UFRN
UNIVERSIDADE FEDERAL DO RIO GRANDE DO NORTE

Exame de Proficiência

2022.2

Inglês — **Ciências Biológicas**

Instruções

1	Confira se os dados contidos na parte inferior desta capa estão corretos e, em seguida, assine no espaço reservado para isso. Se, em qualquer outro local deste Caderno, você assinar, rubricar, escrever mensagem, etc., será excluído do Exame.
2	Este Caderno contém 5 questões discursivas referentes à Prova da Língua Estrangeira escolhida pelo candidato. Não destaque nenhuma folha.
3	As respostas às questões deverão ser redigidas **em PORTUGUÊS**.
4	Se o Caderno estiver incompleto ou contiver imperfeição gráfica que impeça a leitura, solicite imediatamente ao Fiscal que o substitua.
5	Será avaliado apenas o que estiver escrito no espaço reservado para cada resposta, razão por que os rascunhos não serão considerados.
6	Escreva de modo legível, pois dúvida gerada por grafia, sinal ou rasura implicará redução de pontos.
7	**Só será permitido o uso de dicionário INGLÊS/INGLÊS.**
8	A Comperve recomenda o uso de caneta esferográfica, confeccionada em material transparente, de tinta preta. Em nenhuma hipótese se avaliará resposta escrita com grafite.
9	Utilize para rascunhos o verso de cada página deste Caderno.
10	Você dispõe de, no máximo, três horas, para responder as 5 questões que constituem a Prova.
11	Antes de retirar-se definitivamente da sala, devolva ao Fiscal este Caderno.

Assinatura do Candidato: _____

As questões de 01 a 05, cujas respostas deverão ser redigidas EM PORTUGUÊS, referem-se ao texto abaixo.

ACOUSTIC METRICS PREDICT HABITAT TYPE AND VEGETATION STRUCTURE IN THE AMAZON

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The rapidly developing field of ecoacoustics offers tools to extract information quickly from large audio datasets and serves as a cost-effective way to monitor biodiversity and environmental change (Krause and Farina, 2016; Farina et al., 2017; Pijanowski et al., 2011a; Rappaport et al., 2020). The field focuses on the investigation of natural and anthropogenic sounds (i.e., soundscapes) and their relationship with the environment over multiple spatial and temporal scales (Farina et al., 2017). Soundscapes have been used in a variety of studies on topics ranging from describing biotic homogenization (Burivalova et al., 2019) to the impacts of mining and wildfire on ecological communities (Duarte et al., 2015; Gasc et al., 2018). While ecoacoustic methods are promising for ecological monitoring, several lingering knowledge gaps limit its widespread utility (Farina et al., 2017; Pijanowski et al., 2011b). For example, more studies are needed to determine the ability of acoustic indices to differentiate habitat types in different biomes (Farina et al., 2017; Pijanowski et al., 2011b). Another point that remains largely unaddressed is how acoustic indices relate to vegetative habitat structure (Farina et al., 2017; Pijanowski et al., 2011b). The need to fill these gaps in knowledge is particularly pressing for tropical areas, where ecoacoustic monitoring holds great potential for species conservation, yet whose soundscapes are largely understudied (Scarpelli et al., 2020).

One area which needs further investigation is the ability of acoustic indices to distinguish soundscapes of different habitat types (e.g., anthropogenic versus natural). This area of research can improve biodiversity monitoring because if habitats have unique acoustic signatures we can use acoustic indices to monitor habitat change (Farina et al., 2017; Pijanowski et al., 2011b). Further, identifying the indices that correspond most closely with particular habitats across different ecosystems could reduce the computing burden of calculating several indices on large audio datasets (Bradfer-Lawrence et al., 2019; Buxton et al., 2018; Eldridge et al., 2018). To the best of our knowledge, only three studies have tested multiple acoustic indices to investigate habitat-specific soundscapes in terrestrial systems. For example, Bormpoudakis et al. (2013) tested eight acoustic indices and found that the centroid index (CENT) performed best at distinguishing soundscapes of six habitat types in Greece, whereas Bradfer-Lawrence et al. (2019) tested seven acoustic indices across six habitats in Panama and found the acoustic complexity index (ACI) performed best. However, differences in sample sizes, acoustic indices used, and study regions limit the comparative and application value of these results in different ecosystems.

Here, we investigate habitat-specific soundscapes and the relationships between vegetation structure and soundscapes in the Brazilian Amazon. We collected vegetation data and recorded soundscapes at 143 sites across eight habitat types (natural and anthropogenic) representing the majority of habitat types found in the Amazon. We used a total of 13 acoustic indices to describe the soundscapes. Our goals were to test if acoustic indices can predict habitat type, and to test how vegetation structure relates to acoustic indices. We then discuss the implications of our findings for biodiversity assessments.

Discussion

Determining the ability of soundscapes to discriminate habitat types and the response of acoustic indices to changes in vegetation structure is critical for improving ecological monitoring using ecoacoustic methods. In the present study, we found that eight habitat types in the Amazon biome have unique and predictable soundscapes. We found that, in general, acoustic indices that rely on statistical features of recordings (Bormpoudakis et al., 2013; Mitrović et al., 2010) were

better at identifying habitat-specific soundscapes than acoustic indices based on signal complexity (Sueur et al., 2014). We also found that canopy cover was the primary vegetation variable explaining variance in acoustic indices. These results expand our knowledge regarding which acoustic indices best link changes in habitats to changes in soundscapes. These findings are particularly important for diverse ecosystems, like the Amazon, which are known to have complex soundscapes with sound producing animals that are difficult to detect with traditional survey methods (e.g., visual transects).

Implications for biodiversity assessments

Acoustic indices have been proposed as proxies to monitor biodiversity and environmental change (Buxton et al., 2018; Krause and Farina, 2016; Sueur et al., 2014). Scientists and practitioners can differentiate and predict soundscapes of different habitats by using acoustic indices. In particular, our study highlights that acoustic indices (especially TQ and CENT) are able to classify habitats, even among those that are structurally similar or share similar fauna. For example, soundscapes of grasslands burned nine months prior to data collection were different than those of intact grasslands (campina), suggesting that acoustic indices can be used to track the impacts of wildfire, an increasing threat to tropical ecosystems (Staver et al., 2020). Similarly, soundscapes of várzea forests were different than islands forests, and because islands have species in jeopardy due plans of dam construction (Naka et al., 2020), acoustic indices could serve as a cost-effective way to monitor such species.

A second important implication of our findings for biodiversity assessments is the ability to build predictive models linking fine-scale changes in vegetation structure to acoustic diversity. While TQ and CENT indices worked best to differentiate habitats, the acoustic indices that were best linked to changes in vegetation structure (canopy cover) were AEI and SKEW. The reason that some indices might be better at some tasks than others should be explored in future studies. AEI and SKEW could be used together with vegetation remote sensing tools, such as LiDAR, to predict how habitat degradation (e.g., canopy loss due to deforestation) affects animal diversity. This synergetic approach between two scalable remote sensing methods, ecoacoustic and airborne surveys, may offer an alternative for multi-taxa animal surveys at policy-relevant extents (Bush et al., 2017; Pekin et al., 2012; Rappaport et al., 2020).

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Question 1

Write about the two studies that have investigated habitat-specific soundscapes in terrestrial systems and present their limitations.

Espaço para Resposta

Question 2

Write about the knowledge gaps that limit the use of ecoacoustic methods for ecological monitoring.

Espaço para Resposta

Question 3

Write about the data the researchers collected for this study and their specific research goals.

Espaço para Resposta

Question 4

Write about the findings of the research and their importance.

Espaço para Resposta

Question 5

Translate the excerpt below. The translated text should be clear and accurate in terms of structure and meaning.

> *Scientists and practitioners can differentiate and predict soundscapes of different habitats by using acoustic indices. In particular, our study highlights that acoustic indices are able to classify habitats, even among those that are structurally similar or share similar fauna. For example, soundscapes of grasslands burned nine months prior to data collection were different than those of intact grasslands, suggesting that acoustic indices can be used to track the impacts of wildfire, an increasing threat to tropical ecosystems.*

Espaço para Resposta