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QUANTIFICATION OF TOOTH RAKE MARKS IN CAPTIVE BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*) FOR IMPROVED AGGRESSION MANAGEMENT

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Aggression can lead to serious injury and is a normal component of behavior, allowing animals to cope with their environment (Konrad Lorenz, 1963). In group-living mammals, aggressive dominance behaviors often result from competition for scarce resources, which can explain much of the variation in resource acquisition and reproductive success (Samuels et al. 1997; Dewsbury 1982; Harcourt 1987; Silk 1987). However, in managed care, social aggression may be exacerbated by changes in social groupings and may decrease animal welfare, and unmanaged aggression has the potential to negatively affect guest programs and staff safety. In order to manage aggression at zoological facilities, baseline data are needed to better understand antecedent conditions and anomalous trends.

Tooth rake marks were used to objectively compare the relative rates of intraspecific aggression among 9 Atlantic bottlenose dolphins (*Tursiops truncatus*) at Dolphin Cove, a natural seawater, marine mammal facility in Key Largo, Florida. Weekly rake mark frequencies were documented from 2013 to 2014 and compared between sexes and among age classes and then analyzed to establish normal and anomalous population and individual values. Statistical process control (SPC), a tool used to describe chance versus assignable variation (Shewhart 1931), was utilized to detect anomalous increases in aggression within the Dolphin Cove population. Then, the data were compared retrospectively to identify relationships between high levels of aggression and distinct animal and operational events (e.g. animal introductions).

Rake mark frequency was significantly higher in males versus females, and calves and juveniles exhibited significantly more rake marks than adults ($p < 0.05$). The latter may reflect social hierarchies, which have been linked to age-ordered dominance relationships (e.g. Samuels et al. 1997). Furthermore, rake marks on the posterior surfaces (i.e. peduncle and flukes) were recorded at significantly higher frequencies in younger versus older dolphins ($p < 0.05$), which may reflect the positional nature of aggressive interactions that occur between dominant and subordinate animals (i.e. charging versus fleeing). Retrospective analyses of the SPC data indicated a non-random increase in rake frequencies that coincided with the introduction of new members to the population. Thus, social aggression is not randomly distributed over time and likely to be strongly and comprehensively influenced by zoological operations.

The predictive power of the SPC model, as well as a refined method for documenting, visualizing, and analyzing aggression in captive populations, will contribute to improved aggression management, including the strategic implementation of preventative measures and the ability to evaluate applied modification techniques. This tool, as well as functional data visualization tools, will be integrated into population management software (i.e. Ocean Embassy Research and Conservation Application, OERCA) in the year 2014, with the goal of improving animal health and well-being.

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