The Brazilian Atlantic Forest: How much is left, how is the remaining forest distributed and what are the possible consequences of climate change

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The Brazilian Atlantic Forest: How much is left, and how is the remaining forest distributed? Implications for Conservation


The Brazilian Atlantic Forest: a shrinking biodiversity hotspot

Ribeiro, MC, Martensen, AC, Metzger, JP, Tabarelli, M, Scarano, F, Fortin, MJ

In Press. Zachos, FE, Habel, JC. (eds.), Biodiversity Hotspots, Springer Publishers
Top Biodiversity hot spot!

Up to 8% of the world's species!
North - South

29 of latitudinal variation
coastal

25 of longitudinal variation
Complex relief
Atlantic Forest landscape structure

- Amount of Forest (% of remaining forest)
- Forest Configuration
  - Fragment size distribution
  - Edge/Interior
  - Connectivity, by different gap-crossings
    - Area source
    - Matrix type
  - Isolation
    - Importance of small fragments
- Conservation structure
  - Conservation units
  - Distance to Conservation Units
How much is left?

11.26 % forests
0.47 % mangles and restingas

11.73 % Total

Mapping error: Mapped as forest and it is not: 3%
Mapped as non-forest and it is: 37%

Today: 11.4 a 16%
Atlantic Forest heterogeneity

Silva & Casteleti 2005. Based on birds, butterflies and monkeys
<table>
<thead>
<tr>
<th>Biogeographical subregion</th>
<th>Forest today (ha)</th>
<th>% original</th>
</tr>
</thead>
<tbody>
<tr>
<td>Araucaria</td>
<td>3 202 134</td>
<td>12,6</td>
</tr>
<tr>
<td>Bahia</td>
<td>2 162 287</td>
<td>17,7</td>
</tr>
<tr>
<td>Brejos Nordestinos</td>
<td>13 656</td>
<td>16,0</td>
</tr>
<tr>
<td>Diamantina</td>
<td>1 109 727</td>
<td>13,5</td>
</tr>
<tr>
<td>Interior</td>
<td>4 840 188</td>
<td>7,1</td>
</tr>
<tr>
<td>Pernambuco</td>
<td>379 818</td>
<td>12,1</td>
</tr>
<tr>
<td>Serra do Mar</td>
<td>4 169 797</td>
<td>36,5</td>
</tr>
<tr>
<td>São Francisco</td>
<td>499 866</td>
<td>4,7</td>
</tr>
</tbody>
</table>
% of Forest 2650 sub watersheds (5a. Order)
Fragment Size

+ 246,700 fragments

50.2% of the area!!!
Where are the large ones?

Bahia < 25.000
Diamantina < 25.000
Araucária < 250.000
Interior < 250.000
Pernambuco < 5.000
S. Francisco < 10.000
Serra do Mar > 1,2 M
Larger patches
Edge Distance (m)
Cumulative area (%)
25 50 75 100
50 100 250 500 1000 2500 5000 12000

73% > 250 m from edges
45% > 100 m from edges
Edge and core areas

Paranapiacaba

12 km

PARNA Iguaçu
Isolation and Importance of small patches

![Graph showing the relationship between mean isolation (m) and smallest patch size (ha) for different species.

- SFRAN
- INTER
- SEMAR

Legend:
- Arauc
- Diama
- Perna
- Bahia
- Inter
- Semar
- ALL

The graph illustrates the mean isolation (m) in relation to the smallest patch size (ha) for various species, with SFRAN, INTER, and SEMAR highlighted. The data suggests that as the smallest patch size decreases, the mean isolation increases, indicating the isolation and importance of small patches.]
Functional patches > 25,000 ha

Graph theory, Urban & Keith 2001

Functional area, sensus Martensen et al. (2008)
Latitudinal migration given climate change
Elevation range

Altitudinal migration given climate change
Orientation

- Original orientation
- Remaining forest
Conservation Units - distances
## Conservation Units

<table>
<thead>
<tr>
<th>BSR</th>
<th>Protected area (ha)</th>
<th>Remaining forest protected %</th>
<th>% of original area protected forest</th>
</tr>
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<tr>
<td>Araucaria</td>
<td>164 651</td>
<td>3.1%</td>
<td>0.39%</td>
</tr>
<tr>
<td>Bahia</td>
<td>113 447</td>
<td>4.2%</td>
<td>0.70%</td>
</tr>
<tr>
<td>Diamantina</td>
<td>151 412</td>
<td>1.1%</td>
<td>0.15%</td>
</tr>
<tr>
<td>Interior</td>
<td>561 381</td>
<td>6.8%</td>
<td>0.48%</td>
</tr>
<tr>
<td>Pernambuco</td>
<td>4 314</td>
<td>1.0%</td>
<td>0.12%</td>
</tr>
<tr>
<td>Serra do Mar</td>
<td>1 201 848</td>
<td>25.2%</td>
<td>8.11%</td>
</tr>
<tr>
<td>São Francisco</td>
<td>63 297</td>
<td>2.4%</td>
<td>0.11%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2 260 350</strong></td>
<td><strong>9.3%</strong></td>
<td><strong>1.05%</strong></td>
</tr>
</tbody>
</table>
Conservation Units - distances

Distance from Nature Reserves (m)

Area (ha in log scale)

NR <200 200-600 600-1000 1000-2000 2000-5000 5000-10000 10000-25000 25000-50000 >50000

Conservation Units - connectedness of reserves – climate change
Final conclusions

i) More forest than previous estimations
   - Especially given the inclusion of young forests (20-40 yr/old) and < 100 ha

ii) However, way less than the governmental estimations Probio (27%)

iii) The vast majority of the remnants are very small (<50ha; 83% of the patches)

iv) Almost half of the remaining forest (45%) is less than 100 m from forest edges, and 73% is less than 250 m from any edge, what suggests a strong influence of the matrix

v) There is 256 000 ha at 2,5 km from any edge, and 57000 ha further than 5km from any edge (12km is the deeper that you can get)
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vii) Small fragments (i.e. < 200ha) have a very important function in reducing the isolation between larger ones

viii) The conservation units (integral protection) encompass a small proportion of the actual remnants, and around 1% of the original forest cover

ix) A large fraction of the remnants (61%) are further than 25 km from any Conservation Unit
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Thank you!!!

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