SOCIAL NETWORK ANALYSIS OF KILLER WHALES (*ORCINUS ORCA*) OF THE FALKLAND ISLANDS

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Introduction

Killer whales (*Orcinus orca*; KW hereafter; Fig. 1*)* are apex predators with a worldwide distribution. They have a hierarchical social organization, a complex social behaviour, and long-term bonds among individuals. Here, we present a study of a local population of KW that includes both resident and transient individuals. We applied the methods of Social Network Analysis (SNA), that can be particularly suited to KW societies due to their complexity and hierarchical structure.

Fig. 1 – A temporary community of KW including a resident mother-calf pair (red) and various transient individuals (blue).

Methods

Field work was carried out at Sea Lion Island (Falkland Islands) during the spring and summer of 2013-2016 (765 days). We carried out daily surveys of the coastline and observations form vantage points (45614 hours in the field, 74521 km walked), obtaining 1496 KW observations. KWs were identified both visually and in high resolution pictures using features of the saddle patch and dorsal fin. Identification was highly repeatable. We complemented land observations with videos taken from a drone (Phantom III, DJI). KW association was measured as joint presence during the same observation. Association matrices were analyzed using SNA software (UCINET) to generate sociograms and calculate social network statistics.

Results

• Each observation involved 1-11 KW, and we identified a total of 38 KW, 17 resident and 21 transient (Fig. 2).
• Identified KW included 13 calves (61.5% resident), 17 females (35.3% resident) and 8 males (37.5% resident).
• The social structure of the population changed during the four seasons of the study but we identified various repeatable patterns.

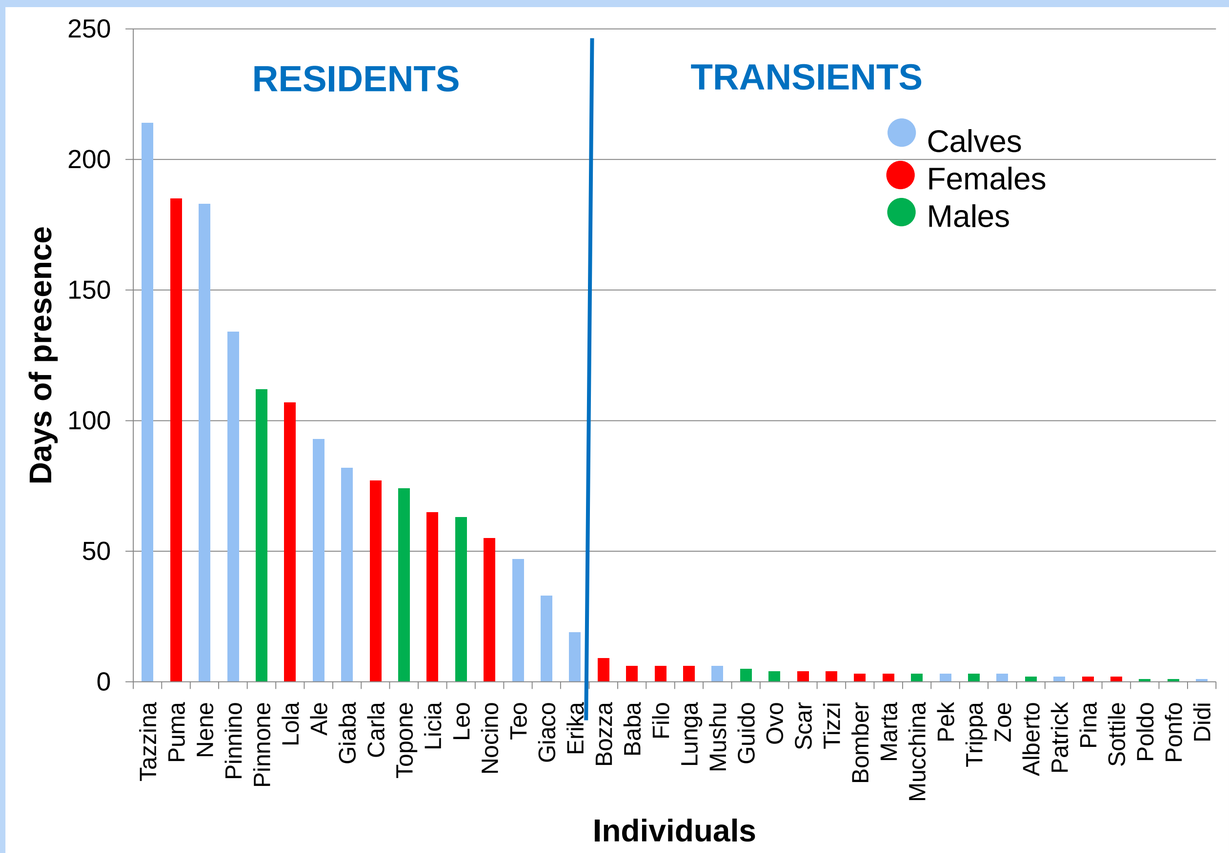

Fig. 2 – Presence of identified individuals during the whole study (2013-2016).

• The basic social unit was the mother-calf pair, that included up to four generations of calves, and lasted trough the seasons.
• Multiple mother-calf pairs were associated in stable pods of 3-9 individuals, that lasted at least for a full season.
• Different pods, and non pod individuals, were often associated together in communities, in particular during predation events.
• We observed short term associations between resident and transients KW, that lasted few hours to few days.
• Sociograms showed that some individuals have a central role in the social network, and often act as a "recruiter" of new KW (e.g., mother Lola and calf Ale, see Fig. 3 center, red arrow).

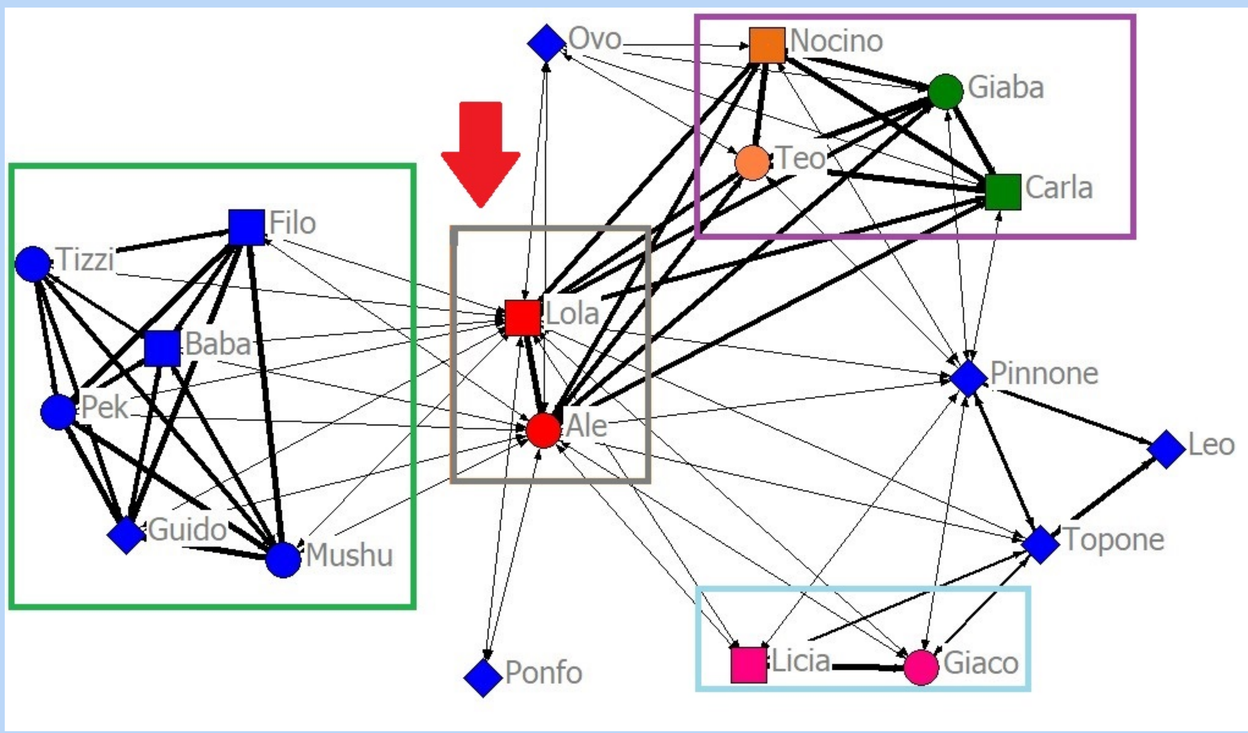

Fig. 3 – Sociogram of KW observed in February, 2014. Circle: Calves of both sexes; square: Adult Females; Diamond: Adult Males; Thickness of lines: strength of the association; Green, pink, orange, red: mother-calf pairs; Blue: transient; Boxes: pods.

• We observed several solitary adult males, that can be associated with other males and different pods at different times (e.g., Pinnone, Leo,Topone, see Fig 3 bottom right).
• Drone videos revealed a more complex social association and interaction pattern that the corresponding land observations (Fig. 4).

Fig. 4 – Lola's pod, a stable pod including three mother-calves pairs.

Conclusions

• KW showed a complex, hierarchical, social system, based on short and long term bonds between related and unrelated individuals.
• Communities changed over time, while mother-calf pairs remained stable over the whole study, and pods were stable at least within each season.
• Different individuals have different social roles, and some individuals, central in the network, act as recruiters of new KW.
• The use of drone videos can greatly increase the understanding of killer whales social structure.

Research project website: www.eleseal.org