Title:	A COMPARATIVE ASSESSMENT OF AVIAN SPECIES RICHNESS OF IISERM USING MANUAL & PASSIVE ACOUSTIC METHODS
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Abstract:	Birds are indicators of the health of an ecosystem and their vocalization provide us an easy means to detect their presence. Many studies use the 'manual survey' method which uses both visual and aural data to detect the presence of these birds. However, collecting such data is time-consuming and effort-intensive . As an alternate, researchers have recently turned to Passive Acoustic Monitoring (PAM) which has come up as a novel and widely used technology for species detection, and more recently, Acoustic Indices (AIs) are being used as a proxy for biodiversity. Studies carried out in the wild habitats of temperate regions of the world have found distinct diel and seasonal patterns of species richness. However, whether such patterns are upheld in the urban landscapes of the tropics has rarely been examined. IISER Mohali is situated in a peri-urban space in Mohali, Punjab. The 125 acres campus is a mix of planted woodland, grassland and anthropogenic spaces including buildings and parks. This study is an attempt to understand the temporal and spatial patterns of avian species richness in IISER Mohali (IISERM), examined both via manual and Passive Acoustic Monitoring. Our findings indicate that IISERM avian species composition undergoes a dynamic turnover across months. However, there was no clear peak hour of avian activity at the diel scale. We also did not see any spatial variation in avian species richness across the four study sites within IISERM. We also compared the historical data on avian species richness with the current data to examine differences in the avian species richness observed during the study period (August 2023 – February 2024) with what has been reported from IISER Mohali so far. A total of 73 species that were there in the historical records were not reported during this study period. On the other hand, a few new records of species have been added to the campus bird list which were not previously sighted on campus. It is not surprising that the current species list is much smaller than the historical records since the historical data spans data collected over 5 years (2013-2017) and the data of this study comes from only 7 months. In this study, we also examined the utility of some commonly used acoustic indices (BI, ADI, AEI, ACI) in understanding the patterns of avian species richness by comparing them with species found by manual census in the field (ground truthing). We did not find a correlation between acoustic indices and species richness. However, examining the utility of Bioacoustic Index in estimating species richness via sound truthing did give us a moderate positive correlation suggesting that BI may be used as a proxy for avian species richness. However, this needs to be examined more thoroughly. The lack of correlation between avian species richness as measured by manual survey (ground truthing) and Bioacoustic Indices can possibly be attributed to the fact that acoustic indices are computed on complete soundscapes which would have differential contributions from biophony, geophony as well as anthrophony. On examining the composition of the soundscape of IISERM, we found that around 74% of the entire soundscape consists of biophony and the rest 26% is contributed by geophony/anthrophony. Of biophony, 75% of the sound comes from bird vocalizations. Thus, effectively only 56% of the soundscape is contributed by bird sound. This explains the lack of a strong correlation between Acoustic Indices and avian species richness. Finally, we examined the efficacy of the Raven Pro Learning Detector for bird species detection and identification as compared to a trained listener in detecting and identifying avian species in a sound recording. We found that a trained observed outperforms the Raven Learning Detector for Indian Birds, with the learning detector misidentifying species 59% of the time. Hence, we can conclude that even though PAM is emerging as an innovative method which is widely being preferred by researchers, manual surveys still hold value and cannot be entirely replaced by PAM just yet.
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