



Introduction

The ecological effect on the functional diversity of migrant birds in Neotropical habitats is poorly understood. Hence, we assess trait space occupancy differences in resident and migrant bird species across three habitats of Center-Western Brazil.

Goals

To investigate functional diversity differences of resident and migratory bird species assembled according to their habitat dependence, aquatic, forest, and non-forest habitats.

Hypothesis

Due the higher number of migrants, we expected that new traits be added to the functional diversity in the aquatic habitat (Fig. 1).

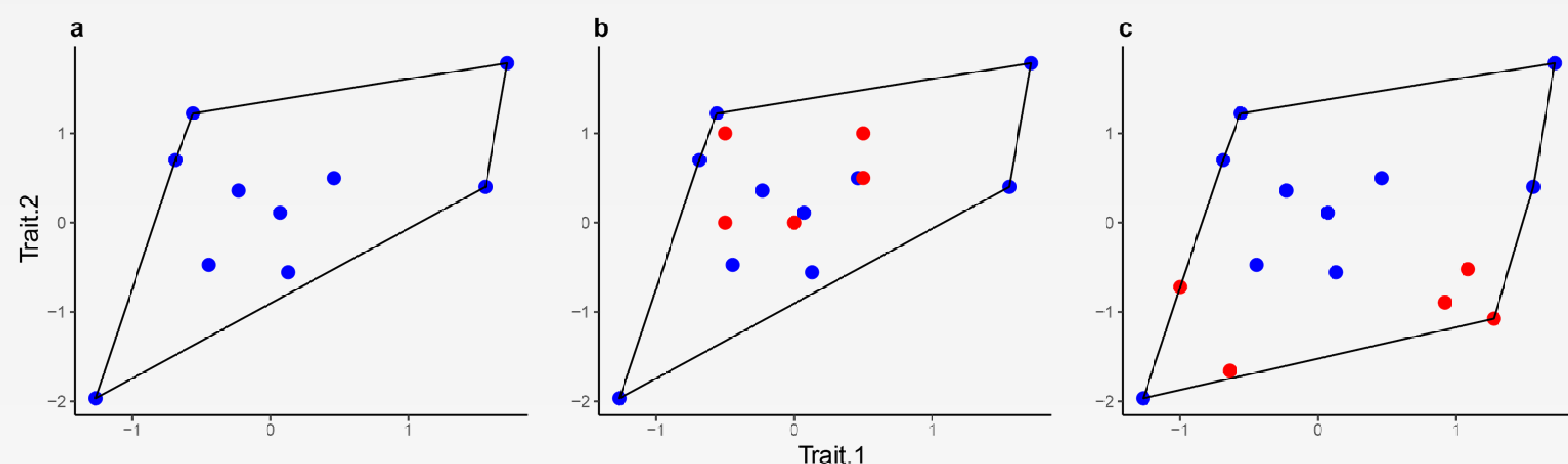


Fig. 1 – Theoretical scenarios of functional space in the presence of migratory species. a = community with only resident birds (blue circles); b - community with migratory species (red dots) functionally redundant to resident ones; c - community with migratory species with new functional trait values.

Methods

- (1) Bird checklist of the state of Mato Grosso do Sul, which include “Pantanal”, a famous wetland area in Brazil (Fig. 2).
- (2) Categorized bird species as (1) resident or (2) migratory and as (1) aquatic, (2) forest and (3) non-forest.
- (3) Assessed 26 functional traits utilized including morphological traits, diet composition, and foraging forest stratum preference to assess the functional diversity.
- (4) In addition, we calculated functional beta diversity to identify functional differences between groups of migratory and resident species (functional.beta.pair in the betapart packages).

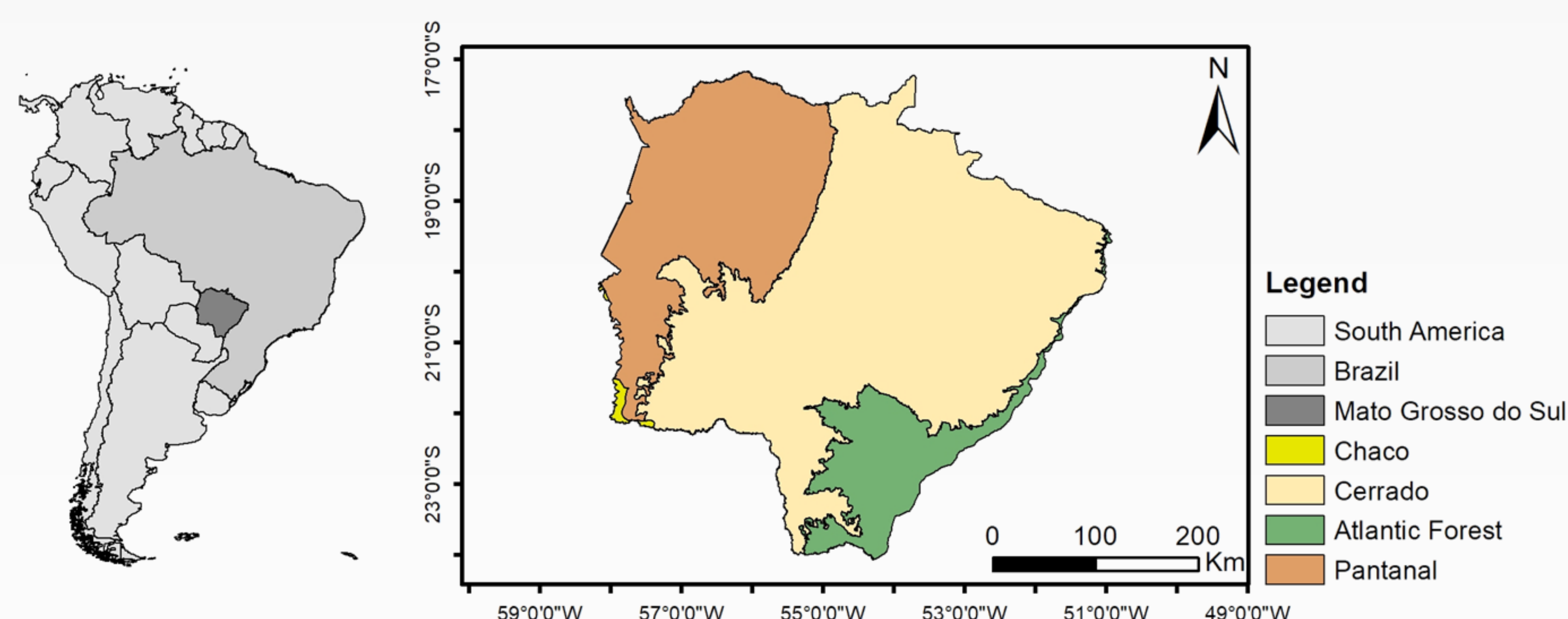


Fig. 2 – Location of the state of Mato Grosso do Sul in the center-west region of Brazil, showing the biomes in its territory

Results

Among 677 bird species in the check-list 544 were residents and 133 were migrants while 370 were forest, 196 were non-forest, and 111 were aquatic. Values of functional diversity were often higher in residents, except for aquatic migratory birds (Table 1).

Table 1 – Species richness (S), functional richness (FRic) and functional dispersion (FDIs) for migrant and resident birds by habitat dependency groups.

Migratory status	Habitat dependence	S	FRic	FDIs
Resident	Aquatic	68	0.124	1.653
Resident	Forest	340	0.351	1.589
Resident	non-Forest	137	0.303	1.756
Migratory	Aquatic	43	0.055	1.804
Migratory	Forest	30	0.018	1.179
Migratory	non-Forest	59	0.066	1.599

In fact, the results indicated that migratory birds contribute to adding new traits to the aquatic groups, showing high functional turnover (Fig. 3).

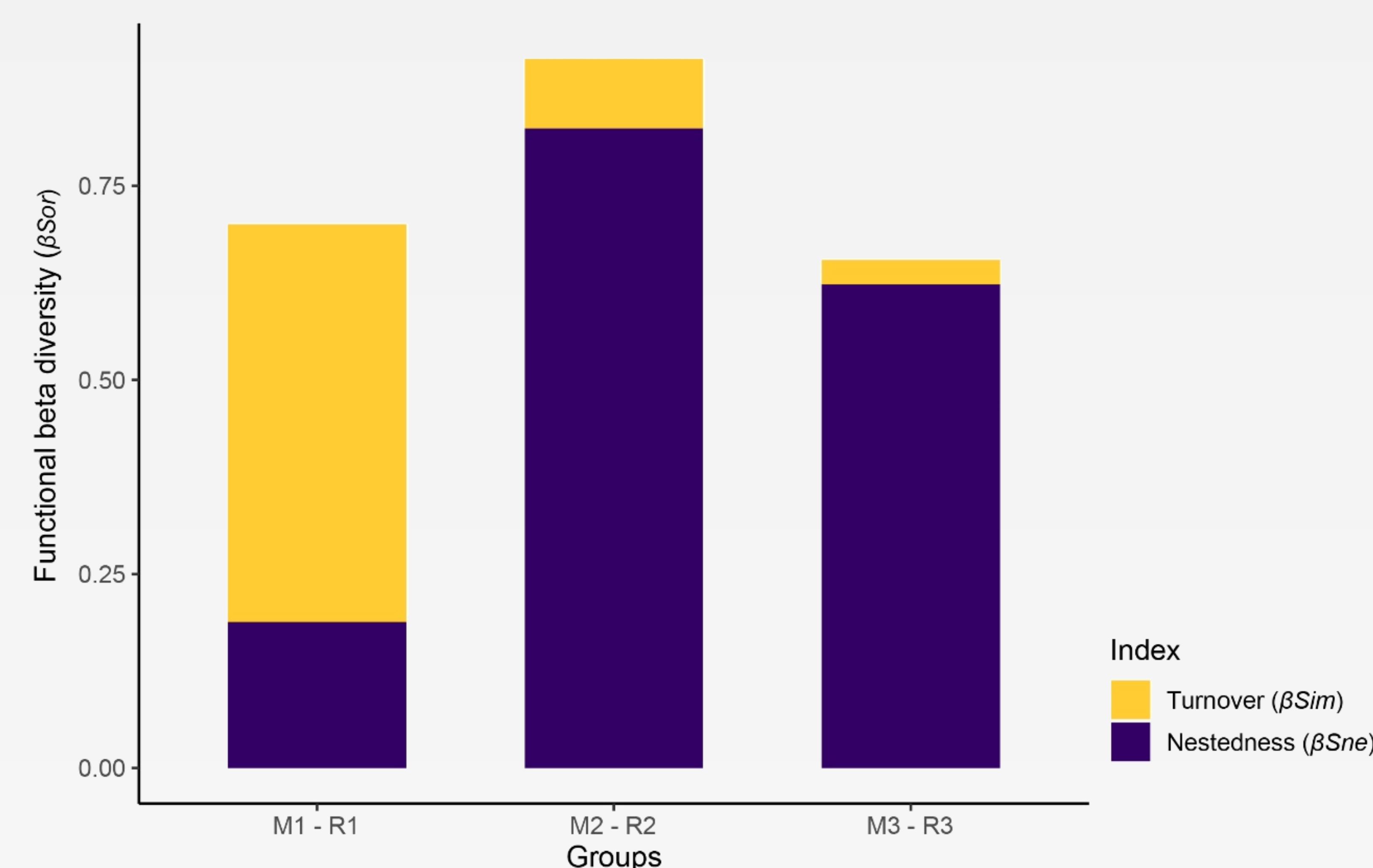


Fig. 3 – Functional beta diversity between bird groups (M = Migratory; R = Resident) in each environment class (1 = Aquatic; 2 Forest; 3 non-Forest). β_{SIM} and β_{SNE} are the beta turnover and nestedness components.

Therefore, migratory and resident groups show greater overlap in functional volume in forest and non-forest habitats but show minimal overlap in aquatic habitats (Fig. 4).

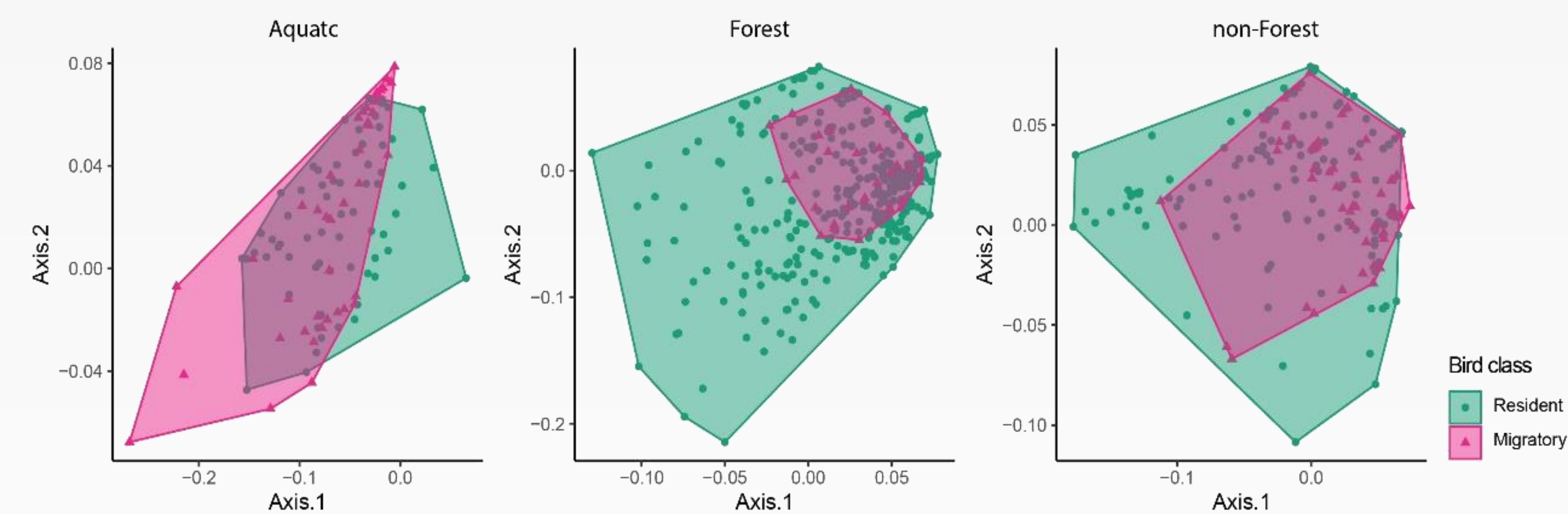


Fig. 4 – Principal coordinates analysis (PCoA) plot of species groups by environment class in the state of Mato Grosso do Sul, Brazil, based on the functional distance matrix by Gower’s method. For simplified visualization, only the first two axes of the PCoA were plotted.

Discussion

The effect of migratory species are higher in aquatic habitats because they add considerable variation in functional traits. Our study highlights the importance of conservation of Pantanal with respect to the maintenance of aquatic migratory species due their relevance on ecological functions. In fact, Pantanal is recognized as a Ramsar Wetland of International Importance due to its vast network of aquatic habitats.

References



Original article

