**Discussion**

We examined the relationship between 13 acoustic indices and biodiversity estimates of various vertebrate taxonomic groupings and found that some individual acoustic indices had moderate to strong correlations with species richness and total count, but lower correlations with Shannon’s diversity. Models incorporating multiple acoustic indices were able to predict species richness of all vertebrates and birds with reasonable accuracy, but performed relatively poorly for non-avian vertebrates and frogs. However, fine scale (? Sensitive?) monitoring of vertebrate richness using acoustic indices still requires …

**Interesting results:**

Individual indices had the highest correlations with birds and all vertebrates (should probably have a stat of the average proportion of species that were birds – is it 90% of species? 40% of species?).

Models of multiple indices also had higher performance for birds and all vertebrates . Other studies have used multiple acoustic index models with mixed results (Buxton et al. 2018; Retamosa-Izaguirre et al. 2021). This may be down to methodological differences, e.g. Buxton et al. 2018 estimated biodiversity from the audio recordings themselves, whereas Retamosa-Izaguirre et al. 2021 used bird point count surveys which includes both visual and aural detections.

In general acoustic indices performed poorly as proxies for frog biodiversity in this study (i.e. low correlations, poorer performing random forest models). As a vertebrate taxa known for conspicuous vocalization this result is surprising? One likely reason for this poor performance is that a large number of surveys found low or no frog diversity during the week long surveys. A number of the sites examined are location in tropical savannah? Region were rainfall is … (wrong season – further work during peak frog chorusing season should be carried out to determine whether indices may be useful during those times). Further study should examine whether acoustic indices may perform well at specific times of the year (e.g. the rainy season).

Despite the study sites examined spanning a very large latitudinal gradient (>20 degrees of latitude), indices performed well? (sites had distinct communities?). Most prior studies examining the relationship between acoustic indices and biodiversity have done so using sites much closer in space (is this true?) …

While results have been mixed, a number of previous studies have found poor correlations between many acoustic indices and bird richness (e.g. refs). We used many of the same indices examined in those studies, however we also included some acoustic indices that are not often used (ACT, EVN, LFC, MFC, HFC, CLS, SPD), three of which (CLS, SPD and MFC) were often among the indices with the highest correlations and the most important variables in random forest models.

How do these individual index correlation results differ to other studies? And why? Time-scale? (Typically, studies comparing acoustic indices with bird biodiversity only record audio during the same duration as their survey method – usually a 10-15 minute point count.)

Shannon’s diversity correlated with individual indices the worst, rf models also performed poorly – why? (similar values of Shannon’s diversity may be the result of very different numbers of species?)

Our models performed well (better than Retamosa-Izaguirre et al. 2021) (not as well as Buxton et al. 2018 – although they determined biodiversity metrics from the audio recordings themselves as opposed to the manual surveys used here),

Our approach to estimating vertebrate biodiversity differs to most other studies (e.g. Eldridge et al. and Buxton et al.), where the audio recordings themselves are manually listened to in order to estimate species richness or the number of sounds (CHECK THIS!).

We did not find strong correlations for many of the commonly used acoustic indices (e.g. ACI, ADI, AEI, NDSI)

NDSI: we used xx bands – which is the standard (did I use standard?), but all our sites are in natural environments with low anthropogenic noise. Additionally, many biological sounds are likely to be within the standard antho-band.

Indices that performed best, both as individual indices with high correlations with biodiversity, and as important variables in random forest models, were those that …

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**Conclusion**

Biodiversity monitoring techniques that can be used a large temporal and spatial scales are needed…

Our study found strong correlations between vertebrate diversity and specific acoustic indices at the scale of a week. Additionally, models combining multiple indices…

Further work…