

# Characteristics of free-roaming cats evaluated in a trap-neuter-return program

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**Objective**—To determine characteristics of free-roaming cats evaluated in a trap-neuter-return program.

**Design**—Cross-sectional study.

**Animals**—5,323 free-roaming cats.

**Procedure**—Data collected included sex, maturity, pregnancy status, number of fetuses per pregnancy, cryptorchidism, and occurrence of complications or euthanasia.

**Results**—Adult cats represented 85% of the population, and 57% were female. Overall, 19% of adult females were pregnant, and mean litter size was 3.6 fetuses. Pregnancy rate peaked at 36 to 47% of all females evaluated in March and April and decreased to  $\leq 4\%$  from October through January. Cryptorchidism was observed in 1.9% of the males; 0.4% of the adult females had pyometra. Only 1.9% of the cats were already neutered. Euthanasia and unexpected death rates were 0.4 and 0.3%, respectively. The most common severe problems encountered included pyometra, neoplasia, surgical complications, diaphragmatic hernia, debilitation, and chronic inflammatory diseases.

**Conclusions and Clinical Relevance**—Neutering programs for free-roaming cats should include preparations to perform more spays than castrations. Typically, almost half of the female cats trapped during spring will be pregnant. Cryptorchidism is uncommon but is encountered on a consistent basis, so care should be taken to differentiate previous castration from retained testicles. Euthanasia of debilitated cats for humane reasons is rarely necessary, and unexpected deaths occur at a low rate. It is feasible and safe to neuter large numbers of free-roaming cats in large-scale clinics. (*J Am Vet Med Assoc* 2002;221:1136–1138)

Considerable controversy exists regarding appropriate methods of population control for free-roaming cats. Even the definition of various cat populations defies universal acceptance and is focused variably on ownership status, lifestyle, and level of socialization. Free-roaming cats are considered by some as those not confined to a yard or house, which is a definition based on confinement of the cat rather than ownership or socialization status.<sup>1,2</sup> Others have defined free-roaming cats as unowned cats, including feral and socialized cats.<sup>3,9</sup>

The size of the free-roaming cat population is unknown, although several sources suggest that it may approximate that of the owned cat population.<sup>5,7</sup> The population of free-roaming cats in our study area

(Alachua County, Fla), a county of approximately 216,000 people residing in 85,000 households, was estimated to exceed 38,000 cats in 1999.<sup>a</sup> Twenty-eight percent of households owned 44,000 pet cats, 83% of which were neutered. In addition, 12% of households fed unowned free-roaming cats, virtually none of which were neutered. Thus, 46% of the known cat population was unowned, not neutered, and likely contributed the most to local overpopulation. Similar results were reported in San Diego<sup>5</sup> and Santa Clara<sup>6</sup> counties in California, in which 36 to 41% of the total cat population was free-roaming and fed by 10 to 15% of households.

Many methods to control the population of free-roaming cat colonies have been attempted, including trapping, poisoning, shooting, and introduction of infectious diseases.<sup>1,3,8-11</sup> Methods that remove cats permanently often result in a new group of cats moving in to fill the void, unless the cats are in a geographically restricted area such as an island. Increasingly, groups throughout the world are attempting to reduce the free-roaming cat population through neutering followed by return to their environment. Removing the tip of 1 ear has become accepted internationally as the sign of a neutered free-roaming cat.<sup>12</sup> Thus, if a neutered cat is trapped, it can be released rather than undergo the stress and expense of repeated handling and anesthesia.<sup>2</sup>

Groups participating in trap-neuter-return (TNR) programs for free-roaming cats must maximize the number of neutering procedures they perform if there is reasonable expectation that overall cat numbers will be reduced. The general efficiency of large-scale cat neutering programs depends on the optimal use of resources such as staff time, financial assets, and space. The availability of information about general characteristics of the free-roaming cat population, including sex, age, and physical condition, may assist groups in planning programs that make the most effective use of their resources.

The objective of the study reported here was to determine characteristics of free-roaming cats evaluated in a TNR program in Florida.<sup>b</sup>

## Materials and Methods

Data were collected on 5,323 cats referred for neutering from July 1998 through December 2001 at 40 monthly clinics (mean  $\pm$  SD, 133  $\pm$  30 cats/clinic; range, 67 to 199 cats/clinic). The clinics were held at a single location in Alachua County, Fla. Alachua County encompasses 874 square miles located in the north central region of the state at latitude 29.70°N and longitude 82.40°W.<sup>c</sup>

Cats were trapped by their caretakers, brought to the clinic in the morning, and picked up the same afternoon. Minimum age for admission to the clinic was 3 months so that

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a rabies vaccine recognized by the state of Florida could be administered. Cats were removed from traps only after they were anesthetized by use of an injection of tiletamine-zolazepam-ketamine-xylazine, as described.<sup>13</sup> All cats were neutered and vaccinated (panleukopenia, rhinotracheitis, calicivirus infection, FeLV infection, and rabies), and the left ear was tipped. Any cat found to be already neutered had its ear tipped and was vaccinated prior to recovery from anesthesia. Prior neutering status was determined by detection of an obvious surgical scar or absence of ovaries and uterus as confirmed by exploratory laparotomy in females and lack of spines on the penis of males. Cats were not tested for FeLV or FIV.

A data collection form was completed for each cat by a veterinarian or technician. Data recorded included sex, maturity, pregnancy status, number of fetuses per pregnancy, cryptorchidism, serious medical conditions, and occurrence of complications or euthanasia. Maturity was defined as kitten (3 to 6 months old) or adult (> 6 months old) on the basis of dentition and opinion of the surgeon.<sup>14</sup> Necropsies were performed on all cats that were euthanatized or died. Descriptive statistics were calculated.

## Results

More females than males were admitted to 37 of the 40 clinics, resulting in an overall proportion of 57% females to 43% males. This proportion remained fairly stable throughout each year. Fifteen percent of the cats were kittens. Only 103 (1.9%) of the cats were already neutered. Most of these cats did not have tipped ears or other identification indicating prior neutering.

Overall, 19% of adult females were pregnant. Pregnancy was highly seasonal and peaked at 36 to 47% of all female cats evaluated in March and April. A smaller peak (25 to 30%) occurred in June through August. Thereafter, pregnancy rate decreased steadily to 4% or less from October through January (Fig 1). Mean  $\pm$  SD litter size was  $3.6 \pm 0.2$  fetuses (range, 1 to 8 fetuses). Twelve (0.4%) of the adult females had pyometra. All but 1 of the cats with pyometra were treated by ovariohysterectomy. The uterus of 1 cat with pyometra had ruptured, leading to septic peritonitis, and this cat was euthanatized at surgery because of inability to provide intensive postoperative care.

Cryptorchidism was observed in 43 (1.9%) males. Unilateral cryptorchidism (83%) occurred more commonly than bilateral cryptorchidism (17%), and unilat-

erally retained testicles were equally likely to be located on either the right or left side. The frequency of retained testicles in the inguinal location (52%) was similar to that for the abdomen (48%). Of the bilaterally retained testicles, 75% were abdominal.

Twenty cats (0.4%) were euthanatized for reasons including neoplasia (7 cats), debilitation (3), chronic inflammatory conditions including pododermatitis and stomatitis (3), diaphragmatic hernia (2), trauma (2), ruptured pyometra (1), advanced infectious disease (1), and surgical complication (1). Unexpected deaths occurred in 14 (0.3%) cats. Necropsies of cats that died revealed underlying causes in 64% of the cats, including surgical complications (5 cats), neoplasia (1), diaphragmatic hernia (1), cardiomyopathy (1), and heartworms (1). No specific cause of death was identified for 5 cats, and death was attributed to anesthetic intolerance or occult conditions.

## Discussion

These results suggest that TNR programs for free-roaming cats should include plans to perform more spays than castrations. This is similar to data reported for another large TNR program, the Feral Cat Coalition (FCC) in San Diego,<sup>4</sup> which admitted more females (55%) than males (45%) in a population of more than 12,000 cats from 1992 to 2000. The predominance of females in TNR programs contrasts with data for several reports of free-roaming cats in the field. Cats caught on Marion Island ( $n = 857$ ) near South Africa were equally distributed between males and females,<sup>10</sup> and those caught on Macquarie Island (246) near Australia included more males than females (56 vs 44%, respectively).<sup>15</sup> Cats in central Rome (301) included fewer males than females (44 vs 56%, respectively).<sup>16,17</sup> In a recent study, 55% of free-roaming cats on an urban Florida university campus (155) were male.<sup>6</sup> The frequent finding of equal to higher numbers of males in populations observed in the field versus the predominance of females referred for neutering suggests that females may be easier to capture, or that caretakers may preferentially select females for neutering.

The first pregnancies of the breeding season occurred in January. This is consistent with the first occurrence of the minimum day length required to induce estrus in cats at this latitude.<sup>18</sup> Later in the spring, almost half of the female cats evaluated were pregnant. A second smaller peak in the summer suggested second pregnancies during the same breeding season for some females, or first pregnancies for late-born kittens from the previous year. A similar pattern was observed in cats neutered in southern California<sup>4</sup> and Australia.<sup>11</sup> On the basis of a mean gestation period of 65 days and the pregnancy rate of 19% found in our study, each adult female cat is projected to produce a mean of 1.1 litters/y. This estimate assumes that pregnant cats are no more or less likely to be trapped than nonpregnant cats, and is consistent with previous findings that free-roaming cats can produce multiple litters during each breeding season. Depending on geographic location, mean annual number of litters per year in free-roaming cats has been reported to range from 0.98 to 2.0, with 4 to 5 fetuses/litter.<sup>10,11,15</sup>

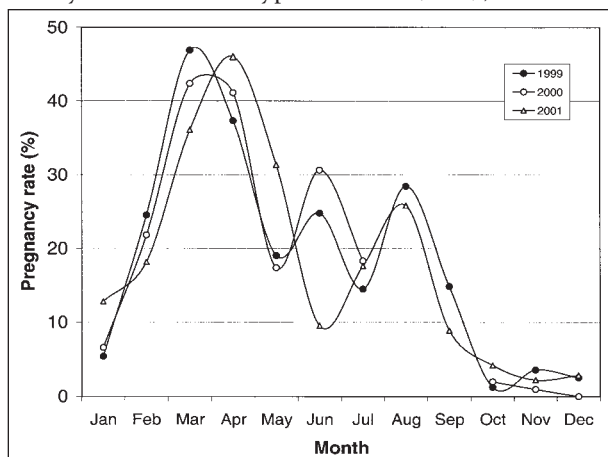


Figure 1—Pregnancy rates for 3,055 free-roaming female cats evaluated in trap-neuter-return clinics during 1999, 2000, and 2001. No clinics were held during August to September 2000.

The frequency and clinical findings of cryptorchid cats were similar to those reported for pet cats undergoing castration.<sup>19</sup> Most cats had unilaterally retained testicles that occurred with equal frequency on the left and right sides and equally in inguinal and abdominal locations. Bilaterally retained testicles were more likely to be found in the abdomen than in the inguinal region. The scrotum of bilaterally cryptorchid males may resemble that of castrated cats, so procedures should be established for confirmation of the true reproductive status, such as examination for penile barbs<sup>19</sup> or exploratory laparotomy. Although retained testicles are often infertile, they are usually capable of secreting testosterone,<sup>19</sup> which contributes to objectionable territorial behavior, aggression, and urine odor. Thus, it is inappropriate to leave retained testicles in place.

Few cats (1.9%) in this study were already neutered when evaluated. A similar low percentage (3%) was observed at the FCC clinics in San Diego.<sup>d</sup> This is in marked contrast to high neutering rates reported for pet cats, including 84 to 86% in California<sup>5,6</sup> and 83% in Alachua County, Fla.<sup>f</sup> In several reports, it is suggested that free-roaming cats are the most substantial source of cat overpopulation and euthanasia at animal shelters in this country, including the municipal animal control facility in Alachua County, Fla.<sup>5,6,8,e</sup> Therefore, plans to control free-roaming cats should be included in programs that seek to reduce the need for euthanasia of homeless animals.

Although free-roaming cats brought to the TNR clinic in this study were homeless, their general body condition was adequate, and the euthanasia rate for humane reasons was quite low. Fatal complications occurred at approximately the same rate as reported for pet cats undergoing anesthesia and surgery.<sup>13</sup> Although complications were uncommon, procedures should be in place for the management of surgical and medical emergencies. It is also helpful for veterinarians and cat caretakers to establish, in advance, protocols for unexpected findings such as cryptorchidism, pyometra, illnesses, and injuries.

To make the most efficient use of veterinary time and resources, organizers of TNR clinics for free-roaming cats should know the characteristics of the population that will be referred for neutering. Ovariohysterectomies are more complex than castrations, and treatment of pregnant, cryptorchid, ill, or injured cats is more complicated, time-consuming, and expensive, compared with routine neutering. Thus, preparations and supplies should be adequate to manage these conditions, especially during spring when pregnancies are common.

Euthanasia of debilitated cats for humane reasons is rarely necessary, and unexpected deaths occur at a low rate. It is feasible and safe to neuter large numbers of free-roaming cats in large-scale clinics.

<sup>a</sup>Woods JE, Levy JK. Human interactions with free-roaming cats in Alachua County, Florida (abstr), in *Proceedings*. Coll Vet Med Res Presentation Day, 2000.

<sup>b</sup>Operation Catnip, Gainesville Inc, Alachua County, Fla.

<sup>c</sup>US Census Bureau, Geography Division, 2000.

<sup>d</sup>Pait T, Feral Cat Coalition, San Diego, California: Personal communication, 2002.

<sup>e</sup>Levy JK, Gale DW, Gale LA. Control of an urban free-roaming cat population by trap-neuter-return and adoption (abstr), in *Proceedings*. Int Symp Nonsurgical Contraceptive Methods Pet Popul Control, 2002.

<sup>f</sup>Alachua County Animal Services statistics, 1994–2002, Gainesville, Fla.

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