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COWBIRD-HOST INTERACTIONS

Brood parasitism, a frequency dependent homeostatic mechanism may negate Gause's principle in the field.

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Since the equilibrium pressure-frequency area is identified, and apparently is also the point for a stable population and the point at which the supra optimal system is operating with the good hosts' population in nature, it is assumed the good host-cowbird interaction is indeed in equilibrium. Empirical knowledge of the stability of parasitized populations, at least before the advent of pesticides, supports this reasoning. But perhaps more direct evidence is now available on the dynamics of this delicately balanced system.

Consider the Kirtland's Warbler data from the 1951 and 1961 censuses along with Mayfield's most valuable data on parasitism, 7 years of which were taken during that period. Although less than ideal (not covering the total period) these data would still seem to be the final, convincing quantitative evidence, from total population counts, which are needed for acceptance of the equilibrium hypothesis for cowbird parasitism. This relict, endangered population was apparently under less than 72 equilibrium cowbird pressure (58) and frequency (24). Its population apparently increased accordingly (16 percent in 10 years)[36], as is predicted by these patterns. The 1971 census by contrasts revealed a 60% decrease in numbers [37]. Evaluation of recent data on control (unmanaged for cowbird) areas[38] reveals a supra equilibrium pressure of 78.5, (32 frequency) as expected.

Summary

The cowbird-host interaction is investigated quantitatively and qualitatively by means of a density or frequency dependent pressure index. This index is the mean of the precent frequency of parasitism on hosts (incidence of nests parasitized) and the precent frequency of multiple eggs with respect to total cowbird eggs (intensity of parasitism).

Cowbird and host fledging success and losses to parasited correlate with the pressure index. Small hosts being vulnerable to competition for heat, food, and care with cowbird eggs or nestling are intolerant, give a low fledging success to the parasites and are rated poor hosts. Larger hosts being less vulnerable, are more tolerant, accept more eggs, raise more cowbird young and are rated good hosts.

The system of analysis is apparently accurate, assuming adequate sampling and the steady state. It is apparently predictive and has merit. Rigorous statistical tests reinforce the belief these are true population patterns.

Since good and poor host success and losses to cowbirds and cowbird success with each are apparently functions of cowbird pressure, algebraic formulae for same are presented.

Host egg size may be the simplest indicator of type of host encountered when same is inknown, since it has a direct bearing on ability to compete with the cowbird egg or young for heat, food, care, etc..

The Kirtland's Warbler is apparently not in the danger suspected from the cowbird. Egg size predicts this large warbler should be in the good host group. Also with all other hosts acceptance of a high cowbird multiple egg burdenand raising of a good portion of same to fledging indicates an ability to endure this parasitism without undue losses to their own population potential. The 1961 census also did not reveal the expected decline.

Critical examination reveals the apparent criteria for sampling used in the 1960 report was complete knowledge of total history of nests from egg laying through termination, successful or otherwise. When what seems to be the total nest sampling available is utilized in the traditional

fashion, with the added insights now provided by the parasite pressure-density or frequency reference frame, a balanced interaction pattern comparable to that of other good (less-susceptible) hosts is apparently established.

The patterns indicate the cowbird is density, or more accurately with this approach, frequency dependent, with some 22 species of two types of hosts. Frequency dependency is a prerequisted for a stable equilibrium. Cowbird pressure is dependent upon and can be translated into cowbird frequency relative to host numbers with a ratio of four cowbird females per 100 pair of hosts for each 10 units of pressure.

The finding of the equilibrium point, stable population frequency area and operation of this system in nature at the same 72 pressure - 28 frequency area, would seem ample evidence that the total supra- optimum, good host-cowbird interaction is indeed in equilibrium.

The Kirtland's Warbler population under less than this equilibrium pressure apparently increased, under greater than 72 pressure, decreased as these patterns predict. This may be the needed field evidence matching recent lab evidence to negate Gause's principle of competitive exclusion in these frequency dependent circumstances where relative competitive fitnesses are inversely proportional to the relative frequencies of the two species competing for the same limited resources.

Conclusion

Cowbird parasitism in theory and operation apparently fulfills the requirements for an equilibrium interaction. As first reported in 1958, and subsequently it is apparently a homeostatic mechanism.[39] These, by acting upon doomed or unneeded surpluses, tend to stabilize rather than harm populations by keeping them in line with amount of optimal habitat thus preventing violent oscillations.[40] Therefore, under natural conditions, they must be considered beneficial.