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Title

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Journal

Proceedings of the Vertebrate Pest Conference, 16(16)

ISSN

0507-6773

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Publication Date

1994

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FERAL CAT CONTROL IN BRITAIN; DEVELOPING A RABIES CONTINGENCY STRATEGY

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ABSTRACT: Feral cat (*Felis catus*) control is required for reasons of public health, the welfare of cats themselves, and rabies control should an outbreak occur in Britain. A prerequisite to the control of feral cat colonies would be establishing their location. A method for locating colonies was developed and tested in four urban areas with a mean area of 157 sq km. Each area was surveyed on foot and by car to obtain the number and distribution of feral cat colonies. The method involved making inquiries at premises most likely to be frequented by cats ("high risk areas"). Most (94%) of the 116 feral cat colonies found (comprising approximately 874 cats) were found at the nine high risk categories. Few feral cat colonies occurred elsewhere, confirming that high risk categories were useful in locating finding feral cats. Information concerning the efficacy of cage trapping as a method of feral cat control was also investigated. A wide variety of baits were used in the traps including proprietary dry pelleted cat food, which was considered to be the most effective and was used in all the subsequent trap trials. In a series of 12 field trials, using live capture cage traps, between 82% to 100% of feral cats in the colonies were captured. Altogether 202 cats were captured at a rate of 21 cats per 100 trap nights.

Proc. 16th Vertebr. Pest Conf. (W.S. Halverson & A.C. Crabb, eds.) Published at Univ. of Calif., Davis. 1994.

INTRODUCTION

Cats in Britain may, according to circumstances, be referred to as pets, strays or feral and it is apparent that a range of cats exist with varying degrees of dependency on humans for food and sociality (Figure 1). One extreme may be seen on Monarch Islands (Randall 1972) where people no longer live but feral cat populations are sustained by feeding on rabbits and nesting birds. In contrast, a domestic cat confined almost totally to an upstairs flat in a city would be wholly dependent on humans for food, harborage, sociality and if neutered would be incapable of reproduction. A stray cat may be considered to be around 50% dependent on humans for food, harborage and sociality. Stray cats are usually solitary but are likely to eventually join a feral cat colony though some were observed associating with pet cats (Page et al. 1992). If a rabies outbreak were to occur in Britain, colonies of feral cats would be among the potential vectors of rabies that would be controlled in order to eliminate the disease. For rabies emergency plans, a feral cat colony has been defined as a group of three or more cats which the owner of the property where they occur would be unable to confine, if required to do so under the 1974 Rabies Act (Page et al. 1992). Because cats living in such colonies are unowned, for the purposes of rabies control, they are regarded as wild animals and will be controlled by the Ministry of Agriculture Fisheries and Food.

The control of feral cats is necessary for several reasons including public health, the welfare of cats and rabies control. Cats are hosts to parasites which affect humans including Campylobacter, Cryptosporidia (Bennett et al. 1985), *Toxocara cati* and *Toxoplasma gondii* (Langham and Charleston 1990). Toxocariasis may cause blindness in humans and Campylobacter and Cryptosporidia are a cause of diarrhea in humans. Cow pox virus which affects man (Baxby 1977, 1982) was isolated from feral cats which may be the natural host for the virus (Gaskell et al. 1983, Bennett 1989). Feral cats are particularly susceptible to feline panleucopaenia (Gillespie and Scott 1973). Southam (1981), and Passanisi and Macdonald (1990) reviewed the health hazards posed by feral cats.

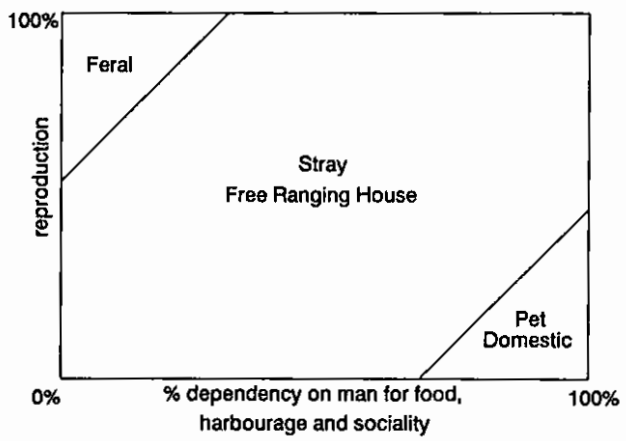

Figure 1. Diagram showing gradation of cats from entirely feral to wholly domestic.

Colonies of feral cats are not uncommon in Britain, particularly in urban areas and, although cats will not support a rabies epizootic alone (Wandeler 1991), their control would also be required in the event of a rabies outbreak. The control of feral cat colonies is labor intensive but necessary, as the use of vaccine bait,

whereby feral cats could be vaccinated against rabies without capture, has not yet been tested.

The aims of the study were: 1) to determine, during four field exercises, the number of feral cat colonies likely to occur in a typical area in which their control may be necessary, and 2) to test by means of a series of trials the efficacy of trapping as a method of control for feral cats.

METHODS

Surveys

Four field exercises were undertaken to assist the planning of control of feral cat colonies in an urban rabies situation and to obtain information on the most likely location of colonies, their frequency of occurrence and size. The exercises were carried out with cooperation, including the provision of an office, from the local authority, usually the Department of Housing and Environmental Health. Although feral cats can survive almost anywhere from isolated sub-antarctic Macquarie Island (Jones 1977) to semi-arid areas of Australia (Jones and Coman 1982), field experience (in which all residential areas of Bristol were searched) including questionnaires (Rees 1981), has shown that in Britain cats are more likely to be found in certain areas than in others and a concept of "high risk areas" proved useful, and these are listed in Table 1. A method of locating feral cats in urban areas was therefore developed involving survey visits restricted to "high risk areas." Prior contact was made by letter containing information about the exercise with the police, hospitals, and owners of the selected premises in "high risk areas."

The sizes of the four urban areas searched for feral cat colonies varied from 40 sq km to 228 sq km (Table 2). Each area was delineated by readily identifiable features such as rivers, estuaries, railway lines or motorways. Each area was divided into nine sectors and each of the nine participants in the exercise was given a list of the notified premises in one sector. Up to date information on "high risk areas" was obtained from the local authority planning department, from Ordinance Survey using SUSI 1:1250 scale maps (supply of unsurveyed information) and from indexed street maps (Geographers A-Z Map Company Ltd., London). The survey team completed a questionnaire card for each site visited (including all the premises which received letters before the exercise) giving a grid reference number enabling the information to be plotted onto a display map. Information was obtained also on the presence or absence of a feral cat colony and, if present, the approximate number of cats. Completed cards including negative returns were filed daily under the appropriate 1:10,000 scale map. Information was also sought during the survey from organizations and members of the public likely to know the whereabouts of feral cat colonies through the nature of their work and included pest control companies, the police, and local branches of national animal welfare organizations.

Table 1. Sites in alphabetical order where feral cat colonies were most frequent and termed "High Risk Areas."

1. Derelict Land
2. Dockyards
3. Factory Premises
4. Hospitals
5. Institutions
6. Large Industrial Sites, i.e., Steelworks, Chemical Plant
7. Military and other Service Establishments
8. Refuse Tips
9. Trading and Industrial Estates

Table 2. The number of feral cat colonies found in the four areas under survey.

Locality	Human Population (thousands)	Area (sq km)	Time (Work-hrs)	Colonies (n)	Density of colonies (colonies/10 km^2)	No. of cats (n)
Bristol	393	225.5	80.0	44	1.95	340
Swindon	91	40.0	17.7	6	1.50	32
The Wirral & Ellesmere Port	336	228.0	28.0	44	1.93	326
Oldham	220	136.0	32.0	22	1.62	140
Total		629.5		116	1.84	874

Trapping trials

In Britain trapping cats can be an emotive subject and the maintenance of good public relations was a high priority throughout the trapping trials. Several criteria had to be met before a site was considered suitable. These included (in order of priority) stipulations that: the site owners consented to the trial taking place, the site should have a colony of at least ten feral cats, the chances of trapping domestic cats should be minimal, and that a good relationship should exist between the site owners, the general public, employers, and employees.

In preliminary tests, a number of different baits were tested including prebaiting with portions of unskinned rabbit, raw fish, proprietary tinned cat food in the form of meat to which fish oil was added, and proprietary dry pelleted food. Dry pelleted food was found to be as effective as the alternatives and was therefore used exclusively without prebaiting towards the end of the trapping trials.

Initially, the following cage traps were considered: the Jackson single dividing wooden cat trap, the RSPCA (Royal Society for the Prevention of Cruelty to Animals) single cat trap, a badger cage trap (Cheeseman and Mallinson 1980) and the Eeziset trap (M D Components, Luton). It was soon apparent that the Eesiset type of trap was likely to be most effective for trapping cats. The trials were conducted using two types of Eeziset trap in the 21 months between May 1983 and January 1985 at the sites listed in Table 3. All but one (hotel) were "high risk areas." A pre-trapping census was made, using coat markings to distinquish individual cats, to determine the size of the colonies and the approximate distribution of the cats before the traps were placed. At about 1800 h, cage traps were baited and set to catch. Traps were inspected after four and seven hours and any cats caught were transferred to a holding cage in a secure warm dry place. The traps were inspected again at 0700 h and removed to a store or kept out of sight during the day. This procedure was repeated for between two and six nights and the number of cats and the traps which captured cats recorded.

RESULTS

Surveys

Altogether 116 feral cat colonies comprising an estimated 874 cats were found (Table 2). Approximately 10% of the high risk areas at The Wirral and Oldham had feral cat colonies and 9.8% of other sites for which cards were completed by the survey team (Table 4). The accuracy and thoroughness of negative returns was uncertain and it was likely that a small number of colonies was overlooked. For example, a colony was discovered while planning the exercise during a field visit to the Wirral peninsula, that subsequently was not found by survey; it was, however, included in the results. The time taken (survey time) to search the area was expressed as the summation of the number of hours taken by all members of the survey team (Table 2). The number, location, and proportion for each type of premise where the feral cat colonies occurred are given in Table 4, and show that most feral cat colonies (55%) were found in the "high risk areas" made up of factories, trading and industrial estates.

Trapping trials

In initial field tests it was found that on occasion cats avoided capture by the RSPCA trap (Jackson 1981) as baits were removed without the animal fully entering the trap (63.5 cm x 30.4 cm x 30.4 cm). The greater length (76 cm) of the Eeziset trap prevented this.

The type of bait used did not appear to affect trapping success significantly. Further trials were conducted to compare two similar non folding types of Eeziset trap differing mainly in the type of floor and end plate closure. Both traps caught cats but modifications were made to the original Eeziset trap to develop a trap specifically for use in a rabies situation in Britain. The specifications of the modified Eeziset trap (Figure 2), included a clear perspex end plate replacing the solid galvanized steel plate, and an open mesh (5 cm x 5 cm) floor in place of a solid metal floor. In addition provision was made to enable the D bar (Figure 2), to be raised from either side of the trap and removal of the ring and wire used to raise the door of the trap [as illustrated in Neville and Remfry (1984)]. A small metal bait plate was wielded onto the mesh floor of the cage close to the trigger plate. Baffle plates were fitted to prevent cats springing the trap externally. The trap measured 76 cm x 28 cm x 32 cm and weighed 7 kg.

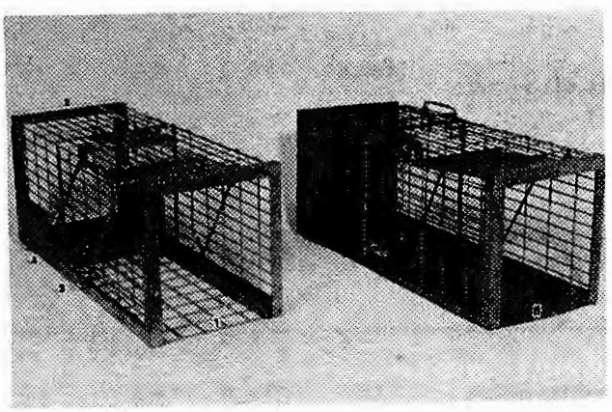

Figure 2. (A). Modified Eezieset live cage trap (left) with an open mesh floor (1), clear perspex end plate (2), setting handles on either end of D bar (resting on open entrance plate) (3), baffle plates (4), and trigger plate (5).

In the trapping trials between 12 and 50 traps were used with a mean per trial of 30.25 SE 3.15 (Table 5), at sites with between 9 and 29 cats. Two hundred and two cats were captured in 958 trap nights or 21.1 cats per 100 trap nights. Trapping success varied from 82% to 100% (Table 3), and the ratio of traps to the number of cats on site, gained from a pre-trapping census was a mean of 1:1.80 SE 0.19. Trapping success was assessed from a post-trapping census when any cats on site that were not trapped were recorded, together with observations of paw prints in stone dust (tracking tiles). Most of the trials continued until no more cats were captured (Table 3).

Table 3. Feral Cat Trapping Trials.

Site	Month	# of traps x nights	Size of site (ha)	Pre-trapping census	# of cats caught/ night Night	#	Total	Post-trapping census	Percent trapping success	Total cats on site
Steel Works	May	30 x 2	1.0	14	1	14	14	0	100	14
					2	0				
Army Camp	July	37 x 6	47.9	12-14	1	16	27	1-2	90-95	29
					2	2				
					3	6				
					4	1				
					5	2				
					6	0				
Farm	Dec.	36 x 2	0.3	22	1	20	22	0	100	22
					2	2				
Hotel	Feb.	24 x 2	0.5	17	1	16	16	1	93	17
					2	2				
Steel Works	March	16 x 1	0.2	7	1	10	10	0	100	10
Farm	March	36 x 2	0.2	13	1	17	18	1	95	19
					2	1				
Army Camp	April	36 x 1	0.8	8	1	12	12	0	100	12
School	May	40 x 3	0.4	15	1	13	18	4	82	22
					2	5				
					3	0				
Trading Estate	Oct.	12 x 4	6.2	11	1	17	21	0	100	21
					2	2				
					3	2				
					4	0				
Army Camp	Dec.	22 x 3	0.5	9	1	8	8	1	89	9
					2	0				
					3	0				
Royal Naval Base	Dec.	24 x 2	0.8	14	1	12	16	3	81	19
					2	4				
Army Camp	Jan.	50 x 3	16.7	--	1	16	20	0	100	20
					2	3				
					3	1				

Table 4. The number and proportion of 116 feral cat colonies found at "high risk areas" in each survey.

Locality	Bristol	Swindon	The Wirral	Oldham	Total
High Risk Areas					
Derelict Houses	4 (9.1)	0	0	2 (9.1)	6 (5.2)
Docks	4 (9.1)	-	9 (20.4)	-	13 (11.2)
Factories, T. Estates	31 (70.0)	3 (50.0)	17 (38.7)	13 (59.2)	64 (55.2)
Hospitals	2 (4.5)	3 (50.0)	1 (2.3)	0	6 (5.2)
Institutions	1 (2.8)	0	0	0	1 (0.9)
H. Industrial Premises	0	0	10 (22.7)	2 (9.1)	12 (10.3)
Chemical Plants	0	-	2 (4.5)	1 (4.5)	3 (2.6)
Total	42	6	39	18	105
Total High Risk Sites Visited	-	-	239	332	
Other Areas					
Shops	2 (4.5)	0	0	1 (4.5)	3 (2.6)
Farms	-	0	4 (9.1)	3 (13.6)	7 (6.0)
Egg Packing Station	-	-	1 (2.3)	-	1 (0.8)
Residential Area	0	0	0	0	0
Total	44	6	44	22	116
Total Sites Revisited	-	-	302	351	

Table 5. Number of traps and cats captured at 12 trapping trials.

Sample Subject	Mean	S.E.	Maximum	Minimum
Number of traps	30.25	3.15	50.00	12.00
Number of cats	17.83	1.66	29.00	9.00
Trap density	0.19	0.11	1.30	0.01
Number of traps per cat on site	1.80	0.19	3.00	0.60

DISCUSSION

Given the right conditions (including a predictable source of food) feral cats can survive in most situations, although colonies arise owing to human influence either directly or indirectly. Most show some dependency on humans for food and harborage and will show a greater tolerance of humans in inclement weather such as unseasonal heavy snowfalls. This has obvious survival value, for as a result temporary food and shelter are likely to be provided by man. In a study of the abundance of cats in an area of Poland of which approximately 10% were feral, Romanowski (1988) reported a significant correlation ($r=0.98$) between the abundance of cats and the number of inhabited buildings. Other studies have shown a marked difference in the frequency of cats in urban areas. In a study of two urban residential areas of Baltimore, Maryland, Childs (1990) found the density of owned free ranging cats in one area was 7.0 cats per ha and 2.8 in another.

In the surveys reported here, most (55%) of the 116 colonies were at factories and trading estates with only 5% at hospitals. In contrast, a study in Great Britain reported by Jackson (1981) found that 65% of 287 colonies were at hospitals. The difference may be owing to relatively few hospitals being included in the present surveys, and perhaps over representation of hospitals, a point which was acknowledged by Rees (1981) in his survey, in which 69% of 704 colonies were at hospitals, industrial sites and private residential properties. In the present study, densities of cat colonies were similar on all sites (Table 2) and data were insufficient to establish any relationship with human population density.

Although knowledge of the frequency and abundance of feral cats is imprecise, few cats were found outside the high risk areas, confirming early field experience in Bristol. Information on feral cat colonies based on local knowledge of the area was obtained and while one colony eluded detection by survey, all the colonies known locally to the organizations approached were found independently and without prior knowledge by the survey team. Although local knowledge did not add to the number of colonies found by survey in this study, such information will continue to be part of the rabies contingency planning in feral cat control.

The use of cage traps to capture cats is an established practice (Neville and Remfry 1984, Jackson 1981, Veitch 1985) and one promoted by the Cat Action Trust and Cat Protection League (Passanisi and Macdonald 1990). The modified Eeziset trap was used in trials for a number of reasons; cage traps with open mesh floors (Veitch 1985) weigh less than those with a solid metal floor and can be placed more firmly on the ground when on grass or earth, enabling a cat to enter a trap without noticing a marked change in the nature of the ground to that surrounding the trap. Possibly the clear perspex end plate of the modified Eeziset trap is not perceived as a barrier by a cat entering the trap and is likely to reduce the "closed-in feeling" (Veitch 1985) of the trap and so enhance its effectiveness.

Trapping only at night in the present study assisted the maintenance of good public relations. This approach was unlikely to affect capture rates significantly since cats were most active during the night, as reported in an area of New York (Haspel and Calhoon 1993) and at Avonmouth docks in Britain (Page et al. 1992) and were therefore more likely to be trapped at night. Proprietary dry pelleted cat food was considered the optimum bait and was used exclusively in the last five trials, because it has a number of advantages over other baits. It does not decompose or foul the traps in hot weather, and does not attract flies. It is also clean and economical to use and was an attractive bait in many situations. Preliminary tests of baits revealed little difference between baits in this field study, although Eason et al. (1992) found a preference for a dry pellet bait by cats in pen trials of non toxic baits. Prebaiting traps was found to be of no advantage, and it was found that it was more effective to replace a trap on the same site than to relocate after a cat had been caught. In the trials up to 57% of the cats were captured in traps that were not resited after the first capture.

Approximately twice as many traps as cats to be controlled were used at each site, and this deployment of traps is recommended for cat control in rabies contingency planning. The preliminary investigations required before trapping starts, will establish the approximate number of cats, their distribution and the nature of the site, and this information can be used to determine the number and locations of traps. The traps should be concentrated in areas most frequented by cats, rather than widely dispersed, to enable most of the cats to be captured quickly as in the present study.

Most feral cats are not difficult to catch and the trapping regime with frequent visits during the night when most cats are active (Page et al. 1992) enabled most of the cats on site to be "mopped up" quickly during a few nights of trapping (Table 3).

However, the high proportion of cats on site that were trapped in the first two nights conceals the difficulty of catching some trap-shy cats. A measure of trap shyness was observed in the difference between the proportion of cats captured on the first and second nights (Table 3). In the twelve trials the difference was not quite statistically significant, $x^2= 3.59$, $0.05<p<0.1$. Langham and Porter (1991) prebaited traps to encourage wary cats to enter traps though this had no effect in the present study. Page et al. (1992) pointed out that alternative methods of capture are required for such cats.

Complete eradication of a typical urban feral cat colony is possible but, for the site to remain free of cats, it is essential that the provision of food ceases to prevent reestablishment of a colony. It is likely that the provision of food attracted the cats to the site originally.

In conclusion, the capture of feral cats in live cage traps is a useful method of control and one which does not necessitate their destruction. The method is in the interests of public health, cat welfare and, should rabies appear in Britain, prevention of the spread of the disease to domestic pets, wildlife, and man.

ACKNOWLEDGMENTS

This study was funded by the Ministry of Agriculture, Fisheries and Food. We are grateful to Mr. S. D. Langton, Dr. G. Smith, Dr. P. Smith, and Dr. J. Ross for critically reading the manuscript and for providing valuable comments.

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