

POSSIBLE PREDATOR-RELATED ADAPTION OF SOUND PRODUCTION AND HEARING IN THE HARBOUR PORPOISE (*PHOCOENA PHOCOENA*).

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The studies of the soundproduction and hearing in the two dolphins, the killer whale, *Orcinus orca*, and one of its prey species, the harbour porpoise, *Phocoena phocoena*, have thrown new light on the predator-prey relationship in the two species.

Both species occur together in the North Atlantic and North Pacific Oceans. The harbour porpoise lives mostly in coastal waters, but the killer whale occupies both deep and shallow water areas (RICE and SCHEFFER, 1968).

At close distance the harbour porpoise may use its vision or draw to advantage its countershaded colouration to avoid its predator. However, acoustical behaviour may be more important in connection with an early detection by the killer whale.

DIERCKS c.s. (1971) showed that the main energy of the echolocation clicks emitted by the killer whale lies between 14 and 20 kHz. The Sound Pressure Level (SPL) at one meter is 58 dB/1N/m² (N = Newton), which is one of the highest found in nature.

These extremely loud sounds fall in the most sensitive hearing range of the harbour porpoise, with threshold values around -70 dB/1N/m² (ANDERSEN, 1970).

The sonar clicks of the harbour porpoise contain a rather weak low frequency component at around 2 kHz (SPL -20 dB/1N/m² re 1 m) and a much stronger high frequency component at about 130 kHz (SPL 20 dB/1N/m² re 1 m) (MØHL and ANDERSEN, 1973) as is shown in Figure 1.

We suggest that the 2 kHz-component has intra-specific communicative value in the schools, and the 130 kHz-component is used mainly for echolocation.

The sound production of the harbour porpoise could thus disclose the animal's existence to its predator, was it not for the fact that the killer whale cannot hear the 130 kHz-component at all, and has weak sensitivity for the 2 kHz-component (HALL and JOHNSON, 1972).

Therefore, it would appear that the harbour porpoise can detect an echolocating killer whale by passive hearing at a very long distance - theoretically the double of the killer whale's echolocation range - and proceed with its own echolocation during flight without revealing its location to the killer whale.

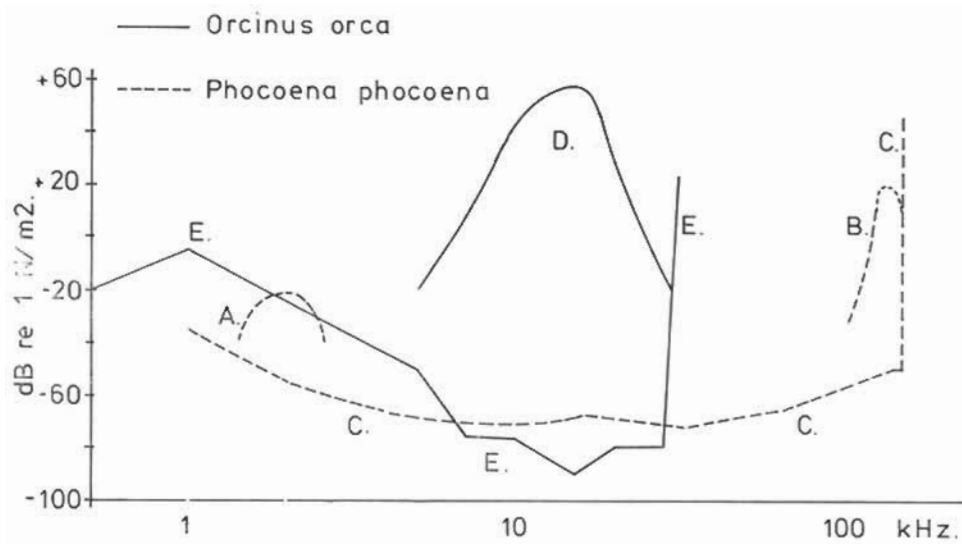


Figure 1

- A : Frequency content of the low frequency component of the harbour porpoise' click.
- B : Frequency content of the high frequency component of the harbour porpoise' click.
- C : Audiogram of the harbour porpoise
- D : Frequency content of the killer whale clicks.
- E : Audiogram of the killer whale.

References

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