

Age and Sex-Related Activity in White-Nosed Coatis (*Nasua narica*)

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ABSTRACT

The time allocation theory mentions that sociality increases an individual's fitness because it cannot efficiently forage and watch for predators at the same time on its own, but if in a group vigilance can be shared and time to forage and participate in other activities can be increased, therefore increasing fitness (Caraco, 1979). White-nose coatis, *Nasua narica*, (Procyonidae) are diurnal and social mammals. Adult females and juveniles live together in bands whereas males are solitary and only join a band when mating. Because and individual cannot perform two activities at once, I studied how age and sex influence how coatis spend their time. I predicted that females would spend the most time as vigilance to protect their young, juveniles would spend the most time foraging to increase growth, and males would spend less time watching out for predators and more time foraging because predators are not as big as a threat to them. A band of between 10 and 14 and several males frequented a garbage pit close to the Estación Biológica, Monteverde, Costa Rica. I recorded each individual's behavior every minute. Adult females, adult males, and juveniles were recorded foraging, fighting, playing, grooming, climbing trees, resting, looking around (vigilance), and staying out of view (out of site). A chi-square test was used to show that females were the most vigilant (32%) and that males foraged the most (60%). A large amount of time was spent in trees by females (30%) and juveniles, (56%) but not by males (4%). There were low observations of coatis fighting (4%), playing (3%), grooming (1%), and resting (1%). The chi-square test showed that all of the activities that the coatis participated in, and the amount of time they spent was significantly different. The results conclude that females are vigilant the most to protect their young from predators. Males will spend more time foraging. And juveniles will spend the most time in trees to avoid predators, and foraging to increase growth.

INTRODUCTION

Time allocation theory suggests that animals can only perform one activity at a time, and that time budgets maximize fitness (Caraco, 1979). Animals must perform a variety of activities to assure their survival and maximize fecundity, including foraging, courtship, avoiding predators and caring for young (Caraco, 1979). Coatis, like other social animals, must balance activities like: foraging for food, watching out for predators, resting, grooming, and taking care of their young (Kaufmann, 1982). How an animal spends its time largely determines its survival and fecundity. For example, in coatis it is most beneficial for an individual to be a part of a band (Kaufmann, 1982). If in a group the job of looking out for predators is divided among all of the members. Less time is spent on vigilance, which means that it can be spent pursuing other activities that can increase its fitness such as foraging or reproducing (Caraco, 1979).

White-nosed coatis are the most social members of the raccoon family (Kaufmann, 1982). The adult females and their young of up to two years live in bands of four to thirty individuals (Kaufmann, 1982). Band members are normally related, but not always (Kaufmann, 1982 and Gompper, 1997). Adult males are excluded except for brief periods during the breeding season (Kaufmann, 1982). At other times, adult females

chase them away, though males tend to stick to the fringes of groups and are never far away (Kaufmann, 1982). The band forages together, and individuals divide their time between foraging, resting, etc. Social behaviors, like grooming and fighting, are also important (Kaufmann, 1982). Fighting is usually around food and can be more intense between less closely related individuals in the band (Gompper, 1997). In addition, non-related band members usually spend more time away from the band (Gompper, 1997).

Coatis have few predators as adults, but are vulnerable as juveniles. Predators can include raptors, boas, and cats. (Kaufmann, 1983) Predation rates are higher on solitary coatis than coatis living in bands. (Hass and Valenzuela, 2002) Adult females living in bands may forage with juveniles in the center of the group, share vigilance between the adult females, sound alarms and mob predators. All of these behaviors show how predation has shaped social behaviors, and the importance the survival of their young are to female coatis because they spend energy watching out for predators instead of using that time to pursue other activities that would increase their personal fitness (Hass and Valenzuela, 2002). Males will constantly spend time attempting to rejoin the band whenever possible (Kaufmann, 1982). It is beneficial to be a member of the band because vigilance is shared among the members; along with mutual grooming that rids the individual of harmful ectoparasites (Gompper and Kinsley, 1992).

In this experiment I observed how adult females, juveniles, and solitary males spent their time, and how it differed between each other. I hypothesized that adult females would spend more time being vigilant than juveniles because they are more experienced and have learned to be wary of predators. I also predicted that juveniles would spend the majority of their time foraging for food and playing because eating and growing is very important in this stage of their life, and playing helps the juveniles learn how to socialize with one another and to find their place in the band.

METHODS AND MATERIALS

Study Organism

Once a male has reached sexual maturity, about two years of age, it will leave the band and live a solitary life. Males will only rejoin a band during the breeding season, one month early in the dry season. (Kaufmann, 1983) During mating one male will join a band and stay with them for the entire mating season, and copulates with several of the females. The male is submissive with the female members, and participates in all of the band's activities. When it is not the breeding season males are not welcome into the band. If a band is approached by a solitary male outside of the breeding season the male will receive aggression from the adult females, and several females will chase it away. After mating, the pregnant females will leave the band. It will make a nest in the trees, and give birth to their young. (Kaufmann, 1983) During this time the female will spend time caring for its newborn young and foraging for its self on its own. Once their young are old enough to keep up with the rest of the group, the female and the juveniles will rejoin the band.

Study Site

My site was located several hundred meters from the Estación Biológica, Monteverde at the Hotel Establo's hidden dumping site and the forest surrounding it. The dumping

site was located in disturbed secondary forest with a close proximity to primary forest. The Holdridge life zone of the area was Premontane Moist/Wet Transition. The experiment took place for two weeks in late July.

Behaviors

Foraging was defined as searching for, consuming, or moving the location of food. Fighting was defined as an individual lunging, hissing, biting, scratching, or aggressively chasing another individual. Playing was defined as non-aggressively chasing or wrestling and running back and forth or up and down objects with no visible purpose. Grooming was defined as licking or biting itself, or giving and/or receiving licks or non-aggressive bites from another individual. Climbing trees was defined as being located in a tree, and moving from branch to branch or from tree to tree. Vigilance was defined as looking around, making territorial grunts when something unwanted was near, or retreating. Out of site was defined as the coati was out of my line of site, so any activity that the individual may have been doing is unknown.

Behavioral Observations

When coatis were observed the individuals were placed into one of three groups: adult female, adult male, and juveniles. A coati was identified as an adult female if it was of full-grown size and in a band, and testicles were not observed. It is to be noted that it was not always possible to see if testicle were present if there was a large number of individuals, or if it was moving around too much, but if the other two factors were present it was still identified as an adult female. An adult male was identified if the coati was full-grown, solitary, and testicles were present. Juveniles were identified if the individuals were not full-grown and appeared to be members of a band. It is to be noted not to confuse a group and a band. A group is a collection of same individuals based on their age and sex. A band is an adult female group and a juvenile group that cohabitate with each other. The total number of individuals in each group was recorded for each observation period of one minute. Using a stopwatch, I scored the activity of every individual I could see at each minute mark. Activities between minute marks were not scored. Activities included: foraging, fighting, playing, grooming, climbing trees, resting, vigilant, and out of site. After all one minute observations had been recorded the total count for the activities in each group was divided by the total number of members in the group to find the average amount time a group spent on the activity.

RESULTS

There were a total of 3757 observations. (females=1994, males=282, juveniles=1481) The three groups were different in that males were observed foraging the most, females foraged the least, and juveniles foraged for a fair amount of time. A chi-square test showed that adult females spent less time foraging than expected (obs.-215, exp.-242). Adult males spent more foraging (obs.-47, exp.-28), and juveniles spent almost the same amount of time foraging as expected (obs.-155, exp.-147). The amount of time a group spent foraging (figure 1.1) was significant (d.f. =2, critical value=5.99, $\chi^2=16.34$). The three differ in tree climbing in that juveniles spent the most time in trees, females spent less time in trees than juveniles, and males spent the least amount of time in trees. Adult

females (obs.-200, exp.-286) males (obs.-3, exp.-33) spent less time climbing trees than expected, and juveniles spent more (obs.-289, exp.-173). Time spent in trees (figure 1.2) was significantly different for the three (d.f. =2, critical value=5.99, $\chi^2=130.19$). The three were different in vigilance or looking around in that females were the most vigilant, males spent a fair amount of time being vigilant, and juveniles spent the least time being vigilant. Less time was spent looking around (vigilance) than expected in juveniles (obs.-51, exp.-100). Adult females spent more time than expected (obs.-216, exp.-166), and adult males spent about the same amount of time as expected (obs.-19, exp.-20). The time spent being vigilant (figure 1.3) was significantly different for the three (d.f. =2, critical value=5.99, $\chi^2=39.12$). Juveniles spent the most time out of site out of the three followed by males. Females spent the least time out of site. Adult females spent less time out of site than expected (obs.-1327, exp.-1451). Adult males spent more time out of site than expected (obs.-203, exp.170), and juveniles also spent more time out of site than expected (obs.-967, exp.-876). The amount of time out of site (figure 1.4) was significantly different for the three (d.f. =2, critical value=5.99, $\chi^2=26.55$). The other activities were not tested due to the low number of observations recorded.

Adult females spent about as much time being vigilant (n = 216) as foraging (n = 215). These two behaviors comprised about 2/3 of the observations observed (not counting those times the coati was out of sight). Only nominally less frequent was climbing trees (n = 200), suggesting that females spend nearly equal amounts of time looking around, foraging and climbing. Fighting was observed only occasionally (n= 25) and females were out of site frequently (n = 1327). Adult females spent time grooming (n = 6) and resting (n = 5), and no time playing (n = 0). Excluding the out of site activity females were observed foraging and looking around for 32% of their time. They spent 30% climbing trees, 4% fighting, 1% grooming and resting, and 0% playing. The amount of time that adult females spent on each activity (figure 2.1) was significantly different (d.f. =7, critical value=14.1, $\chi^2=74.52$).

Adult males spent the most time foraging (N=47), excluding out of site. They spent a fair amount of time looking around (N=29). A small amount of time was spent in trees (N=3), and there were no observations of males fighting, playing, grooming, and resting (N=0). Males did spend a large amount of time out of site (N=203), but by omitting this activity they spent 60% of their time foraging, 36% looking around, 4% in the trees, and 0% fighting, playing, grooming, and resting. The interesting trend here is that males spend more relative time foraging than females do. Likewise, they spend relatively less time in vigilance. The relative amount of time that the adult males spent on each of the activities (figure 2.2) was significantly different (d.f. =7, critical value=14.1, $\chi^2=45.75$).

Juveniles spent the most time climbing trees (N=287), excluding out of site (N=967). Juveniles also spent a good amount of time foraging (N=151), and a little bit as looking around (N=51). There were very few observations of juveniles playing (N=13), grooming (N=5), and resting (N=1), and there were no observations of them fighting (N=0). Omitting out of site, juveniles spent 56% of their time climbing trees, 29% foraging, 10% looking around, 3% playing, 1% grooming and resting, and 0% fighting. The interesting trends here are that the juveniles spend nearly all of their time climbing and lots more of their time foraging than in other behaviors. The juveniles also spent less time as vigilance, unlike the males and female who spent more time being vigilant. The time that

juveniles spent of each of activity (figure 2.3) was significant (d.f. =7, critical value=14.1, $\chi^2=104.61$).

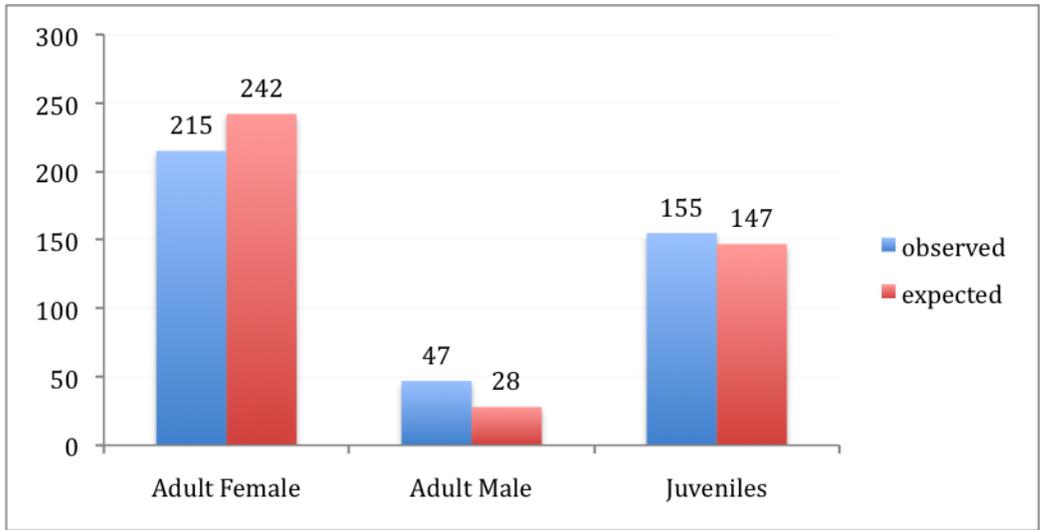


Figure 1.1. Amount of time spent foraging by White-nosed coatis (*Nasua narica*) around a garbage pit near the Monteverde Cloud Forest, Costa Rica. Compared to males and juveniles, adult females spent less time foraging (obs.-215, exp.-242) than what was expected. Adult male coatis (obs.-47, exp.-28) and juvenile coatis (obs.-155, exp.-147) spend more time foraging. Chi-square suggests groups are significantly different (d.f. =2, critical value=599, $\chi^2=16.34$).

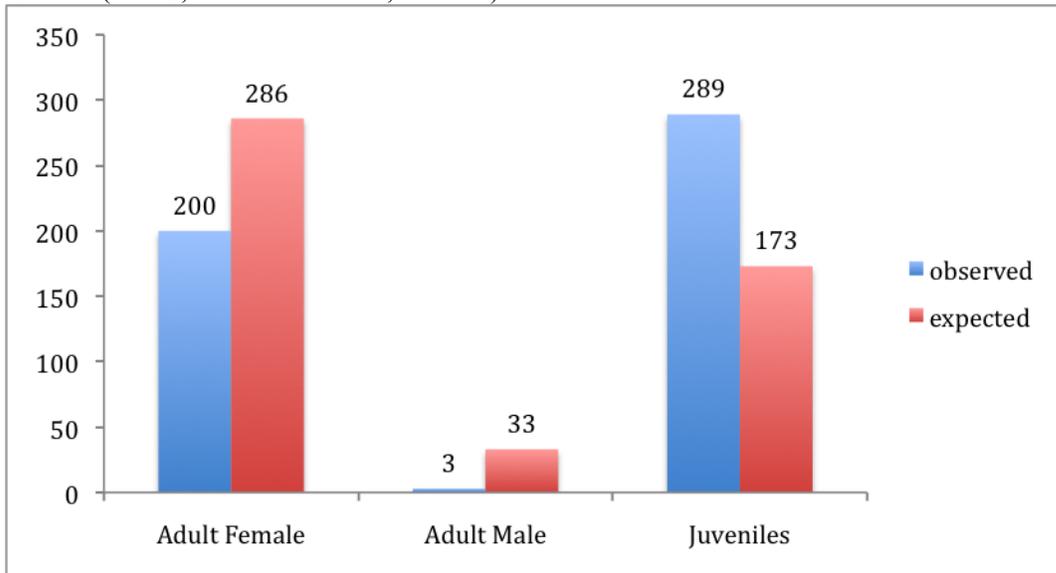


Figure 1.2. Amount of time spent climbing trees in White-nosed Coatis (*Nasua narica*) around a garbage pit near the Monteverde Cloud Forest, Costa Rica. Compared to juveniles adult female coatis (obs.-200, exp.-286) and adult male coatis (obs.-3, exp.-33) spent less time climbing trees than what was expected. Juveniles (obs.-289, exp.-173) spent more time climbing trees than what was expected. The chi-square test suggests that the groups were significantly different. (d.f. =2, critical value=5.99, $\chi^2=13.91$).

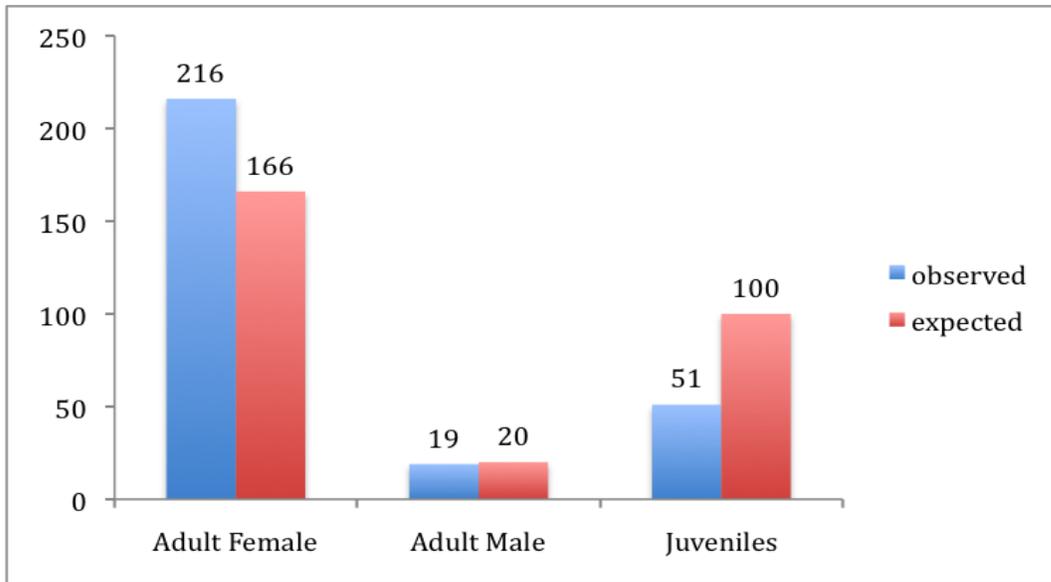


Figure 1.3. Amount of time spent looking around (vigilance) in White-nosed Coatis (*Nasua narica*) around a garbage pit near the Monteverde Cloud Forest, Costa Rica. Compared to adult males and juveniles adult female coatis spent more time being vigilant (obs.-216, exp.-166) than what was expected. Juveniles spent less time being vigilant (obs.-51, exp.-100) than what was expected, and adult male coatis spent close to the same amount of time of being vigilant (obs.-19, exp.-20) of what was expected. The chi-square test suggests that the three groups were significantly different (d.f. =2, critical value=5.99, $x^2=39.12$).

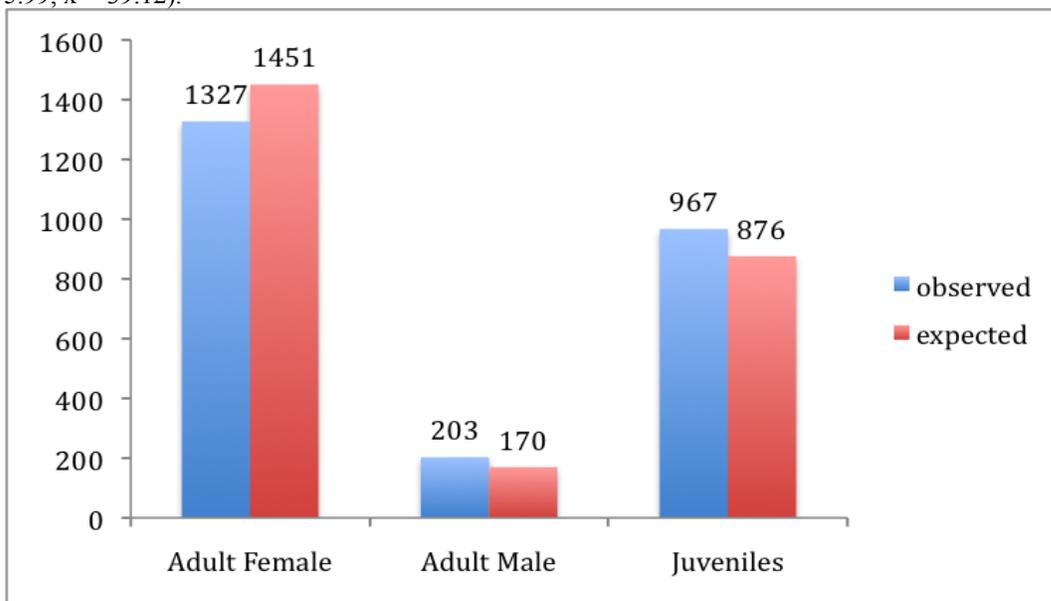


Figure 1.4. Amount of time spent out of site in White-nosed Coatis (*Nasua narica*) around a garbage pit near Monteverde Cloud Forest, Costa Rica. Compared to adult males and juveniles adult female coatis spent less time out of site (obs.-1327, exp.-1451) than what was expected. Adult male coatis (obs.-203, exp.-170) and juveniles (obs.-967, exp.-876) spent more time out of site than what was expected. The chi-square test suggests that the three groups were significantly different. (d.f. =2, critical value=5.99, $x^2=26.55$).

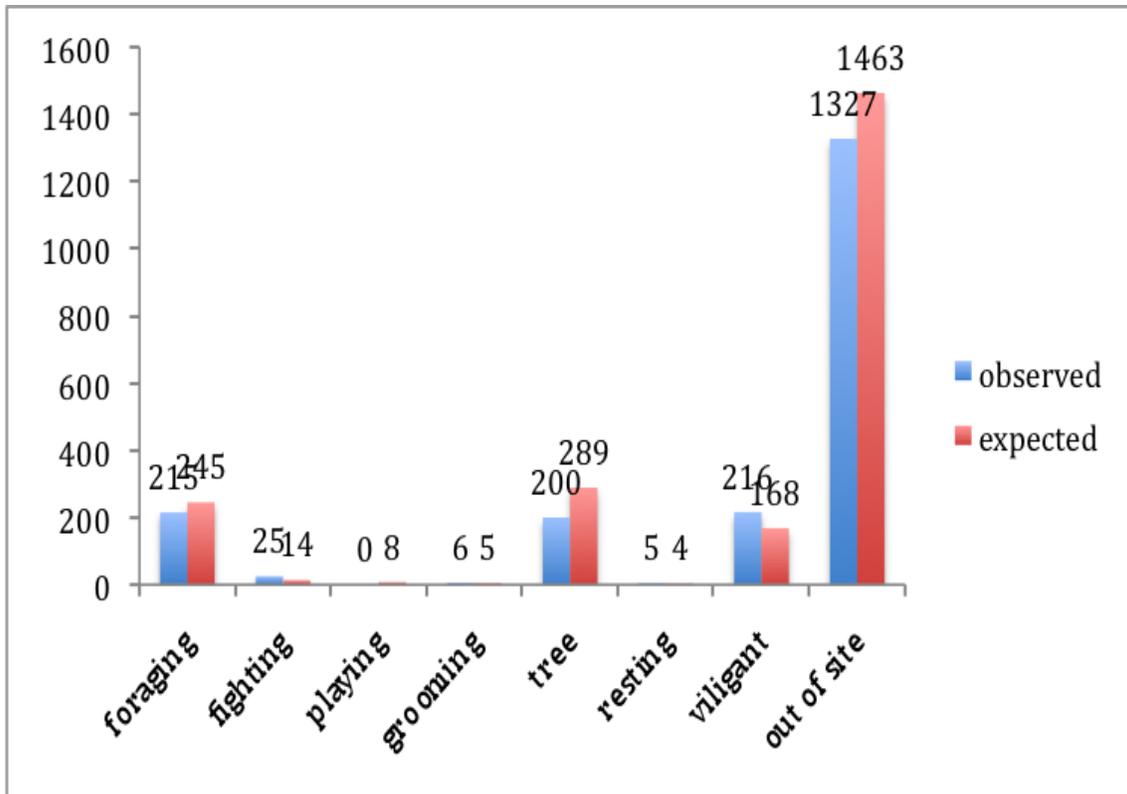


Figure 2.1 Activity budgets for adult female White-nosed Coatis (*Nasua narica*) around a garbage pit near Monteverde Cloud Forest, Costa Rica. Compared to the other activities adult female coatis spent less time foraging (obs.-215, exp.-245), climbing trees (obs.-200,exp.-289), and out of site (obs.1327, exp.-1463) than what was expected. They spent more time fighting (obs.-25, exp.-14) and being vigilant (obs.-216, exp.-168) than what was expected. They spent close to the same amount of time grooming (obs.-6, exp.-5) and resting (obs.-5, exp.-4) of what was expected, and no amount of time playing (obs.-0, exp.-8), which was not expected. The chi-square test that the time spent on each activity was significantly different (d.f. =7, critical value= 14.1, $\chi^2=74.52$).

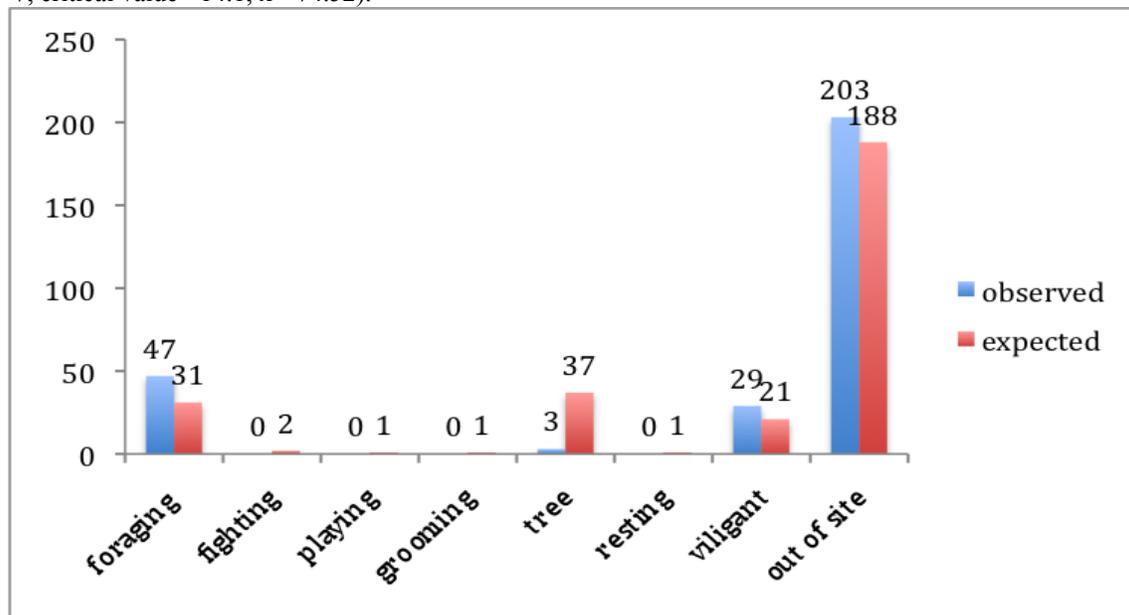


Figure 2.2 Activity budgets for adult male White-nosed Coatis (*Nasua narica*) around a garbage near Monteverde Cloud Forest, Costa Rica. Compare to the other activities adult male coatis spent more time

foraging (obs.-47, exp.-31), and out of site (obs.-203, exp.-188) than what were expected. They spent less time climbing trees (obs.-3, exp.-37) than what was expected. They spent close to the same amount of time being vigilant (obs.-29, exp.-21) of what was expected, and they spent no amount of time fighting (obs.-0, exp.-2), playing (obs.-0, exp.-1), grooming (obs.-0, exp.-1), and resting (obs.-0, exp.-which was not expected). The chi-square test suggests that the time spent on each activity was significantly different (d.f. =7, critical value=14.1, $\chi^2=45.75$).

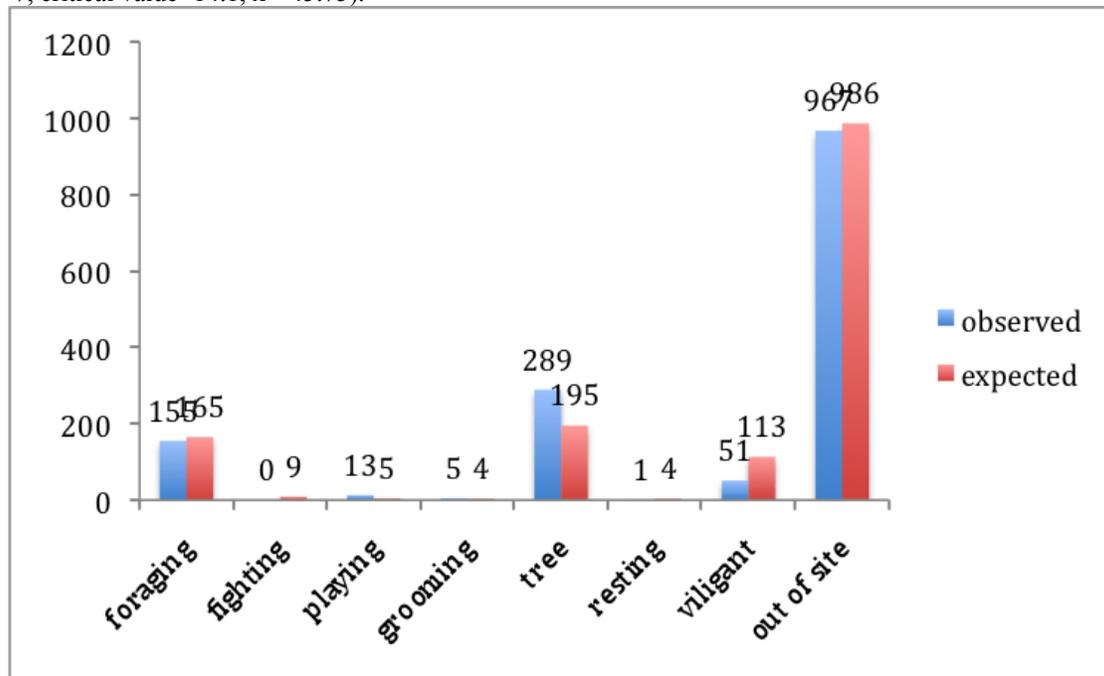


Figure 2.3 Activity budgets for juvenile White-nosed Coatis (*Nasua narica*) around a garbage pit near Monteverde Cloud Forest, Costa Rica. Compared to the other activities juvenile coatis spent more time climbing trees (obs.-289, exp.-195) than what was expected, and they spent less time being vigilant (obs.-51, exp.-113) than what was expected. They spent about the same amount of time foraging (obs.-155, exp.-165), playing (obs.-13, exp.-5), grooming (obs.-5, exp.-4), and resting (obs.-1, exp.-4) of what was expected. They spent no amount of time fighting (obs.-0, exp.-9) which was not expected. The chi-square test suggests that the amount of time spent on each activity was significantly different (d.f. =7, critical value=14.1, $\chi^2=104.61$).

Additional Observations

Additional observations were also recorded that were not subject to statistical analyses. The coatis would always forage in the pit where the freshest food was dumped. Whenever a coati was spooked it would retreat into the forest and climb up a tree. This action was observed in all of the groups. All of the coatis were observed foraging on the ground, and no where else. Fighting was rare and only happened between females. The dispute was usually over food, and the altercation was always brief.

Adult female coatis were observed performing different techniques on how they were foraging and watching for predators (vigilance). On several occasions a band was observed foraging. First one or two adult females would enter the garbage pit alone, forage by themselves for about a minute. Then the female would leave, and return with other females and juveniles. One female would then enter the pit first with juveniles following behind her. The other females stayed at the top of the pit looking around, and would then descend into the pit with the juveniles one at a time. The whole band would forage together in the pit except for one or two females that would remain at the top of the pit and not forage, but were vigilant. On other occasions it was observed that only

one or two females were foraging in the pit by themselves, and other females were at the top of the pit looking around. The female foraging in the pit would only do so for a short time; she would then climb out of the pit with a scrap of food in her mouth, and leave. The female that was stationed at the top of the pit would then enter the pit and forage while another female would come and stay on vigilance. The action was then repeated by leaving with a scrap of food, and another taking her place. Occasionally a juvenile was seen with a few females entering the pit but it was rare, and few juveniles were seen but heard in the forest close by. Juveniles were never seen foraging without the accompany of an adult female throughout the entire data collection period.

On many occasions a solitary male would approach the garbage pit while a band was foraging. The male would sometimes hesitate before entering the pit, but would eventually enter the pit on the opposite side of the band, and forage by itself away from the band. Adult males would have to forage for garbage that was dumped previous days before when a band was foraging at the same time, because the band was foraging on the most recently dumped garbage. Sometimes a male was observed approaching a band while foraging. The females in the band usually tolerated his presence, and did not show aggression towards him until he was in close physical contact. At that point he would be chased away by females until he retreated several meters away from the band. Solitary males would also show less vigilance towards me while I was observing. On one occasion a male approached me at close proximity. On several other occasions a male would watch me from a tree or tall grasses.

DISCUSSION

Excluding the out of site activity. The coatis were observed foraging, climbing trees, and being vigilant the most. More adult females were observed foraging than juveniles, and adult males were observed foraging the most. Juveniles may have been foraging less than the females because it might have been riskier for juveniles to come out of the forest. The observations of where females took food from the pit, and taking it into the forest may have been for the juveniles that were hiding. Males were observed foraging less than the females than juveniles because females and juveniles travel together, and can overtake the trash pit, making it hard for a male to forage. Males may also be intimidated to approach the pit while a band is foraging due to being on the receiving end of the females' aggression. My study did not support Kaufmann's report (Kaufmann 1962, in Ideris 2001) that stated coatis spend about 90% of their time during the day foraging or Ideris's report (Ideris 2001) that says they spent 88.66% of their time foraging. Although a difference in interpretation may be relevant here. The other authors could say that all of my observations counted as foraging due to the proximity of the trash pit even though I did not. But another possible reason for this outcome could be that their observations took place in the dry season, Dec.-April, and Kaufmann's study took place in a seasonal dry tropical forest in Barro Colorado Island, Panama, (Gompper and Krinsley, 1992) where food is scarce at that time of year. My observations took place in the wet season, July, in a wet tropical where food is more prevalent. Because food is in a greater abundance, the coatis do not need to spend as much time searching for food. The trash pit also provides a constant, reliable food source so it eliminates the time it takes to

search for food. Because the food gets dumped into the pit year round, the coatis foraging behavior may not change during the dry season as well.

A large number of juveniles were observed climbing trees. This could be because it is safer for the juveniles to be in the trees because they are out of reach of predators. Females were also seen climbing trees with juveniles through not as many. Females were probably seen in the trees because it gives them a high vantage point, and they are able to see anything in close proximity including potential predators. Another reason that more juveniles were seen in the trees is because they could still be learning how to climb trees, and may not be allowed onto the ground until they have mastered the skill. It is possible that climbing trees is an important skill to have because a coati will have to be able to quickly escape from a predator by climbing up a tree. The large number of observations of females and juveniles in trees may also mean the band is moving from one place to another, and it might be safer to travel by tree than land. Also if the band is not foraging then there may be no real reason from them to be on the ground, it is possible that it is much safer for them because they are high up, and well hidden in the forest's canopy. There were few observations of males in trees. This does not mean that males spend less time in trees, but because they travel alone perhaps they are able to go by unnoticed, unlike a noisy band of females and juveniles with many individuals.

Out of the three groups adult females showed the most vigilance. This was most likely because they are protecting their young who are probably more vulnerable to predators. The females displayed several strategies to protect the band from predator. One was when a female would stay at the top of the garbage pit while the rest of the band foraged. That female could have posed as a look out, and watch for predators while the group ate. If a predator approached she could alert the group, and the band could escape. Another method observed was one or two females foraging while others posed as lookouts. The foraging female would take food from the pit and carry it into the forest, and then trade positions with the females on guard. Because no juveniles were observed, but heard it is assumed that the females were bringing food back to the juveniles that were hiding in the forest. The female probably did not bring the juveniles out because it may have posed as too much of a danger to them to be out in the open. Juveniles did not show vigilance as much of the females because they are still learning about dangers. They also do not need to spend the energy of being vigilant when the have the females doing it for them instead they can focus that energy on foraging, which it is most important for them to be eating as much as possible in this stage in their life, so they can grow to become strong, healthy adults. The solitary males were less vigilant than the females and the juveniles. In fact they showed interest in my presence, and would approach or watch me from treetops. Males may be less vigilant because they do not have any young to look after, and because of their size they have few predators to worry about. This may allow the males to move about with less fear, and to boldly investigate new things around them.

Out of site was the largest recorded activity. This activity does not tell much, it just indicates that some coatis previously observed were not seen while other coatis were observed. The out of site coatis could have been doing any of the other activities. Activities that got low observations such as: grooming, playing, and resting might have taken place at this time. Because they had taken refuge in the forest, and they could leisurely take part in these activities in a safe and relaxed environment.

Grooming each other is an important social behavior among White-nosed Coatis. Not only does it remove harmful ectoparasites from each other but consuming blood filled ticks has nutritional benefits (McClearn, 1992). Further, it is an important bonding time for the band and reinforces their dependence on each other. Although there were few observations on grooming, this activity might have been more common at night. McClearn's findings somewhat support this theory. Although his study had to do with the mutualist behavior between tapirs and coatis, he found that coatis would remove ticks from tapirs. (McClearn, 1992) The behavior only happened at night, and if coatis only participated in grooming activities at night then the mutualist behavior would not exist in the daytime. This theory may seem far-fetched because tapirs are nocturnal, and that could have something to do with, but it is still something to consider, and investigating what activities coatis do during the nighttime would be interesting. Resting most likely happened at night as well since coatis are diurnal. Coatis also sleep in trees which would have made finding them difficult.

Fighting was rare, and it was only observed in the adult female. In all of the occasions the fighting was short and the issues was over food. My observations on fighting is similar to Ideris's findings that most aggression is shown over food between two adult females, and that the encounter was brief. No aggression was shown towards juveniles. (Ideris, 2001) It did not follow Ideris's research in the fact that there seemed to be no form of dominance of one individual in the band (Ideris, 2001), but it did follow Kaufman's interpretation that a band lives together in peace with no hierarchical system (Kaufman, 1982).

My observations on how a band would react to an approaching solitary male did not compare to Kaufmann's study that found adult females are actively aggressive to any adult males that are in the vicinity of the band outside of the mating season. (Kaufmann 1962, in Gompper and Krinsley 1992) Kaufmann found that out of 63 encounters 55 ended with males being aggressively excluded, 10 ended in actual fights, and only 3 ended with the males being allowed to feed close to the band. My observations agree with Russell's (1981) results, which reported males being allowed to submissively approach (in Grompper and Krinsley 1992). In my observations adult males were allowed to approach, and feed close to the band. If the male overstepped his boundary and came too close a female would chase him until he was a preferred distance away. The reason for the female's tolerance towards the males could be because food is plentiful, and there is no competition between each other. The approaching male may also have been a previous member of the band when he was a juvenile, and the band has more tolerance towards their relatives. In Grompper and Krinsley's (1992) study they found that young adult males of about three years of age were allowed to join a band for a extended period of time but only if the males were related to the band that they were associating with because the males probably will not bother the females about mating (Grompper and Krinsley, 1992). This behavior is possible in my study, because every time a band was observed the adults were automatically labeled as females because external genitalia was never observed, but it is possible that some adult males were with the band and were incorrectly identified. Although this outcome is highly unlikely. Another reason why males are usually excluded from the band is because they are known to prey on or harm the juveniles (Russell 1981, in Grompper and Krinsley 1992, and De La Rosa and Nocke 2000). But if the male poses no threat to the juveniles, there is no competition for food,

and they will not bother the females then there is no reason not to let the male join. Also young related males might be more tolerated because they are smaller in size and not likely to attack their younger relatives. The male may also have joined the band during the mating season, and some of the juveniles may be his offspring, therefore he does not want to attack his own young. It has been noted that after a female gives birth she allows the father to join them for a short period of time, so that he can recognize his offspring. (De La Rosa and Nocke, 2000) This is beneficial, so that the male will not attack his offspring in the future.

My data may be skewed due to my presence. To the coatis I was a potential threat to them, so they were always wary when I was around. I feel that if I would have been able to observe the coatis without my presence being known then I would have received more conclusive data because they would not have to spend energy being constantly focused on me, and I would have been able to observe how they act more naturally. Further research where the observer is not noticed by the coatis would give better data on the amount of time they spent being vigilant and participating in other activities.

Overall my results did show that the time allocation theory did apply to White-nosed coatis, and that age and sex to determine how much time they spend on each activity. Their social behavior and interaction with one another can differ from individuals, bands, regions, and the time of year. Although much has been reported on the animals there is still a lot that is unknown about them, and the reasons behind their behaviors. Many more studies can be explored to unlock the mysteries of the most social members of the raccoon family.

ACKNOWLEDGMENTS

I would like to thank the Rodríguez García family for allowing me to stay with them, and providing me meals during the duration of my research. The Estación Biológica for allowing me to use their facilities. The Hotel Estabolo because although illegally dumping garbage into the rain forest is horrible, it provided a good site to study coatis, but they should still be ashamed of themselves. I don't know how those people sleep at night. Karen Masters, Pablo, Moncho, and Raquel for answering any random questions that I had, especially Moncho when my figures would not show up on my powerpoint the night before my symposium. Alan Masters for advising me on my project, and giving an immense amount of help on writing this report. He returned my rough draft and it looked like my paper had been stabbed multiple times. It was a bloody mess with all of the red comments, but I know that when Alan assulted my paper it was only to improve my writing and make me a better biologist. CIEE for putting together this fantastic program that has forever changed my life. The rest of the CIEE posse who put up with my coati obsession, and always made me laugh. My parents, Becky and Bursell Munro, who not only gave me life, but also always providing guidance, love, and support, and for paying for this trip of course. Thank you mom and dad! But most of all I give thanks to the blessed rain forest. Its beauty and magic has touched my heart, and the heart of others, and I can only hope that the *homo sapien* species won't destroy the most beautiful and wonderful place on Earth. Pura Vida!

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