When the Use of Artificial Conspecific Attraction Methods Are Counter-Indicated

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Mentors
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Extinction in History
Extinction has occurred across continents, for species that inhabit land or water. Much of the history focuses on endemic species, or those that specifically inhabit an area. There is also random extinction that has a lot to do with the fact that a large portion of the population inhabited one area.

Conservation Efforts
This is when the model being shown in this presentation can be used. In the case of random extinction, the population dies because they live in one specific area. However, if the population were able to disperse and/or individuals of another population were able to be drawn to another area, then the possibility of extinction would decrease.

Effect of Future
The effect on the future is that species will continue to be threatened if proper conservation methods are not used.

Species Are Going Extinct
“Species are going extinct at a rate 100 to 1000 times higher than pre-human extinction levels” (Pimm, 1995)
Conspecific Attraction

**WHAT**
For animals, conspecific attraction is used when selecting a habitat. Numerous species practice conspecific attraction, which is considered a social cue. It allows the individual to make an assumption about the quality of life of a certain area.

**WHO**

Fruit Fly-*Drosophila melanogaster*
In an experiment conducted by Stamps et al used statistical models to demonstrate how virgin female fruit flies use conspecific attraction to inoculate fruit with nourishments and other small organisms. By doing this, they provide the larva with food for survival.

Black-Capped Vireo – *Vireo Atricapilla*
Ward and Schlossberg used artificial conspecific attraction to draw Black-Capped Vireos to new habitats. This territorial bird species is found through small regions of Texas, Oklahoma, and Mexico but have been threatened by habitat loss due to fire and parasites.

Ghost Crab-*Ocypode rotundata*
In the same study done by Stamps et al found that ghost crabs may use conspecific when working in foraging patches. They modeled this with statistics and probability.
WHY
With the understanding of conspecific attraction in bird populations, specifically territorial species, ecologists can protect an endangered population. With the use of projected population matrices models, there is also the possibility of not only protecting them but also increasing populations.

CSA places emphasis on habitat management. If there is an understanding of the suitable habitat of the bird populations, then the birds can be called to beneficial areas using song playback. Density dependence effects cause the population to reach a maximum.

Assessing the cues that cause birds to co-habitat are also important in the conservation of the species. This main clue is song playback as well as habitat quality. (In addition, the proliferation of offspring will also draw males to a specific site?) “If successful males are more likely to be site-faithful, dispersing males could use these site faithful males as an additional indication of habitat quality beyond structural habitat cues” (Ahlering & Faaborg). Social cue is the communication.
The population projection matrices will focus on the concerns that affect the success of artificial conspecific attraction and in turn the population of the birds. These variables are the Allee Effects, Environmental Stochasticity and Habitat Quality, and Philopatry.
**Allee Effects**
Density Dependence is a positive effect. In order for CSA to be most effective, the starting population has to have minimum viable population (Quasi Extinction Threshold) so that areas of different populations can thrive.

**Environmental Stochasticity and Habitat Quality**
The lower the environmental stochasticity and higher the Habitat Quality, the more chances the population has to survive and the more stable the population. When there is less ES, then the population probability has less variation and is more predictable.

“Low environmental correlation ...will effectively spread the risk of extinction over more than one independent population” (Robinson).

**Philopatry**
The successful males drawn to an area will return if mating was successful. In addition, juveniles and first time breeders will be drawn to new location. How this will affect the artificial removal of the juvenile and 1st breeders to the population.
This is the breakdown of the elements used in the matrices to determine the PPM model. The probability matrix uses beta probability distribution. The 2\textsuperscript{nd} vector is the population vector, and the 3\textsuperscript{rd} the projected population vector. The elements of the column are P1, P2, and P3. In the case of birds, P1, P2, and P3 are egg, juvenile, adult respectively.

Fecundity and Survival collectively are called vital rates.

\[
\begin{array}{ccc}
1 & 2 & 3 \\
1 & 0 & F_2 & F_3 \\
2 & S_{12} & 0 & 0 \\
3 & 0 & S_{23} & S_{33} \\
\end{array}
\times
\begin{bmatrix}
N_{1t} \\
N_{2t} \\
N_{3t} \\
\end{bmatrix}
=
\begin{bmatrix}
M_{1t} \\
M_{2t} \\
M_{3t} \\
\end{bmatrix}
\]

P – phase (3 phase breakdown)
F – Fecundity (offspring)
S – Surviving Offspring
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Recipient Population

<table>
<thead>
<tr>
<th>Transition Matrix</th>
<th>Population Vector</th>
<th>Projected Population Vector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3P</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
\begin{bmatrix}
0 & F_2 & F_3 \\
S_{1-2} & 0 & 0 \\
0 & S_{2-3} & S_{3-3}
\end{bmatrix}
\times
\begin{bmatrix}
N_{1t} \\
N_{2t} \\
N_{3t}
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The growth rate is the dominant right eigenvalue. If over or around 1, this means that the population is growing. If under 1, this means that the population can be slowly or rapidly declining depending on the value. This value is represented by the lowercase greek letter lambda.
The donor population has an average lambda above 1. When a percentage of juvenile individuals of its population are removed, the average realized lambda is slightly lower than the average lambda, but it is still over one. The recipient population has an average lambda below 1, thus the population is failing. However, after receiving juveniles from the donor population, the population begins to grow because average realized lambda is above 1.
The donor population has lambdas similar to those in Figure 8. In the case of the recipient population, it was failing and would quickly reach quasi extinction, but the addition of some juveniles created a new growth rate above 1.
This shows the growth rate of the recipient population increasing in a fashion similar to the other two implementations. This time, however, the donor population has actually failed. Its growth rate went from a value above 1 before individuals were removed to an average realized lambda of \(~0.95\).
Discussion

Artificial Conspecific Attraction

- shields population from affects of ES and HQ
- importance of multiple populations
- viable starting and receiving populations

Moreover, when ecologists and wildlife managers use artificial conspecific attraction, they are protecting the species from environmental factors that lead to the extinction of the species. The model used can also aid those in the field to use better discernment when considering conspecific attraction as a conservation method of a species.
Ahlering, M., & Faaborg, J. 2006. Avian habitat management meets conspecific attraction: If you build it, will they come?. The Auk, 123(2), 301-312.
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