

# The Social Lives of Free-Ranging Cats

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Factors impacting FRC conspecific interactions include cat body size, cat social rank, cat individuality, cat age, relationship to conspecific (kin/familiar), cat sex, level of human caretaking, presence of food, the health of the individual, or sexual status of conspecifics. Interspecies interactions also occur with humans and wildlife. The human's sex and the weather conditions on the day of interaction have been shown to impact FRC social behavior. Interactions with wildlife were strongly linked to the timing of cat feeding events. These findings support the idea that FRCs are “social generalists” who display flexibility in their social behavior. The social lives of FRCs exist, are complex, and deserve further study.

Felis silvestris catus

cat

free-ranging cat

social behavior

cat colony

social generalist

## 1. Introduction

Domestic cats are ubiquitous across the human landscape. They are found living as companions in human homes and living as free-ranging cats (FRCs) on city streets, in parking lots, on farms, and other outdoor locations where resources such as food, shelter, and mates are plentiful <sup>[1]</sup>. The social system of FRCs has been described as “facultative sociality” and domestic cats display much flexibility in their social behavior <sup>[1][2][3]</sup>. FRCs are found living both solitarily and in groups. Cat groups live at low and high densities, ranging from <1 cat per km<sup>2</sup> to over 2500 cats per km<sup>2</sup> <sup>[4]</sup>. Despite the diversity of social situations in which FRCs live, the degree to which FRCs are social is still debated <sup>[5]</sup>.

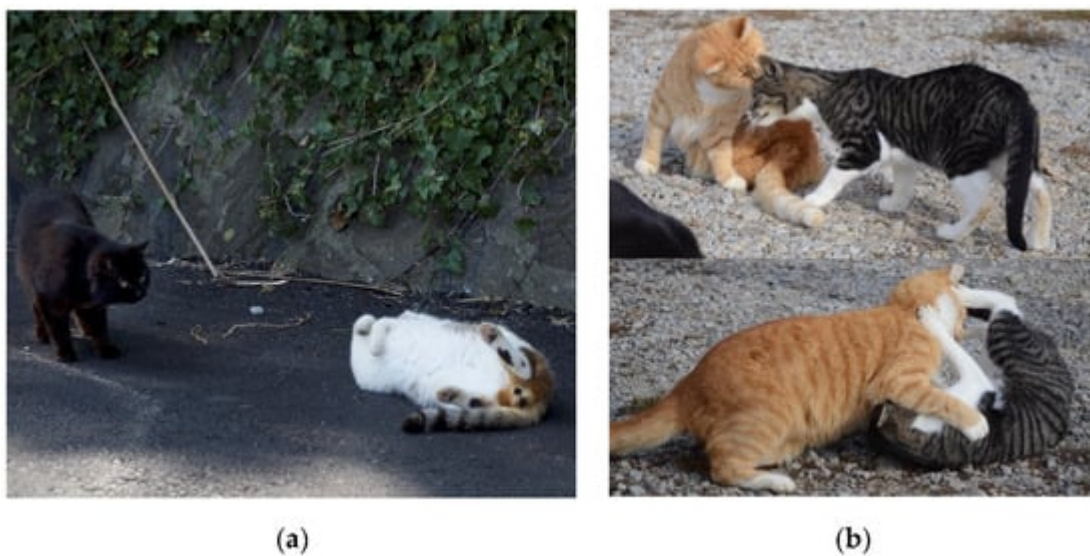
FRCs include any domestic cat (*Felis silvestris catus*) that has no constraints on their movement. FRCs can be composed of cats of various levels of experience with and dependence on humans. Key terms related to FRCs are defined in **Table 1**. Individual FRCs will differ in their socialization experience (e.g., duration of socialization, number of social partners, when the socialization occurred in the development of the individual) and the degree to which they are domesticated (e.g., number of generations or strength of selection) <sup>[6]</sup>. As Udell and Brubaker state, “The interaction between domestication and socialization best predicts the social phenotype an individual will display as an adult” (<sup>[6]</sup>, p. 329).

**Table 1.** Definitions of key terms related to free-ranging cats (FRCs).

Social behavior can be defined as any interaction between two or more individuals of the same or different species <sup>[7]</sup>. These interactions are non-predatory and can be placed into several behavioral categories. These include

affiliative behaviors, which are friendly social behaviors that function to form, maintain, or strengthen a social bond. Agonistic behavior is any social behavior related to aggression, submission, or threatening behavior [8]. Reproductive behaviors include any interactions related to mating such as courtship, mounting, and copulation. Caregiving behaviors include social behaviors related to the important survival interactions that occur between a queen and her kittens [9][10].

Although it may seem simple to assign behaviors to specific categories, some behaviors may cross into multiple categories [11]. For example, a social roll (rolling onto back, exposing belly to a social partner) could be considered either affiliative or submissive (see **Figure 1a**). In these cases, the category of the focal behavior will depend on the context of the behavior. For example, if allogrooming (grooming a social partner) occurs between a queen and her kitten, it would be considered caregiving, but if allogrooming occurs between adult conspecifics, it would be considered affiliative. Additionally some behaviors may initially appear to fall into multiple categories. This can be seen with several behaviors involved in play. Play behaviors may resemble aggression (e.g., biting or cuffing), but they can be distinguished as they are not done to their full extent and they are often preceded or followed by affiliative behavior (**Figure 1b**, discussed further below). In all, behavioral categories are not always clear-cut but can be clarified by examining the context in which they occurred.



**Figure 1.** Photos of FRC social interactions taken by K. Vitale: **(a)** a social roll is displayed from one FRC to another; **(b top)** a male tabby cat rubs his head against an orange male as a greeting; **(b bottom)** interaction continues into play and full contact social play is seen between the dyad.

In many animal species, social relationships form between individuals with a history of interactions. In some cases an affiliative bond can form, defined as “long-term relationships established among individuals and characterized by high rates of friendly and peaceful interactions” ([7], p. 1). The idea that FRCs form social relationships has been debated and Spotte stated that FRCs “should be considered solitary—not social” ([5], p. 49). Therefore, the aim of this review is to explore the literature on the social behavior of free-ranging cats. This paper will discuss which

social behaviors have been studied in FRCs and the main findings of each study in order to make conclusions about the social nature of FRCs.

## 2. Findings: Solitary or Social?

A review of the literature on FRC social behavior highlights several key findings. The first is that several factors influence FRC social behavior (**Table 2** and **Table 3**). For conspecific interactions, these factors relate to characteristics of the cat's themselves (e.g., sex, age, sexual status, and body size), relationships to the conspecific (e.g., kin, familiar individual, and group member), or factors in their environment (e.g., level of caretaking). For interactions with humans, factors in their environment, including the sex of the human and weather conditions, have been found to impact FRC–human social behavior.

Additionally, FRC groups display much variability in their social behavior. The intraspecific social dynamics of FRCs differ based on group of cats surveyed. Some cat groups display strong social bonds with preferential affiliations among group members (e.g., <sup>[12]</sup>) while other cat groups are more loosely associated and display little to no social interaction <sup>[13]</sup>. Even FRCs living in similar environments can differ greatly in terms of social behavior, as seen in the studies with dockyard cats. Dards reported that Portsmouth FRCs lived socially in groups <sup>[14]</sup> while Page et al. found that Avonmouth Dockyard cats displayed primarily solitary living <sup>[15]</sup>. In some cases, a collection of cats may not qualify as a social colony, especially for groups that primarily engage in solitary behavior or only have loose affiliations (See **Table 1**). However, it is evident from a review of the literature that cat groups often have non-random associations and social relationships within the colony.

For cats that do form social groups, the use of affiliative behavior is often seen. Familiarity between cats seems to be an important factor impacting use of affiliative behavior. Familiarity between conspecifics may also be one important factor impacting the formation of “preferred associates” <sup>[14][12]</sup> and kinship may play a role as well <sup>[12]</sup>. Cooperative behaviors between FRCs were also noted, specifically among members of the same social group. These include behaviors such as communal denning, and cooperative care in which adult females nursed and cared for kittens indiscriminately <sup>[16][12]</sup>. Additionally, physical fights involving direct contact between cats are infrequent. Instead, agonistic interactions that involve submissive behaviors and body posturing (e.g., use of head aversion to avoid eye contact) are observed. It is possible that a lack of social relationships within a group may increase aggression between cats in the same location <sup>[17]</sup>.

In all, Dards stated of the Portsmouth Dockyard cats, “It is evident that the domestic cat is capable of a much more complex social structure than has previously been thought, and that this also extends to the adult males, which at first sight appear to be independent of it” (<sup>[14]</sup>, p. 151). Similarly, Macdonald et al. state of the Church Farm cats, “there are many non-random relationships between these cats” (<sup>[12]</sup>, p. 45) and these findings, “indicate that the colony had a social structure and was not simply an aggregation and that the cats’ social interactions were structured according to distinct social relationships” (p. 59).

Although several of the reviewed studies have found that groups of cats form colonies with distinct social relationships, not all studies of cat social behavior have found the same results. Page et al. note of the Avonmouth Dockyard cats, “The cats were mostly solitary rather than group-living, with little contact or social interaction” ([15], p. 263). Additionally, cats at a waste site were often observed eating rubbish simultaneously, but cats remained mainly separated and interaction was infrequent [13]. Cats were observed interacting on only 35 occasions out of 330 observations, which accounts for just 10.6% of observations. These examples highlight the social flexibility of the domestic cat and its ability to form strong bonds as well as loose associations.

This review explored the work to date that has examined the social behavior of FRCs in order to make conclusions about the social nature of FRCs. Spotte stated, “That the domestic cat is social at all, much less socially complex, is doubtful” [5]. Although it is true that “Increased tolerance of conspecifics is not necessarily a sign of willing social interaction” (p. 50) and that “aggregation itself is not evidence of sociality” (p. 70), the review of the present literature indicates that in several instances, the social behaviors of FRCs extend beyond that of mere tolerance. Although groupings of some cats may be more accurately described as displaying “mutual tolerance” with loose affiliations [18], this description does not accurately fit many of the behaviors exchanged between cats in these colonies or during interactions with people. FRCs choose to initiate social interactions with humans and conspecifics and can be highly social. As mentioned, an affiliative bond is an enduring social relationship noted by high rates of affiliative behavior [7]. Cats do not display social behavior randomly. In many cases, cats within the colony appear to display affiliative bonds with certain cats over others, the direction of these interactions appears to be stable, and cats from outside groups are likely to receive increased aggression from group members. These findings indicate that the relationships between FRCs are indeed complex and deserve further study.

Domestic cats are not a unique case in this display of flexible social behavior. Variability in the social behavior of the domestic dog has also been noted [6]. Domestic dogs also live in a variety of social environments, both in human homes and as FRDs outdoors. Domestic dogs also have a sensitive period for socialization (~3–12 or ~3–16 weeks of age) and similar to cats, their social behavior is dependent on the experiences they encounter during this time. Dogs not socialized during this window would also be considered “feral” and dogs that were socialized during this window would be considered “tame” (see **Table 1** and [6] for a discussion on FRDs). Some scientists have also described domestic dogs as “facultatively social” [6][19]. The social living of FRDs is also known to vary depending on environmental factors such as resource availability. This variation may be due to a “social plasticity” that allows dogs to occupy a range of social environments. Udell and Brubaker define a social generalist as a “species that can thrive in many different settings as a result of an ability to adapt to a wide variety of social environments and adopt different social strategies” (p. 327).

As a species: domestic cats can also be considered as “social generalists” that display flexibility in their social behavior. Research with housecats indicates that some pet cats become stressed from living without conspecifics while other cats are stressed by the presence of conspecifics [20]. Pet cats also show variation in their sociability toward people and many cats display the capacity to be highly social [21]. Pet cats have also been found to form strong bonds to humans [22][23][24] and these relationships are relatively stable over time [22]. Finally, many cats seek out social interaction from people [21] and many cats prefer social interaction with humans, even over other

preferred rewards like food, toys, or scent objects <sup>[25]</sup>. In all, the findings of this review suggest that FRC social behavior is highly individual, socially flexible, and dependent on a number of lifetime and genetic factors. The social lives of FRCs exist and they are complex. The present body of literature provides an excellent foundation for future work. Continued work in this field is important and will help further illuminate the social lives of FRCs.

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