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MiniDisc (MD) digital audio recorders have the potential to benefit bioacoustics research, but concerns about the ATRAC (Adaptive Transform Acoustic Coding) compression method employed by MD recorders have prevented their widespread acceptance in the research community. We compared the performance of MD recorders with that of professional grade audiocassette recorders. Test sounds were synthesized or recorded directly onto a computer hard drive and then transferred to each of two MD recorders and three cassette recorders. The sounds were then transferred back to a computer and compared to the original versions to quantify degradation caused by the recorders. MD recorders proved superior to cassette recorders in the accurate reproduction of mean frequency and the reproduction of low amplitude signals when a high amplitude signal occurred at a nearby frequency. Unlike audiocassette recorders, MD's did not generate artefactual variance in signal frequency and amplitude. The new MD recorder used in our study consistently outperformed all other units in the ability to reproduce natural sounds, as quantified by two automated sound comparison techniques. We found, however, that MD recorders introduced acoustic artefacts after the rapid offset of signals. Artefact duration was not affected by signal duration, resulting in a positive relationship between signal duration and signal-to-noise ratio. The artefacts' periodicity, duration, and amplitude depended on the frequency of the signal; high-frequency signals produced more periodic, shorter, and quieter artefacts than did low frequency signals. Recording amplitude has little to no effect on signal-to-noise ratio. Cassette recorders introduced non-periodic offset artefacts that were similar to the artefacts introduced by MD recorders after low frequency signals. We conclude that researchers should base their choice of a recording device on the types of sounds they intend to record and the relative importance of accurate reproduction of sound offset versus other aspects of recording fidelity. Overall, however, we see no compelling reason to avoid MD recorders for most field recording and playback applications, and we suggest that the study of bioacoustics stands to benefit from the many practical advantages and novel research methods afforded by this technology.