

An ear for detail, a matter of life and death for harbour seals

For harbour seals, fine hearing is not just a basic life skill – it can mean the difference between surviving until the next meal or becoming another species' dinner. This finding is reported in a recent issue of *Nature*, where Volker Deecke, a biologist at the University of St Andrews and colleagues show that harbour seals have the ability to distinguish between the calls of different killer whale populations. Along this 'better safe than sorry' strategy, harbour seals learn what not to fear. They become used to the calls of those killer whales that mean them no harm, and use them as a baseline to compare them with calls from other killer whales.

Off the coast of British Columbia, Canada, harbour seals share the seas with killer whales. Some are local and feed exclusively on fish (and hence pose no threat to harbour seals), while others are nomadic killer whales which prey exclusively on marine mammals - harbour seals included. In addition to their differing eating habits, local and nomadic killer also have different calls. But while locals are often communicating between each other, nomadic whales are stealthier and relatively less vocal. It is therefore particularly important for harbour seals to distinguish the calls of killer whale populations to avoid becoming a dinner item. But how can harbour seals do this given the complexity of killer whale communications?

To find out how harbour seals distinguish between potentially lethal and harmless killer whales, Deecke and his team carried out two experiments. In the first one, the researchers played two underwater sound sequences - one with nomadic killer whale calls, another with background noise only. The harbour seals' response to the killer whale call was immediate, with many seals swimming away from the source of the sound. For the researchers, this behavior was evidence that harbour seals respond to the calls of nomadic killer whales, either because they consider them as dangerous, or because they elicit an unfamiliar and hence potentially fatal cue.

To find out if seals respond differently to calls of nomadic and local killer whales, the scientists repeated the experiment by playing the calls of nomadic and local killer whale populations. And to really find out if the harbour seals' response was due to their ability to associate the calls of nomadics with danger, or rather their familiarity with the calls of harmless locals, the team played calls of Alaskan fish-eating killer whales, which British Columbia harbour seals would be unfamiliar with.

The researchers observed that harbour seals were just as likely to swim away from playback calls of mammal-eating killer whales as to avoid unfamiliar but harmless fish-eating Alaskan killer whales. However, seals showed no major response to playbacks of

resident, equally harmless, killer whales. For Deecke, these results show that seals can tell apart the calls of different killer whale populations.

But a much more subtle hearing ability shown by harbour seals elevates their survival skills to an art form. Research has shown that there is just as much variation between calls of different groups in a local population as between groups of local and nomadic populations. Wouldn't this make it much more difficult for harbour seals to identify which killer whale group is 'safe' and which one isn't? Not for harbour seals. Although some groups within a local killer whale population have no calls in common, harbour seals all label them as 'safe'. This finely tuned hearing system allows harbour seals to associate as a potential danger any call from a killer whale which they do not recognize as emanating from the local population.

Responding to all killer whale calls – dangerous or not – could be seen as a waste of time and energy. However, according to Deecke and his team, in the case of harbour seals this 'better safe than sorry' strategy pays off. Rather than learn to identify a specific predator and expand on it by adding cues (e.g. when attacked, or by seeing other seals respond to attacks) – a risky strategy – harbour seals start off with a general image of a predator, from which the harmless features are removed over time.

By learning which killer whale calls not to fear, and by relying on an extraordinarily acute sense of hearing, harbour seals can ensure that any chance encounter with a killer orca is never the last one.