Mortality risk and social network position in southern resident killer whales (Orcinus orca): sex differences and the importance of salmon abundance

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Mortality Risk and Social Network Position in Resident killer Whales

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Social Life Histories

1. How does the ecological environment shape population social structure?

2. What are the consequences of social structure for patterns of survival and reproduction?

3. What are the evolutionary consequences of social structure (social evolution)?

4. **Future**: How can this information be used to better inform management decisions?
Center for Whale Research: 1976-2018

Over four decades of data collection

Photo: Center for Whale Research

1976

2016
Individual Life Histories: J2


Missing Oct 2016, declared dead Jan 2017
Sex Differences in Life History

[Graph showing survival probability vs. age for males and females.]
Sex Differences in Social Life History

Adaptive Prolonged Postreproductive Life Span in Killer Whales

Emma A. Foster,²,³ Daniel W. Franks,² Sonia Mazzi,² Safi K. Darden,¹ Ken C. Balcomb,² John K. E. Ford,¹ Darren P. Croft¹ ²
www.sciencemag.org  SCIENCE  VOL 337  14 SEPTEMBER 2012  1313

What about social relationships within the wider social group?

Adult males are dependent on their mothers for survival.
Social Networks as a Tool for Quantifying Social Position

1976 - 2010
Measuring Social Position

Degree Centrality (Direct connections)

Community Centrality (Indirect connections)

High Low
Social Position and Survival in Male Killer Whales
Sex Differences in Social Position and Survival

The graphs illustrate the survival probability of whales over age, differentiated by sex and social position. The x-axis represents whale age, and the y-axis represents survival probability. The colors and shaded areas indicate the differences between socially central and socially peripheral whales.

- **Male (♂)**
  - Socially Central: Orange line with a darker shade
  - Socially Peripheral: Green line with a lighter shade

- **Female (♀)**
  - Socially Central: Orange line with a darker shade
  - Socially Peripheral: Green line with a lighter shade
Estimated chinook salmon abundance

Approximately half of all whale deaths occur in years with the lowest quartile of salmon abundance.

Sociality, Survival and the Ecological Environment

**Low salmon years**

- Socially Central
- Socially Peripheral

**High salmon years**

- Socially Central
- Socially Peripheral

![Graphs showing survival probability vs whale age for low and high salmon years]
Conclusions

1. The survival of male, but not female, southern resident killer whales is significantly related to their social position in their local community.

2. Adult males are larger than females and require more food.

3. Social position could affect the survival of males by mediating their access to resources (information, food sharing events).
Future Work: Social Life Histories
Mortality risk and social network position in resident killer whales: sex differences and the importance of resource abundance

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