶ age 21: last dies

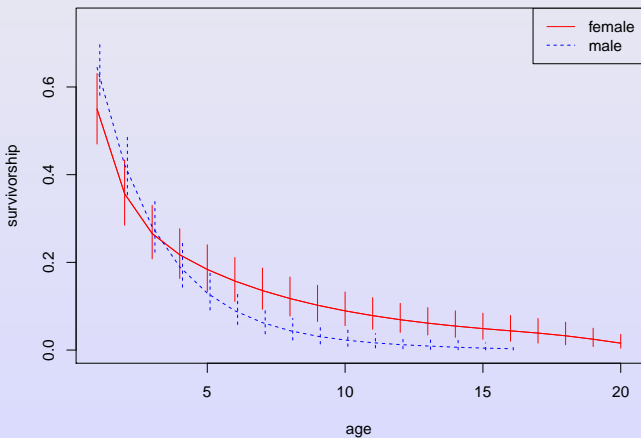


# Male survivorship



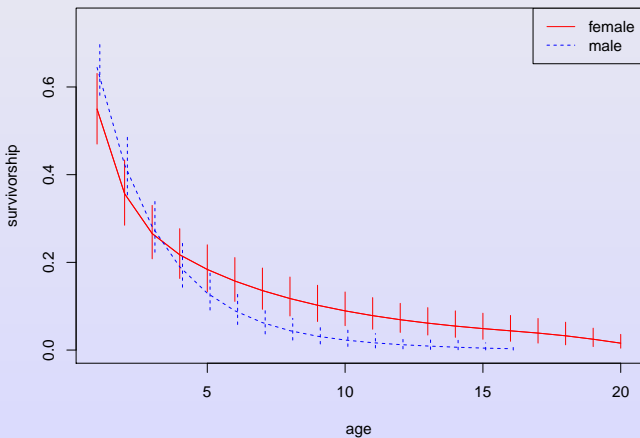
# Male survivorship

189 males permanently branded as pups in 1986-87



# Male survivorship

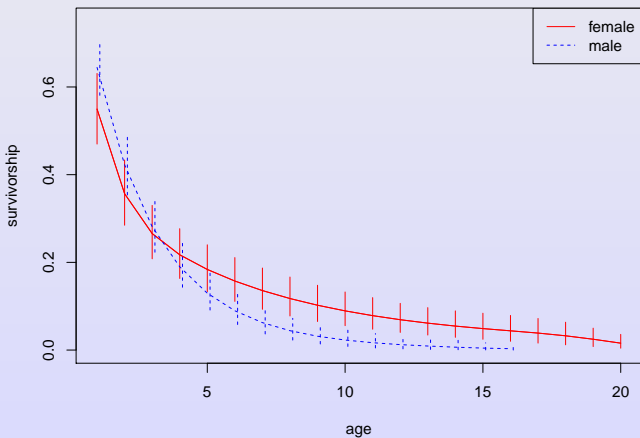
189 males permanently branded as pups in 1986-87



► age 1: 119 survive

# Male survivorship

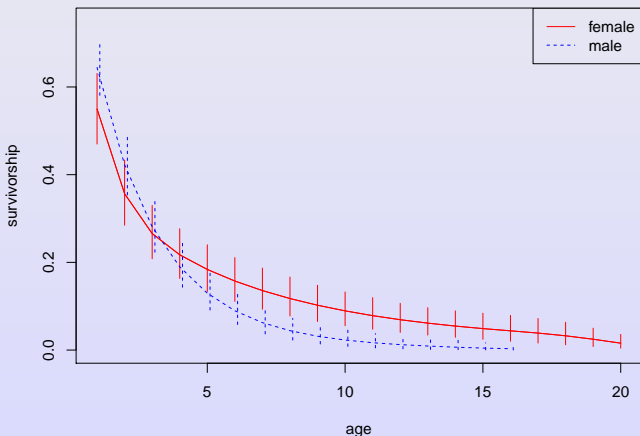
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- ▶ age 1: 119 survive
- ▶ age 4: 33 survive

# Male survivorship

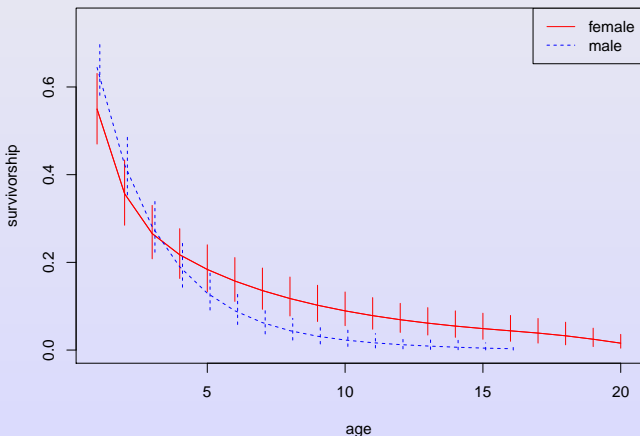
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- ▶ age 1: 119 survive
- ▶ age 4: 33 survive
- ▶ age 9: 7 survive

# Male survivorship

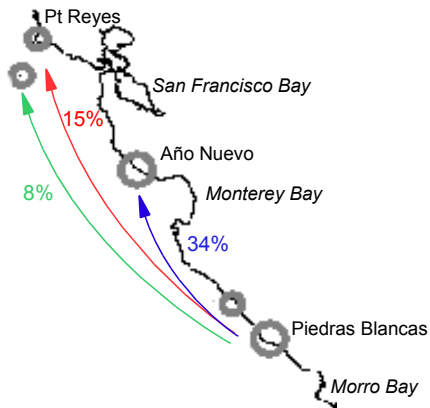
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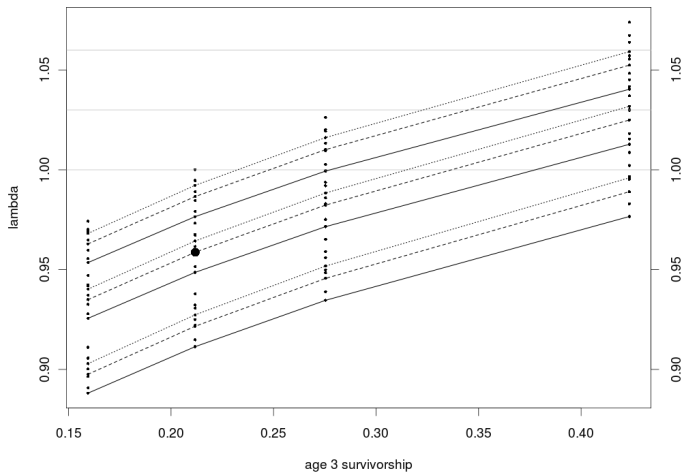
- ▶ age 1: 119 survive
- ▶ age 4: 33 survive
- ▶ age 9: 7 survive
- ▶ age 15: last dies

# Dispersal and immigration

Breeding dispersal  
Females born at Piedras Blancas  
(1998-2000 cohorts, N=101)



# Dispersal and immigration





# Demography

- ▶ Low juvenile survival at Año Nuevo: 50% die in first year
- ▶ High adult survival at Año Nuevo: 13% die each year
- ▶ Oldest female known: 22 years
- ▶ Oldest male known: 15 years
- ▶ Fecundity nearly 1 pup per yr: 5-15% of females 'skip'
- ▶ High immigration from south sustains Año Nuevo

# Oldest elephant seal known

19 Jan 2012, Big Midden So.



# Review

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