Systematic Map Protocol

Title
What evidence exists on birds and mammals' biodiversity in the Brazilian Atlantic Forest (BAF) agricultural ecosystems? A systematic map protocol

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Background
Brazil has one of the planet's greatest biodiversity, with over 20% of the world's total species. The Brazilian Atlantic Forest (BAF) spans 17 Brazilian states, making it the third-largest biome in Brazil. The BAF is composed of a range of ecological formations, with climatic conditions and landscape diversity that directly contribute to the different structures of the forest. The fragmentation of the original habitats, mainly due to anthropogenic activities, is one of the main causes of biodiversity loss, causing the decline and habitat loss for several species, including birds and mammals. While there has been extensive research on species diversity in forest fragments or protected areas, there is a lack of basic research in agricultural ecosystems. Only 1.5% of the studies on bird occurrence data in the BAF were reported from pasture habitats and 1.4% from exotic tree plantations. To address this gap, the present systematic map protocol aims to carry out a bibliographic survey on the presence of birds and mammals in agricultural landscapes and its adjacent areas of natural vegetation to describe the prevalence of species across different (semi-)natural and anthropogenic habitat types. Collecting this data is important to support environmental management policies to preserve biodiversity in these areas.

Theory of change or causal model
Agriculture activities may lead to habitat fragmentation, resulting in habitat loss and the decline of species, including birds and mammals. In this context, biodiversity research in agricultural areas permits a comprehensive understanding of species' occurrences and their interaction with the landscape. This data can be used to understand the implications of anthropogenic modification in the ecosystem and its service provision. Nonetheless, data on biodiversity in tropical agricultural fields is scarce, especially in the BAF, jeopardizing the implementation of conservation and management policies.

Stakeholder engagement
N/A

Objectives and review question
This systematic map aims to collate scientific data on the presence of birds and mammals in

agricultural landscapes and their adjacent areas of natural vegetation, considering the Brazilian Atlantic Forest (BAF). It aims to address the following primary question and associated subquestions: What are the species of birds and mammals in agricultural fields and their adjacent areas of natural vegetation ? Subquestions: 'What are the different species of birds and mammals in agricultural fields that undergo varying management practices within the BAF? What is the contribution of nearby natural areas to the diversity of birds and mammals in agricultural fields?

Definitions of the question components
The question components will be addressed using the PICO/PECO model. Population (P): Birds and Mammals (including flying and non-flying mammals and New World marsupials) Exposure (E): Agricultural Landscape in the BAF (e.g., perennial crop, annual crop, agroforest, tree plantations, and pasture) and its adjacent areas of natural vegetation (e.g. forests, natural fields, etc.). Comparator (C): Diversity and abundance of birds and mammals in the agricultural landscapes (farmland, pasture, tree plantation, agroforest) in the BAF compared to adjacent natural areas. Outcome (O): The species' occurrence in agricultural fields and adjacent natural areas according to abundance, diversity, guilds, habitats, crops, regions, and the number of studies for each case.

Search strategy
The literature search will be performed on three bibliometric databases: Web of Science (WoS), Scopus, and PubMed. Regarding grey literature, specifically dissertations and thesis, the search will be performed in the "Biblioteca digital brasileira" database (https://bdtd.ibict.br/vufind/). Grey literature search will not include conference abstracts and posters. In all cases, we will not limit the year of publication, performing searches up to the present time. No additional searches will be conducted on website search engines and organizational websites. We will consider literature in English and in Portuguese only. All literature searches will be combined using the systematic reviewing tool Rayyan (Ouzzani et al., 2016).

Bibliographic databases
The following research string was developed for bibliographic databases: a) WoS, Scopus and PubMed: (BIRD* OR MAMMAL* OR AVIFAUN* OR PRIMATE* OR RODENT* OR AVIAN OR MARSUPIAL* OR FAUN* OR OMNIVOR* OR CARNIVOR* OR FRUGIVOR*, GRANIVOR*OR INSECTIVOR* OR BAT* OR PASSERIN* OR CHIROPTER*) AND (AGRICULT* OR CROP* OR FARM* OR PASTURE OR MATRIX OR PATCH* OR CORRIDOR* OR "PROTECTED AREA" OR PLANTATION* OR FRAGMENT* OR TROPIC* OR ECOSYSTEM* OR AGROFOREST* OR "SECONDARY FOREST*" OR "FOREST REMNANT*" OR "AGRICULTURAL FIELD*" OR "PRIMARY FOREST*" OR ARABL* OR SYSTEM* OR PRACTICE* OR MANAGEMENT OR ORGANIC OR AGROECOLOG* OR "CONSERVATION AGRICULTURE" OR "PEST MANAGEMENT" OR BIOCONTROL OR "URBAN AGRICULTURE" OR TILL* OR ABANDONMENT OR SET-ASIDE OR FALLOW* OR "MIXED CROP-LIVESTOCK*" OR "INTEGRATED CROP-LIVESTOCK*" OR "DIVERSIFIED CROP-LIVESTOCK*" OR "VEGETATION STRIP*" OR "INSECT STRIP*" OR "FLOWER STRIP*" OR DIVERSIFICATION OR ROTATION OR "INTER-CROP" OR COVER-CROP*) AND ("ATLANTIC FOREST" OR "BRAZILIAN ATLANTIC FOREST" OR RIPARIAN OR SEMI-DECIDUOUS OR "BRAZILIAN ATLANTIC RAINFOREST*" OR NATIONAL PARK* OR TREE PLANTATION* OR PERENN* OR "PERENNIAL CROP*" OR NEOTROPIC*) AND NOT (CAATINGA OR CERRADO OR AMAZON OR PAMPA OR ARGENTINA) AND BRAZIL b) Biblioteca digital Brasiliera: the same search string used in the WoS, Scopus and PubMed will be translated to Portuguese and used in the Brazilian database to search for dissertations and thesis. (See Table 1, in the Supplemental Material).

Web-based search engines
N/A

Organisational websites
N/A

Comprehensiveness of the search
Search terms were developed to comprehend previously described PECO elements (e.g., Birds, Mammals, Brazilian Atlantic Forest, Agriculture, Farm, etc.). A preliminary pilot search was conducted using Google Scholar's Advanced Search feature to elaborate a search string for bibliometric databases such as Web of Science (WoS), Scopus, and PubMed. A preliminary screening string was employed to conduct the pilot search, details of which are provided as Supplemental Material (Benchmark studies_Birds and Mammals_Search String_revised.xlsx). This pilot search yielded more than 6,000 publications. From this extensive collection, a dataset comprising 100 publications was selected and documented in the supplemental file "Literature Eligibility Pilot_Consolidated.xlsx". The selection process for these publications was initially based on the scrutiny of titles. However, in instances where an article was considered relevant, a subsequent search for related articles was also undertaken. A pilot screening and eligibility assessment was conducted to ascertain the eligibility of selected publications per the PECO model. This pilot exercise resulted in the identification of 24 eligible publications. Subsequently, 10 publications were designated as benchmark articles; these were selected based on their titles and citation indices. The benchmark publications were then screened in full text to identify keywords that cover elements of the PECO model. After identifying the keywords and additional keywords recommended after the protocol's peer-review process, the string was used to determine the efficacy of retrieving all 10 benchmark publications within the WoS database. The initial test successfully located all benchmark publications, obviating the need for further refinement of the search string.

Search update
After the publication of the systematic map protocol, we expect to conclude the literature search and publish the results within a year. Nonetheless, suppose this process takes longer, and a systematic map manuscript is not submitted after one year. In that case, an update on the literature search will be performed if the time between the last literature search exceeds one year after the publication of the protocol.

Screening strategy
A visual summary of the screening strategy employed in this systematic map is provided in Figure 1 (Supplemental Material). To facilitate the removal of duplicate entries from the search results across all databases (Web of Science, Scopus, and PubMed), we will utilize the systematic review software Rayyan (Ouzzani et al., 2016). Documentation will be maintained for all duplicate files identified and removed. After the deduplication process, we will verify the availability of the full text for each publication. Those publications for which the full text is not accessible will not advance to subsequent stages of review, and the rationale for their exclusion will be systematically recorded. The assessment of eligibility will be conducted in a two-step process: (a) an initial appraisal of titles and abstracts, followed by (b) a subsequent evaluation of full texts. In the preliminary phase, should a reviewer encounter uncertainty regarding a publication's compliance with the selection criteria, the study will proceed to full-text review. All non-eligible publications will be archived, accompanied by the reasons for their rejection. A list of excluded studies will be made available as supplemental material.

Eligibility criteria
Eligible population: birds, mammals (including flying and non-flying mammals and New World marsupials). Eligible exposure: Brazilian Atlantic Forest (BAF) and Agricultural Landscape (e.g., perennial crop, annual crop, agroforest, tree plantations, pasture, and urban agriculture). Eligible comparator: diversity and abundance of birds and mammals present in the agricultural landscape

(farmland, pasture, tree plantation, agroforest) and its adjacent natural areas in the BAF. Eligible outcome: Identify the species in agricultural fields and its adjacent natural areas according to abundance, guilds, habitats, crops, regions, and the number of studies for each case. Study type: qualitative and quantitative studies, reviews, meta-analyses, modelling studies. Timeframe: There will be no limited timeframe. The search will be conducted up to the present time. Language: English and Portuguese.

Consistency checking
FCA and GSS will independently screen the same subset of articles according to the eligibility criteria described in the flow-chart (Figure 1). To evaluate the consistency between the reviewers, these reviewers will evaluate an initial sample of 10 % of publications, and the outcome will be compared for consistency by estimating the percentage of agreement and by calculating Cohen's Kappa (k) index (McHugh, 2012), aiming for a k > 0.6, which indicates substantial agreement (Landis and Koch, 1977). If the k index is below 0.6, reviewers will discuss the reasons for disagreement, record it, and decide eligibility. After that, the reviewers will screen an additional sample of 10% of the publications, and the Kappa index will be calculated again. This procedure will be repeated until Cohen's Kappa is higher than 0.6. In cases where disagreement persists between the reviewers, a third reviewer will act as a mediator. We have performed a pilot to test this procedure, which can be found in the Supplemental Material (see Literature Eligibility Pilot_Consolidated.xlsx).

Reporting screening outcomes
When the literature search is complete, we will follow the Reporting for Systematic Evidence Synthesis (ROSES) guidelines by filling out the ROSES form for Systematic Maps Reports and the ROSES flow diagram. ROSES forms and diagrams are meant to ensure that the Systematic Map includes all necessary content required by the Collaboration for Environmental Evidence (CEE) guidelines and is described in detail by Headway et al., 2018. The form will help describe the methodology and report research synthesis and will also help interpret the data and draw conclusions, especially in identifying knowledge gaps. A ROSES flow diagram will also be included in the final manuscript to help summarize the information required by the ROSES Map Report form. The flow diagram will also present the number of studies assessed and rejected at each screening stage and the number of rejected studies. Full-text screening will be recorded with the reason for rejection. The ROSES file will be uploaded and provided as supplementary material. The systematic map will discuss any deviations from the ROSES flow diagram.

Study validity assessment
No study validity assessment will be completed.

Consistency checking
N/A

Data coding strategy
After the screening and eligibility evaluation, the selected articles will proceed to data extraction to gather data on species abundance in the agricultural landscape. The pre-defined inclusion criteria are taxonomic group, type of agricultural system, type of study, biological organization, in or outside conservation units. The excluded articles will be archived and the reason for rejection will be recorded. Records of excluded articles will be provided as supplemental material, as indicated in Figure 1. File "Pilot Data Coding Strategy_Data Extraction.xlsx" indicates the details of the data coding strategy, indicating what the codebook will contain and how the information from the surveyed literature will be extracted.

Meta-data to be coded

The meta-data to be coded can be found in the Supplemental Material (file: Pilot_Data Coding Strategy_Data Extraction.xlsx).

Consistency checking

For data extraction, FCA and GSS will independently extract data from all eligible studies. However, if the number of studies is large, only the primary reviewer (FCA) will extract the data, while the secondary reviewer (GSS) will subsequently check a sample of 20% of the publications. Discrepancies in the data coding will be discussed within the team (FCA, GSS, and AC).

Type of mapping

The systematic map will provide a narrative and quantitative synthesis. The research gaps will be identified by analyzing the meta-data representation, which will be visually shown as tables or diagrams according to guilds, habitats, and crops. The data collected, meta-data, and codes will be reported in the final manuscript or as supplemental material.

Narrative synthesis methods

Narrative and quantitative synthesis.

Knowledge gap identification strategy

The research gaps will be identified by analyzing the meta-data representation, visually shown as tables or diagrams according to guilds, habitats, crops. The data collected, meta-data, and codes will be reported in the final manuscript or as supplemental material. Based on the analysis of the meta-data and conclusions thereafter, possible data gaps will be identified and reported in the final manuscript to be published in Environmental Evidence.

Demonstrating procedural independence

The authors have publications in the field, which will be considered due to the scarceness of published research articles from Brazil.

Competing interests

The authors declare no competing interests.

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Author's contributions

Each author contributed equally to the research aims, objectives, and conceptualization. FCA and GSS and contributed to the creation of search strings. AC, FCA, and GSS wrote the first draft of the protocol and revisions. All authors contributed to the revisions of the protocol.

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