

Killer Whale Vocalizations during Periods of Reconciliatory Echelon Swimming

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Introduction

Since agonistic interactions are among the most consequential of all social behaviors, understanding such events should be a high priority when investigating the social dynamics of a species. In the underwater ecology inhabited by cetaceans, acoustics play essential roles, and may be expected to convey information about significant mood/motivational states such as aggression and reconciliation. Attempts to decode the functional significance of animal sounds often depend upon establishing correlations of those sounds with other ongoing behaviors seen by observers (Crockford & Boesch, 2003; Janik, V. & Slater, P., 1998).

Following episodes of intraspecific aggression, killer whales show periods of avoidance that are followed by periods of echelon swimming that have been interpreted as reconciliatory. The goal of the present study was to characterize the calls produced by orcas during such echelon swimming.

Methods

The subjects of this investigation were two adult wild-caught Killer Whales (*Orcinus orca*) of Icelandic origin, held in captivity at Marineland of Canada (Niagara Falls, Ontario). Twenty-four hour video/audio recordings were collected via underwater viewing windows and in-pool hydrophones. From these recordings, eight aggressive episodes between the two whales were identified. These episodes were characterized by multiple periods of high speed chase, apparent bite attempts, and evasive maneuvers. All vocalizations during each period of aggressive chase, and the subsequent periods of parallel swimming, were characterized according to 13 acoustic dimensions and 12 vocal categories. The vocalizations during time-matched control periods (during which no aggressive behavior was observed) from the days prior to the aggressive episodes were similarly analyzed.

Results

Call Type

The vocalizations were categorized into 8 types characteristic of Killer Whales (cf. Ford, 1987). These included five "call" types, whistling, screeching, and hi-rate repeated pulses. Illustrative sound spectrograms of each type are presented in Figure 1 below.

Fig 1: Marineland Killer Whale Vocalization Types

| Call Type | Sound Spectrogram | Call Type | Sound Spectrogram |
|-------------------------|-------------------|-------------------------|-------------------|
| Call Type 1 ("Mosqpha") | | Whistle | |
| Call Type 2 ("Huit") | | Screeching | |
| Call Type 3 ("Catcalf") | | Hi-rate Repeated Pulses | |
| Call Type 4 ("SBS") | | Other Calls | |

Vocalization Frequency as a Function of Call Type and Social State

Comparisons among the immediate post-aggression periods, periods of echelon swimming, and control periods revealed significant differences for seven vocalization types (See Figure 2 below).

The post-chase periods were characterized by marked reduction in Whistling and Hi-Rate Repetition Pulses, compared to both Chase and Control periods.

The rate of occurrence during echelon swimming was intermediate between that observed immediately post-aggression and that observed during time-matched control periods for Whistling, Hi-Rate Repeated Pulses, and Screeching. The rate of occurrence Call Type 1 ("Mosqpha") was lower during echelon swimming than during any other period.

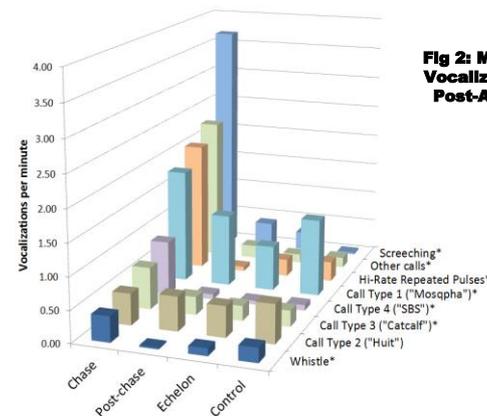


Fig 2: Marineland Killer Whale Vocalization, as a Function of Post-Aggression Period and Type

Conclusions

The results define a unique acoustic signature of post-aggression in the Killer Whale, and this work extends our understanding of the ways in which Killer Whales alter the features of their vocalizations with changes in mood.

During such consequential events, it would seem highly adaptive for such powerful animals to have unambiguous communicative signals, as was first theorized in Darwin's Principle of Antithesis (1872), and the extremely distinct vocalizations documented in this study seem to match that expectation. It is hoped that these findings will aide wildlife researchers when interpreting hydrophone recordings of killer whale vocalizations so that they can better determine the time-course of post-aggression reconciliation in wild populations of killer whales. It is also hoped that captive animal managers will also be able to use this acoustic pattern to detect, or even anticipate, episodes of aggression/reconciliation so that managed interventions can be employed where warranted (cf. Renner, M. & Kelly, A., 2006).

References

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