Diversity of termites from the upper Madeira River region, Brazil

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INTRODUCTION

The Santo Antônio and Jirau hydroelectrics plants (HP) were recently built in the Madeira River region, in Porto Velho, Rondônia, Brazil. This region is unique, since the alignment of Amazonas-Madeira-Mamoré Rivers divides the Neotropical region into two areas of endemism for a diversity of taxa. This work aimed to monitor termites for three years in areas near the Jirau HP and two years in areas near the Santo Antônio HP, as well as conduct a community level study and analyze the spatial distributions of termites from the areas influenced by Jirau HP.
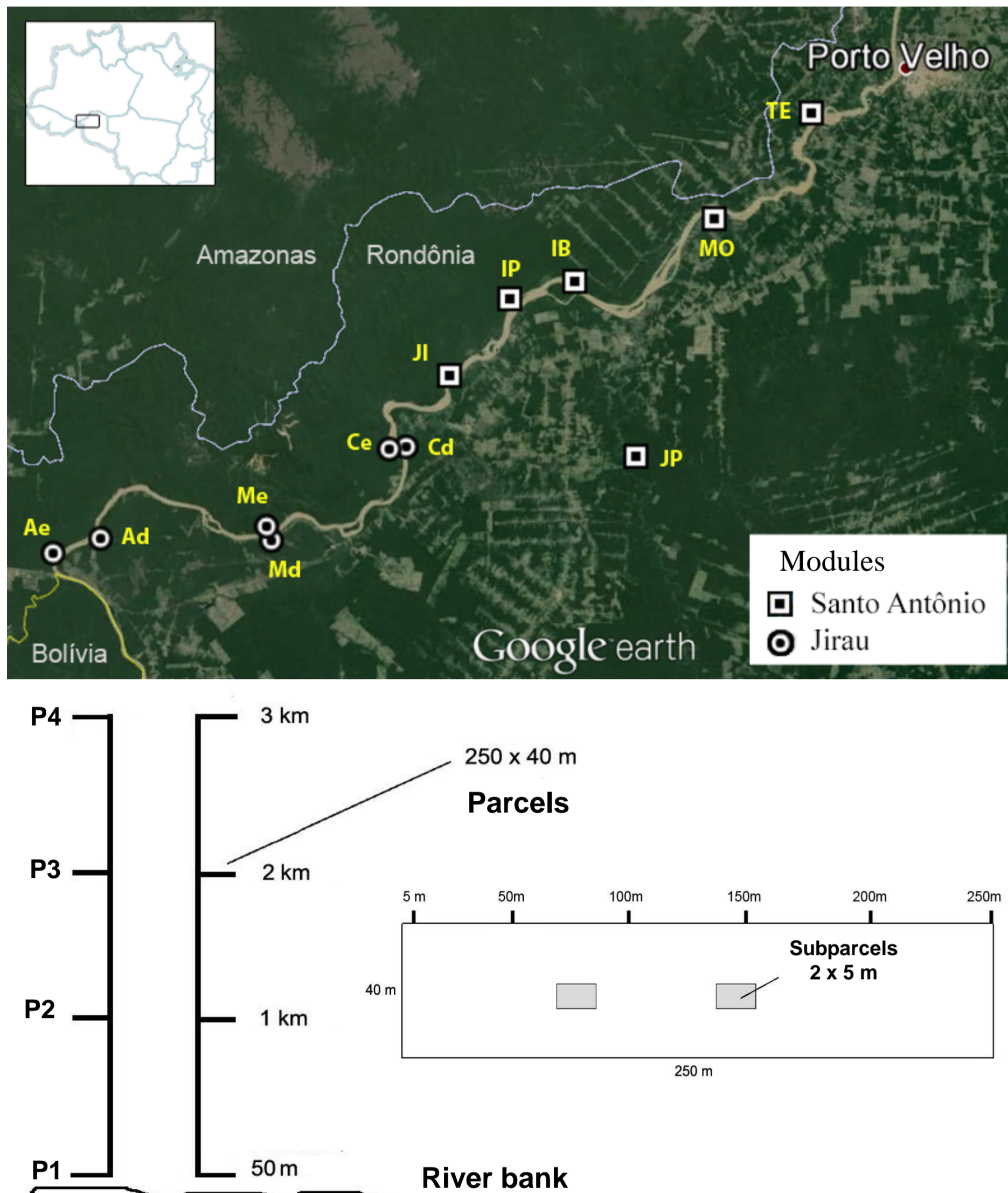
MATERIALS AND METHODS

Twelve modules were marked, seven on the left bank of the river and five on the right bank. Each module had 3 or 4 km transects and perpendicular parcels every 1 km. The sampling was conducted in subparcels of 5 x 2 m inside each main parcel.

For the community study, 20 subparcels were randomized in this six modules of the Jirau HP, with five subparcels marked in relation to distance from the river margin (P1-50m, P2-1km, P3-2km, and P4-3km).

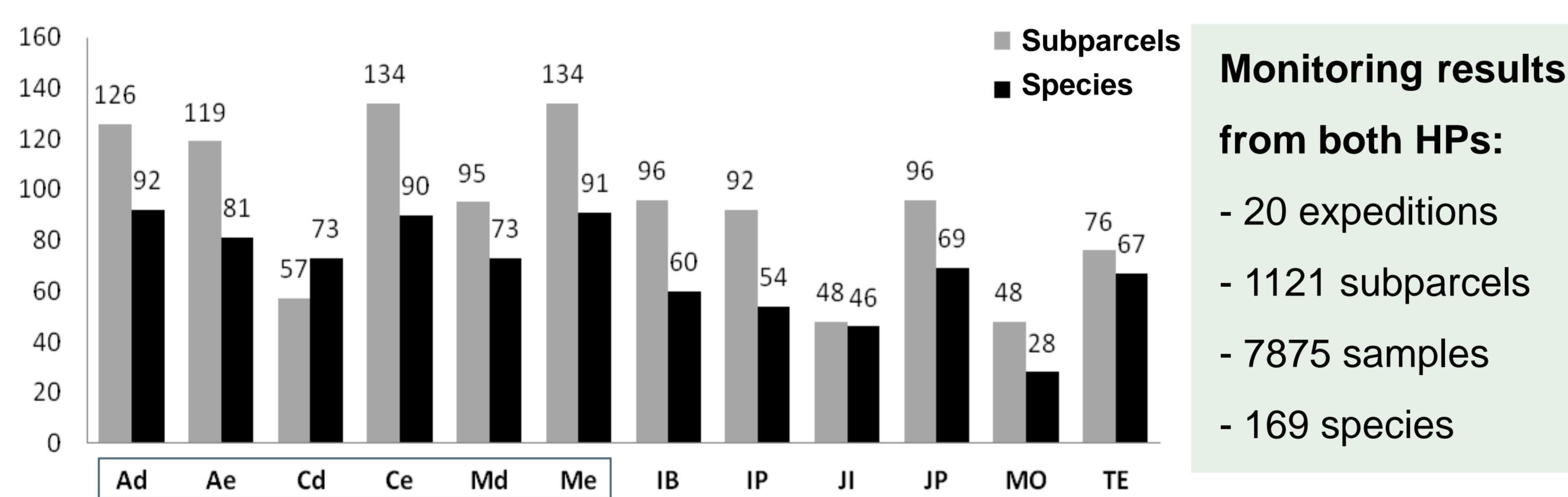**Figure 1.** Sample design of the transects in both HPs (above), and parcels and subparcels in the Jirau's modules (below)

RESULTS AND DISCUSSIONS

Monitoring results from both HPs:
- 20 expeditions
- 1121 subparcels
- 7875 samples
- 169 species

Figure 2. Number of species and subparcels sampled per module in Jirau and Santo Antonio HPs.

Results from the community level study in the areas influenced by Jirau HP:

This study registered one of the highest local termite diversity in some of the sampled modules, and the more optimistic estimator suggests that local species richness is 159. (During the entire monitoring, 147 spp. were sampled in 665 subparcels in Jirau – Figure 2; but from this number, only 20% of the Apicotermitinae were identified).

Table 1. Richness, number of encounters, richness estimators, and sampling sufficiency for the **30 subparcels** from the modules of Jirau HP;

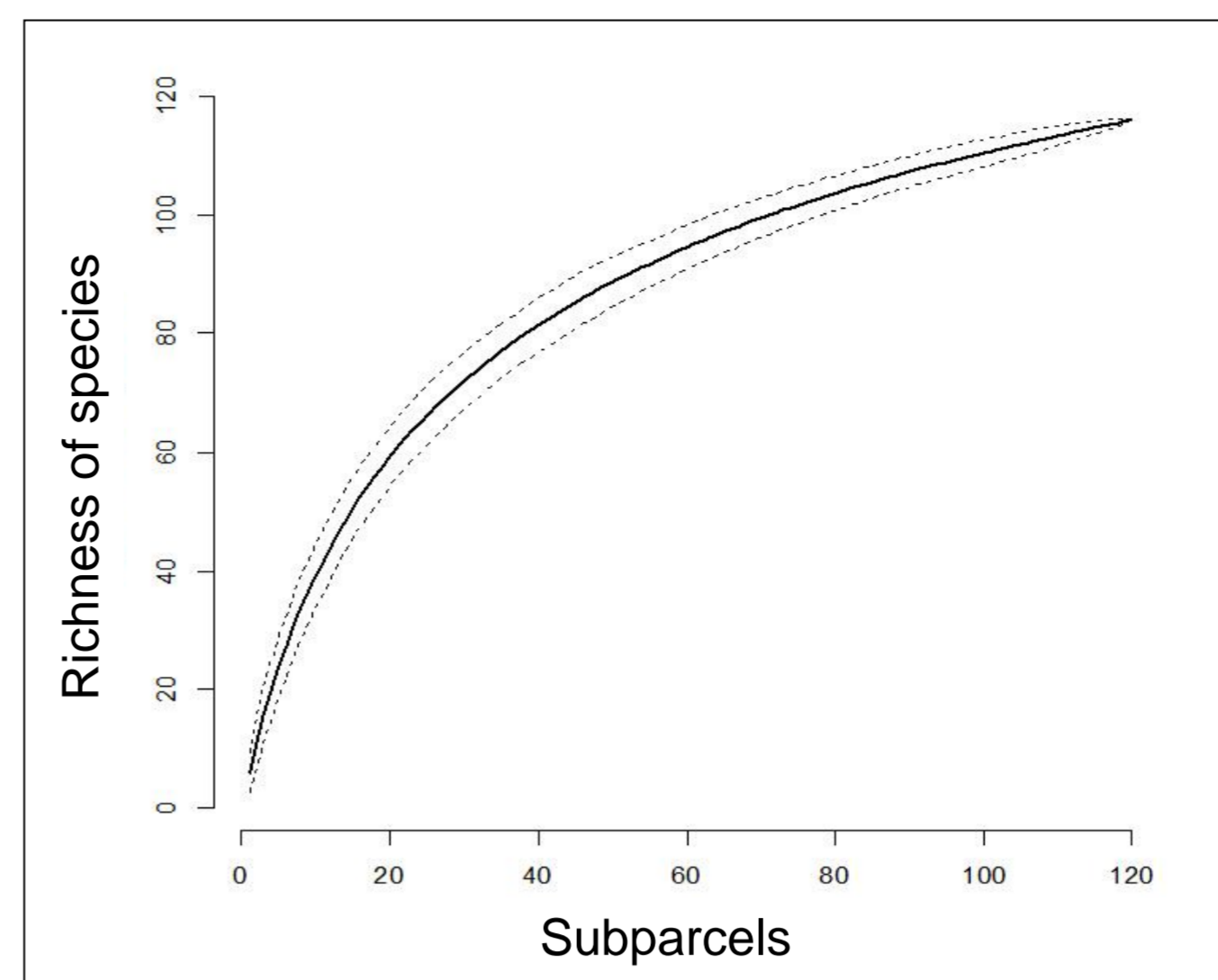| Module	Ad	Ae	Cd	Ce	Md	Me	Total
Richness	62	53	55	55	50	54	116
Encounters	135	107	109	138	119	96	704
Chao	86	83	123	81	72	83	159
Jackknife 1	88	79	86	78	71	82	148
Jackknife 2	99	93	109	90	81	96	167
Bootstrap	74	65	68	65	60	66	130
Sufficiency	71%	66%	57%	70%	70%	66%	77%

Figure 3. Species accumulation curve with the 120 subparcles used in the community level study in Jirau.
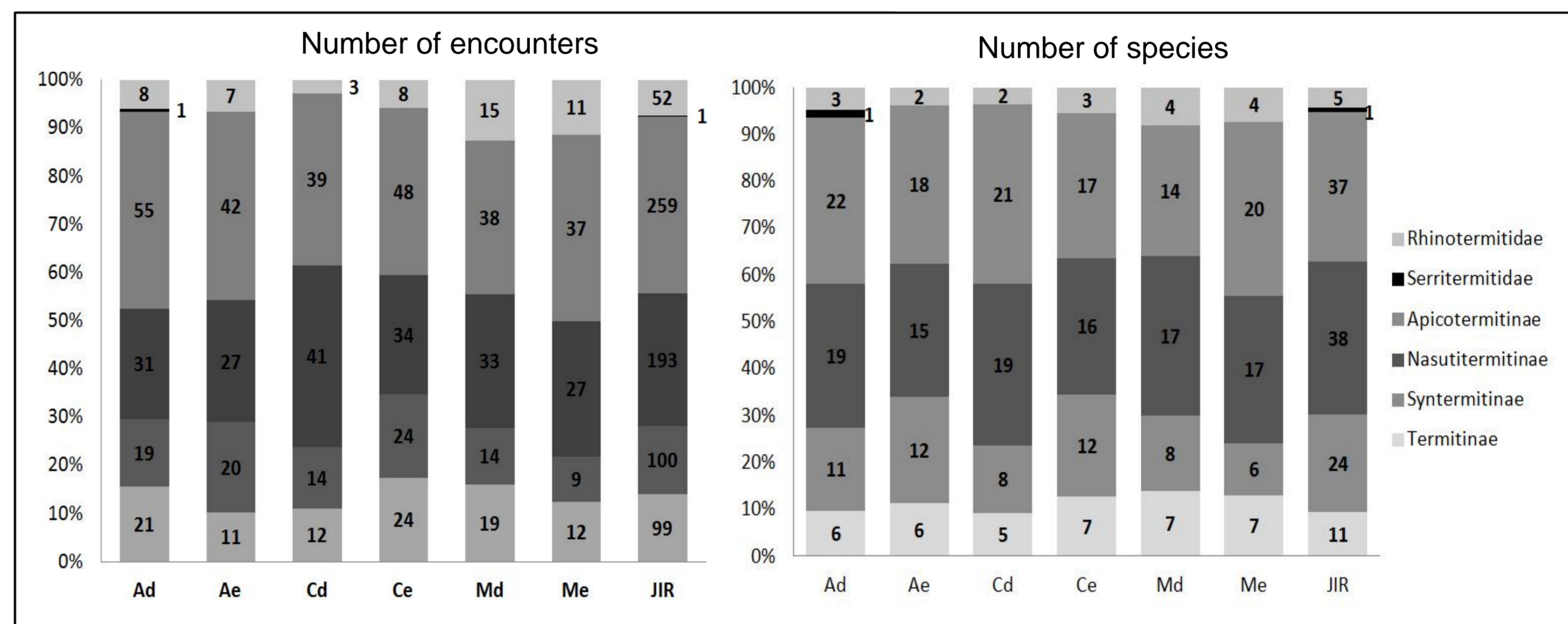
Figure 4. Number of encounters and number of species for family and subfamily of Termitidae in Jirau.

The termite species composition was not related to side of the river bank. The beta diversity analysis with termite species composition clustered for modules with the same soil type, suggesting that some termite species may be distributed accordingly to this variable.
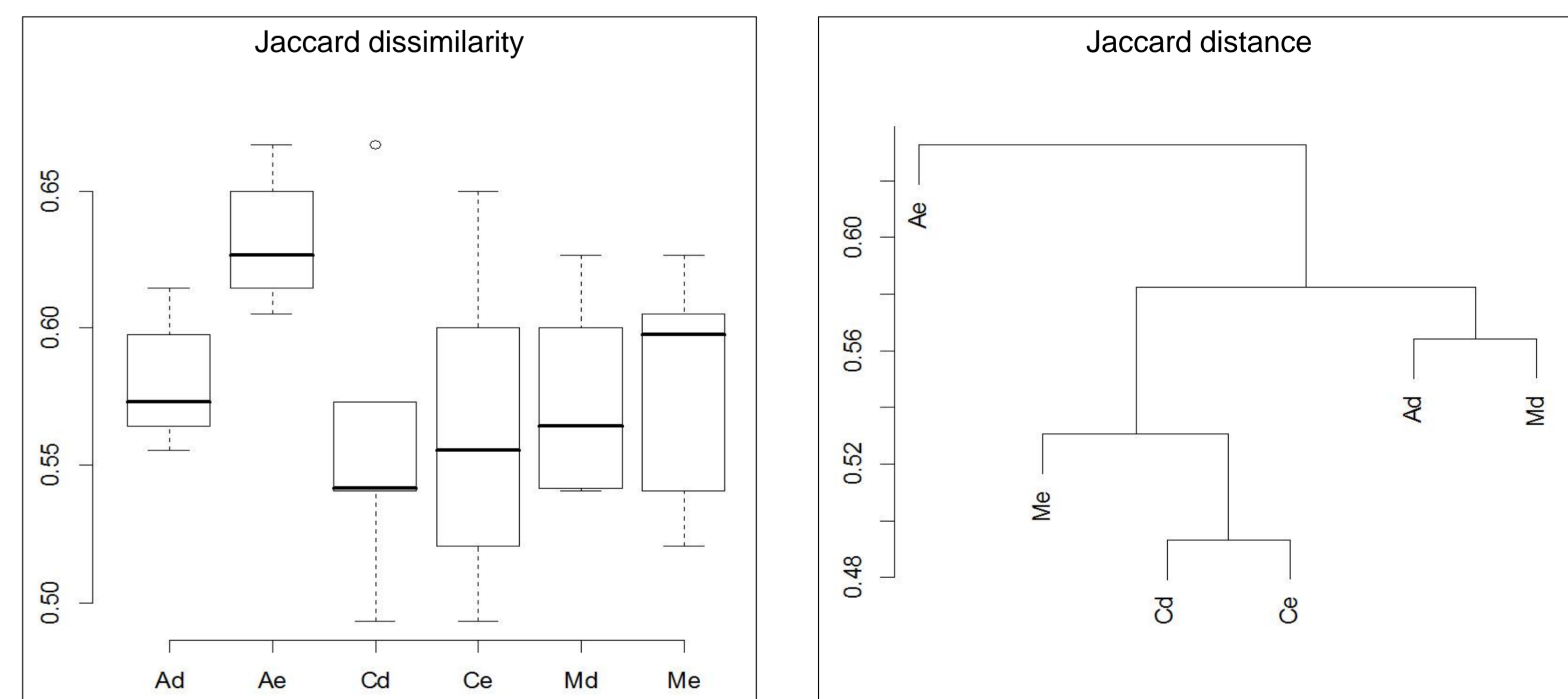

Figure 5. Jaccard index: average beta diversity (left) and dissimilarity dendrogram (right) for each module of Jirau HP influence areas.
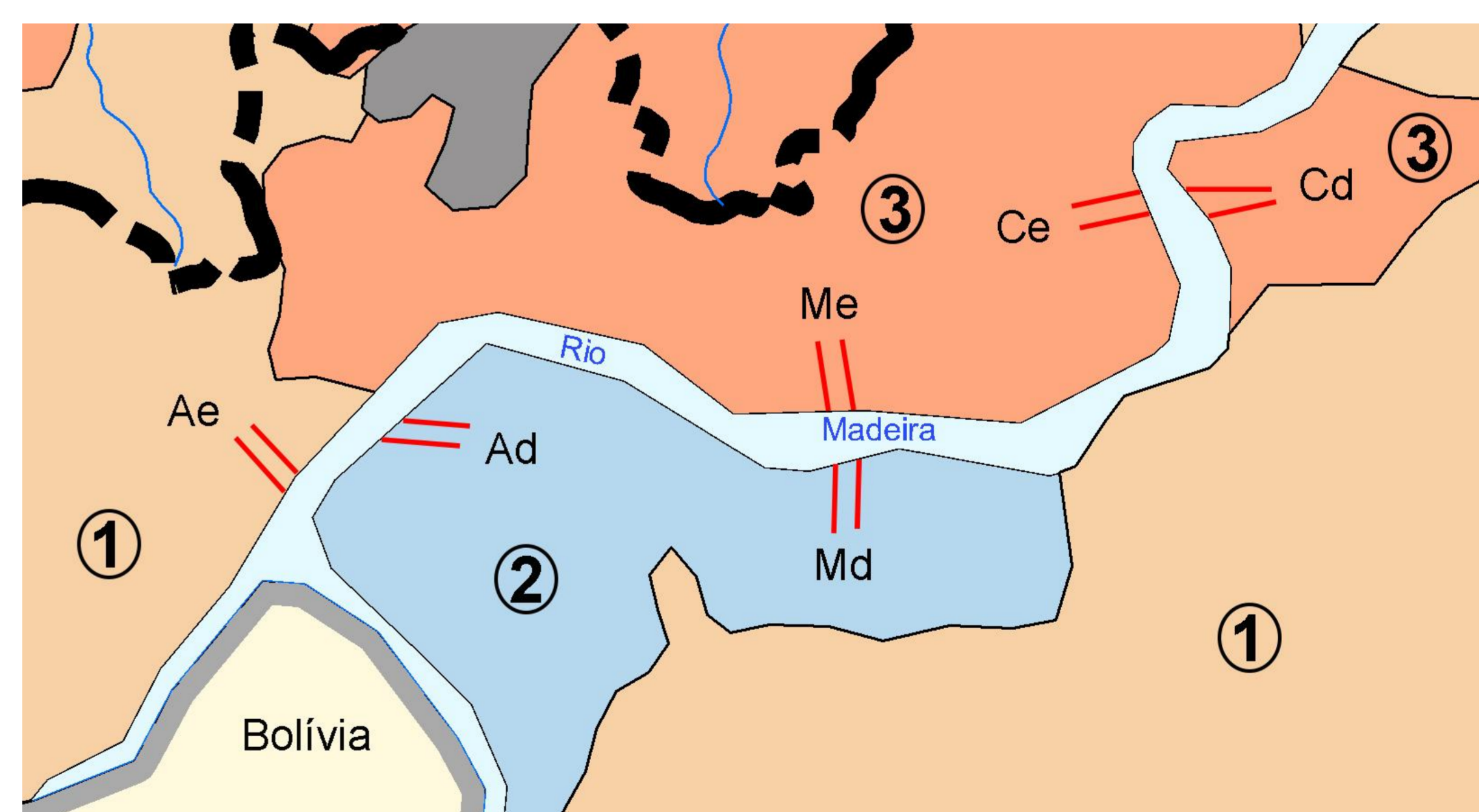

Figure 6. Image showing the three different types of soil of Jirau HP influence areas.

The parcels closest to the river were the most peculiar, both in terms of termite species composition and abundance patterns, with some species restricted to the P1 and others absent there.

Table 2. Indicator species of environments in relation to distance from bank of the Madeira River.

Local of indication	Species	Ind Val (%)	Significance (p)
P1	*Nasutitermes globiceps*	81.6 %	0.001 ***
P1	*Nasutitermes octopilis*	64.5 %	0.004 **
P4	*Planicapritermes planiceps*	58.9 %	0.011 *
P4	*Atlantitermes* sp. 2	51.6 %	0.038 *
P2 + P3 + P4	*Nasutitermes banksi*	74.5 %	0.001 ***
P2 + P3 + P4	*Nasutitermes similis*	62.4 %	0.04 *

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