Study on Behavioral Patterns of Semi-Stray Cats

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Abstract

The author conducted a manual observation of the activities of four "semi-stray cats" who were fed on campus but were not limited of freedom, and found some behavioral features not reported in the past. These features include: the average activity range of "semi-stray cats" is about 5,700 square meters, which is much smaller than the 5,400,000 square meters of stray cats, and the range of activities of domestic cats with owners but stocking is close to 20,000 square meters [1]. The stray cat's cross-activity range is approximately 120 square meters and is centered on the feeding point. Although the range of activities of many semi-stray cats overlaps, they try to avoid each other. In addition to the artificial feeding, the minimum average distance between the stray cats at other times is more than 20 meters, and the cats stay in position with obstacles between each other, it is difficult to see each other. These behavioral characteristics are consistent with the cat's solitary characteristics. Semi-stray cats form a group of female individuals, and the areas of activity between the groups rarely overlap. Half-stray cats spend more than 90% of their time in the observation area, and other times are used to explore the food in their surroundings. The favorite position of the semi-stray cats is radially distributed around the feeding point, and the position from the feeding point is within 30 meters. Half-stray cats with fewer or slower arrivals will spend more time near the feeding point to increase their chances of competing in food. In-depth study of the behavioral characteristics of semi-stray cats can provide control and management of the thinking and methods of stray cats to prevent their threat to the ecological environment and disease transmission. At the same time, the study of semi-stray cats helps us to understand the domestication process of cats and provide more possibilities for the domestication of cats.

Keywords

1.　Introduction

In the cities, the phenomenon of abandoning cats and dogs has been around for a long time. In some cases, these animals will be taken up by institutions such as stray animal shelters, but that's rarely the case. Sometimes, these animals can find a food-rich area that allows for Settling down. Coincidentally, a group of cats that fit the above description lives on the campus of the affiliated high school of South China Normal University (later referred to as "Huafu"). These cats are mainly active in food-rich areas such as teaching buildings, canteens, and dorms. Their main food source is the cat food provided by the students, the leftovers in the canteen and their self-captured prey.

As Huafu is a more stable and safer habitat than outside on the urban streets, more and more stray cats have chosen here for shelter and breeding ground. With the feeding of students and the school's tolerance towards these cats, more cats began to stay on campus. These cats are called "Huafu Cats" by the students. By June 2018, the number of semi-stray cats on the campus has reached 20, but due to the reduction in the number of food during the holidays, most cats leave the campus and return at the beginning of school.

As a student of Huafu, I have the condition to observe the cats on campus for a long time and summarize the rules in their behavior. After an unrecorded observation in the past year, I found that the behavior of "Huafu Cat" has obvious regularity and seems to be different from stray cats and

domestic cats. As animals living in open spaces, they have much larger territories and more obvious territorial behaviors than ordinary domestic cats, including markings and patrols. However, unlike wild or wandering domestic cats, due to its stable food source and no natural enemies threatening its survival, "Huafu Cat" has significantly lower hostility or alertness to similar, human and other animals. These cats will not drive away other cats entering their territory, nor will they need to attack each other for food, etc., and they will be closer to human beings. In most cases, they choose to forage, ignore rather than avoid.

The types of cats that have been studied in the past mainly include the main captive cats (in China, the cats raised in most urban families are housed indoors), and there are active stocking cats. These cats have owners and usually, have exclusive accommodation places. , but not limited by the scope of activities, no mainstream cats (Unowned cats or Free-roaming cats) refers to the stray cat[1]. who usually does not have a master. The "Huafu Cat" does not belong to any of the above categories. They have no owners, some are fed, and no one limits their scope of activities. In view of the visual observation, they seem to have many different behaviors, so I call them Semi-Nomadic cats. The figure below shows the difference between these four states.

	whether regularly fed	whether legally owned	whether in captivity
Owned cats	+	+	+
Free Roaming Owned Cats	+	+	−
Semi-stray Cats	+	−	−
Stray Cats	−	−	−

These behaviors between domestic cats and stray cats reflect the cat's abandonment of other behavioral characteristics for food, shelter and other conditions, as well as its ability to adapt to the environment. Other changes in behaviors such as the reduction of the territorial scope and the increase in tolerance of the same kind and human beings after the cat has met the needs of food and shelter have once again reflected the transformation of humans through food. Just as the domestication process of wolves (dogs), the part of the domestic cat who dares to obtain food and sacrifice for it by approaching humans will be chosen, bred, and produced a next generation that is more accessible to humans.

The author believes that the process of changing from a stray cat to a semi-stray cat is a process that takes place around the people and occurs when humans domesticated cats (dogs) 3,500 years ago. The study of the behavior of semi-stray cats may help us to reproduce the process of domestication of wild cats by humans, restore the scenes at that time, and discover the crucial factors. On the other hand, studying the behavioral patterns of semi-stray cats can provide a reference for protecting the ecological environment and controlling disease transmission.

2.   Research area

The main experimental area of this experiment is an irregular polygon of 200 meters*100 meters centered on the lawn in front of the teaching building of Huafu International Department. The specific scope is shown in Figure 1.

This map is taken from the high-definition map screen, the scale is shown in the figure, and the north is facing up. The inside of the red polygon is the campus of the secondary school affiliated to South China Normal University. The purple part is the main active area of the cats. This area is about 200 meters long and 100 meters wide from north to south.

The gray plots in the map are buildings. Most of the cats are inaccessible, so the cat's activity basically occurs in the purple area.

In the purple area, it is divided into α, β, γ, δ, ε, ζ, η, θ, ι, κ, λ according to the characteristics of grass, road, parking lot, small bush, indoor, cement floor. Δ is the teaching building, part of which is outside the gate and part of which is inside the door. The feeding point is usually at the gate. κ, λ is the road outside the gate, and is divided into two areas for the higher accuracy of recording. α, β are two panes of grass divided by road κ, λ. θ is a relatively closed area behind the school building. The first few areas, based on the author's observation experience, are the areas that cats like. γ is a small parking lot, and cats sometimes rest under the car. I, ζ is a grassland surrounded by bushes and sporadic trees next to the building. The grass is not luxuriant, with roads separated. η is the brick floor in front of the teaching building.

Since most of the cats in the upper part of Fig. 1 do not arrive at all, the parts including the purple area below are separately enlarged as shown in the following figure.
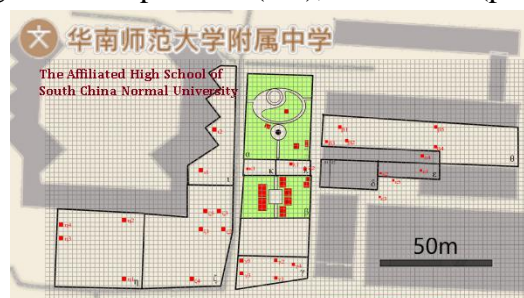

Figure 1. campus area (red), active area (purple)

Figure 2. cat's active area and its key points of lingering

In this 200*100 meter irregular area, the cat's preferred position is also limited, and it is not arbitrarily chosen. In fact, these preferred areas often have obvious characteristics. These positions are marked separately, and the method of labeling is to add a number after the large area, such as α1. These locations are actually exhaustive based on later observations.

The extent to which cats prefer different regions will be determined by subsequent

3.   Analysis

3.1 Research object

The study was conducted on the remaining four cats in the summer building of the Huafu International Department. The details of these cats are as follows:

Cat A: named "Mama", female domestic cat, white long hair, orange plaque, age about 3 years old

Figure 3. Mama

Cat B: Named "Marco", male domestic cat, and Mama is a sibling, white long hair, orange plaque, age about 3 years old

Fig. 4 Marco

Cat C: named "Dahu", female domestic cat, dark brown tabby-like stripes, age about 2 years old

Figure 5 Dahu

Cat D: named "Gege", male domestic cat, orange tabby stripes, age 3 years old

Figure 6 Gege

3.2 Research method

The specific research method used this time is to manually observe the position of the cat and mark it on the paper map every 15 minutes. The map uses a printed map of Gaudí. The data observed in the morning and afternoon of each day are marked on a map, and each map has a date, time, weather, temperature, etc.

The observation date is July 23, 24, 25, 27, 28, and the middle 26 days are suspended for personal reasons. Observe the time every morning, 8:30-11:30 due to traffic and other reasons. The observation time every afternoon is 12:30-16:30. 11:30-12:30 is the time for the author to organize the data and eat.

3.3 Experimental record and data analysis

Original charts (with the original records) are attached as below.

3.4 Data collation and analysis

The data on the original map is very large, it is difficult to see the law, so the data is organized as follows.
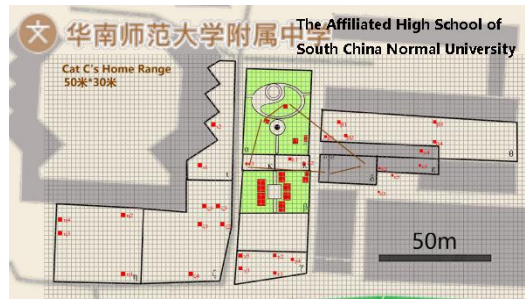
First, let's take a look at the Cat's Home Range. Based on the experimental records, I came up with the home range of the four cats. See the four pictures below.
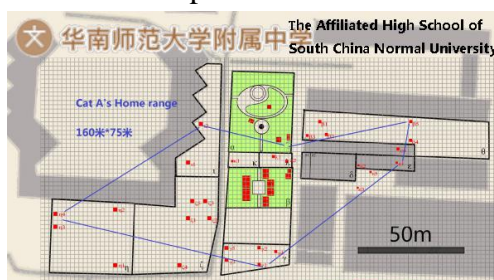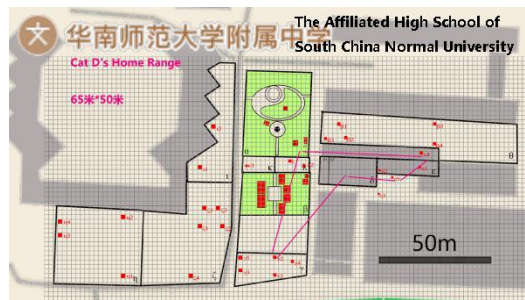

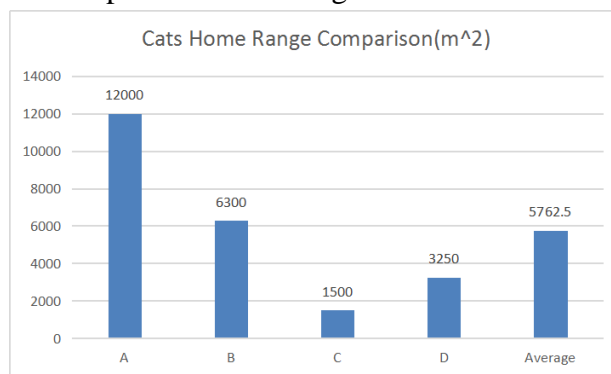(Activity range of A: 160*75m)
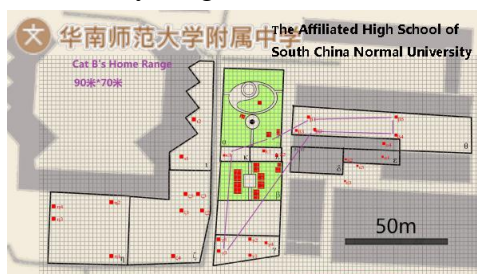
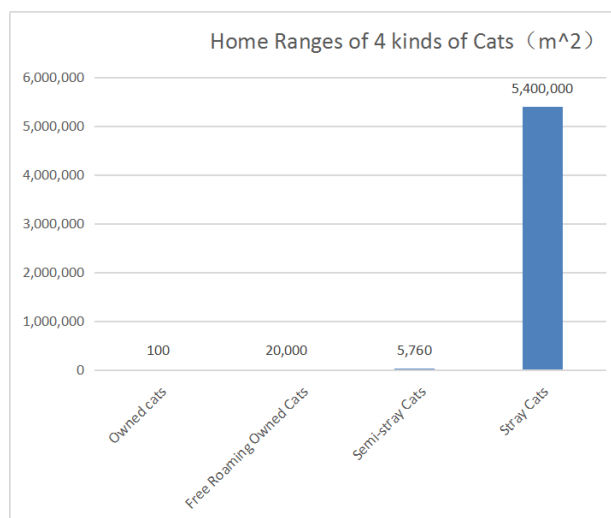(Activity range of B: 90*70m)

(Activity range of C：50*30m)

(Activity range of D：65*50m)

The figure below reflects the comparison of the range of activities of the four cats.

Next, we compared the average range of the four cats' activities to 5,762 square meters with the other three cats.


Among them, the activity range of the main domestic cat is estimated to be 100 square meters based on the area of the ordinary family. The Home Range of Owned Cats is 20,000 square meters and the data is from Jeff A Horn's paper. Unowned Cats has a range of activities of 5.4 million square meters, and the data is also from Jeff A Horn's paper.

As can be seen from the comparison chart above:

6

Guess one: The range of activities of semi-stray cats is much smaller than the 5.4 million square meters without mainstream cats, which is three orders of magnitude worse, and is obviously closer to 20,000 square meters with main cats.

If you overlap the activities of the four cats, you will find that their common area is actually very small, only 12 meters * 10 meters, about 120 square meters, see the picture below.
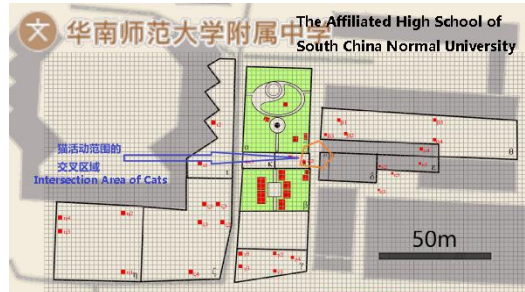
(Intersection area of cat activity range: orange polygon, about 120 square meters)

The activities of the four cats range from 1,500 square meters to 12,000 square meters. In such a small area, will the four cats be very crowded and stay together all the time? Just like a group of lions?

In order to understand this, we need to visually reflect every day, every cat, every time point of observation, in which position, the author designed the following table (Table 1). This table has five levels in the horizontal direction. Each layer represents the data of the day, which is 23, 24, 25, 27, and 28 respectively. In the table for each layer, the ordinate represents the four cats A, B, C, and D, and the abscissa is the time axis every 15 minutes. The location where the horizontal and vertical coordinates meet is the position number of the cat that appears at this moment.

Table 1 cat staying position finishing record table

If we look at the vertical data of the day in the table, that is, the location of the four cats at the same time, we will find that they basically do not appear in the same position. (The only exception is that at 9:15-9:30 am on July 28, both A and B appear at β1.)

But we still can't know how far the cats usually stay with each other. To understand this, on the basis of Table 1, the author draws another observation time, the relationship between the cats' positions and the 150 pictures. Figure. Analysis of these figures, I found that in most of the time, the average minimum distance between the semi-stray cats is more than 20 meters, and their minimum distance is not less than 8 meters, except for the short gathering at the feeding point. The exception is always. The figure below illustrates these features.
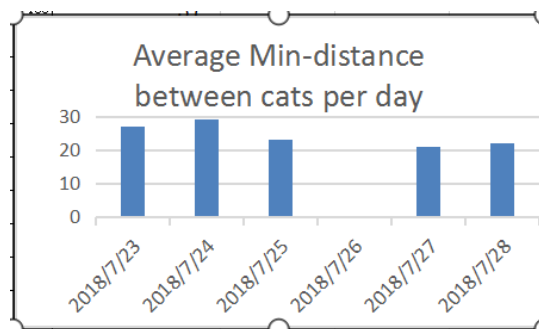
(This picture shows that the minimum distance between cats is more than 20 meters.)

Percentage of different Min-distance
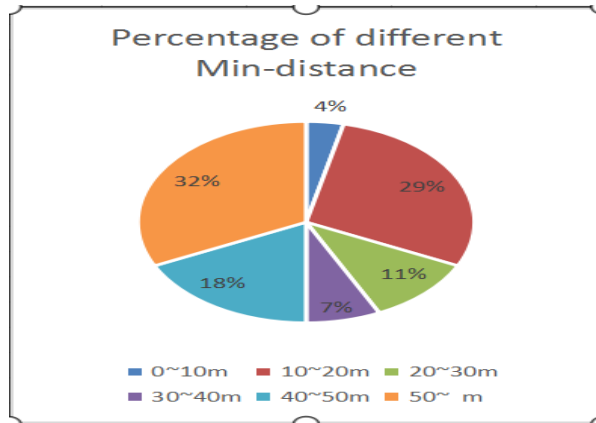
(This picture shows that the distance between cats is less than 10 meters in only 4% of the time. The minimum distance is more than 40 meters in 50% of the time.)

Moreover, the authors found that in addition to keeping the distance between the cats, they could not see each other between their resting positions, and their sights would be obscured by buildings, sculptures or bushes.

Therefore, we have come to conjecture 2: The semi-stray cats will not stay in the same place at the same time when the scope of activities is reduced and the range of activities overlaps. The minimum average distance is more than 20 meters. Obstacles can avoid each other from seeing each other. This is in line with the cat's solitary character.

Further, we want to understand what principles they follow each other to distribute these preferences and avoid mutual interruptions.

So the author made further finishing. Make a statistic of each cat's length of time spent at each location every day and try to find the law. Since the observation interval is 15 minutes, it is observed once in one position and counted as the length of 15 minutes. After the statistics, the following table is formed.
Table 2 shows the length of stay and the percentage of cats in various regions and locations, see Appendix 1 for details


This table counts the length of time each cat appears in each area. After considering the author's total length of observation, the percentage of time the cat stays in each area can be calculated. There are several interesting places in the bottom part of this table, such as the lower left part of Table 2 below, which is the following table:

Table 3. Comparison of cat staying length in α, β area

	α					β							
	α1	α2	α3	α4		β1	β2	β3	β4	β5	β6	β7	
A	105	0	0	0	5%	300	0	150	105	0	60	150	36%
B	150	0	30	0	9%	285	90	0	360	150	0	0	42%
C	30	930	0	75	49%	0	0	0	0	0	0	0	0%
D	60	0	0	0	3%	0	0	0	0	0	0	0	0%

As can be seen from Analysis Table 3, A and B have a very long time to stay in the β region, reaching 36% and 42%, respectively, but C never appears in the β region. For the alpha region, A, B stays less than 10%, while C reaches 49%, and A and B prefer α1, C prefers α2, and they are staggered from each other. The figure below illustrates this.
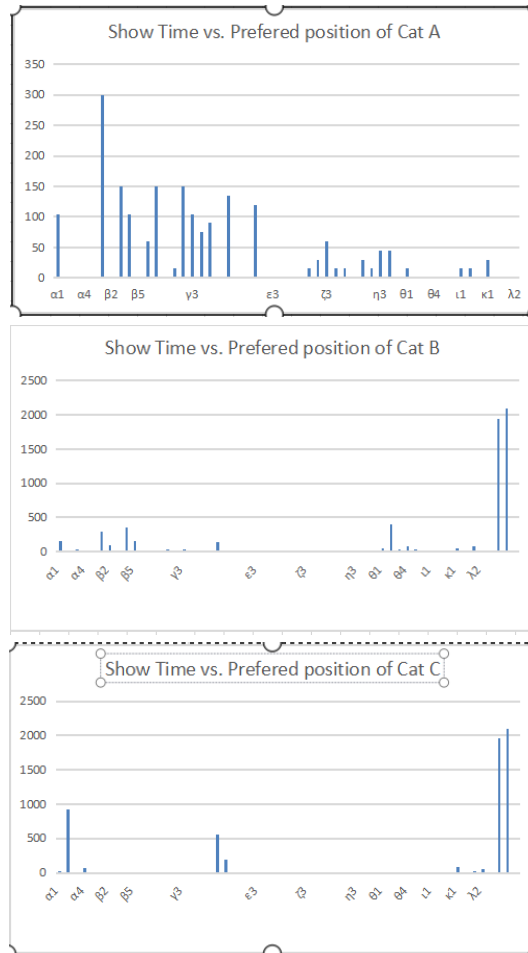
Further statistics show that C will only stay at the position where A or B has stayed for 5% of the time, and will never be used with A and B at the same time.

In other words, A and B have a much larger range of activities, and C overlaps very little with their range of activities.

Considering that A is a female and B is a brother, they are a group, which we call the A group. C is also a female, although it has only one, it also forms an independent C group. These two female-centered groups are staggered from each other's range of activities. This is in line with the conclusion of the *** study. (citing papers)

During the whole observation period, the total length of occurrence was only 11%, the proportion of time in the α and β regions was not high, and D obviously did not belong to any group, and all were not necessary for discussion.

So the author came to the conjecture three: semi-stray cats form a group centered on females. Different groups will be able to stagger each other's range of activities as much as possible, even if the overall space is already very narrow.

As mentioned earlier, when the number and frequency of summer feeding are reduced, the number of semi-stray cats will decrease, and after school, as the number and frequency of feeding will increase, more stray cats will join the campus to become semi-stray cats. So how do these cats find food here or find food in other places?

The data in the lower right corner of Table 2 may explain this, which is the following table:

Table 4. Percentage of cats in total observation duration

	show rate
A	90.71%%
B	92.14%%
C	93.57%%
D	11.43%%

It can be found from Table 4 that although A, B, and C appear to be very random in various regions, the percentage of their three occurrences is between 90% and 93%, which is very close. That is to say, they have 7%-10% of the time does not appear in the observation area. In these unobserved times, they should have left the area. Perhaps they are using this time to explore the food around. That is to say, A, B, and C have 7-10% of the total duration used outside the observation area. Since these cats are essentially stray cats, they are likely to spend these hours exploring the surrounding food sources. 7%-10% of the time ratio may be their innate experience, always helping them balance the real benefits and future risks. The appearance rate of D is only 12%, which seems to indicate that D is only a neighbor of A, B, C, and occasionally come to find a new food source. Therefore, the author proposes that four: semi-stray cats in the observation area with artificial feeding, the residence time is about 90%, the rest of the time is used to explore food opportunities in other areas.

In the above analysis, we have found that cats have different preferences for different positions. What are the characteristics of these cats' favorite positions?

In order to understand this, on the basis of Table 2, I compared the percentages of the lengths of A, B, C, and D in each area to form the next table:

Table 5. Percentage of the length of lingering in each area

	α	β	γ	δ	ε	ζ	η	θ	ι	κ	λ
A	5%	36%	21%	6%	6%	6%	6%	1%	1%	1%	×
B	9%	42%	1%	6%	×	×	×	28%	×	2%	4%
C	49%	×	×	36%	×	×	×	×	×	4%	4%
D	3%	×	1%	4%	4%	×	×	×	×	×	×
	66%	79%	24%	52%	9%	6%	6%	29%	1%	8%	8%

From Table 5, we can further summarize the regional rankings that each cat likes, as shown in the table below.

Table 6. Cat favorite area ranking
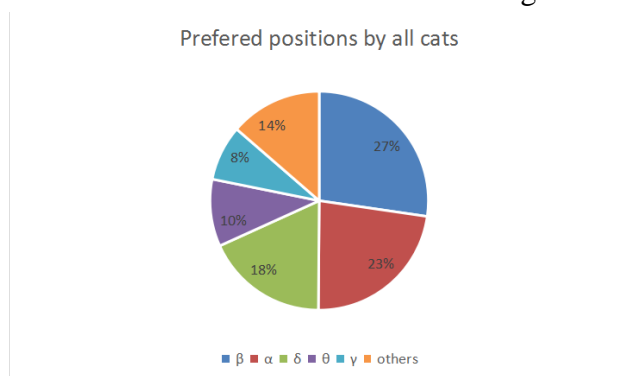
It is not difficult to find from the map below that β, α, and δ are the closest areas of food.

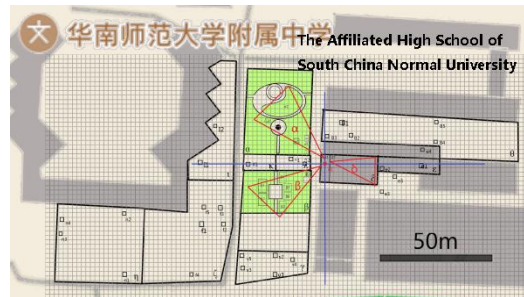Fig. 7 Schematic diagram of the nearest region from the feeding point, the red triangle in the figure is β, α, δ

Therefore, the author has the conjecture five: the three regions most popular with cats, β, α, δ are just the three regions closest to the feeding point, that is, the cats like to stay in the area closest to the feeding point. Waiting for food.

In addition to the above conjecture, it is not difficult to find that A and B will stay in most areas for a certain period of time in addition to the areas they particularly like. Especially A, it stays in almost all areas except one area k. In addition to the four areas, B will stay in the remaining seven areas. However, C spends 85% of the time in the α and δ regions, only κ and λ in the other two regions, respectively, 4%, and the distance between these two regions is very close to the feeding point, which is sandwiched between α and Between β. (See the orange triangle in Figure 22)

In other words, C spends almost all of his time near the feeding point. The author speculates:

Conjecture 6: The C group feels the competitive pressure from the A group and needs to spend more time waiting near the food source. It shows that the group of semi-stray cats will use the power of the group to compete for food. Groups in a weak position need to be more vigilant.

4. Conjecture summary and applicability discussion

Guess one: The range of activities of semi-stray cats is much smaller than the 5.4 million square meters without mainstream cats, which is three orders of magnitude worse, and is obviously closer to 20,000 square meters with main cats.

Conjecture 2: When the range of activities is narrowed and the range of activities overlaps, the cats will still not stay in the same place at the same time. The minimum average distance is more than 20 meters. There are basically obstacles between the rest places to avoid each other. They see each other. This is in line with the cat's solitary character.

Conjecture 3: Half-stray cats form a group centered on females. Different groups will be able to stagger each other's range of activities as much as possible, even if the overall space is already very narrow.

Conjecture 4: Half-stray cats spend about 90% of their time in the observation area with artificial feeding. The rest of the time is used to explore food opportunities in other areas.

Conjecture 5: The three regions most popular with cats, β, α, and δ, are just the three regions closest to the feeding point. That is, cats like to stay in the area closest to the feeding point to wait for food.

Conjecture 6: The C group feels the competitive pressure from the A group and needs to spend more time waiting near the food source. It shows that the group of semi-stray cats will use the power of the group to compete for food. Groups in a weak position need to be more vigilant.

Simple data analysis reveals hidden laws or

clues in cat behavior. This gave me the confidence to surprise and continue to study.

The fly in the ointment is that because the observation period is during the holidays, and the holidays are other arrangements, so the time is short, and the number of cats is small, so the author is looking forward to watching more cats for a longer period of time to further verify these conjectures and find a semi-stray cat. More behavioral characteristics.

Acknowledgments

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