Evidence of shark attacks on Atlantic spotted dolphins (Stenella frontalis) off Bimini, The Bahamas

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Abstract: The rate of shark predation on small cetaceans is poorly understood, but information is increasing as more long-term cetacean and shark studies are conducted. Resident Atlantic spotted dolphins (Stenella frontalis), off the coast of Bimini, The Bahamas, have been the subject of ongoing photo-ID and behavioral studies since 2001. Sharks in this area have also been systematically documented for decades. Despite these efforts, an actual shark attack on a dolphin has not been observed in Bimini and such an observation is rare anywhere in the world. Because of this, photo-ID records were analyzed for evidence of shark-induced injuries, often in the form of a crescent-shaped injury or scar. Fifteen percent of cataloged individuals within the Bimini dolphin population exhibit evidence of a shark attack. Patterns in the location on the body of the attack and trends related to age and sex were considered. Potential shark species responsible for the attacks are discussed.

Introduction: The amount of information on shark predation on small cetaceans is increasing as longitudinal cetacean projects and anecdotal evidence of past shark attacks was determined and compared to other dolphin species consumed by the following shark species: Carcharhinus leucas, tiger (Galeocerdo cuvier), shortfin mako (Isurus oxyrinchus) and dusky (Carcharhinus obscurus) to be possible predators of dolphins near Bimini. This study does not estimate the frequency of attacks on dolphins; here, we estimate the occurrence of unsuccessful attacks.

Methods:

Site: West and north of North Bimini, Bahamas (Great Bahama Bank)

Subjects: Atlantic spotted dolphins (Stenella frontalis)

Data collection: Annual video recordings with mobile video/acoustic system (Dudzinski et al. 1995) and digital still photographs from 2001 - 2011

Photo-ID: Spot patterns and scarring

Criteria for shark bite delineation: Crescent-shaped scar/injury or tooth rakes that could not be attributed to dolphin (Heithaus 2001)

Results:

• 14 of 92 (15.22%) cataloged individuals have confirmed evidence of shark attack
• 15 of 92 (16.30%) had injuries/scars from undetermined sources (e.g. Fig. 2)
• Only one individual with evidence of multiple (2) attacks
• Nearly equally dispersed between males and females (Table 1, p<0.05)
• When age at time of attack could be determined, most commonly calves (Table 1)
• Most attacks to dorsal side of body, but not significant (Table 1, p>0.05)
• Bimini Stenella show significantly less evidence of attacks than Tursiops at
  • Moreton Bay (Heithaus 2001, χ²=15.438, p<0.00)
  • Shark Bay (Corkeron et al., 1987, χ²=7.541, p<0.00)
  • Sarasota (Urian et al., 1998, χ²=7.695, p<0.006)
  • Indian River Lagoon (Bechdel et al. 2009, χ²=184.308, p<0.00)
• Bimini Stenella not significantly different from Tursiops off Natal (Corkeron, 1989, χ²=1.244, p>0.05)

Discussion:

• Few shark-related scars in a dolphin population may not equate to low predation; it may simple indicate very few unsuccessful predation attempts (Corkeron et al., 1989)
• Unsurprising that calves are targets, but does indicates an ability to survive
• Sub-adult and adult were both females – vulnerable as they protect calves
• Unsurprising that fewest shark injuries on ventral side; these attacks likely have a higher fatality rate
• Rare to observe fresh injuries in this population; therefore limited ability to determine shark species
• Future research to compare Stenella to Tursiops in this area, although Tursiops near Bimini may have a larger range, therefore different risks

Fig 1: DCP ID#87 (female), injured as a juvenile. Confirmed as shark (suspected bull, possible tiger) with possibility of 5 teeth embedded in wound.

Table 1: Breakdown of all confirmed shark-induced scars/injuries (N=14) by sex, age and body location; age of attack could not be determined when scar was well healed, except in calves.

<table>
<thead>
<tr>
<th>Extremity</th>
<th>Male</th>
<th>Female</th>
<th>Unknown sex</th>
<th>Calf</th>
<th>Juvenile</th>
<th>Sub-adult</th>
<th>Adult</th>
<th>Unknown age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dorsal*</td>
<td>50.00%</td>
<td>7.14%</td>
<td>50.00%</td>
<td>7.14%</td>
<td>7.14%</td>
<td>7.14%</td>
<td>28.57%</td>
<td>50.00%</td>
</tr>
<tr>
<td>Ventral</td>
<td>14.29%</td>
<td>35.71%</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Extremity</td>
<td>35.71%</td>
<td></td>
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</tbody>
</table>

Fig 2: Two views of DCP ID#22 with injury suffered as a calf; the cause of this injury could not be confirmed and was not included in this analysis.

References:
Maldonado, D. 2003. Evidence of predation by a tiger shark (Galeocerdo cuvier) on a spotted dolphin (Stenella attenuata) off O’ahu, Hawai‘i. Aquatic Mammals 19(1):84-87.