Fig. 18.3. Loss and fragmentation of heathland in the pool basin, Dorset. (From Webb and Haskins 1980.)

Fragmentation within a "relatively intact" area: Dorset Heath
**In Theory**

\[ \lambda_s = \lambda_0 - \alpha S \]

\[ \mu_s = \beta S \]

**Actual Data**

for birds in Solomon Islands

---

**Figure 2.11** Immigration and extinction rates that change linearly with island species density. Equilibrium species density, \( \hat{S} \), is a simple function of the slopes and intercepts of the two lines.

**Fig. 9.7.** The actual extinction (solid line) and immigration (dashed line) curves for the avifauna on Three Sisters, one of the smaller Solomon islands: the rates are plotted as relative number of species to go extinct, or to immigrate, per year as a function of the number of species on the island.
Figure 6.5 Relation between number of permanent resident boreal bird species, the number of small, boreal mammal species, and the size of isolated mountain ranges (>7,500 ft, 2,300 m elev.) in the Great Basin (modified from Brown 1978).

**Equation:**

\[ \log S = \log C + 2 \log A \]

The area-species curve of the West Indian herpetofauna (amphibians plus reptiles). (From MacArthur and Wilson, 1967.)

**Graphs:**

(a) Birds in S.E. Asian Ocean

(b) Birds in S. Pacific
The Distance Effect: more isolated islands hold fewer species

Fig. 9.2. An example of the relation between species number and island distance from the colonization source, for birds on tropical islands of the Southwest Pacific. The ordinate (logarithmic scale) is the number of resident, nonmarine, lowland bird species on islands more than 500 km from the larger source island of New Guinea, divided by the number of species on an island of equivalent area close to New Guinea. The abscissa is island distance from New Guinea. The approximately linear relation means that species number decreases exponentially with distance, by a factor of 2 per 2600 km. (From Diamond, 1974).
**Distance Effect**

**Theory**

![Graph showing immigration rates and extinction rates, with labels for near and distant species, and a dashed line indicating turnover rates.]

Figure 2.13 Immigration rates should decrease with increasing distance from source areas so that distant islands should reach equilibrium with fewer species, $S_d$, than close-in islands, $S_c$, all else being equal. Moreover, turnover rates should also be higher on nearby islands than on comparable but more distant islands ($T_c > T_d$).

**Data**

![Graphs showing number of seeds caught and distance from seed source, with curves for heavy and light crops.]

Figure 2.12 Some actual patterns of dispersal, both vertical and horizontal. The number of organisms decays rapidly at first and then more and more slowly with increasing distance. [From Odum (1959) after Wolfenbarger.]

**Combined Distance/Area Effects**

![Graph showing colonization, near, small, and extinction areas with different rates for low and high numbers of species.]

**Implications for reserves?**
Figure 2.14 Extinction rates should be little affected by distances from source areas, but they should often vary inversely with island size, complexity, or both. Immigration rates may also be slightly higher on larger islands because they present a larger "target" for potential invaders. Thus, all else being equal, a small island should equilibrate with fewer species, $S_s$, than a larger island, $S_l$.

**Data**

Figure 9.6 Probability of four species of common forest-interior Neotropical migrant birds nesting in United States mid-Atlantic forests of various sizes, based on point counts. Dotted lines indicate 95% confidence intervals. (From Robbins et al. 1989.)

- **Red-eyed vireo**
- **Wood thrush**
- **Scarlet tanager**
- **Ovenbird**
The colonists of island E9

**ORTHOPtera**
- Gryllidae
- Cryptocerinae
- Gryllotalpidae

**DERMATOPTERA**
- Anostidae
- Cryptocercinae
- Trichoptera

**COLEOPTERA**
- Anthicidae
- Sphingidae
- Elateridae

**BREviostrepta**
- Acroceridae
- Chrysomelidae

**CERCOPHILA**
- Chrysomelidae
- Coccinellidae
- Curculionidae

**LYCOSIDA**
- Acariidae
- Lychnidae

**SOLPUGIDA**
- Solpugidae

**QUESITULA**
- Solpugidae
- Theridiidae

**THERISOPTERA**
- Theridiidae

**LYCOSIDA**
- Araneidae

**LIOPTERA**
- Araneidae

**LYNCHIDAE**
- Araneidae

**TILAPIDAE**
- Araneidae

**LYNCHIDAE**
- Araneidae

**Aranneae**
- Araneidae

**29 spp before 24 spp Aftr**
8 of Next same spp
Figure 23.7 The effect on the number of arthropod species of artificially reducing the size of mangrove islands. Islands 1 and 2 were reduced in size after both the 1969 and 1970 censuses. Island 3 was reduced only after the 1969 census. The control island was not reduced, and the change in its species richness was attributable to random fluctuations. (After Simberloff, 1976.)

Table 3. Summary of studies investigating cowbird parasitism rates (% nests parasitized) of natural avian nests as a function of distance from an edge.

<table>
<thead>
<tr>
<th>Distance from edge (m)</th>
<th>Habitat</th>
<th>P*</th>
<th>N°</th>
<th>type*</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>25</td>
<td>50</td>
<td>75</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>65</td>
<td>46</td>
<td>36</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>19</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>8</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>10</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*aLikelihood ratio (G²) testing whether parasitism rates were independent of distance from an edge.
*bTotal number of nests.
*cDF = deciduous forest, PR = prairie.
*dEdge was considered any gap in the forest canopy ≥0.2 ha (not 0.02 ha in the paper, S. Temple, personal communication).
*eBased on my analysis of Best 1978, Figure 4.