Gray whale sounds in their breeding and reproduction area of San Ignacio Lagoon Baja California Sur, Mexico.

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Introduction
The gray whale is the only species in the mysticete family Eschrichtiidae. The monitoring data have revealed that gray whales are, producing several low frequency calls ranging from 50 to 2000 Hz. Both in the feeding grounds in the Arctic and in the breeding/calving grounds, the most common sounds produced by gray whales are pulses ranging from 50 to 800 Hz. This study described the acoustic behavior of gray whales by determining if there was a relationship between calling rate, call type and call structure, among mothers with calves and singles whales (demographic groups). Using Bio-Probe tags.

Methods
Tagging records were taken during: March, 2008; March, 2009, and February and March , 2010; comprising a total of 405 hours of recordings. The tags were deployed from a small outboard engine boat and the tags were attached on the dorsal section of the whale’s body using suction cups. The tag was tracked using a Yagi antenna and a R410 receiver using the VHF transmitter of the Bio-probe.

For the analysis of the acoustic recordings obtained, two MATLAB routines used to extract and visualize the vocalizations registered in the recordings. The pulsed calls were divided in 4 categories: CONGA, CROAC, QUEJIDO and PURR; the only group of FM calls was named RONRONEO.

Results
A total of 24 tags were placed in three years of which only 17 registered whale sounds: 9 were placed on mothers with calves, 5 on solitary whales and 3 on calves with mother. A total of 1638 minutes of recordings were analyzed, comprising 1255 calls. Calls recorded were attributed to the whale on which the tag was placed. From the calls analyzed 239 were produced by solitary whales and 804 were emitted by mother with calves.

Differences in the acoustic structure of each call type (Call duration, minimum, maximum and low-maximum frequency, number of pulses could only be determined for CONGA calls for which statistically significant differences were found among demographic groups.

<table>
<thead>
<tr>
<th>Call Type</th>
<th>Parameters</th>
<th>ANOVA Kruskal-Wallis P</th>
<th>P≤0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONGA</td>
<td>Minimum frequency</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum frequency</td>
<td>0.2246</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low-Maximum frequency</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Duration call</td>
<td>0.278</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pulses number</td>
<td>0.009</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion
The correlation between a type of call and a particular demographic group indicated that the most common call for both groups was the CONGA. Mothers with calf used the QUEJIDO call more frequently than solitary whales, which showed a greater production of the RONRONEO and CROAC calls and both groups used the PURR call to the same extent. These results indicate that both groups use the entire acoustic repertoire, nevertheless with different preferences and periodicity. In the case of the gray whale none of the calls recorded were exclusive of one demographic group, although the vocalizations weren’t used in the same way; except for the CONGA , which was produced in a similar manner by both demographic groups. Crane and Lashkari (1996) proposed that the pulsed call of the gray whale could be used for communication between whales at short distances. This agrees with the results of this study showing a greater frequency in the use of this type of call and with the fact that it happens more in cow/call groups; suggesting a particular importance of this call for the rearing process (Crane & Lashkari 1996). The production of CONGAS by solitary whales could be associated to communication with con-specifics, although the context under which it occurs is yet to be analyzed.

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