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Feral Cat Population Surveys and Management Options for the University of Hawai'i at Mānoa

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ABSTRACT: The effects of feral cats on Pacific island ecosystems are a well known and long standing pest problem. While control and/or eradication of feral cat populations have been successfully accomplished on several islands, they are typically in locations with little to no human population. The Hawaiian Islands have a human population of just over 1.2 million people, making certain feral cat control methods difficult, if not impossible, to implement. The University of Hawai'i at Mānoa, located in Honolulu, has a large number of feral cats living on it that often cause problems among the numerous stakeholders who use or frequent the campus. One of the primary concerns related to the cats is their feces, which may carry such diseases as toxoplasmosis and may cause illness in the employees that have to clean up after the cats. The university has implemented the use of feeding stations and litter boxes to obtain a population estimate and control the quantity of cat feces on the ground. But these two approaches have not been successful, due to inconsistent participation by the cat colony caretakers. Hence, little information exists about the status of the campus's feral cat population. In order to begin addressing the campus cat problem, our goal is to develop a survey method for estimating the distribution and size of cat colonies, conduct health assessments, and identify ownership of cats with microchips. We are conducting surveys to estimate the population size, to see if it changes over time, and to determine basic health indices of the cats. Ultimately, we expect to provide information on whether the feral cat population is changing over time and whether or not trap-neuter-release efforts are succeeding and reducing the population relative to removal, and status quo management options.

KEY WORDS: distance sampling, *Felis catus*, feral cats, population estimation, transects, trap-neuter-release, University of Hawai'i at Mānoa

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INTRODUCTION

Domesticated cats (*Felis catus*) have been introduced to nearly every part of the world, with some individuals becoming feral and moving into remote areas. In the United States, there are currently 148 million to 188 million cats, with 88 million estimated to be pets (~65% of these are free-ranging outdoor cats) and 60 to 100 million estimated to be feral or strays (Dauphine and Cooper 2009). Thus, free-ranging cats include outdoor pet cats, stray cats (cats that were once owned but were abandoned), and feral cats (unsocialized cats that were not previously owned as pets), all of which can have a detrimental effect on the environment. A large reason for this detrimental effect is that cats are opportunistic predators that primarily prey on small mammals, but still have a large impact on birds since they are a secondary food source (Lepczyk et al. 2004). Notably, however, birds can easily constitute the majority of a cat's diet (Hess et al. 2007). Furthermore, island ecosystems are less resilient to the effects of cat predation, as many native animal species have evolved without predators (Nogales et al. 2004). In fact, cats have been identified as either the sole or a contributing factor to at least 33 bird extinctions around the world, including the Stephen's Island wren (*Xenicus lyalli*), the Guadalupe storm petrel (*Oceanodroma macrodactyla*), and the Secorro Island dove (*Zenaida graysoni*) (Nogales et al. 2004, Dauphine and Cooper 2009).

In Hawai'i, domestic cats arrived with the first European ships in the late 1700s and soon thereafter

established feral populations on several of the islands (Hess et al. 2007). Since their arrival over 200 years ago, cats have become well known as predators of native animals, including many endangered species. For example, cats were the major cause of wedge-tailed shearwater (*Puffinus pacificus*) deaths during the breeding season (Smith et al. 2002) and are a major predator of other ground and burrow nesting sea birds in Hawai'i, including the Hawaiian petrel (*Pterodroma sandwichensis*), Newell's shearwater (*Puffinus auricularis newelli*), and Laysan albatross (*Pheobastria immutabilis*). Aside from predation, feral cats are also suspected of spreading diseases, such as toxoplasmosis (*Toxoplasma gondii*), to native wildlife in Hawai'i (Danner et al. 2007), as only cats have been found to spread toxoplasmosis on tropical islands (Work et al. 2002). Notably, several endangered species, including the 'Alalā or Hawaiian crow (*Corvus hawaiiensis*), the Nēnē or Hawaiian goose (*Nesochen sandwichensis*), and the Hawaiian monk seal (*Monachus schauinslandi*) have died due to infection from toxoplasmosis (Danner et al. 2007, Honnold et al. 2005, Work et al. 2002). Other major diseases found in feral cats in Hawai'i are feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV). A major concern with feral cats carrying these diseases is that they can easily be spread to other outdoor pet cats, which are extremely common in Hawai'i.

One location within Hawai'i where feral cats have been, and remain to be, a long-term problem is the

University of Hawai'i at Mānoa campus. The university is home to a number of feral cat colonies that are regularly fed by faculty, staff, students, and people unassociated with the university. Because of this feeding, there have been a number of concerns regarding feral cats on campus including sanitation, disease transmission, native bird predation, and aesthetics. Sanitation is a major concern because of litter from cat food containers and fecal and urinary waste near many campus buildings. As a result of the fecal waste, there has also been growing concern about disease transmission to humans, especially toxoplasmosis, since it can survive in the soil. Because bird predation does occur on campus, there is also concern that the feral cats are depredating several native species, such as the Pacific golden plover (*Pluvialis fulva*) and the white tern (*Gygis alba rothschildi*), that are known to utilize the campus. Finally, to many people who use and visit the campus, the feral cats are unattractive and thus detract from the aesthetic beauty of the university.

Because of the various concerns associated with feral cats on campus, the Facilities Management Office for the university oversees people who feed and care for the cats. Specifically, the Facilities Management Office requires cat caregivers and their assistants to register with them and follow rules set forth by the university in a service bulletin (University of Hawai'i 2008). According to this service bulletin, cat caretakers are responsible for providing a census of cats under their care, neutering, vaccinating, and providing identification for the cats they feed. In addition, feeding stations were provided by the university, and cat caretakers are responsible for maintaining the feeding stations while adhering to a feeding schedule. Although guidelines are in place for managing the cat population, they are not strongly enforced, and people not registered with the university still feed cats. In fact, cats are often fed multiple times throughout the day by multiple people, and several of the colonies also appear to be in poor health.

Other than cat caretakers performing censuses of the cats they care for, no formal study has been conducted to estimate the total number of cats on the campus. Hence, the main objective of this initial study is to estimate the abundance of feral cats on the University of Hawai'i at Mānoa campus. Following estimation of the feral cat abundance, future objectives include: 1) determining the effectiveness of the current cat management program; 2) assessing the general health of cats on campus; and, 3) implementing an adaptive management plan of different management techniques for controlling feral cats.

METHODS

Feral cats were counted along 3 transects in the university's upper campus on 4 consecutive nights in January 2010 from 6:00 PM to 7:00 PM. This time period was often utilized by cat feeders, so cats generally stayed in the same area each day. Each transect was traversed by 2 to 3 observers over approximately 30 minutes, who recorded cat sightings and location. Because we used a cluster method of analysis (see below), all cats in close proximity to one another were considered a cluster. Individual cats found alone were

considered their own cluster, although it is likely that these single cats were part of one of the other colonies. Perpendicular distances for the gravitational center of each cluster were measured in meters. Transect counts were subsequently analyzed in DISTANCE, a software package that accounts for detectability based upon species detections and distance from the transect, which produces an estimate of animal abundance (Thomas et al. 2009). Daily estimates from DISTANCE were averaged to provide an overall estimate of the number of feral cats on the upper portion of the campus. Results are presented as means and standard deviations.

RESULTS

Cats were found to occur in about 14 colonies (Figure 1) that generally stayed in specific areas on the campus. Colonies were usually found where feeding occurred and cats were often fed several times over a short period of time. Average colony size was approximately 7 cats (± 5.8 SD). The total number of cats observed on each survey was 92.5 (average of 2 separate surveyors), 87, 111, and 96, with an average of 96.6 (± 10.3 SD). Mean estimated cat abundance for the upper campus based upon DISTANCE was 286 (± 48.9 SD).

DISCUSSION

Our results to date show that there are a large number of feral cats on the University of Hawai'i at Mānoa campus, living in about 14 colonies. Although there was some daily variation in our estimates, they were fairly consistent. Some of the day-to-day variation can be attributed to human traffic and weather, as the second evening was colder and it had rained during much of the day. Because no previous cat population estimates have been conducted for the campus, it is unknown how our results compare to historical population sizes.

Several universities on the continental U.S. have implemented feral cat management programs, such as Stanford University, the University of Texas at Austin, Texas A & M University, the University of Florida, and Southern Methodist University in Texas. Each university manages feral cats through volunteer organizations that tend to promote trap-neuter-release (TNR) programs. A study was conducted by Hughes and Slater (2002) for Texas A & M University to assess a trap-test-vaccinate-alter-return-monitor (TTVARM) program. This program is similar to TNR but includes health assessments and monitoring after release. Cats were caught using the mark-recapture method then tested for diseases. Individuals positive for certain diseases were humanely euthanized. Cats were also recaptured and revaccinated throughout the 2-year study. It is considered to be very successful by TNR proponents, but the program was very costly and still did not resolve predation, sanitation, and disease transmission. Success may have been due to the fact that some cats were euthanized and tame cats were adopted out, which strictly speaking is not TNR. Funding, facilities, volunteers, and veterinary students were also available, which is not usually the case for other universities.

Aside from the estimation of cat abundance, we witnessed or found two instances of cat predation on

Figure 1. Map of the University of Hawai'i at Mānoa upper campus with cat colonies indicated with stars.

Image credit: Julson D. Pacheco, 2009.

nonnative birds during the first and fourth evening of surveys. On the first evening, a cat caught what appeared to be a Java finch (*Padda oryzivora*), while on the fourth night the carcass of a pigeon (*Columba livia*) that had been scavenged was observed near a large cat colony. The results to date will be used to conduct further assessments of the cat population on campus and may be used to measure temporal changes, and eventually be used to develop an effective management program.

FUTURE RESEARCH

Future studies being planned for feral cat colonies on the campus include further population surveys and health assessments. More line transect counts will be conducted, and other survey methods may be utilized to compare results and investigate change over time. Health assessments will include body condition, blood snap tests for FIV and FeLV, ectoparasite assessment, and fecal sample collection for toxoplasmosis testing and trapped cats will be checked for microchip identification. Management practices conducive for the reduction of the feral cat population on the university will be developed

and implemented under an adaptive management framework.

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