THE LEPIDOPTERAN FAUNA IN FIVE FRAGMENTS, WITH DIFFERENT METRICS, IN SOLEDADE, RS, BRAZIL.

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INTRODUCTION

The deforestation process of forested areas leads to the formation of isolated fragments that function as "islands" of forest surrounded by non forested habitats. In some situations the process of fragment formation is natural and the transition zone between the fragments and the non forested habitats is less abrupt. This is the case of an area in Soledade, Rio Grande do Sul, where the formation of isolated forest fragments is separated by great extensions of native fields, or, when there is human interference, by pastures. The consequences of the process of forest fragmentation have been studied intensely, mainly for the conservation biology, as form of trying to foresee the most appropriate size and the form for forest reservations. The principal theoretical referential is supplied by the Island Biogeography Theory of MacArthur and Wilson (1967), and recently by the metapopulation theory (Hansky & Simberloff, 1997). The fragmentation process takes the creation of a forest border affecting directly the size and the form of the fragments. The reason between the interior and margin imposes restrictions to the maintenance of certain species populations while it moves with spatial factors with strong ecological impact.

The effects of habitat fragmentation can be of two types: the internal effects of the fragments that are related with the formation of forest border and the influence of the external matrix on the fragment dynamics. This second process includes landscape interaction in a wider habitat configuration level (patch, matrix and connectivity). The proposal of the present work is to use remote sensing techniques and analysis of landscapes to select fragments with different physical, distributional and connective characteristics, for the evaluation of the lepidopteran fauna in each fragment.

MATERIAL AND METHODS

The study area is located in Soledade municipality, Rio Grande do Sul state, Brazil (28°48'48" and 28°52'10"S; 46°24'03" and 46°29'14"W). It is characterized by great extensions of native fields with fragments of araucaria forest. In some areas the human action can be observed by the substitution of the field by pasture and farming.

An information base was used involving the planialtimetric base maps elaborated by the Management of Brazilian Army Geographical Service (DSG,1979) in scale 1:50.000, image of the satellite ETM+/Landsat 7, orbit-point 222-080, passage of 04/02/2002, software of Geographical Information System (GIS) Idrisi 32, software AutoCAD 2000, software of Landscape Ecology Fragstats 3.3 (MacGarigal et al., 2002) and cartographic data receiver GPS-Garmin 12. The planialtimetric base map of DSG was scanned and georreferenced. Soil usage and covering map was generated starting from the not supervised classification of the bands 3, 4 and 5 by the module Isoclust. Six soil usage and covering classes were selected: native forest, native fields/pastures, farming, exposed soil, urban area and water. The soil usage and covering map generated in SIG Idrisi 32, was analyzed using the software Fragstats, generating the indexes for analysis of the fragmentation degree of the landscape unit characterized as forest. Based on the map of soil usage and covering, and using the software Fragstats five forest fragments were selected in agreement with their spatial location, size, form, and possible connection with corridors.

Ten work fields were accomplished with a sampling effort of 3 hours-net for each fragment, totaling 150 hours-net: 30 hours-net for each one of the 5 selected fragments. The visualized individuals in

field were captured with the aid of entomological nets and sacrificed in ethylic ether.

RESULTS AND DISCUSSION

The five fragments (F) selected presented the following measurements (area, in ha; core area, considering a border of 30m; total of border, in ha; forms, the more close the value of 1, squarer the form; and presence or not of connection by corridors): F1 (15.6600; 12.7350; 2.95; 1.77 and not connected); F2 (65.7450; 58.6575; 7.0875; 2.11 and not connected); F3 (15.1200; 12.4200; 2.7; 1.65 and not connected); F4 (55.5750; 42.1650; 13.41; 4.27 and connected to F5); F5 (30.8250; 24.1200; 6.705; 2.81 and connected to F4). It was captured 839 individuals belonged to 6 families. The following families of lepidopterans were observed with their respective percentile: F1 - Hesperiidae (6.3%); Lycaenidae (1.6%); Nymphalidae (69.5%); Papilionidae (3.1%); Pieridae (18.8%) and Riodinidae (0.8%). F2 -(8.1%); (3.2%); (72%); (3.8); (10.8%) and (2.2%). F3 - (2.1%); (6.3%); (73.4%); (1.1%); (17.8%) and (0%). F4 - (11.3%); (0%); (66%); (3.8%); (17.6%) and (0%). F5 - (6.2%); (0%); (60.2%); (0%); (24.6%) and (0%). Considering the five fragments in relation to the total, the following frequencies of number of species (%) /individuals (%) per fragment were observed: F1 (41.9/19.3); F2 (43.1/26.6); F3 (29.4/14.9); F4 (31.9/21.1) and F5 (30.0/18.1) .It was observed that large fragments (F2 and F4) presented the largest individuals' percentile, but not necessarily species. The Spearman's correlation between individuals and area and species and area was 0.7 and 0.9 respectively (P = 0.233 and P = 0.0833). The number of species shared among fragments varied from 16 (between F1 and F3) to 27 (between F2 and F3), the Sorensen index of similarity varied from 0.28 to 0.462 and the Jaccard index from 0.163 to 0.274. The areas with a large number of shared species were F2 and F3, that were at a distance of 248m from F2, and of 553m from F4. The corridor is located between F4 and F5, and these areas shared 20 species, of a total of 51. In spite of the differences, the ˜ diversity value, that measures the fauna changes from a fragment to another stay little altered, varying from 1.25 to 1.29. The percentile of singletons calculated by the software Estimates 7.5 (Colwell, 2005) indicate that between 38.3% and 56.2% of the captured species were represented by only one individual, showing the heterogeneity of the fragments and indicating that perhaps those five fragments form a dynamic system with few resident species. It supports the fact that from a total of 159 collected species only 13 (8.1%) presented abundance higher than 5% in at least one fragment. The landscape has a total of 5267ha with 887.91ha of native forest distributed in 374 fragments. These fragments have the following size: 73% (1-5ha); 17.38 (5-10ha); 4.28 (10-15ha); 2.14 (15-20ha) and 3.20 (more than 15ha). There is an average of 7.1 fragments in 100ha, with the mean distance between each fragment of 84.08m. This kind of spatial landscape structure allows a great butterfly movement, although the matrix element is better for species from the families Heperiidae and Lycaenidae. The fragment proximity and size enhance the possibility that they could work like stepping stones providing a good community flux and a small group of fragment resident species.

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