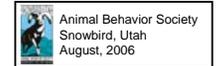


The Timing of Killer Whale Calls Is Not Random in a Social Context: Killer Whales Take Turns When Calling

Malini Suchak and Michael Noonan, Canisius College, Buffalo, New York



Introduction

Social animals need to have a way to maintain group coordination and cohesion. In the limited visibility that exists underwater, it is likely that vocalizations serve this function in the killer whale (*Orcinus orca*).

When vocalizing in this context, it is often necessary for individuals to both produce calls of their own and monitor those coming from others. The goal of this study was to assess whether the timing of calls indicates alternation between individuals in a way suggestive of a call-listen sequence.

Methods

The subjects were killer whales of Icelandic origin, held in captivity at Marineland of Canada.

Hydrophone recordings were made from two adult females, two juvenile females, and one juvenile male. We examined calling bouts in which two to three subjects were involved and every call was attributable to a particular whale.

A total of 15 calling epochs, averaging 1.4 minutes in length, were used in this study. This amounted to 21 minutes of observation that included 716 discrete calls.

The extent of overlap among calls coming from different individuals was assessed to the tenth of a second using Spectrogram 6.2 (Visualization Software). The observed overlap was determined by counting the tenths of a second in which calls from separate whales overlapped in time. The expected overlap was computed as the time one whale was calling divided by the total time in the epoch, multiplied by the time in which the other whale was calling.

Results

Over the entire 21 minutes analyzed, the observed occurrence of call overlap was 61.6 seconds, while the expected frequency was computed as 156.2 seconds. Thus, the overall rate of temporal overlap was only 39% of that expected by chance. A T-test assessing the observed proportion of temporal overlap from each of our 15 time samples against the mean expected proportion was significant ($t(14)=-7.4$, $p<.001$).

The ratio of observed vs expected overlap did not differ significantly between those epochs with two calling whales and those with three whales ($F(1,13)=0.53$, ns), nor between adult-adult and adult-juvenile epochs ($F(1,7)=0.01$, ns).

Discussion

The low frequency of call overlap during bouts of vocalization suggests that killer whales do not call randomly in a social context. Three possibilities might account for this.

Call-Listen: The behavior may relate simply to an effort to optimize sensory reception. That is, the whales may benefit from their own quiet periods when assessing calls coming from their pool mates.

Shifting Attention: The behavior may derive from an inability of the whales to do two things at the same time. That is, the whales may need to alternate their attention between their own call production and reception of calls coming from other whales.

Social Coordination: The behavior may reflect a form of social cooperation in which the whales allow each other effective space in the chorus in which to be clearly heard.

Acknowledgements

We gratefully acknowledge the hospitality and support of John Holer, Tom Western, Pete Forrester, and the wonderful staff at Marineland of Canada. This work was supported in part by the Howard Hughes Medical Institute.

