

Being heard in the herd: do harp seals use pitch changes to reduce the cocktail party effect?

Every March, hundreds of thousands of harp seals migrate south to the Gulf of St. Lawrence, Canada, to give birth on the pack ice and to mate. They have a large repertoire of underwater calls that they use to help find each other, to form a single large herd, and to communicate socially. Sound travels farther in water than in air and harp seals make some loud calls that can be heard by other seals many kilometers away. These long ranges mean that the call of one seal can mask, or block, the calls of another seal that is far away. Masking occurs when calls have the same pitch and occur at the same time. With hundreds of thousands of seals within vocal range of each other, simultaneous calling raises the noise levels and makes it difficult for individual seals to be heard by their neighbours. For humans, this is called the “cocktail party effect”. When many people are speaking in a crowded room it becomes very difficult to hear each other, so people talk louder (which makes things worse) and move closer together. Using hydrophones (underwater microphones) and sound recorders, we have recorded the calling behaviour of harp seals and identified the 19 main call types (knocks, growls, grunts, tones, whistles, trills, chirps, squeaks, etc.), all of which occur at pitches that humans can hear. The seals call throughout the day and night, with the highest rates between midnight and 5:00 a.m. Can the seals reduce the cocktail party effect by changing their vocal behaviours?

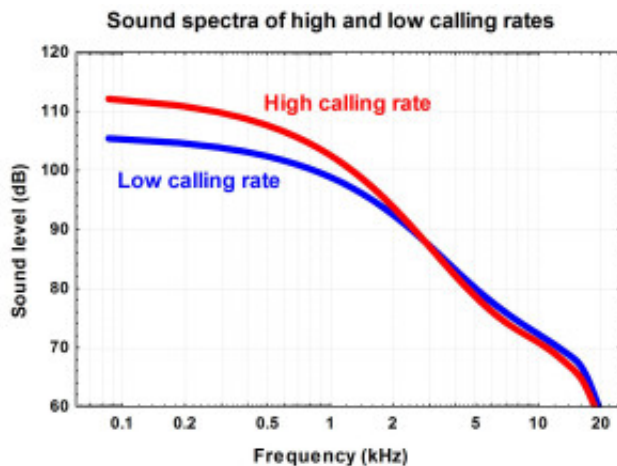


Fig. 1. The spectral levels of harp seal underwater calls at high and low calling rates. The seals do not use more high frequency calls at high calling rates.

Some songbirds in cities raise the pitch of their calls above the pitch of low frequency traffic noise. By calling at a higher pitch, the birds are able to communicate over longer ranges because they have avoided masking by the lower frequency background noise. Some whales also raise the pitch of their calls when nearby ships are making low frequency noise. For these species, the problem

of masking by ship noises is relatively recent but harp seals have encountered naturally occurring high levels of background noise in the breeding herds for thousands of years. Our research investigated if the seals have evolved ways to reduce the problem of so many calls being made that they would mask the calls of individual seals. In particular, we asked if harp seals would increase the pitch of their calls (especially above 2 kHz) when the overall herd noise increased. They could do this by raising the pitch of some call types and/or by choosing to use higher pitched calls when so many seals were calling that the background noise becomes continuous. That is, when the lower and middle frequency ranges are being “filled” by the calls, individual seals could increase the likelihood of being heard by using higher pitched calls. We studied this by measuring the frequency spectrum of all of the calls when the calling rates were low (50-76 calls per minute) and high (98-130 calls per minute). We found that there were no differences in the spectral patterns and the seals did not use more higher frequency calls when the lower frequencies were filled (Fig. 1.). Thus, the seals do not naturally respond to high noise levels by changing their vocal behaviours. The increased use of shipping routes from Europe to Asia, via the Arctic, will introduce more underwater noise to areas that, until recently, have been relatively unaffected by low frequency noise. Harp seals are unlikely to be able to reduce the impacts of low frequency masking of ship noises by altering their vocalizing behaviour.

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Publication

[Harp Seals Do Not Increase Their Call Frequencies When It Gets Noisier.](#)

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