Temporal and spatial patterns of humpback whales in the Sainte Marie Island, Madagascar, breeding ground

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First study on humpback whale population of Sainte Marie Island (East coast of Madagascar): important calving and breeding spot for humpback whales, Megaptera novaeangliae, in the Southwest Indian Ocean. Little is known on the breeding phenology and habitat use of humpback whales in this significant breeding area. Opportunistic sightings data of different social group types of humpback whales (singleton, pairs, mother-calf pairs, mother-calf escort, competitive groups) were collected between 2009-2013.

Data collection

Table 1. Effort survey and number of sightings from whale-watching boats during the breeding seasons, June to September, 2009 to 2013.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total effort (hours)</th>
<th>Total number of sightings by month</th>
<th>Mean sighting rate (sighting/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>469</td>
<td>731</td>
<td>1.56</td>
</tr>
<tr>
<td>2010</td>
<td>622</td>
<td>749</td>
<td>1.2</td>
</tr>
<tr>
<td>2011</td>
<td>882</td>
<td>1184</td>
<td>1.34</td>
</tr>
<tr>
<td>2012</td>
<td>698</td>
<td>776</td>
<td>1.11</td>
</tr>
<tr>
<td>2013</td>
<td>959</td>
<td>1328</td>
<td>1.38</td>
</tr>
<tr>
<td>Total</td>
<td>3630.6</td>
<td>4768</td>
<td>1.31</td>
</tr>
</tbody>
</table>

Funding from

• The ratio of number of groups with calf to groups without calf varied strongly from year to year, and similarly to the annual sighting rates (Table 1).

Spatial distribution

- The mean distances to shore of the social group categories were significantly different.
- The ratio of groups with calf to groups without calf decreased drastically with increasing distance from shore

Material & Methods

Opportunistic sightings data were collected from whale watching-boats from 2009-2013 between June and September in the south of Sainte Marie channel. The bottom depth and the distance to the nearest coastal feature were associated to each sighting location.

The peak of abundance of humpback whale groups with calf was observed one month later than groups without calf. Whaling data have showed that lactating females accompanied with weaning yearlings were the first to arrive on the breeding grounds, followed by immature individuals, mature individuals and then late pregnant females (Dawbin, 1997). We therefore suggest that females arriving in July at Sainte Marie Island are mostly animals resting or weaning their calf, while pregnant females arrive and give birth in August. Our five years time series demonstrates that the lag between those two females categories is about one month and that such temporal segregation is consistent over years. At fine scale, the distribution pattern of social groups is determined by bottom depth and distance from shore, with mother and calf pair groups clearly showing a preference for coastal and shallow waters. As suggested for other regions, the females with calf in Madagascar may favour shallow waters and short distance from shore to avoid male harassment and to provide young calves with calm sea conditions (Ersts & Rosenbaum, 2003).