A Focus on Feral and Free-Roaming Felines: Population Dynamics and Potential of a Long-Acting Contraceptive – *Slater*

Free-roaming cats are all cats allowed to roam off their owners' property and include owned cats, lost and abandoned cats, and unsocialized (feral) cats. While the sources of these cats may differ, the problems are similar and include public health concerns, predation of wildlife, nuisance complaints and the welfare of the cats themselves. Sterilization is commonly considered an important mainstay of population control in the U.S. Only a few population dynamics models have been used for free-roaming cat populations in which the objective was to predict how various methods of population control (or lack thereof) would impact population size over time.

Populations are groups of animals who live and reproduce together. They can be defined for our purposes in many different ways. For example, a population might be cats in a shelter, feral cats in a park, all the cats in a county, or pet cats in a state. Populations are influenced by many factors, including (1) population and individual level parameters (e.g., birth and death rates, age or stage of life, and sterilization status); (2) season and climate; (3) availability of males to breed all fertile females; (4) catastrophic events like hurricanes or disease outbreaks; (5) carrying capacity of the location (maximum sustainable population based on food and shelter); and (5) immigration/emigration rates for the population. Unfortunately, what data currently exist indicate that these factors are quite variable from one location to another.

The data that are usually collected for populations are called vital rates. These are birth (fecundity, fertility) rates, death (mortality, survival) rates, immigration and emigration. Death and emigration decrease population size; birth and immigration increase population size. Changes in these rates can cause a population to grow, remain stable or decrease.

Population dynamics models are a way of looking at a very complicated system in a simplified way. Despite this simplification, these models can provide extremely useful information and allow comparison of potential interventions under similar situations or provide projections of population size into the future.

In the study presented here, a matrix population dynamics model was developed to project population growth over time using permanent sterilization (like spaying or neutering) or a non-surgical three-year contraceptive. Data from the literature were used to estimate high, medium and low birth and death rates for a hypothetical population starting with 100 female cats (divided into juveniles less than one year old and adults one year of age or older). Only females were modeled because there are typically enough male cats available to breed all females. We assumed a closed population and no carrying capacity due to lack of reliable data. During a 10-year period, the matrix model led to exponential growth with about 4,000 cats at the end of the period, assuming the medium birth and survival rates. Permanent sterilization of 10%, 20% and 30% of the intact female population annually did not stabilize or decrease the population (the goal) except for combinations of low birth and low survival rates. At medium birth and survival rates, 51% of juvenile and adult cats needed to be sterilized permanently to stabilize the population, or 60% needed to be treated using the non-surgical three-year contraceptive. We assumed that the contraceptive was 100% effective and that we could re-trap cats after three years at the same rate as the initial trapping.

Juvenile survival rates were the most important variable for most combinations of high, medium and low fertility and survival. This is consistent with other small mammalian species that need to survive in order to reproduce. However, within a given combination of fertility and survival, sterilization of juveniles had a strong effect on the percentage of cats needing to be sterilized each year. This demonstrates the importance of sterilizing cats early, hopefully before their first litter, to have the greatest impact on the population size in a 10-year period.

Data from actual populations can be entered into these types of models to provide more specific information as data become available. Economic analyses comparing different interventions are also possible and desirable.

References

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