Association Patterns of Seasonally Resident Bottlenose Dolphins (Tursiops truncatus) at adjacent North Carolina Study Sites

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Abstract

Although bottlenose dolphins live in fusion-fission societies, stable associations have been documented in several populations. One of the most stable association patterns is the male pair bond; this bond has yet to be documented in migratory dolphin populations. In North Carolina, a seasonally resident group of bottlenose dolphins are monitored via photo-identification by two research groups at separate study sites. During the summer, individuals are monitored in the Nags Head area and during the winter, the same individuals are observed in Beaufort waters. Since 1997, stable associations have been documented in both study areas between presumed adult males. We present a preliminary description of these associations at each seasonal study site and a comparison of these association patterns to those demonstrated by known male pairs in other study areas. Photographic records of six dolphins that exhibit pair associations were collected from each study site to quantify association patterns. A half-weight coefficient of association (COA = 0.5(a+b)) was calculated for each pair at each study site. The COA analysis revealed differences for the three pairs year-round (0.27 – 0.52). The strength of pair bond associations between these North Carolina dolphins are comparable to those observed in Sarasota, Florida and Shark Bay, Australia. These preliminary observations lead us to question whether social associations documented over time may be used to determine male gender in the field. As social strategies may influence reproductive behavior and survivorship, further understanding of these associations may provide insight into conservation measures and management.

Introduction

- Bottlenose dolphins live in fusion-fission societies where group membership and composition are highly variable (Connor et al. 2000); however, stable sex-specific associations have been documented in several populations throughout the world (Smolker et al. 1992; Wells et al. 1987).
- The male pair bond is one of the most stable types of sex-specific associations (Wells et al. 1987; Connor et al. 1992).
- The bond formed between two adult males is long-lasting and serves both ecological and reproductive purposes (Wells 1991; Owen et al. 2002).
- Since 1997, seasonally resident bottlenose dolphins have been monitored at their apparent migratory endpoints (Nags Head in May-October, Beaufort in November-April) via photo-identification. This has offered a unique opportunity to study the behavior of migratory dolphins year-round.

Long-term associations between the same presumed adult males have been described in both study areas suggesting the first observations of stable male pair bonds in a migratory population.

Objectives

The objectives of this preliminary study were to:

1) Quantify the nature of these associations at each seasonal study site
2) Compare these associations to those demonstrated by known male pairs in Sarasota, Florida and Shark Bay, Australia

Study Areas

- The Nags Head study site was approximately 200 km and encompassed estuarine waters in the Roanoke Sound from Oregon Inlet north to Colington Harbor, as well as the northern Pamlico Sound, eastern Croatan Sound, and southern Albemarle Sound (Figure 1).
- The Beaufort study site was approximately 150 km of nearshore coastal and estuarine waters between Cape Lookout and Core Creek near Beaufort, Carteret County, NC (Figure 1).

Methods

- Photo-identification data were collected via small boat surveys and opportunistic sightings as part of long-term studies, summers in the Nags Head area during 2007-2008 and 2008-2009.
- Standard photo-identification techniques were used for photographing dorsal fins at both study sites (Wursig and Wursig 1977).
- We used FinBase (Nags Head) (Adams et al. 2006) and an MS Access database (Beaufort) to examine sighting trends, resident histories, and associations of individual dolphins.
- Photographic records of 5 dolphin pairs that exhibit long-term associations were collected from both study sites to quantify association patterns. Each individual is a presumed male and observed in both study areas. Sighting records for each individual date back to at least 1998 at each study site; individuals are assumed to be males based upon being known adults and never being seen with a calf.
- Associations were quantified using the half-weight coefficient of association: COA = 0.5(a+b) (Schaller 1972). In this formula, J represents the number of sightings with both dolphin A and B in the same group, a is the total numbers of sightings of dolphin A, and b is the total number of sightings of dolphin B. Based on this formula, coefficients can range from 0.0 for a pair that is never seen together to 1.0 for a pair that is always seen together. A COA was calculated for each pair to measure the strength of their associations at each study site.

Results

- These three dolphin pairs were seen together year-round and at both ends of their migratory endpoints (Figures 2-4).

Discussion

- Wells (2003) defined males as paired if their COA remains 0.8 or greater over time. The COA for only one pair in this study (“Rake” and “92” in Beaufort) was lower than 0.8. This pair may be younger in age than the other two pairs (R. Mallon-Day, pers. comm.). If these males were subadults during their earlier sightings, their COA may have been affected as the association between two males strengthened upon reaching sexual maturity (Wells et al. 1987; Wells 2005). In addition, a lower number of sightings of this pair may have affected the COA value.
- Two of the three male pairs had been the subjects of previous analysis in Beaufort, NC, Beaufort and Rittmaster (1998) had found the COAs between “Onion” and “Butterfly/Pinchers” and “Bud” and “Mo” to be 0.89 and 0.77, respectively, indicating that these pairs have remained stable over time.
- This preliminary study suggests the potential to use associations for determining male gender in the field, especially in areas where waters are murky. Currently, male sex determination in the field may occur by direct observation of an erection, the size of the gap between the genital and anal slits, the absence of mammary glands, or a combination of these observations (Connor et al. 1992). Female sex may be determined by indirect means, such as that an individual is sighted consistently with a calf may be determined to be a female. Perhaps behavioral patterns may be used to identify males as well.
- Male pairs in Sarasota, FL exhibit greater ranges than unpaired males (Owen et al. 2002) and are likely vectors of genetic exchange (Wells et al. 1987; Connor et al. 1992). The presence of male pair bonds in this seasonally resident community may imply genetic exchange is occurring with other adjacent communities.

Figures

- Figure 1: North Carolina Study Areas
- Figure 2: Sighting histories at each North Carolina study site
- Figure 3: COA values by study area
- Figure 4: Comparison of male pair COA values.

References


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