Pine Snakes in the Long Run

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The Problem facing Pine Snakes

- Increasing and varying temperatures pose a threat to Pine Snakes.
- More male snakes being born can eventually lead to a decrease in population in the future.
- One goal is to determine if climate change impacts Pine Snakes in the state of Louisiana.
Assumptions

● The pine snake population is located in Louisiana
● Pine snakes are able to reproduce immediately after birth
● The initial male and female population are equivalent
● Each pine snake has one mate and lays eggs once per year
● The survival rate for male and female pine snakes is the same
Defining Variables

m=male pine snakes
f=female pine snakes
P= total pine snake population
b= average amount of offspring pine snake partners make
a= chance offspring survives
s=male to female ratio of pine snakes
A= Average annual temperature (celsius)
c= average annual temperature increase (Celsius)
d=change in annual survival chance, based on Evolutionary Pressure.
t= time (years)
Population & Temperature Models

\[ \frac{dP}{dt} = (m + f)(b - a) \]  \hspace{1cm} (1)

\[ \frac{dm}{dt} = \frac{dp}{dt} \cdot \frac{s + ds}{dt} (f) \] \hspace{1cm} (2)

\[ \frac{df}{dt} = \frac{dp}{dt} - \frac{ds}{dt} (f) \] \hspace{1cm} (3)

\[ \frac{dT}{dt} = A \cos(2\pi t) + c \] \hspace{1cm} (4)
Graph of Pine Snake Population
Additional Issue

How does evolutionary pressure affect population of Pine Snakes?

\[
\frac{da}{dt} = d
\]
Graph of Pine Snake Population (Evolutionary Pressure)
Conclusion

- Snakes in the long run
- Determine the effect of climate change on pine snakes
- Decline in pine snake population
- Further research ideas
References

Thank you

Questions?