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?
2009

Missing

Oct 2016,
declared
dead Jan
2017

Individual Life Histories: J2


1976

1998

2011

2016


1976

2007

2009

Missing
Oct 2016,
declared
dead Jan
2017

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Sex Differences in Life History

Survival probability

Age

Credit Center for Whale Research
Adult males are dependent on their mothers for survival.

What about social relationships within the wider social group?
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

![Graph showing survival probability vs whale age for socially central and socially peripheral whales.]

- Survival Probability
- Whale Age
- Socially Central
- Socially Peripheral

![Network diagram illustrating social connections among male killer whales.]

- Connections between whales
- Social network analysis

[University of Exeter logo]
Sex Differences in Social Position and Survival

[Graphs showing survival probability over whale age for males and females, with categories of socially central and socially peripheral highlighted.]

- For males, socially central whales have a higher survival probability compared to socially peripheral whales.
- For females, the survival probability trends are similar but slightly different from males.

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Sociality, Survival and the Ecological Environment

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

Estimated chinook salmon abundance

Sociality, Survival and the Ecological Environment

![Graph showing survival probability for whales in low and high salmon years.](image)
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).

Social network correlates of food availability in an endangered population of killer whales, Orcinus orca

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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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