Feeding Behaviors of the Dog, Cat, and Betta Fish

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Abstract

Feeding behaviors of the dog, cat, and betta fish are explored using observational methods and comparison to previous records of species-specific feeding behavior. The feeding habits that have been previously observed of each species are reviewed. Common feeding times, type of food consumed, and physiological processes involved with eating are covered using previous literature. After each species is observed via video recording, a complete ethogram is formed for each species that includes all observed feeding behaviors during the time of recording. The observations that have been termed in the ethograms are compared the observations of feeding behavior recorded in previous literature. This will give a more accurate and complete description of feeding behaviors in the domestic dog, cat, and betta fish.

Introduction/ Literature Review

Feeding behavior varies greatly by species. Physiological constructs and limitations are what cause variation in what different species consume, how they obtain food, and how digestion occurs from the moment the food enters the mouth. Other variations include the number of meals consumed a day, predispositions for different types and tastes of food, and physiological functions of the body for prehension and digestion. Three common household pets that vary greatly in nutrition, apprehension, and digestion of food are the domestic dog, cat, and betta fish.

Dogs that are kept as household pets most commonly eat at specified meal times that can occur up to 3 times a day (Bradshaw, 2006). Most dog breeds consume meals extremely fast and in large amounts; however, there are some exceptions to this (Bradshaw, 2006). One theory that might explain rapid meal consumption in dogs is the idea that this behavior was genetically passed down from wolves to domestic dogs (Bradshaw, 2006). The idea is that wolves can be observed in the wild today eating extremely quickly to compete with other juvenile wolves who eat after the alpha has finished its meal (Bradshaw, 2006). Another theory for fast eating habits in dogs is that this is an adaptation from when dogs became domesticated scavengers that had to compete for food (Bradshaw, 2006). Both theories hypothesize that dogs had to compete for resources such as food in the past which leads to rapid eating behavior in the home today.

Food selection for dogs has varied greatly since the time of domestication. During domestication, dogs could be found congregating in urban areas to eat human waste for survival (Bradshaw, 2006). This scavenging behavior is still observed in feral dogs today (Bradshaw, 2006). However, the domestic dog that lives in a household relies completely on their human owner for food. Humans most commonly feed dogs at designated mealtimes to reduce over-consumption and consequent obesity that can occur from an ad libitum feeding style (Bradshaw, 2006). Dogs are fed dog food which contains a combination of a major nutrients such as proteins in meat byproduct, carbohydrates in corn or soy meal, fats in oils, and vitamins and minerals. These nutritionally sufficient food products appeal to dogs' sense of smell before any other sense

(Bradshaw, 2006). Most dogs are less picky than other species when it comes to food preference, but learned taste aversions can occur, preventing dogs from liking a food they may have had a negative experience with (Bradshaw, 2006).

Physiological responses to food are evident both on the outside and inside of the dog's body. When presented with food, dogs become excited and focused on the food source. Salivation occurs and may present as drool falling from the mouth (Shapiro & Herendeen, 1975). Dogs consumed food by picking it up using a combination of their tongue and front teeth. The back teeth then grind the food before it is swallowed (Shapiro & Herendeen, 1975). Inside the body, heart rate and arterial pressure begin to increase at the anticipation and consumption of food (Vatner, Franklin, & Citters, 1970a). Blood flow to the gut area increases to begin digestion in the stomach and intestine (Vatner, et. al. 1970a). About 50-60 minutes after the meal has been consumed, heart rate will return to resting rate after a gradual decline (Vatner, et. al. 1970b).

The normal method for cats to obtain food in the wild is to hunt for it (Bradshaw, 2006). Unlike wolves, large cats hunt solitarily (Bradshaw, 2006). Many of the hunting instincts of large cats are observed in feral cats today (Bradshaw, 2006). Pouncing and batting are examples of these common hunting behaviors of cats (Bradshaw, 2006). Cats in households today rarely have to hunt for their meals because they are provided by their owners. As opposed to dogs, cats do relatively well when fed ad libitum (Bradshaw, 2006). There is a theory that cats mimic the spontaneous meal eating patterns of their ancestors even in the household because they eat small amounts several times a day (Bradshaw, 2006).

Cat diets in the household consist of mostly pre-formulated cat food (MacDonald, 1984). Cat food contains much more protein and much less carbohydrates than dog food (MacDonald, 1984). This is because cats do not have the enzyme that breaks down carbohydrates, so this nutrient is not very helpful for the cat to obtain energy (MacDonald, 1984). Therefore, cat food has a large protein source from a meat byproduct with few carbohydrate sources that are added for palatability (MacDonald, 1984). Cat food has nearly every amino acid to provide a balanced source of energy (MacDonald, 1984). Cats' sense of taste differs from the dog in that they do not register sweet tastes as well (Bradshaw, 2006). Cats also taste less fruity foods and can taste more bitterness in foods (Bradshaw, 2006). Cats prefer food to be highly palatable, which is why canned food with a lot of moisture is preferred over dry foods (MacDonald, 1984). Cat taste preferences, which are developed through nursing, have been shown to mimic that of their mothers' (Bradshaw, 2006).

Internal physiological changes in cats are very similar to dogs. Cats experience increase in heart rate and arterial pressure shortly after consuming food (Taylor & Cody, 1974). This response appears to be slightly slower than in dogs (Taylor & Cody, 1974). Cats eat similarly to dogs. They use a combination of their front teeth and tongue to obtain food in the mouth and then use their back teeth the break the food into pieces that can be swallowed.

Betta fish, or Siamese fighting fish, are much more diverse in what they eat and how they feed. Betta fish in the wild search for brine and Mysis shrimp, bloodworms, mosquito larvae, and fruit flies ("The Ultimate Betta Fish Food and Feeding Guide," 2018). The betta fish search the

surface of the water or the floor of the body of water they are in for these food sources (Simpson, 1968). Betta fish are opportunistic feeders, so they will eat whenever presented with food rather than at certain times of the day (Simpson, 1968). Because of this, owners often feed betta fish in a fixed schedule to prevent health issues from over-feeding (Simpson, 1968).

In the household, betta fish are fed fish flakes or pellets that contain a high amount of protein ("The Ultimate Betta Fish Food and Feeding Guide," 2018). Bettas are carnivores in the wild, and due to their short digestive tract, they do not digest carbohydrates very well ("The Ultimate Betta Fish Food and Feeding Guide," 2018). Betta fish pellets include fish and shrimp meal as the primary protein source with corn gluten meal for palatability and essential vitamins and minerals ("The Ultimate Betta Fish Food and Feeding Guide," 2018). Betta fish prefer smelly, high protein foods that are easy to chew and digest (Simpson, 1968).

To obtain food, betta fish will swim quickly towards the pellets located on the surface of the water. The fish will then curve its body into an "S" shape before lunging at the pellet and crunching it (Simpson, 1968). If the pellet is too hard to chew, betta fish will spit the food back out before grabbing it and chewing again (Simpson, 1968). When swallowing, some of the food particles will leave the mouth through the gill area (Simpson, 1968). This can be observed in many fish as it is a process meant to eliminate scales of the prey fish consumed by predators (Greenburg, 2016).

Methods

To learn more about feeding behavior of dogs, cats, and betta fish, each species was closely observed while eating a meal at normal feeding times of the day. For this observational study, the dog that was observed is a 4-year-old, female, mix-breed of poodle and golden retriever that weighs 60 pounds. The dog has a body condition score of 3 on a 5-scale chart, indicating that the dog is at a healthy and ideal weight. For observation, each animal was fed an amount that was normal for that animal to receive on a daily basis. The dog was fed two cups of Kirkland Adult Dog food, which is the suggested amount for a 60-pound dog. The most common ingredients in this food formula are lamb, lamb meal, whole grain brown rice, white rice, and rice bran. To avoid deviation from the dog's normal feeding schedule, the dog was fed at 3:00 pm. The dog was given a plastic, slow-feed bowl with dividers inside intended to slow down the feeding process by making the food less accessible. This served the purpose of slowing the eating process so that more observation could be done. The dog was fed outdoors in her normal feeding environment. The temperature outdoors during the dog feeding was 78 degrees Fahrenheit with winds at about 15 miles per hour.

The cat that was observed is a 7-year-old, male, domestic shorthair that weighs 14 pounds. The cat has a body condition score of 3 on a 5-scale chart, indicating that the cat is at a healthy weight. The cat in this study was fed Meow Mix Tender Centers cat food. The most common ingredients in this cat food formula are whole ground corn, chicken by-product meal, corn gluten meal, soybean meal, whole wheat, and animal fat. The cat normally feeds ad libitum, so the observer recorded the cat choosing to feed at 6:00pm. The cat was fed indoors in his usual

feeding area using a small metal bowl. The cat was fed at an indoor temperature of 73 degrees Fahrenheit. Both the cat and the dog had access to water during the feeding process.

The fish that was observed was an adult, male, betta fish (also known as a Siamese fighting fish) that is over 6 months old and measures about 1.5 inches in length. The fish was fed 1 pellet of TetraBetta Pellets fish food. The most common ingredients in this fish food formula are wheat flour, fish meal, wheat gluten, potato protein, and corn starch. This fish is normally fed one pellet at 7:00am and one pellet at 9:00pm. The 9:00pm feeding was observed for this study. The fish was fed by dropping the pellet onto the surface of the water of the fish tank. The fish tank had a temperature of 76 degrees Fahrenheit at the time of feeding.

Refer to Table 1 (below) for the conditions under which each species was observed.

Table 1: Conditions Under Which Each Species Was Observed

Feeding Method	**Dog**	**Cat**	**Betta Fish**
Time of day	3:00pm	6:00pm	9:00pm
Temperature	78 F (Outdoor)	73 F (Indoor)	76 F (In tank)
Feed Type	Kirkland Adult Dog	Meow Mix	TetraBetta Pellets
Feed Amount	2 cups	Ad libitum	One Pellet
Feed Container	Slow-Feed Bowl	Metal Bowl	Water Surface

To collect the data from the observation, each animal was recorded eating at normal scheduled feeding times using a smartphone. To ensure behavior displayed was normal, the recorder did not intervene with the eating process after the food was provided for each animal. While recording the observer made minimal movements to avoid distracting the animal. No interaction with the animal occurred until the observer stopped recording each video. Following recording, each video was watched and stopped every 5 seconds to record the behavior of the animal at that time. Behavioral descriptors from ethograms (Tables 2, 3, and 4) developed by the researcher were used to describe and analyze behavior at the paused video intervals. The average

video length was about one minute and thirty seconds. The dog and fish were observed from the point that food was available until the point they had consumed all available food. The cat was recorded for about a minute eating because the cat normally feeds ad libitum which prevented observation of meal consumption from start to finish.

Results

The following ethograms for cat, dog, and fish feeding behavior were developed after observing the feeding process in the aforementioned species and recording every behavior that occurred during the observation period.

Table 2: Dog Feeding Ethogram

Behavior	Description
Chewing	Dogs jaw is opening and closing to crunch or chew food already in the mouth
Prehension	Dog has muzzle in bowl and is moving head slightly forward with mouth open and closes teeth to enclose food in mouth or uses tongue to lick food and bring into mouth
Swallowing	Dogs head is up and neck muscles flex as dog swallows with slight movement of head as swallowing occurs
Surveying	Dog is not focused on food bowl but is looking away from food
Licking	Tongue leaves the dogs mouth and grazes nose or muzzle area, or the tongue purposefully comes in contact with other surfaces
Sniffing	Dog's mouth is closed and nose flexes as dog has head near food of dog is looking away from food
Maneuvering	Dog is moving its body or head around/ toward the food to locate it and gain access to it. This behavior occurs shortly before prehension.
Movement	Displacing body position by directly taking steps towards or away from food. Movement has an obvious direction and/or motivation.
Feeding Activity	Total observation time minus total time not eating (eating includes prehension, chewing, or swallowing)

Table 3: Cat Feeding Ethogram

Behavior	Description
Chewing	Cats jaw is opening and closing to crunch or chew food already in the mouth
Prehension	Cat has muzzle in bowl and is moving head slightly forward with mouth open and closes teeth to enclose food in mouth or uses tongue to lick food and bring into mouth
Swallowing	Cat's head is up and neck muscles flex as dog swallows with slight movement of head as swallowing occurs
Surveying	Cat is not focused on food bowl but is looking away from food
Licking	Tongue leaves the cats mouth and grazes nose or muzzle area, or the tongue purposefully comes in contact with other surfaces
Sniffing	Cat's mouth is closed and nose flexes as dog has head near food of dog is looking away from food
Maneuvering	Cat is moving its body or head around/ toward the food to locate it and gain access to it. This behavior occurs shortly before prehension.
Feeding activity	Total observation time minus total time not eating (eating includes prehension, chewing, or swallowing)

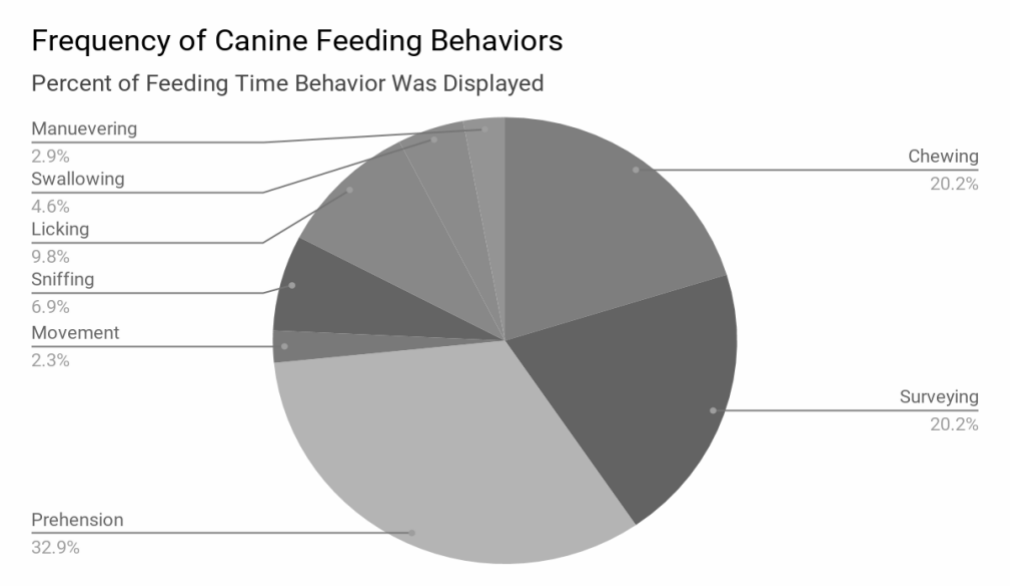
Table 4: Fish Feeding Ethogram

Behavior	Description
Chewing	Fish jaw is opening and closing to crunch or chew food already in the mouth
Prehension	Fish moves towards food with an open mouth and bite down to put food in mouth
Swallowing	Head moves slightly upwards and food particles move through the gill area, indicating the food is being swallowed
Surveying	Fish is not focused on food, but is looking away from food (when food is in outer environment)

Maneuvering	Fish is moving its body or head around/ toward the food to locate it and gain access to it. This behavior occurs shortly before prehension.
Lunging	Fish curves in an "S" shape before making a sudden movement towards the food to either move it or bite it
Spitting	Fish opens mouth that has food inside and allows food to float out
Movement	Displacing body position by directly swimming towards or away from food. Movement has an obvious direction and/or motivation.
Breathing	Fish swims to surface and touches lips with an open mouth to take in air
Threatening	Expanding dorsal and tail fin suddenly or flaring gills
Drifting	Fish is moving but with no displacement of the body drifting may occur but no more than less than half the length of the fish body
Feeding Activity	Total observation time minus total time not eating (eating includes prehension, chewing, or swallowing)

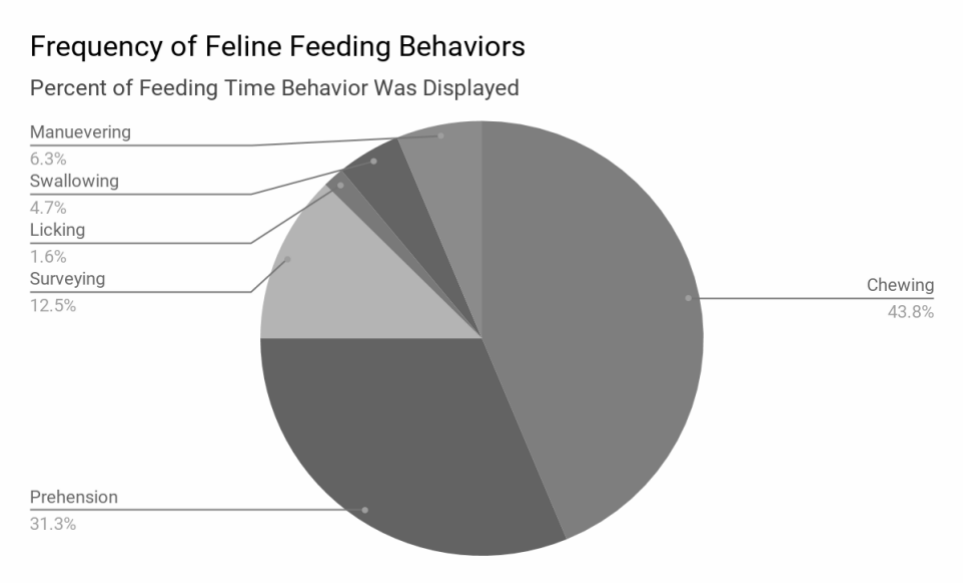
The following pie charts (Figures 1, 2, and 3) were created by listing every displayed behavior the animal performed while eating, and then each behavior was timed every time it was displayed throughout the entire video. The total time a single behavior was displayed was then divided by the total time of the video and multiplied by 100 to provide the percentage of time each behavior was displayed in a single feeding.

Figure 1



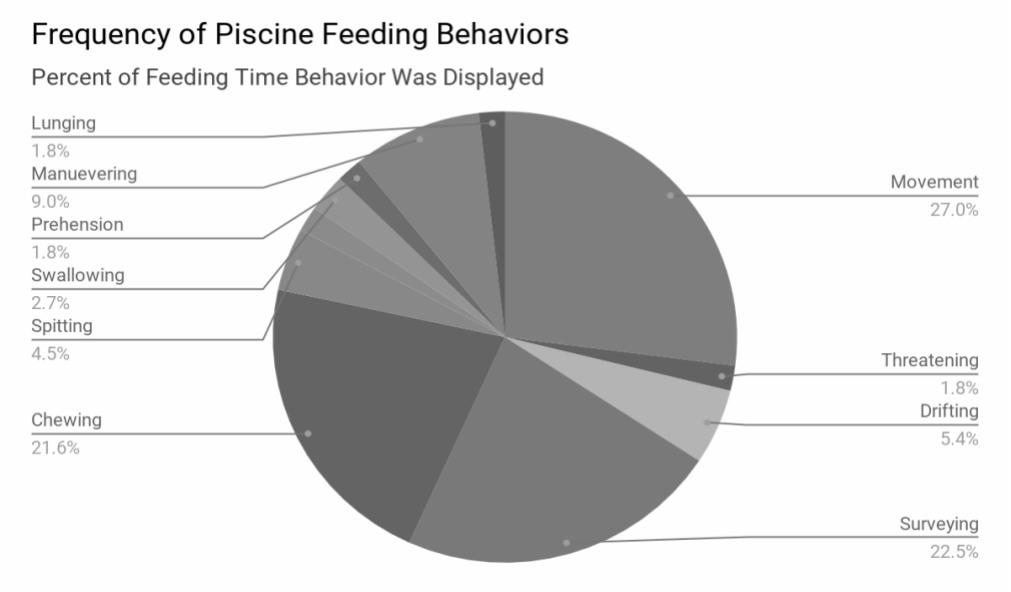
*Sample Size for Figure 1 is one.

Figure 2



*Sample Size for Figure 2 is one.

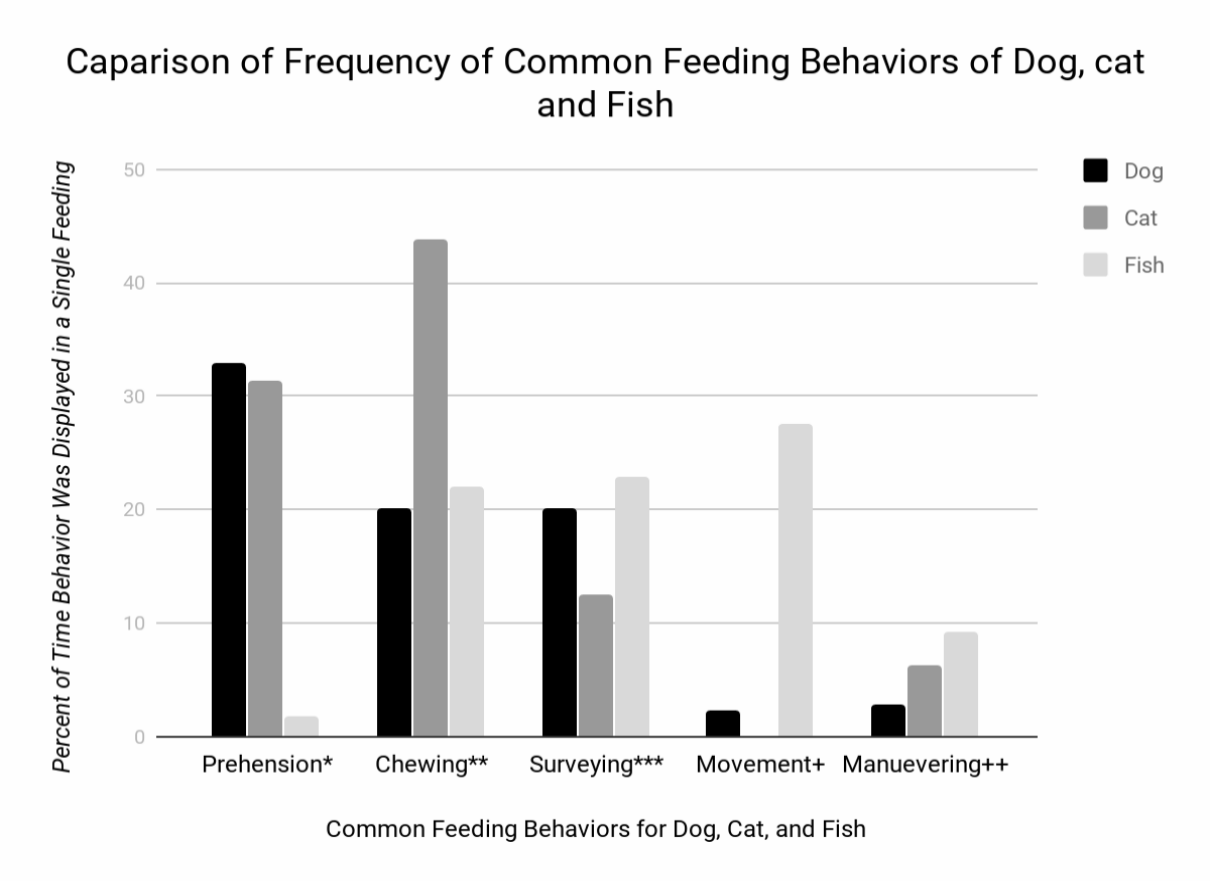
Figure 3



*Sample Size for Figure 3 is one.

The following figure (Figure 4) shows the percentage of time each animal displayed prehension, chewing, surveying, stepping, maneuvering behavior. These five behaviors were chosen because they were common across all three species. This figure compares the frequency of the behaviors, that all observed animals had in common, for each species. The frequency of behavior is measured by the percent of time each species performed each behavior in a single feeding session. The frequency is shown as a percent of time rather than a duration in seconds because not all total feeding times of the animals were the same, so a comparison of seconds (rather than percentage) performing each behavior would be inaccurate.

Figure 4

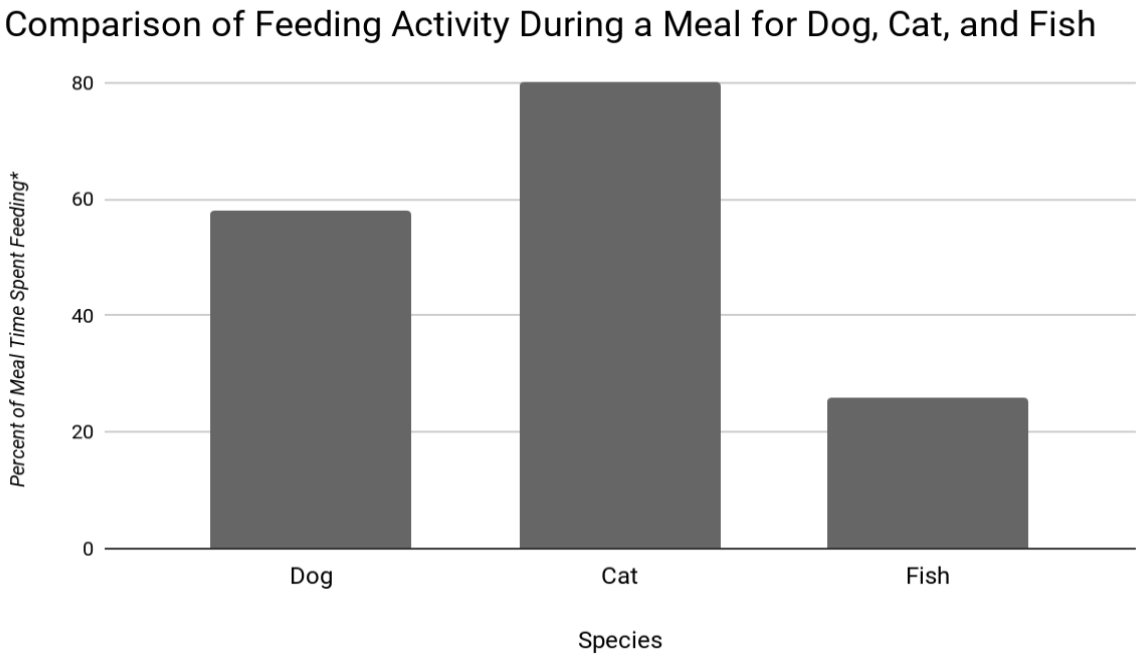


-Sample Size for Figure 4 is one for each species listed (Dog, cat, and fish).
*Prehension is defined as any movement that contributes to move food into the mouth
**Chewing is defined at using up and down jaw movement and teeth to grind food
***Surveying is defined at moving head or body to look at surroundings
+Movement is defined as displacing body position by directly taking steps or swimming towards or away from food. Movement has an obvious direction and/or motivation

++Maneuvering is defined as repositioning the head or body to gain access to food. This movement is observed shortly before prehension.

The following figure (Figure 5) compares the amount of time each species spends eating during a meal. This figure is intended to show how each species differs in how much time the animal spends eating, which is defined as chewing, prehension, and swallowing, versus doing another activity, such as moving, or surveying.

Figure 5



*Sample Size for Figure 4 is one for each species listed (Dog, cat, and fish).
*Feeding is defined as prehension, chewing, and swallowing as defined in the ethograms above

Discussion

For canine feeding behavior, the most common behavior displayed was prehension (Figure 1). The dog displayed prehension by moving its head down in to the bowl while opening its mouth. The dog then bit down over the kibble to enclose multiple pieces in the mouth by trapping it with the teeth. This observation coincides with the literature discussing the importance of teeth in canine feeding (Merillat, 1919). The second most common behavior the dog displayed while eating is chewing (Figure 1). Chewing was observed best when the dog had its head raised and the jaw was visibly moving up and down. There was also an audible

crunching sound the corresponded with this action. The food was no longer visible at the front of the mouth which supports the literature stating that the breakdown of food in the mouth occurs when the back teeth grind the food rather than the front (Merillat, 1919). This also supports the literature in stating that the tongue serves a role to push food to the back of the mouth (Merillat, 1919). The third most common feeding behavior in the dog was surveying (Figure 1). The dog would usually look around at the environment while chewing. The dog would swivel its head while focusing on its surroundings. The literature suggests that this behavior is a passed down behavior that contributes to survival by checking for competition that could steal food resources (Bradshaw, 2006). The fourth most common feeding behavior was licking (Figure 1). The dog would spend time licking the bottom of the food bowl when there was no more food and licking its muzzle shortly after swallowing. Literature indicates that this licking behavior could be to enhance taste of the food (Merillat, 1919). The fifth most common feeding behavior was sniffing (Figure 1). This could be observed by noticing the flaring of the nostrils and a corresponding slight movement of the head upward as the sniffing occurred. The muzzle would often be pointed up while this behavior occurred. The literature suggests that this behavior could be a surveying method. The dog may be sniffing to detect any competition for the food. This could also be a genetic behavior that serves to detect possible danger or predators while in a vulnerable eating position (Bradshaw, 2006).

Other noticeable, but less significant behaviors observed for the dog were swallowing and maneuvering to obtain food (Figure 1). The swallowing was noticeable by observing the neck muscles flexing shortly after chewing while the head was slightly elevated. The literature suggests that after salivary break down combined with manual grinding of the food, the food is swallowed as a bolus (Merillat, 1919). The dog also maneuvered to obtain food by turning its head and taking steps with its hind legs to pivot around the food bowl. This maneuvering may have occupied a larger amount of time because the dog was fed using a slow-feed bowl which made the food more difficult to access.

For feline feeding behavior, the most common behavior displayed was chewing (Figure 2). Chewing was made evident by observing up and down movement of the cat's jaw and head. There was also an audible crunching sound as the cat chewed. This corresponds with the literature because it indicates that cat was using its hind teeth to grind the food before swallowing (Merillat, 1919). The food was not visible near the front teeth when chewing. The second most common feline feeding behavior was prehension (Figure 2). Prehension was not directly visible while recording because the camera could not be positioned to capture a view inside the bowl. However, prehension was observable by marking the moments when the cat had its head down in the bowl and was tilting or maneuvering it to get food. There was also no audible crunching sound when this was occurring, so prehension was easily discernible from chewing. The literature states that cats use their front teeth to close around food in order to get the food into the mouth as well as their tongue (Merillat, 1919). Although this is not directly observed, the visible motions suggest the method of prehension aligns with the description in the literature. The third most prominent feeding behavior for the cat was surveying (Figure 2). The

cat paused multiple times while feeding to suddenly look up and stare into the distance. The cat appears to be focusing on its surroundings. The literature suggests that this may be a survival behavior passed down to the cat that protects resources by being aware of possible competition for food (Bradshaw, 2006). The fourth most common feeding behavior observed in the cat was maneuvering. This was particularly interesting in the cat because the majority of maneuvering involved manipulation of only the head. Maneuvering was evident when the cat stretched its neck to reach the far end of the bowl and when the cat tilted and angled its head to reach different areas inside the food bowl. The results suggest that maneuvering (Or movement that results in better access to food) in wild cats is a bit more involved. Wild cats make take steps or paw their food prior to prehension (Bradshaw, 2006). This could differ from the house cat's method of eating because the house cat feeds on kibble which is much easier to apprehend than meat from a kill. The fifth most common feeding behavior in cats is swallowing (Figure 2). When swallowing, the cat would raise its head slightly upward shortly after chewing had stopped. There could have been some error in observation here because movement of neck muscles was not as evident in the cat. Therefore, only significant evidence that swallowing occurred led to the behavior being recorded. Previous literature suggests that cats swallow small amounts of food as a bolus after chewing, and that respiration temporarily ceases while swallowing (Bradshaw, 2006). The cat observed seemed to mimic this behavior described in the literature.

A rarer feeding behavior observed in the cat was licking (Figure 2). The cat licked his nose 2 times during the feeding process. The literature suggests that licking the nose during feeding could enhance taste by triggering olfactory senses (Stilwell, 2014).

For piscine feeding, the most commonly observed behavior was movement (Figure 3), which is defined as displacing body position by directly swimming towards or away from food (Table 4). Movement has an obvious direction and/or motivation. The betta fish would display direct swimming motions toward where the food was located each time the food was in the environment. Movement toward the food occurred multiple time because the fish would spit out the food and apprehend it again several times. The literature suggests that the direct and smooth movement towards food is very similar to how a wild betta fish would approach surface-dwelling prey (Simpson, 1968). This literature describes this as a subtle, but direct swimming motion toward the food on the surface that occurs to position the fish to be able to lunge at the food (Simpson, 1968). This same behavior was observed in the betta fish in this study. The second most common fish feeding behavior observed was surveying (Figure 3). Surveying is defined as moving head or body to look at surroundings (Table 4). The betta fish would perform most surveying behavior by swimming in a circular fashion while holding the food pellet in its mouth. This behavior is also observed in wild betta fish, and it is supposed to serve the purpose of checking the surroundings for competition (Simpson, 1968). The third most commonly observed behavior for the fish was chewing (Figure 3). The fish would show chewing by quickly moving its head upward while its jaw made movements up and down. The fish chewed for several seconds before spitting the food out and then chewing it again. The literature explains that there

are small teeth that break the food down as the fish chews and the jaw bone moves the entire head while this happens (Simpson, 1968). The behavior in this study matches this description from the literature. The fourth most common feeding behavior in the fish observed is maneuvering, which is movement that gave the fish better access to food. The betta fish would circle food to gain a better angle before lunging at the food. This circling or maneuvering behavior is observable in wild betta fish. It is a means of better seeing the food to get an accurate location for it before lunging (Simpson, 1968). The fifth most common fish feeding behavior observed was drifting (Figure 3), which is defined as moving with no direct displacement of the body (Table 4). Any displacement without moving must be less than half the length of the fish body. The betta would drift while the food was in its mouth, and would chew at the same time. Drifting is not mentioned in the literature, but drifting could occur when the fish is chewing and has no need to swim around or survey the area.

Less common but notable feeding behaviors of the betta fish observed are lunging, prehension, spitting, swallowing, threatening, and breathing (Figure 3). The fish would lung by creating an "S" shape with its body before making a quick movement towards the food. The fish would then show prehension by opening its mouth as it lunged at the food and enclosed the food inside the mouth as it bit down. Betta fish in the wild show this behavior when they eat surface-dwelling food (Simpson, 1968). The betta fish would also spit the food out after chewing multiple times. The literature suggests that this is common in domestic betta fish that are fed pellets because often the pellets are too hard to swallow and therefore must be chewed and spit out multiple times to soften it (Simpson, 1968). The fish would show swallowing behavior when it moved its head slightly upward and food particles passed out of the gill area. The literature claims that many species of fish do this, and it serves to allow the scales of the fish' prey to leave through the gill area instead of being swallowed (Simpson, 1968). Threatening was also observed while the betta fish ate. The fish would flare its gills so that they would stick out, making the face appear larger. Previous literature explains that this is a behavior meant to threaten or ward off other fish (Greenburg, 2016). This could have been displayed while eating to ward off competition for food resources. This fish also showed breathing behavior by swimming the surface and "kissing" the surface of the water to take in air. This behavior was only done twice during feeding.

Comparing the feeding behaviors of the dog, cat, and fish showed only five observable behaviors in common: prehension, chewing, surveying, movement, and maneuvering (Figure 4). Prehension was displayed for a similar percentage of feeding time for the dog and the cat, but the betta fish took a significantly less amount of time showing prehension behavior. The cat showed much more chewing behavior than the dog and the fish. The dog and the fish spent a similar percent of their time chewing. The dog and the fish showed more surveying behavior than the cat. However, all surveying behavior was manifested differently in each species (see discussion above). Interestingly, the fish showed a great amount of movement behavior (defined in Table 4), while the dog and the cat showed little to no movement while eating. This could be because the fish lives in a more fluid environment that requires more movement during the feeding

process. All three species displayed maneuvering (defined in Tables 2, 3, and 4) in a different way, but this behavior was displayed for a similar percentage of feeding time for all three species. The fish showed the most maneuvering behavior while the dog showed the least amount of maneuvering behavior.

Feeding activity, or the percent of meal time the animal spent showing prehension, chewing, or swallowing behavior (defined in Tables 2, 3, and 4), varied greatly for all three species (Figure 5). The fish spent the least percentage (26%) of meal time engaging in feeding activity. The cat spent the most amount of meal time (80%) engaging in feeding activity. The dog was between the cat ant the fish in percent of meal time spent in feeding activity (58%).

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