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Introduction

Killer whales (*Orcinus orca*; KW hereafter; Fig. 1) are apex predators with a worldwide distribution. Their diet includes a large array of species, from fish to marine mammals, and can be more or less specialized. This diet variability is linked to a large variation in hunting techniques. KW have a hierarchical social system, based on long-term bonds between related individuals, and a complex communication system. The main goal of this research was to study KW sociality during predation events at Sea Lion Island (Falkland Islands; SLI hereafter), that hosts breeding colonies of various potential KW preys, including southern elephant seals (SES hereafter), southern sea lions (SSL), and various species of marine birds and penguins.



Fig. 1 – A pod of five individuals, two mother-calf groups, Licia plus Giaco, and Nocino plus Teo, and an adult female without calf, Lola.

Methods

Field work was carried out during four seasons, 2013-2016 (2-8 observers; 765 days). We did daily surveys of the coastline (74521 km; 45614 hours), obtaining 1496 KW observations, including 221 predation events. KW were identified visually and on pictures using features of the saddle patch. We considered as a predation event each observation where KW were involved in activities as chasing, catching and consuming a prey. We took videos of predation events from land and using a drone (Phantom III, DJI). We carried out necropsies of prey found washed ashore. We measured KW association as joint presence during the same observation. We draw sociograms, and calculated social network statistics on association matrices using UCINET software.

Results

- We observed 221 predation events, involving 1-11 individuals.
- Predations were successful in 32% of cases.
- Main prey were elephant seals (83.7%), while predation on penguins (8.2%) and sea lions (8.2%) was rare (Fig. 2).

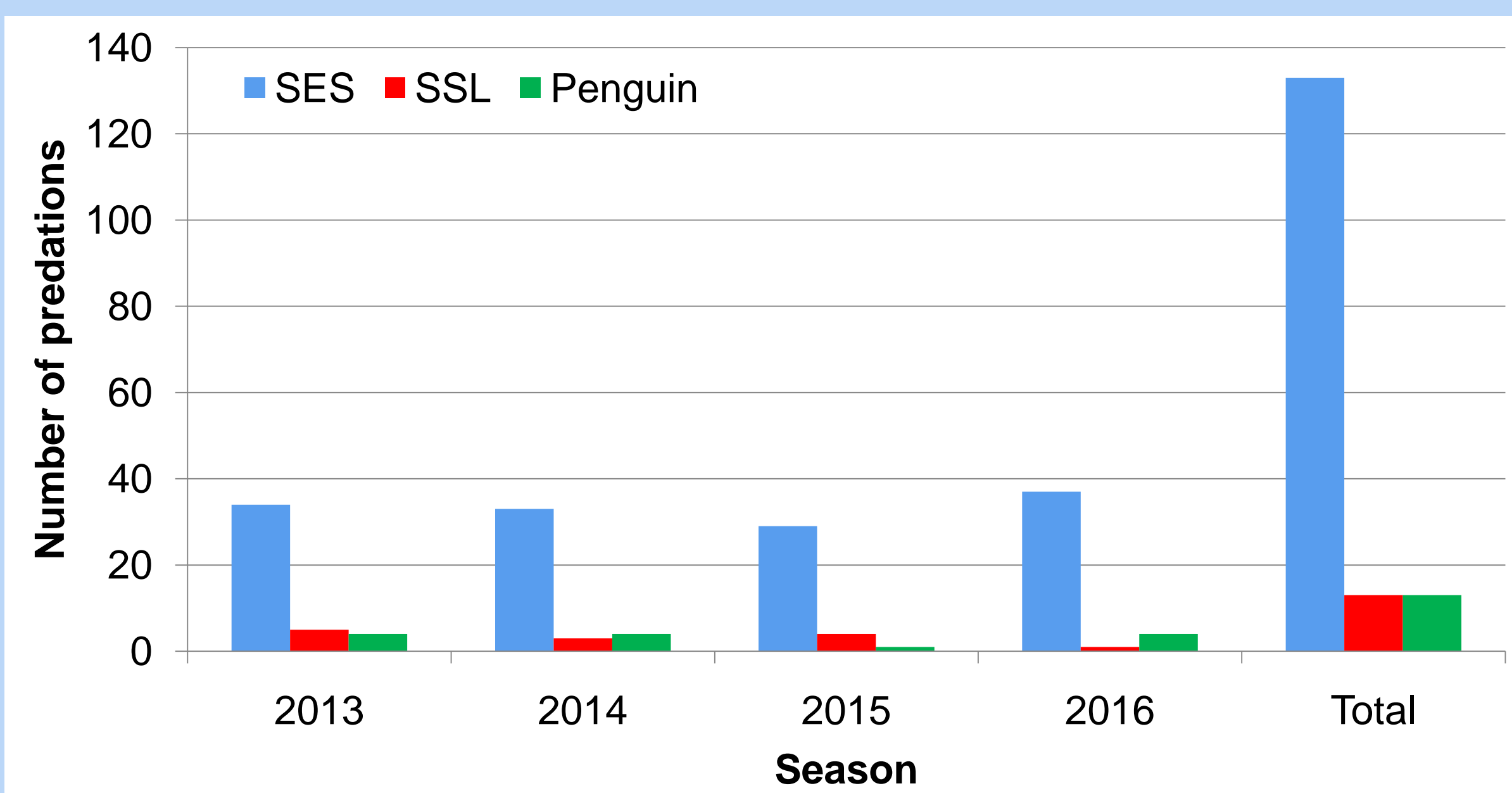


Fig. 2 – Number of predations for each kind of prey from 2013 to 2016.

- Most of the attacks against SES regarded weaned pups (50%) and predation events were concentrated in late November and early December, when the weanling density was maximum.

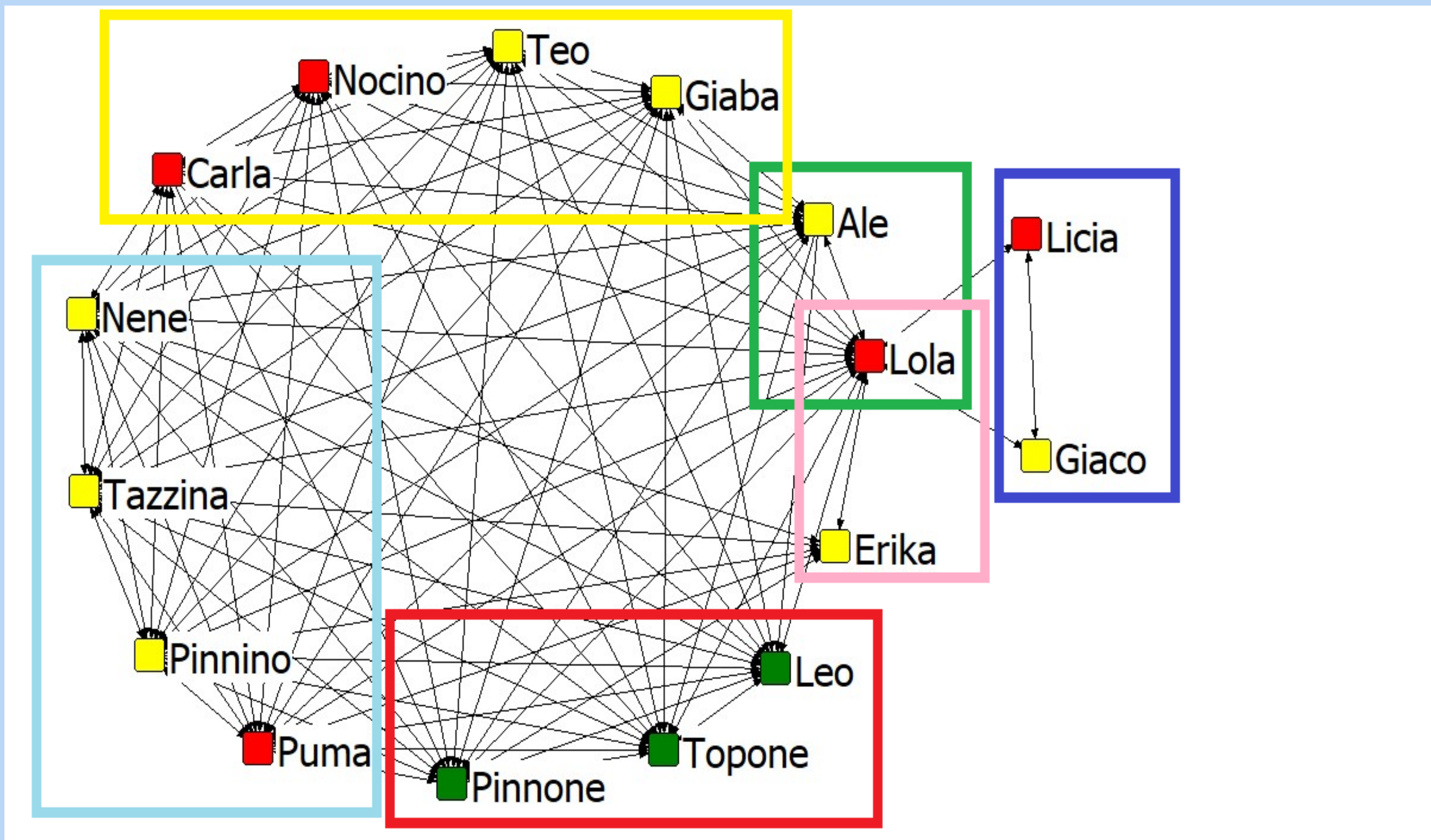


Fig. 3 – Sociogram of predation events from 2013 to 2016. Individuals are classified by colour: green = adult males, red: adult females, yellow = calves. Different pods are identified by boxes of different colours.

- The basic KW social unit was the mother-calfs group, and these groups were associated in stable pods of 4-8 individuals (Fig. 2).
- During predation events different pods were frequently associated, and resident KW were often joined by transient KW and males.
- Predation events involved intense and complex interactions among KW, including sharing of the prey, play with the prey by young individuals, and adult facilitation of young feeding.
- Although prey capture was usually done by one or few individuals, all KW were involved in prey handling, feeding, and socialization during and after the predation event.
- Sociograms of predation events showed no central or dominant individuals, contrary to what we observed in non-predation contexts.
- Drone videos revealed a more complex social association and interaction pattern than the corresponding land observations (Fig. 4).



Fig. 4 – Pod from the drone during predation event.

Conclusions

- Predations events involve complex social behaviours, including collaboration to keep the prey carcass floating, active prey sharing and calf feeding facilitation by adults.
- Social networks observed during predation events are more complex than the one observed in other contexts.
- The use of drone videos can greatly increase the understanding of killer whales sociality during predation events.

Research project website: www.eleseal.org