



1. Introduction

The domestic cat, *Felis catus*, L. , has long been an accepted member of many households in Britain. However, despite its domestic status, the cat has been subjected to little selective pressure by man, in comparison with other domestic animals. Physically, it differs little from its wild ancestor, except in hair length and colour (see Chapter 9), and its smaller body size.

There has been considerable controversy over the exact origin of the domestic cat, and indeed of the classification of the small cats in general. It is now usually accepted that *F. catus* was derived from the desert cat *Felis libyca* Forster, these being considered by some to be conspecifics, together with the Scottish wild cat, *Felis silvestris* Schreber, (Todd 1978), and also Pallas' cat, *Felis manul* Pallas (Zeuner 1963). There is evidence that *F. catus* will hybridise with both *F. libyca* and *F. silvestris*. The Scottish wild cat differs from the domestic cat, however, not only in appearance, but also in temperament, and is said to be impossible to tame. It seems likely that the domestic cat, although originally derived from *F. libyca* stock, which was imported into Britain by the Romans (evidence of domestic cats being found dating from about the fourth century AD), later hybridised with the native 'sub-species'.

The cat was one of the last animals to be domesticated by man, although the exact date when it achieved this status is unknown. The earliest positive evidence dates the domestication of the cat in Egypt at about 2000 BC (see Necker 1970, for a chronological summary). Earlier cat remains are assumed from context to have been wild animals; it is not possible to distinguish domestic cats by skeletal remains alone.

Although the domestic cat is often found to live as a pet, it has an independent, predatory nature, and is quite capable of surviving on its own. Farm cats may hunt for their prey over large areas, in a way of life which may be described as 'free ranging'. Some domestic cats may leave their owners and fend for themselves. These cats may return to their homes at a later date, and are described as strays or vagrants. A true feral cat is one which has been bred in the wild, and lives independently of man. However, there is some variation in the degree to which feral cats are independent, rural cats in isolated areas becoming similar to wild cats in their habits (Corbett 1978), whereas urban cats usually obtain a large proportion of their food from garbage and handouts. The R.S.P.C.A. has defined feral cats as 'not domiciled with man', thus

including all free-living cats. It is in this sense that the term is used throughout this thesis, although there is some justification for confining the term to those populations of cats which are truly independent.

The domestic cat is a relatively long-lived animal, sometimes reaching ages of nearly thirty years. However, eight to ten years is the normal life-span, for animals surviving more than five years (Comfort 1956). The age at which the animal becomes sexually mature differs between toms and females. (It should be noted that male cats are also referred to as 'toms' in this thesis, this being a traditional term. However, females are not referred to as 'queens', since this is a modern cat breeders term, and seems inappropriate when applied to the dockyard cats.) Males are said to become sexually mature at 11 months (Kling, Kovach & Tucker 1969), 10 to 14 months (Robinson 1977), or 36 weeks, with a minimum body weight of 3.5 Kg (Scott 1970). Females are said to become sexually mature at six to eight months in the laboratory, and at fifteen months in free-ranging animals (Kung et. al. 1969), or at 20 to 23 weeks, with a body weight of 2.3 to 2.5 Kg (Scott 1970). Cats are induced ovulators and polyoestrus, with several periods of oestrus in the spring and autumn, if unmated (Asdell 1946). The females are receptive for four to six days after the commencement of oestrus if they mate, and for up to ten days if they do not. The oestrus cycles occur at intervals of two to three weeks. There is no post partum oestrus in the cat, oestrus occurring two to three weeks or more after weaning (Dawson 1950). The gestation period is 60 to 65 days (Schneirla, Rosenbach & Tobach 1963), and in housecats most litters are born from mid-March to mid May, and mid-July to late August. Females are anoestrus during the winter months, and this is regulated by day-length (Dawson 1941, Scott & Lloyd-Jacob 1959). The male shows a stable sexual response throughout the year (Kling et. al. 1969).

The average litter size is one to eight, with a mode of four, in laboratory conditions (Scott 1970). Kittens' eyes open at seven days (Kolb & Nonneman 1975), or nine to 20 days (Ewer 1973), and they are mainly immobile until they are three weeks old. Weaning commences at about four weeks, and is usually completed by about seven to eight weeks (Scott 1970). Cats are independent by the age of about six months (Ewer 1973), and fully grown at about ten months.

van Aarde separated cats into three age classes (juvenile, adult and subadult), on the basis of tooth replacement and body size (van Aarde 1973). Thus cats were classed as juveniles until 16 weeks, and subadults until 28-30 weeks. Fitzgerald and Karl (1979) classed cats weighing less than 1.5 Kg or known to be less than six months old as kittens, and all other cats were classed as adults, since they appeared to be independent. Because of the apparent variability in the age at which cats become sexually mature, it is difficult to delimit suitable age classes.

The behaviour of cats has been studied primarily under laboratory conditions. The vast majority of studies have been for neurophysiological investigation, with apparently more literature on induced abnormal behaviour than on normal behaviour.

Prior to this study, the only detailed data on the behaviour of free-ranging cats were those of Leyhausen (1965, 1973). He concluded that these cats were not as asocial as had previously been considered, but he stated that each defended a home against neighbouring or trespassing cats. He considered that there was a 'relative social hierarchy' between neighbours, which depended on the location and time of meeting,

but that there was also an 'absolute social hierarchy', mainly within the litter and among adult males, but also in evidence when cats were crowded.

West (1974) noted that three feral mothers left their kittens when these were about four months old, appearing to move to another part of their ranges, and leaving the kittens to fend for themselves.

The only other studies to specifically examine the behaviour of free-ranging cats are two recent studies on farm cats (Macdonald & Apps 1978, Laundré 1977), which are discussed in Chapter 6.

There are some narrative accounts of domestic cat behaviour, which provide a useful background impression of the housecat's behavioural repertoire, and often include summaries of the cat's history and breeding. A good example of this is that of Necker (1970). A useful popular account is provided by Beadle (1977), who also gives a bibliography.

There has been a relatively large number of studies on the behaviour of cats in laboratory conditions, much of which has been ably reviewed by Fox (1975).

A large portion of the work conducted concerns the behaviour of kittens and its development (see more recent work by Barret & Bateson 1978, Kolb & Nonneman 1975, and West 1974). The vocalizations of housecats have been considered by Moelk (1944), who conducted a phonetic study. More recently, the vocalizations of kittens have been examined (Hartel 1975, Haskins 1979). Dominance has been investigated among laboratory cats (Baron, Stewart & Warren 1957, Cole & Shafer 1966, Winslow 1938, 1941, 1944), and in some cases dominance by one individual, and in other cases a linear hierarchy, was found. The felid social system was compared with that of canids by Kleiman & Eisenberg (1973). They pointed out that most felids seem to have evolved primarily as solitary hunters and feeders, and that the female and her offspring are the basic social unit. They considered the lion to be the only truly social felid. However, they noted that the Felidae and Canidae demonstrate an equivalence in signal complexity when absolute numbers of signals are compared, although it is difficult to quantify the information content of the signals. Kiley-Worthington (1976) examined the tail movements of ungulates, canids and felids, and appears to consider that the tail movements of cats have little social significance, concluding that this reflects their solitary nature. The behaviour of the dockyard cats is described in Chapter 6, and compared with the observations of felid behaviour from previous studies.

Ecological studies of feral cats have been concerned primarily with food habits, and these have been reviewed recently by Fitzgerald & Karl (1979). They concluded that feral cats are mainly predators of small mammals, although some birds and insects may also be taken. McMurry & Sperry (1941) examined the stomach contents of cats from an urban area, and found that garbage accounted for up to two-thirds of the diet. They also found that insects, which are usually found in only small quantities in the stomach contents, accounted for 17-25% of the diet. The insects found were mainly Orthoptera, including crickets, grasshoppers and cockroaches. Other studies concerning the ecology of rural cats and housecats are reviewed in Sections 4.1 and 7.1.

There have been studies of urban mammals other than cats. Especially interesting are those concerning feral dogs (Beck 1973, Fox 1978), and one concerning a suburban

raccoon population (Hoffmann & Gottschang 1978), involving similar problems to those encountered in the present study.

Although the main function of the present-day domestic cat seems to be largely decorative, it was originally valued by man as a hunter of rodents, and was made welcome in barns, in granaries, and on board ships. It is in this capacity that cats must first have been introduced into Portsmouth dockyard, and over the years they have developed into a well-established population.

With the advent of chemical methods of rodent control, and increased standards of hygiene, the dockyard cat is no longer considered to be a useful animal, and its official status is that of a pest. Until October 1975, when this study commenced, cats in Portsmouth dockyard were trapped by pest control officers, using R.S.P.C.A. approved cattraps, and destroyed by gassing with chloroform. The main reason for the cats' pest status is the nuisance they cause by fouling, since most areas in the dockyard are covered with tarmac or cement, and the cats cannot bury their faeces. Dead cats are also a problem, especially when they rot in inaccessible places. Further complaints are caused by cat fleas (*Ctenocephalides felis* (Bouche)) biting dockyard workers. Tomcats also cause complaints when they spray urine onto stored materials.

Despite the objections to the cats, there are many cat-lovers in the dockyard, who provide food and shelter, and sometimes even veterinary care. Some of the cats have been fitted with collars, since this labelled them as 'pets', which were not destroyed if caught by the pest control officers. The cat-lovers did all they could to prevent cats being destroyed, not only by putting collars (with some difficulty) on cats which were not tame, but also by releasing cats from traps.

A few collared cats live inside buildings for most of their lives, are friendly, and are essentially domestic cats. However, by the adopted definition, they are still 'feral'. The only true domestic 'housecats' in the dockyard live in some of the few residences.

In 1975, with rabies spreading across Europe, the dockyard cats ceased to be merely an inconvenience, and became a potential threat. In view of the apparently large number of cats in the yard (estimates ran as high as a thousand), and the fact that the years of trapping and killing of cats by the pest control officers had had little observable effect on the population, it was decided by the dockyard authorities that a scientific study of the cats should be conducted. This offered an ideal opportunity to study an animal about which, despite its close association with man, there was surprisingly little scientific information. Since virtually nothing was known concerning urban feral cats, this study aimed to cover as many aspects of population ecology as possible, with special emphasis on population dynamics.

This study was financed by a NERC-CASE studentship, from October 1975 to September 1978, although some field observations were also undertaken in 1979. Although the dockyard authorities did not provide any direct funding, they provided all the facilities required. These included an office in the north-west part of the dockyard, provision of maps, access to copying and photographic facilities, and publicity through the dockyard newspaper. They also provided passes for entry into the dockyard, and help and co-operation on all matters.