Our article “Change in singing behavior of humpback whales caused by shipping noise” was published in PLOS ONE journal

On October 24, 2018, a research paper titled “Change in singing behavior of humpback whales caused by shipping noise” was published in a science journal “PLOS ONE”. The authors are listed at the bottom of this page. Thankfully, our paper gathered significant attention internationally, including from popular worldwide news media. The authors believe that our paper well demonstrates our serious efforts for preserving marine echo system from scientific viewpoints.

Outline of this paper

- Our research examined reactions of singing behavior of individual humpback whales (*Megaptera novaeangliae*) to a specific shipping noise.
- Two autonomous recorders separated by 3.0 km were used for the acoustic monitoring of each individual song sequence.
- A passenger-cargo liner was operated once per day, and other large ship noise was excluded given the remote location of the Ogasawara Islands, 1000 km south of Tokyo.
- In total, locations of between 26 and 27 singers were measured acoustically using time arrival difference at both stereo recorders on the ship presence and absence days, respectively.
- Source level of the ship (157 dB rms re 1μPa) was measured separately in deep water.
- Fewer whales sang nearby, within 500 m, of the shipping lane. Humpback whales reduced sound production after the ship passed, when the minimum distance to the whale from the ship trajectory was 1200 m.
- In the Ogasawara water, humpback whales seemed to stop singing temporarily rather than modifying sound characteristics of their song such as through frequency shifting or source level elevation. This could be a cost effective adaptation because the propagation loss at 500 m from the sound source is as high as 54 dB. The focal ship was 500 m away within several minutes.
- Responses may differ where ship traffic is heavy, because avoiding an approaching ship may be difficult when many sound sources exist.

Limitations

1. Our research focuses on the singing behavior of male humpback whales

In our research, we found humpback whales' tendency to reduce sound production within the range of 1,200m from the ship. It is known that, with respect to humpback whales, only adult males sing. As our research relies on acoustic observation, it covers only the behavior of singing males. We did not capture or focus on the behavior or reaction to shipping events by female and calves.

2. Our research did not focus on the fitness of humpback whales

Our research did not assess or give conclusion on any effect of underwater noise on the fitness of the whales. "Changes in behaviors" and "effects on the fitness" are completely different research themes, which needs different methods and approaches of analysis. In order to learn the possible negative impact of underwater noise on marine species fitness, we need further research.

What we actually did in our study was the short term observation and statistical analysis of the behaviors of singing whales. Long term effect of noise on the whales is still unclear.

3. Coverage area by the current passive acoustic system could be limited.

This is a physical limitation of acoustic monitoring. In the result of our research, many singers were detected in west side of the monitoring array and few were detected from south area. The bathymetry around Minami-jima, which is in the south part of study area, is complicated and includes very shallow areas that could prevent sound propagation to the recorders even if there were singers in this area.

In the research field of underwater noise, we need further scientific study in order to obtain correct understanding on its effects on the marine lives. In particular, authors consider that quantitative knowledge on harmful noise level or exposure time for specific species still needs further research. Our research tried to be a piece of efforts to reveal them. The authors sincerely hope that both the achievements and the limitations of our research will help the potential readers of this paper. Brilliant future studies should be carried out in this important research field for the sustainable ecosystem and human activities.

More information is available in our research paper on the website of PLOS ONE linked below.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0204112

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