
Density can be misleading for monitoring top predators distributed at low densities: benefits of Passive Acoustic Monitoring

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Abstract

Climate-induced changes may be more substantial within the marine environment, where following ecological change is logistically difficult, and typically expensive. As marine animals tend to produce stereotyped, long-range signals, they are ideal for repeatable surveying. In this study we illustrate the potential for calling rates along with remote sensing data to be used as a tool for determining habitat quality by using an Antarctic pack-ice seal, the leopard seal, as a model. With an understanding of the vocal behaviour of a species, their seasonal and diurnal patterns, sex and age-related differences, an underwater passive-acoustic survey conducted alongside a visual survey in an arc of 4,225 km across the Davis Sea, Eastern Antarctica, showed that while acoustic and visual surveys identified similar regions as having high densities, the acoustic surveys surprisingly identified the opposite regions as being ‘critical’ habitats. Density surveys of species that cannot be differentiated into population classes may be misleading because overall density can be a negative indicator of habitat quality. Under special circumstances acoustics can offer enormous advantage over traditional techniques and open up monitoring to regions that are remote, difficult and expensive to work within, no longer restricting long-term community assessment to resource-wealthy communities. As climatic change affects a broad range of organisms across geographic boundaries we propose that capitalizing on the significant advances in passive acoustic technology, alongside physical acoustics and population modeling, can help in addressing ecological questions more broadly.

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