Letters to the Editor

Sir,

Kamminga (1989) takes us to task, in his letter, for missing opportunities to obtain high quality recordings from dolphins. I would ask the author to consider the following points:-

1 Our reference in Morris and Lockyer (1988) to acoustic measurements, relates to the paper by Goodson *et al.* (1988). In that paper we attempt to give a detailed analysis of the NAGRA recordings, recognising the limitations of the NAGRA, but that was the best equipment we had access to for that work.

2 The statement in Morris (1986) on high frequency emissions, was based on unpublished work completely separate to the work described by Morris and Lockyer (1988). This work has subsequently been published (Mitson and Morris, 1988) and is based on data from a ship-mounted sector scanning sonar. In fact we document acoustic emissions from the White-beaked dolphin going above 300 kHz.

3 For many years we have been very conscious of the limited frequency range recording equipment available to most research groups, and I find the comments of the author extremely condescending. We have made considerable efforts to beg, borrow or make the type of equipment that would take our recording facility into the 50–200 kHz range. As the author must be aware, this type of equipment is highly expensive. We are a small, independent group of scientists, who carry out this type of work in our spare time and have a very limited equipment budget. If the author would care to lend us one of his expensive recording desks, I can assure him that we will put it to good use.

R. J. MORRIS

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Sir,

The comments made on my letter to the Editor in *Aquatic Mammals* **15.3**, 87–88, compel me to answer; as Morris has requested I consider a number of points.

(1) If the limitations of the NAGRA recorder are and were recognized, the authors should not have attempted a detailed analysis of *Tursiops* sonar, the frequencies of which have been observed to extend an octave (or more than an octave) above the bandwidth of this recorder.

(2) It cannot be denied that acoustic emissions above the established hearing range of dolphins do occur. As far back as 1970 Poulter reported a high frequency band centred around 380 kHz, and this is interesting to report. However, as commonly stated in literature, for the emissions to be effective as echolocation signals, their frequencies would have to fall within the range of the dolphin's auditory perception faculty. Were it otherwise, the white beaked dolphin would be the first dolphin with hearing outside the repeatedly established hearing range of about 150 kHz.

In 1982 I measured the dominant frequency of the white beaked dolphin to be in the order of 60 to 80 kHz.

(3) As was already known in the early seventies (through research on *Phocoena phocoena*) a recording facility of up to 150–200 kHz is definitely required, a fact endorsed by Morris himself.

For the considerable number of years during which this valuable equipment has been transported to many countries all over the world for research purposes, there has always been cooperation with researchers from other disciplines. Only on the visit to China in 1982 was it not permitted to make collective use of the equipment.

Finally, I should like to add to Morris' comments the remarks made by Paul Terry and myself in two papers presented at the Animal Sonar System Symposium in 1986, held in Denmark, as to the desirability of more cooperation between different disciplines being undertaken to discover the intriguing intrinsic properties of the delphinid sonar system.

C. KAMMINGA

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