



SOIL ARTHROPOD DIVERSITY IN TWO MOIST MONTANE FORESTS OF THE SEMI-ARID BRAZILIAN "NORDESTE"

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INTRODUCTION

With an area of about 750.000 km², the semi-arid region of northeastern Brazil forms the fourth largest morphoclimatic and phytogeographical brazilian domain (the "caatingas" domain), after the Amazonian, Tropical Atlantic (Mata Atlântica) and "Cerrado" domains (Ab'Sáber, 2003). It is also the most critically threatened region of Brazil, and the diversity, distribution and ecology of its biota remain poorly known, especially with regard to the invertebrate fauna. Although most of its territory is formed by extensive crystalline or sedimentary depressions covered by a mosaic of xerophytic and deciduous thorny vegetation (the "caatinga" biome stricto sensu), this continuity is broken by sedimentary plateaux ("chapadas") and small isolated residual crystalline mountains ("serras") where other vegetal formations are found. The moist montane forests ("brejos") that occur on the highest parts (between 600-1000 meters above sea level) of "serras" or the slopes of "chapadas" exposed to humid winds are of special interest since they are viewed as disjunction areas from the Atlantic forest, and refuge areas for a biota formerly linked to the present-day Atlantic forest and even perhaps to the Amazonian forest biotas (Andrade-Lima, 1982; Coimbra-Filho & Câmara. 1996).

In the state of Ceará, the moist montane forests formed an 4878 km² total area, today reduced to 56 % of its original size, and furthermore greatly threatened by high anthropic pressure.

In the period 2002-2004, we carried out an extensive research program to study the soil ant fauna of the moist montane forests of the state of Ceará, using the ALL (Ants of the Leaf Litter) protocol, a set of standardized methods to sample soil ant fauna (Agosti and Alonso, 2000). Our aim was to survey and to compare the soil ant fauna of the five principal moist montane forests of the state of Ceará (serra de Baturité, serra de Maranguape,

serra da Meruoca, chapada do Araripe, chapada da Ibiapaba). This sampling program also allowed us to capture many non-ant arthropods.

In this paper, we present the preliminary analysis of the non-ant arthropod soil fauna captured in two of the five studied moist montane areas.

MATERIAL AND METHODS

The non-ant arthropod material was obtained from the soil ant fauna sampling carried out in two areas of primary montane moist forests, both at an average altitude of 860 meters. The first area (04°16'S-38°56'W) was located on the "serra de Baturité", about 90 km from the Atlantic coast and the main city of the state (Fortaleza), while the second (03°54'S-38°43'W) was located on the "serra de Maranguape", a smaller mountain, about 32 km from Fortaleza. In each area, sample points were marked every 10 meters along 4 ("serra de Maranguape") to 9 ("serra de Baturité") 200-meters transects, each separated by a minimum of 50 meters. At each sample point, two methods were used, as recommended in the ALL protocol (Agosti and Alonso, 2000): a pitfall trap placed 1 meter from the transect line and filled with a 70% alcohol solution, and the collection of 1 m² leaf litter on the opposite side of the transect line. The litter sample was sifted before the ants (and other arthropods) were extracted using a Winkler apparatus, a system by which ants (and other arthropods) are forced down a bag connected to an alcohol-filled recipient after migrating out of a mesh bag containing the sifted leaf litter (Agosti and Alonso, 2000). Both the pitfall traps and the Winkler extractors were operational for 48 hours. Samples were first sorted to separate ants from other arthropods. Ant and non-ant arthropods were next sorted to the level of morphospecies and then identified to subfamily, genus and, where possible, to species for the former, and to order and family for the latter.

RESULTS AND DISCUSSION

In the "serra de Baturité", 386 insect species from 9 orders and 87 families were recorded. The most speciose order was Hymenoptera (170 spp., 21 families), followed by Diptera (59 spp., 25 families), Coleoptera (57 spp., 15 families), Hemiptera (42 spp., 16 families), Blattariae (25 spp., 1 family), Orthoptera (14 spp., 2 families), Dermaptera (7 spp., 2 families), Collembola (6 spp., 3 families) and Isoptera (6 spp., 2 families). Among the hymenopterans, 128 species were ants (Formicidae) from 36 genera and 8 subfamilies (Myrmicinae, 75 spp.; Formicinae, 26 spp.; Ponerinae, 16 spp.; Ectatomminae, 4 spp.; Dolichoderinae, 3 spp.; Ecitoninae, 2 spp.; Pseudomyrmecinae, 1 spp.; Heteroponerinae, 1 spp.). In addition to the insects, 44 arachnid species (Acari, 29 spp.; Opiliones, 8 spp.; Pseudoscorpiones, 7 spp.), 19 myriapod species, 3 crustacean (Amphipoda) species, and a yet undetermined number of spider species (Araneae), were collected.

In the "serra de Maranguape", 229 insect species from 9 orders and 64 families were recorded. The most speciose order was Hymenoptera (118 spp., 14 families), followed by Coleoptera (52 spp., 16 families), Diptera (29 spp., 17 families), Hemiptera (11 spp., 8 families), Blattariae (6 spp., 3 families), Orthoptera (4 spp., 3 families), Isoptera (4 spp., 2 families), Collembola (4 spp., 2 families) and Dermaptera (1 spp., 1 family). Among the hymenopterans, 80 species were ants (Formicidae) from 28 genera and 7 subfamilies (Myrmicinae, 45 spp.; Formicinae, 16 spp.; Ponerinae, 13 spp.; Ectatomminae, 3 spp.; Ecitoninae, 1 spp.; Heteroponerinae, 1 spp.; Amblyoponinae, 1 spp.). In addition to the insects, 13 arachnid species (Acari, 7 spp.; Opiliones, 4 spp.; Pseudoscorpiones, 2 spp.), 7 myriapod species, 3 crustacean (Amphipoda) species, and a yet undetermined number of spider species (Araneae), were collected.

In the two areas, 414 non-ant arthropod species (spiders not included) and 256 ant species were recorded. Only 82 non-ant arthropod species and 51 ant species were recorded in both the areas (Sorensen's similarity coefficient: 0.33 and 0.49 respectively).

CONCLUSIONS

Our preliminary results show that the two moist montane forests are characterized by a high invertebrate diversity, thereby confirming the scarce data obtained with other animal groups, like reptiles (Borges, 2002). The low similar coefficients

also indicate that the moist montane forests of the semi-arid region could have distinct faunas. However, such a conclusion should be cautiously considered since the sampling effort was not the same in the two studied areas.

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