

LSM1303 Animal Behaviour Symposium 2017
Student observations of animal behaviour in Singapore
Symposium I (21 March 2016) & Symposium II (04 April 2016)

Group No. 1: “How does human presence affect the foraging efficiency of the white-breasted waterhen (*Amaurornis phoenicurus*)?”

Choo Jia Le (SOC3), Daryl Ng Wee Kiat (SoC3), LEE KIM HUA @ MICHAEL LIM (SOC3), Goh Zhi Lynn (FASS2), Ivan Tan Yee Shu (SCI3)
Symposium I (21 March 2016)

The White-breasted Waterhen (*Amaurornis phoenicurus*) is a rail bird identifiable through the contrasting colors of its body. It is commonly sighted near freshwater marshes foraging on the ground and less often, on trees. We studied the effects of human presence on the foraging efficiency of the white-breasted waterhen in January and February 2016 at Kent Ridge Park. Five observers collected 24 data points from eight waterhens, from 1000 to 1200 hours over four sessions, using behaviour and ad libitum sampling. The foraging efficiency was calculated by dividing the number of peckings observed over the duration of time in seconds when the bird was visible. The results were interpreted to show that the average foraging efficiency is higher without human presence than with human presence (0.22 versus 0.05). It is concluded that the white-breasted waterhen has higher foraging efficiency when there is no human presence.

Group No. 2: “Flicking In Action: How does the behaviour of *Varanus salvator* affects its tongue-flicking?”

Go Hui Shan (SOC2), Talya Wei Yen Randall (FOS2), Tok Xin Hui (FOS3), Wen Jiahui (FAS2), Yeo Shi Er Shannon (LAW3)
Symposium I (21 March 2016)

The Malayan water monitor lizard (*Varanus salvator*), like most reptiles, senses its surroundings by flicking its tongue. In this project, we investigated the effect of swimming, crawling and basking on the monitor lizard's tongue flicking. All occurrence sampling of the tongue flicking behaviour of lizards was conducted at Chinese Garden from 1400 hrs to 1800 hrs for three days. A tongue flick is the movement of the tongue, from its appearance outside of the mouth until complete retraction. The average number of tongue flicks per unit time (30s) from 25 samples was calculated for each behaviour. The results indicate that there is higher average of tongue flicks in behaviours involving locomotion, particularly in swimming. A higher average of tongue flicks while the lizard is swimming is also attributable to its foraging. This supports the argument that the lizard's tongue is used as sensory organ to obtain information from their surroundings.

Group No. 3: “Handedness and courtship behaviour of porcelain fiddler crab (*Uca annulipes*): Lefty or Righty?”

Faiqah Bte Hussin (FOS3), Mohamed Sultanul Arifin s/o Noor Mohamed (FOS2), Muhammad Fathul Ariffin Bin Ayub (FAS3), Nur Yaisyah Bte Md Yasin (FOS3), Sunthar s/o Balakrishnah (FOS3),
Symposium I (21 March 2016)

Porcelain fiddler crabs (*Uca annulipes*) are small-sized crabs found within Pasir Ris Park Mangroves. Our project explored the relationship between handedness of the fiddler crabs and their courtship behaviour. We conducted focal sampling of both left and right-handed males over 6 trips (12 hours) during low tides (3-5pm) during February and March. We recorded the (1) duration of interaction between a male and a female and (2) number of waves executed by the males towards the females, until either a success or failure is observed. As our results showed no successful mating, we identified external factors that may have caused this outcome. Hence, (1) and (2) have no influence on the courtship behaviour. We conclude that there is an equal opportunity to mate for the males, regardless of handedness. Ergo, the relationship between handedness and courtship behaviour is complex, thus this trend is worthy of further investigation.

Group No. 4: “How does human traffic affect the reactions of male red jungle fowls (*Gallus gallus*)”

Benjamin Oh (BAC3), Crystal Lim (FAS3), Eugene Wong (FAS3), Rodson Chue (COM3), Karina Lee (FAS1)
Symposium I (21 March 2016)

Red Jungle Fowls (*Gallus gallus*) (RJF), ancestors of domestic chickens, were recently sighted in across Singapore island. As male RJFs are territorial animals, we chose to investigate their reaction to human traffic. Using all occurrence sampling, we collected samples from Botanic Gardens (SBG) and Pasir Ris Park (PRP) from 0800hrs to 1000hrs for eight days. Three people per trip observed one to two RJF(s), accumulating a total of 873 samples. Every reaction to each passer-by was recorded as one data point. The response rate in PRP [36%] was higher than in SBG [9%]. The median distance in PRP [2.5m] was shorter than in SBG [4m]. We conclude that response rate inversely correlates to human traffic while distance positively correlates to human traffic. We suggest that assimilation with its environment might explain the inverse correlation of response to human traffic but is inconclusive in explaining distance to reaction.

Group No. 5: “The repertoire of behaviours exhibited by the water montor lizard (*Varanus salvator*) between 12pm – 3pm”

Koh Rui Han Nicholas (FOS3), Leow Wei Xiang (FOS4/SOC4), Goh Jia Zhi (FOS3), Casey Koh Miao Li (FOS3), Tan Xi Min (FAS3),
Symposium I (21 March 2016)

Varanus salvator is the second largest lizard in Southeast Asia. A reference study on a similar species suggested that the *Varanus* genus lizards were most active in the day, with foraging being the most common activity. We investigated the behaviours exhibited by the lizards during our study period (12pm - 3pm) at Chinese Gardens. Five observers performed ad-libitum sampling on 31 adult and 11 juvenile lizards for 15 hours across 5 days, recording the amount of time spent on each behaviour onto a graph. Our data suggests that juveniles are more active and spend less time basking than adults. Both exhibited common behaviours, such as tongue-flicking consistently when the lizard is moving or in a new area. Distinct actions during feeding were also noted. Furthermore, they tend to be indifferent to non-lizard animals but averse to sharing space with other lizards. Lastly, they engage in left-right head movement when approaching other lizards.

Group No. 6: “Do Plantain squirrels (*Callosciurus notatus*) consume its food at the point of discovery? ”

Chen Min (SDE4), Teo Wei Lun Shawn (SDE3), Ker Ying Ying (SDE4), Yong Gene (SDE3), Max Teo Jun Yang (SDE4)
Symposium I (21 March 2016)

Plantain squirrels (*Callosciurus notatus*) are arboreal animals that live in trees in a wide range of habitats. An observational study was conducted on the consumption behaviour of 6 to 7 plantain squirrels each time in Bishan-Ang Mo Kio Park of Singapore. Ad libitum samplin was used in the initial recce session to establish an ethogram. Following which, focal sampling was used to record consumption behaviours of each individual for 4 days from 9am - 11am. As prey animals, there is a need for plantain squirrels to strike a balance between their consumption behaviours and vigilance against predation. Thus, they are expected to consume at a location sheltered from predators. Contrary to expectations, there were occasions when plantain squirrels consumed food on the ground at the point of discovery. However such consumption behavior may vary in different habitats.

Group No. 7: “Courtship rituals of rock pigeons (*Columba livia*)”

Lee Jia Min (FASS4), Choo Hui Hong Melissa (FASS 2), Lim Hui (FASS2), Kit Wei Min (SOC3), Jia You Wei (ESE4)

Symposium I (21 March 2016)

Rock pigeons (*Columba livia*) are found in urban areas and are monogamous despite being communal animals. This unique bond between the male and female pigeon piqued our interest in courtships. We thus ask “how does food as a variable affect courtship rituals”? Our sampling method consists of four 1-hour studies, whereby each male pigeon was observed for 2 minutes, with 2-minute intervals between the observation of each specimen. We then calculated the frequency of courtship initiation within the hour, and the duration of each courtship, with reference to the amount of food present. We discovered that while an increase in food increases the frequency of courtship initiation, it decreases the duration of courtships. Additional information such as the procedures following failed and successful courtships, and during mating were also observed. In conclusion, the significance of courtship within a pigeon’s daily routine is dependent on the amount of food present.

Group No. 8: “Why does the yellow-spotted mudskipper (*Periophthalmus walailakae*) raise its dorsal fin?”

May Mann Oo @ Ivy (FASS3), Tammy Ng Shi Min (FOS3), Kwan Wai Leong (FOE3), Wong Jit Nung (FASS3)

Symposium I (21 March 2016)

Yellow-spotted mudskippers (*Periophthalmus walailakae*) are amphibious fishes living in muddy environments that have yellowish spots scattered on its ‘cheeks’ and body. Our project focuses on finding out what does the raising of dorsal fins signify. Scan sampling was conducted at Sungei Buloh Wetlands Reserve (SBWR) in 10-minute intervals on four days during low tide, with information gathered from a total of 25 individuals. At least two members were present during each observation to generate a more accurate data for scan sampling. Our observations reveal that raising of dorsal fins occurred most frequently when another mudskipper approaches the resident mudskipper within a 20cm radius, and when the observed mudskipper is in motion. Hence, we conclude that raising of dorsal fins largely indicates territorial behavior and can also be observed during movement. Furthermore, it can also be deemed as a courtship behavior.

Group No. 9: “Does the most frequent foraging technique used by little egrets (*Egretta garzetta*) have the highest success rate of capture?”

Rebekah Mak (FOS3), Lim Xuan Jun (FOS3), Cindry Handojo (FOS3), Ng Miao Yu (FAS2), Chew Wei Ting (FAS2)

Symposium I (21 March 2016)

Little Egrets (*Egretta garzetta*) are white herons commonly found in Sungei Buloh. We investigated the relative frequencies of five foraging techniques and success rates of capture by Little Egrets. Two methods were used. In all-occurrence, we observed the frequency of techniques used by a group of individuals (n=20) for a 20-minute period. In focal sampling, success rates were determined by observing actively foraging individuals (n=14) for 5-minute time periods. Results showed a discrepancy between the most frequent (Walk and Stalk, 48.2%) and most successful technique (Pecking, 75.0%). Reasons for the discrepancy could be the different energy expenditure required by different techniques, which affects prey choice as expounded by Optimal Foraging Theory and other literature. Our findings showed that the most frequent technique does not have the highest success rate of capture. Future studies could explore other factors that affect foraging behaviour, such as prey choice.

Group No. 10: “Does level of human activity affect the behaviour of plantain squirrels (*Callosciurus notatus*) in Clementi Woods Park?”

Ang Xinhao Edmond (FOE4), Chin Yui Yih (FASS2), Jasper Lee (COM3), Lee Jia Ying Darren (FASS1) and Lim Zheng Wei (FOE3)

Symposium I (21 March 2016)

Plantain squirrels (*Callosciurus notatus*) are arboreal rodents native to South-East Asia. In this study, we investigated the effect of varying human activity levels on the behaviour of the plantain squirrel in Clementi Woods Park. Five observers conducted focal sampling in two areas of high and low human activity (HHA and LHA respectively). Two observations were made per area from 0800 hrs to 0900 hrs on four weekdays, recording: 1) sighting frequency, 2) height location on trees, 3) distribution of behaviours, 4) number of squirrels. Results indicate varying levels of human activity affect the plantain squirrel behaviour in nature parks: lower sighting frequency and numbers, higher average position on trees and frequency of stationary behaviours were observed of squirrels in HHA (n=3) compared to LHA (n=13). It was also found that dynamic, compared to static, nature of human activity affected behaviour. These findings suggest that plantain squirrels are only partially habituated to human disturbances in nature parks.

Group No. 11: “How is the foraging efficiency of cattle egrets (*Bubulcus ibis*) affected by the presence of other bird species?”

Gee Jie Min Joyce (FAS2), Hong Ting Yu Rachel (FAS2), Ivan Toh Jun Liang (FAS2), Joice Ng Rui Yi (FAS2), Muhammad Faiz Bin Zulkiffley (FAS2)

Symposium II (04 April 2016)

Cattle Egrets (*Bubulcus ibis*), commonly associated with cattle when foraging, are small, white herons with yellow bills and black legs. This project investigates the effect of the presence of other bird species on the foraging efficiency of cattle egrets at three fields beside Yio Chu Kang Station. Focal and all-occurrence sampling were conducted over 6 days (16 - 21 February 2016), in the morning and evening. Video recordings were taken and replayed to obtain the raw data. For each observation (n=120), we noted the duration and counted the number of pecks and swallows. Upon processing, it showed that cattle egrets had a lower foraging efficiency when other bird species were present (i.e. within 5m sphere radius of a cattle egret). Interspecific competition, including factors such as body size and diet, could be possible reasons. Thus, the foraging efficiency of cattle egrets decreases in the presence of other birds species.

Group No. 12: “Parental care by female Long-Tailed Macaques (*Macaca fascicularis*)”

Tan Young Sing (COM4), Lee Wei Hong (COM3), Lee Xing Hui (ARS2), Chan Yuebei Alison (ARS2) and Bernice Kwok Huimin (ARS2),

Symposium II (04 April 2016)

Long-Tailed Macaques (*Macaca fascicularis*) are common primates in Singapore, and can be found travelling in large troupes for protection against predators, especially mothers, who are the primary caregivers and are intensely protective of their young. In this project, we investigated parental care by female long-tailed macaques at the Central Catchment, with a focus on avoidance of other monkeys and permitted infant-handling. Focal Sampling and All Occurrence Sampling, 30mins/pair and 2h/pair respectively, were employed in the 10-hours' worth of observations of 4 unique mother-infant pairs. Moving away from another monkey constitutes as a count for 'Avoidance', and letting another monkey touch the infant counts towards 'Allow' for infant-handling. Results show that mothers do not avoid other monkeys (n=15/20), and mothers permitted other monkeys to touch their infants (n=8/13). From our results, we conclude that it is likely the natal coat of infant has conferred immunity, leading to most cases of non-avoidance, and that permission to touch infant is dependent on grooming of mother.

Group No. 13: “The Alpha Javan Myna”

Tan Kuan Llang (FASS3), Muhammad Afi Syafiq Bin Mohamad Zin (FOS2), Lin Yuan Hon Zenn (FOE3), Loh Weijit (FOE3), Eugene Foo Zhi Jun (FOE3)
Symposium II (04 April 2016)

The Javan Myna (*Acridotheres javanicus*) is a widely known bird in Singapore. In this research project, we seek to find out the group system which the Javan Myna adopts when foraging and whether there is any form of hierarchy within the group. Here we utilised focal sampling method to observe the Javan Myna pairs' movement pattern. Based on the literature that we took reference from, we formulated a ratio of the 'follower movement' between the birds in a pair to determine the leadership behaviour of the myna pairs. Upon analysis of the data collected, our results showed that a high percentage of effective pairs observed satisfied our proposed ratio and hence conclusive of the Javan Myna exhibiting leadership behaviour within a pairing. However, our research method is highly simplified and more advanced and technical research would be required to ascertain our results.

Group No. 14: “Relative size of tree climbing crabs (*Episesarma* spp.) and their gill-wetting behaviour”

Bay Chuan Wei (SOC4), Quek Jie Ping (SOC4), Samuel Lim Yi Jie (SOC3), Lam Li Ting Yvonne (FAS3), Lim Zhen Ming (SOC4)
Symposium II (04 April 2016)

In the course of tide rise and recession, tree climbing crabs (*Episesarma* spp.) climb trees to avoid predators in the waters. While mainly staying motionless to avoid detection, they may partially submerge into the water to oxygenate their gills. We seek to answer this question: Does the relative size of crabs affect how often and how long they enter the water before the tide reaches its peak until it subsides? Our group conducted focal sampling at Sungei Buloh Nature Reserve and Pasir Ris Park on 4 Saturdays. The number of times each crab partially submerge into the water are recorded and the duration of each submerge is timed. Results show that larger crabs (n = 10) submerge more frequently and for longer duration than smaller crabs (n = 25). This suggests that the size of crabs may account for the willingness to risk exposure to underwater predators in exchange for moist gills.

Group No. 15: “Does group size affect vigilance level of the cattle egrets (*Bubulcis ibis*)?”

Jemima Koh Jia En (SCI1), Lim Joey (FAS2), Lim Ying Rui Jacqueline (FAS2), Ong Yan Ling Josephine (BIZ4), Wu Weizhong Joshua (FAS3)
Symposium II (04 April 2016)

Cattle Egrets (*Bubulcis ibis*) are a species of heron found foraging in open fields. In our study, we are interested in finding out the effect of group size on vigilance activity. Observers worked in pairs to conduct scan sampling, observing the vigilance behaviour exhibited by cattle egrets in Ang Mo Kio Industrial Park 2, over a period of seven days from 1600h to 1800h. Egrets were classified according to group size (≥ 10 = big / < 10 = small). The vigilance behaviours were recorded in intervals of three minutes and a total of 215 data points were collected. Results show that smaller groups of Cattle Egret displayed a higher incidence of vigilance behaviour per bird compared to those in bigger groups. Thus, group size can be concluded to be inversely related to vigilance activity of the Cattle Egrets. The “many eyes” hypothesis, and the dilution/confusion effect, which support our results, will be discussed.

Group No. 16: “Are Grey herons (*Ardea cinerea*) nests with no fledglings are sites of more active nest building compared to nests with fledglings in the causarina tree at Japanese Gardens?”

Ong Qin LI (FOS2), Teo Li Shan (FAS4), Jerome Chua Jie Ren (BIZ2), Kelvin Phua Song Yong (ENG3)
Symposium II (04 April 2016)

Grey herons (*Ardea cinerea*) generally nest in colonies and have nests built with sticks that are lined with grass or leafy branches. This project investigates if grey heron nests with no fledglings (NF) are more active in nest building compared to nests with fledglings (WF) on a causarina tree at Japanese Gardens. Focal sampling of four heron nests was conducted over 3 days (15th, 16th, 21st March) with two sessions each – 8.30am to 11am and 4pm to 7pm. There were a total of 47 fly-ins recorded with building materials, split between the WF and NF by a ratio of 13:34 respectively. Non-building materials were also recorded for comparison purposes. Results indicate that NF bring back more building materials. We conclude that WF have their priorities split between feeding their chicks and maintaining the nest, so they bring less building materials back and more non-building materials like food.

Group No. 17: “How do thermal factors affect the activity of the Malayan water monitor (*Varanus salvator*)?”

Chew Jun Kong (FOS2), Glenda Tan Yu Fang (FAS3), Tan Li Yi Denyse (FOS2), Tay Ye Han (SDE4), Yu Yue (BBAH)
Symposium II (04 April 2016)

The Malayan water monitor (*Varanus salvator*) is a species of monitor lizard in Singapore, with dark grey scales and commonly found around water bodies. In this project, we investigated how temperature and cloud cover affects activities including locomotion, basking, foraging and interaction between individuals. Ad libitum video recording and notes were taken for our data collection. We observed approximately 10-15 individuals around Chinese Garden from 0900-1200hrs and 1400-1700hrs for 2 days (22Feb, 24Feb). The time, hourly temperature and presence of sunlight were recorded. The results indicated that under direct sunlight, there was high occurrence of water monitors swimming with heads above water and low occurrence of them remaining stationary. This could be attributed to the reduced need to sunbathe, due to lower likelihood of falling below active body temperature. Hence, when there is direct sunlight, Malayan water monitors are more active, entering the water more often in order to thermoregulate.

Group No. 18: “How do the adult smooth-coated otters (*Lutrogale perspicillata*) behave differently when they are with their young?”

Darius Foo Tsien Wei (SOC4), Low Jen Hui Julia (SOC4), Low Weilin (SOC4), Lim Hong Hui Eugene (SOC/BIZ4), Muhammad Fazli B Sapuan (SOC4)
Symposium II (04 April 2016)

Smooth-coated otters (*Lutrogale perspicillata*) are social mammals, often hunting in groups. We investigate how adult otters behave differently when they are in close proximity to their young. Ad libitum sampling was performed on one family of smooth-coated otters by measuring the percentage of time spent engaged in various behaviours, with and without their young (aged approximately 1.5 to 3 months). The observation was conducted at Kallang Basin in 8 trips over a period of 6 weeks, from 0700 to 1200 hrs. Our data indicates that when around their young, adult otters spent 28% of their time interacting with them. Up to 14% less time was spent on other activities, such as feeding and territorial behaviours. This could be due to adult otters behaving more cautiously around their young. Therefore, we conclude that adult otters do behave differently around their young, spending a significant amount of time interacting with them.

Group No. 19: “Drawing relations between the foraging behaviour of the red jungle fowl (*Gallus gallus*) and their substrate”

Chua SuQi (FASS2), Foo Yu Ki (FASS2), Wong Xiao Hui (FASS2), Tay Jun Wu Alan (SOC4), Chew Tee Ming (SOC4)

Symposium II (04 April 2016)

The Red Jungle Fowl (*Gallus gallus*) is the wild ancestor of the domestic chicken and is listed as an endangered animal in Singapore. Using All-Occurrence Sampling, relations between foraging success and their habitat substrate were investigated at the Singapore Botanic Gardens from 0700-1100, over 6 days. Foraging success was measured by the number of times the *Gallus gallus* swallowed over the total amount of time spent foraging. It was found that the success rate of foraging tended to be highest on plant litter (17.2%) out of the four substrates we had observed them forage on. This may be due to the abundance of food available, suggesting that plant litter is the preferred foraging ground for the *Gallus gallus*. An absence of such a substrate may thus upset their dietary needs and prevent them from repopulating in Singapore. Other observations pertaining to foraging behaviour will be discussed.

Group No. 20: “What are the courtship behaviors displayed by male rock doves (*Columbia livia*)?”

Lim Hui, Kei (FAS3), Lin Tzu Yao (ENG4), Nguyen Le Minh Dat (SOC4), SherylN Toh Hui Hsian (SOC3), Tammy Lim Wee Khee (FAS3)

Symposium II (04 April 2016)

Rock doves (*Columbia livia*) are one of the most common birds found in Singapore. Researchers have found that male rock doves have a specific set of behaviours they display when attempting to court a female. Consequently, in our study, we aim to identify which of these courtship behaviours had the highest incidence rates. Data was gathered through filming of a flock of about 20 rock doves in the Singapore Botanical Gardens on six separate occasions, over the span of one month. Time of data collection ranged between 10.30am and 7pm. Through quantitative analysis of behaviour incidence rate, it was found that cooing, bowing, and treading had the highest occurrence out of all behaviours males display, and hence were likely to be central to the courtship ritual.

Group No. 21: “What do Malayan water monitors (*Varanus salvator*) do when it gets too hot?”

Yan Mingwei, Dalton (SOC2), Chia Liu Ee (SDE3), Queenie Loh Chen Ying (FAS3), Jaslyn Lim Xinyi (FAS3), Toh Xin Hui (FAS3),

Symposium I (21 March 2016)

Malayan water monitors (*Varanus salvator*) are large lizards that can be found near water in forests, mangroves, scrubland, and canals in Singapore. For this project, we investigated the effects of temperature on their foraging and thermoregulatory behaviors. Focal sampling was conducted on the lizards during different blocks of timings between 0700 to 2000hrs over a fortnight. Air and water temperatures were measured with a Thermo-hydrometer and an Outdoor Pen Thermometer respectively. The results indicated that when temperatures were above 35°C, lizards swam or sought shelter 80% of the time, compared to 40% when temperatures fell below 30°C. Basking was observed between 28.3°C to 36.7°C and foraging happens most usually on unsheltered land when temperatures were below 34°C. Ultimately, the hypothesis of foraging behaviour being affected by temperature has been supported. However, the results show that thermoregulation by basking also occurs during higher temperatures instead of solely lower temperatures.

Group No. 22: “Does human density affect the foraging behaviour of long-tailed macaques (*Macaca fascicularis*)”

Alyssa Nicole Ng Jen (BIZ3), Lee Mui Gek Elvina (FOS2), Quek Jun Jie (SOC4), Toh Yan Ling (FOS2), Sim Xing Kai (FOS2)

Symposium I (21 March 2016)

Native to Singapore, long-tailed macaques (*Macaca fascicularis*) are ubiquitous and reside on the fringes of nature reserves. Foraging is an important behaviour for survival, but humans have invaded their habitat, resulting in these primates altering their behaviour. Our project investigates whether human density affects the foraging behaviour of macaques. Ab libitum and scan sampling was conducted within a 50 meter radius along pavements at Mushroom Cafe in Macritchie Reservoir. Sampling was carried out over 4 days, both weekdays and weekends, between 8-10am, and at 10 minute intervals. Foraging includes macaques searching for food, be it eating leftovers at the café or rummaging through dustbins. Our results showed that there is a positive correlation between human density and the number of foraging attempts by macaques. With the increase in number of people, there is an increase in food source which can motivate the macaques to forage more extensively.

Group No. 23: “Foraging behavior of the white-crested laughingthrush (*Garrulax leucolophus*) in the natural and urban environment”

Eng Teng Chuan (SOC4), Goh Yih Xun (FOS2), Christopher Ng Wei Jie (FOS2), Tan Mei Yu (BIZ3), Cheryl Seet Shi Qian (FASS3)

Symposium I (21 March 2016)

White-crested laughingthrush (*Garrulax leucolophus*) are social birds identifiable by their vocalization. We investigated whether the foraging behavior (time of forage and effort required) of the laughingthrush differs between populations in a natural and urban environment. Focal sampling was conducted at Bukit Batok Nature Park and PGP Canteen across ten observation sessions (15 February – 15 March 2016) in the mornings (7am-9am) and afternoons (12:30pm-2:30pm). Every ‘peck’ and ‘flick’ executed by the laughingthrushes counted towards their foraging effort. The number of laughingthrushes observed varied ($3 \leq n \leq 10$). Our results show that laughingthrushes in the natural environment forage in the morning and require more effort, while those in the urban environment forage in the afternoon and require less effort. Possible reasons include habituation, and accessibility and visibility of food. We conclude that the environment does impact the foraging behavior of the laughingthrushes.

Group No. 24: “What is the foraging behaviour of the pink-necked green pigeon (*Treron vernans*) on simpoh air (*Dillenia suffruticosa*) in Kent Ridge Park?”

Celine Tham Yi Xin (FASS2), Khor Kar Yee (FASS3), Lim Jia Le Bryson (FASS2), Poh Jing Hui (FOS4) and Venus Tang (FASS2)

Symposium I (21 March 2016)

Pink-necked green pigeons (*Treron vernans*) often feed in flocks and on tall trees that provide a safe perch and fruits. Their foraging behaviour on simpoh air plants at Kent Ridge Park was examined. Ad libitum sampling was used to create an ethogram of specific behaviours related to foraging. Instantaneous sampling was then conducted for periods of 30-minutes with ten-second intervals over two trips by two observers per trip. A total of 310 observations were collected. The behaviours were broadly categorized as “eating”, “looking” and “locomotion”. The results indicated that the pigeons spent the highest percentage of time in locomotion (specifically LoF, flying=28.71% and LoH, hopping=13.87%) while eating behavior was low (specifically EPE, pecking=10.65%) during foraging. Further analysis of the results present the species as social and active foragers.

Group No. 25: “How are the foraging behaviours of the plantain squirrels (*Callosciurus notatus*) in Kent Ridge Park affected by the presence of humans?”

Brandon Chew Hui Teck (SOC3), Muhammad Hanif Bin Ghazali (SOC3), Jessica Respress (Non-graduating), Sreinick Keo (NonEX), Hyeyeon Park (Ex)
Symposium I (21 March 2016)

Plantain squirrels (*Callosciurus notatus*) are rodents in the family of Sciuridae and order of Rodentia. In Singapore, they can be found across the island due to their adaptive nature. Their diet consists of fruits, insects and nuts. Our group investigated how the foraging behaviours of the plantain squirrel in Kent Ridge Park are affected by the presence of humans. We employed scan sampling with an interval of 60 seconds based on each sighting of the plantain squirrel and observed their foraging-related behaviours. Over a period of 4 days between 10am-12pm, there were 9 sightings of 18 squirrels. We observed that the plantain squirrels' behaviour were generally unaffected by human presence as they would continue with their activity if humans walked by. Thus, we concluded that plantain squirrels in Kent Ridge Park mostly do not see humans as threats or competition to food.

Group No. 26: “Are the foraging patterns of the red junglefowl (*Gallus gallus*) affected by human and vehicular traffic?”

Lum Jian Kun Darren (FASS3), Yu Ruofan (SOC2), Chai Ming Xuan (SOC2), Lai Zhin Hou Darryl (SOC2), Choo Tze Wei Renfred (SOC2)
Symposium I (21 March 2016)

The red junglefowl (*Gallus gallus*) is native to Southeast Asia and is currently an endangered species in Singapore, partly due to habitat loss from human development. This leads us to question whether human presence, in the form of human and vehicular traffic, has an impact on the red junglefowl, namely in terms of their foraging patterns. All occurrence sampling on foraging behaviour was conducted at Sin Ming Avenue on four separate mornings. Videos of red junglefowls were taken for review. We calculated the average number of pecks on the ground per individual per minute in both high traffic (9.29) and low traffic (23.22) conditions. The results indicated that high human and vehicular traffic may have negative impacts on the red junglefowl, resulting in a significantly lower number of pecks. We theorised that this was because the red junglefowl spent more time looking out for potential threats.

Group No. 27: “What is the effect of tidal level on territorial and foraging behaviour on giant mudskippers (*Periophthalmodon schlosseri*)?”

Chua Si Hao (SOC2), Shirlene Quah Jiamin (SOC2), Chao Shuai Benjamin (SOC2), Ye Kyaw Swa Aung Joshua (SOC2), Wong Jun Wei (SOC1)
Symposium I (21 March 2016)

Giant mudskippers (*Periophthalmodon schlosseri*) are commonly found in the mangrove areas of Singapore. The purpose of this study was to observe and draw a conclusion about the effects of tidal level on foraging and territorial behaviour of the mudskippers. Scan sampling was conducted over two days in the month of February, starting from low tide and ending at high tide, in three distinct areas along the mudskipper pod in the reserve. Only preying, eating, defensive, and nesting behaviour were observed for and counted. Through our observation and analysis, we found that the level of the observed activities was highest when the tides were less than 1.5 metres. Thus, basing on the data that we have collected, we conclude that the the level of the observed activities of the mudskippers is inversely proportional to the tide level.

Group No. 28: “Does tidal change affect the intensity of feeding behaviour in male porcelain fiddler crabs (*Uca annulipes*)?”

Terence Chok Ke Wen (SOC2), Lau Xing Yi (SOC3), Tan Qian Yi (SOC3), Nicholas Lum Aik Yong (SOC3) and Gilbert Chua Kian Chu (SOC2)
Symposium I (21 March 2016)

Porcelain fiddler crabs (*Uca annulipes*) are a species commonly found along the shorelines of Singapore. From our literature review, we understood that another species, *Uca tangeri*, feeds more intensively nearer to both high and low tides. Hence in this short study, we were interested to find out if male *Uca annulipes* have a higher intensity of feeding nearer to low tide than high tide. All occurrence sampling was used during our observations. Samples were taken 1 hour before high tide and 1 hour after low tide. We analysed 5 samples of 30 seconds each with intervals of 5 minutes. We found out that male *Uca annulipes* have a higher intensity of feeding at low tide as compared to high tide.

Group No. 29: “The behaviour of water monitor lizards (*Varanus salvator*) in Chinese Garden and Garden by the Bay East”

Ainina Hajir Adha Bte Abdul Manaf (FASS2), Nasirah Bte Mohamad Nasir (FASS2), Nur Nadhirah Binte Abu Khalid (FASS2), Nur Raihan D/O Azim Khan (FASS2), Teng Xin Hui (FASS2),
Symposium I (21 March 2016)

Water monitor lizards (*Varanus salvator*) are semi-aquatic lizards native to South Asia and Southeast Asia. In this project, we are interested to find out how different weather conditions and locations affect behaviour of lizards in Singapore’s recreational spaces – Chinese Gardens and Gardens by the Bay East. Focal sampling of monitor lizards was conducted from 1500hrs to 1700hrs on 24 & 25 February for the aforementioned study sites. The weather conditions were significantly different for both days - 24 degrees celsius (raining) and 32 degree celsius (sunny). The results were collected by five observers with nine monitor lizards observed in total, and nonmain behaviours of monitor lizards were tabulated. The results revealed that different locations affect lizards’ swimming, running and climbing behaviour and different weather conditions affect swimming, stationary and basking behaviour. Hence, we conclude that weather (temperature) and location (human activity and physical landscape) affects water monitor lizards’ behaviour.

Group No. 30: “Why does the white-collared kingfisher (*Todirhamphus chloris*) exhibit high levels of aggression?”

Chua Yi Cheng (FASS2), Gabriel Tee (FASS2), Genevieve Especkerman (FASS2), Kenneth Kwek (FASS3), Subhashini Krishnan (ExchangeStudent)
Symposium I (21 March 2016)

The white-collared kingfisher (*Todirhamphus chloris*) whose main habitats are mangrove and coastal areas, is very common on offshore islands. Our research explores the reasons behind the aggressive behaviour of the white-collared kingfisher at various locations around Singapore. Focal animal samplings of the Kingfishers’ behaviours were conducted at Choa Chu Kang Park, NUS Science Field and Bishan Park every 30 minutes across different timings over four visits (23 February - 3 March 2016). Aggressive behaviour was considered as flight towards other birds with vocalisations. A relationship was found between the number of birds present and the number of aggressive behaviour actions displayed by the kingfisher. Other factors were also attributed to their aggression, including preserving resources in nesting grounds for reuse and a relatively low number of offsprings.

Group No. 31: ““Is crowing associated with dominance among male red junglefowls (*Gallus gallus*)?”

Nicole Nee (FAS4), Hakeem Hussain (FAS2), Heng Chye You (FAS2), Shermaine Chua (FOS2) and Victoria Esteves (FAS4),

Symposium II (04 April 2016)

The red junglefowl (*Gallus gallus*) is the wild ancestor of the domesticated chicken and the male is known to have a very loud and distinct crow that is frequently heard in the mornings. Our study aims to examine whether crowing is linked to dominance and how it differs between dominant and non-dominant males. We conducted focal animal sampling on one dominant male and one non-dominant male red junglefowl from the same flock at the Singapore Botanic Gardens, for four days (1st March to 4th March 2016) from 0700h to 0900h before activity levels fell after 0900h. The results indicate that the dominant male crows more frequently than a non-dominant. By studying this in relation with other dominant behaviours such as wingflapping and vigilant behaviour displayed before and after crowing, we concluded that crowing does indeed provide clues to a male's hierarchical status.

Group No. 32: “Otter Ott-iquette: The food sharing behaviours of a smooth-coated otter (*Lutrogale perspicillata*) family”

Tan YuYan, Ian (FOS3), Chin Yug Han (FASS3), Mark Teo Ek Jim (FASS3), Long Jiayan Risa (FASS3), Lee Shuk Kan (FASS3)

Symposium II (04 April 2016)

Smooth-coated otters (*Lutrogale perspicillata*) live and forage in packs in close proximity to freshwater bodies. In our project, we investigated the patterns of food sharing amongst a family of 10 otters at their foraging location in Kallang Basin. We expected to observe food sharing amongst the adults and the second generation pups. All-occurrence sampling of feeding behaviours was conducted from 0700hrs - 1200hrs over three days (13, 23, 24 Feb), and from 1500hrs - 1900hrs over two days (4, 18 Mar). Out of 343 observations recorded by five observers for every otter, 31 incidents of sharing, defined as two or more otters feeding on the same prey, were noted. A higher number of food sharing was observed between adults and pups. Furthermore, we observed more food stealing behaviours than food sharing. Hence, our findings suggest that although food sharing is present, stealing is more prevalent.

Group No. 33: “Foraging behavior of javan mynas (*Acridotheres javanicus*) at two parks in Singapore”

Cheong Yan Qin (SOC4), Goh Hui May (SOC4), Shaian Lim Jia Min (FASS3), Elysia Goh Chiao Yee (FASS3)

Symposium II (04 April 2016)

Javan Mynas (*Acridotheres javanicus*) are small black birds commonly found in open grass patches. We investigated the effect of flock size on the frequency of foraging behaviour at Botanic Gardens and Bishan-Ang Mo Kio Park. Four observers conducted scan sampling of flocks of 1 to 10 Javan Mynas at 30-second intervals between 5-7pm. A total of 821 observations were recorded over 8 days. Foraging (pecking and/or looking at the ground), vigilant and moving behaviours were recorded. Results indicate that average foraging frequency (AFF) increases with flock size (when $n \leq 5$) before plateauing and eventually decreasing. Average scanning frequency drops sharply when flock size increases from 1 to 2, then gradually increases with flock size. These trends can be explained by the many eyes hypothesis, dilution effect and competition. In conclusion, Javan Mynas forage more often as flock size increases to 5, then less for flock sizes ≥ 7 .

Group No. 34: “The case of the grey herons (*Ardea cinerea*): The effect of conspecifics on foraging efficiency of territorial feeders at Pasir Ris Park”

Ang Weili (BME3), Han En Chou (BBA5), Kong Li Xian Roxanne (BME3), Sun Wang Jun (COM3), Wong Si Ying Vinncent (ARS3)

Symposium II (04 April 2016)

Grey Herons (*Ardea cinerea*), the second tallest birds in Singapore, are known to exhibit behaviours to maintain feeding territories. They may behave aggressively towards conspecifics infringing their territories, possibly because the presence of conspecifics affects their foraging efficiency. To test this hypothesis, we studied the foraging behaviour of *Ardea cinerea* along Sungei Tampines and Pasir Ris Beach during receding tides. The effect of conspecifics was then measured in terms of distance between adjacent herons and number of conspecifics in the area, and the foraging efficiency measured as the percentage of successful fish captures over total capture attempts. Observations indicated a 12.6% increase in foraging efficiency as the average inter-heron distance increased by 35m, and a 68% increase as the number of conspecifics decreased from 8 to 3. While these results suggest that the presence of conspecifics reduces foraging efficiency, other factors may also affect this relation, necessitating further studies.

Group No. 35: “How do singles and pairs of Giant Mudskippers (*Periophthalmodon schlosseri*) differ in burrowing behaviour?”

Choo Xing Yu (FAS3), Feng Junhan (SOC3), Goh Shi Chun (FAS2), Lee Ping Zheng (FAS3), Lim Shi Kai (FAS3)

Symposium II (04 April 2016)

Giant mudskippers (*Periophthalmodon schlosseri*) are amphibious fish that lay eggs in self dug burrows in mangroves. In this project, we investigated and compared the amount of time spent on burrowing between single and paired mudskippers found in Sungei Buloh Wetland Reserve (SBWR). Focal sampling of burrowing mudskippers was conducted for between 16 - 30 minutes during low tide timings over 4 separate days. 4 singles and 3 pairs were observed. Burrowing behavior was operationalized as an individual diving beneath the water surface in its burrow before resurfacing again. Results showed that individuals in a pair spent more time burrowing compared to single mudskippers. Females in pairs also spent more time burrowing than males. The combined results suggest that responsibility for their offspring compels pairs to spend more time burrowing than single mudskippers and provides support for the theory of parental investment.

Group No. 36: “What are the climbing behaviours of tree-climbing crabs (*Episesarma* spp.)?”

Lee Xin Hui (FAS2), Lim Zhi Ming (FOE3), Ho Jun Rong (FOS3) and Seow Ee Yang (FAS3)

Symposium II (04 April 2016)

During high tides, tree climbing crabs (*Episesarma* spp.) scale trees to avoid predators. Prior research conducted on other species of tree climbing crabs in Trinidad revealed two general climbing patterns. Our study investigates presence of common climbing behaviours pertaining to tree climbing crabs in the Singapore context. Through occurrence sampling, tree climbing crabs found in Pasir Ris Mangrove were observed from transition of low to high tide and from high to low tide for three hours each, over a span of two days. 26 out of 37 crabs and 22 out of 31 crabs were observed ascending and descending head-first respectively, indicating that head-first orientation is the prevalent tree climbing behaviour during both ascending and descending. However, head-first climbing behaviour seems to be a preference and is not immutable. It can be altered when influenced by several outside factors, such as the size of tree trunks and presence of predators.

Group No. 37: “Investigation of dorsal fin raising behaviour in mudskippers in both high and low tides”

Hsu Cheng Hsien (SOC4), Edward Chu Gao Xi (SOC3), Tang Yu Long (SOC3), Yip Jiajie (SOC4), Joshua Aaron Jude Xavier (FAS4)

Symposium II (04 April 2016)

Mudskippers are unique amphibious fish well adapted to intertidal habitats, such as the Sungei Buloh Wetlands Reserve (SBWR) mudflats. We investigated if a correlation between dorsal fin raising behaviour of mudskippers with the changes in the tide exists. Six observations of 1.5 hours each were conducted over 3 consecutive weekends at SBWR. Scan sampling was adopted to estimate the number of observable mudskippers every 30 minutes while focal sampling was employed to observe mudskippers with dorsal fin raising behaviour. Our data shows over 93% of dorsal fin raising instances during low tide is associated with interaction with other mudskippers, and 55.6% of dorsal fin raising instances during high tide was associated with individual stationary behaviour. This suggests the predominant factor dorsal fin raising behaviour during high tide was mainly environmental, while that for low tide was mainly due to presence of other individuals.

Group No. 38: “Behaviour of long-tail macaques (*Macaca fascicularis*) of different ages at different times of the day”

Glen Ng Jian Sen (BIZ3), Tan Jo Lin (BIZ4), Wafir Hidayat B Riduan (FASS2), Toh Yi Hui (FASS2), Xie Jia Nan (FASS2)

Symposium II (04 April 2016)

Long tail macaques (*Macaca fascicularis*) live in groups in lowland forest and secondary forest in Singapore. In this project, we investigated if behavioural patterns of these macaques differ across gender and age throughout different times of the day. A total of five observers sampled eight macaques through ad-Libitum and focal sampling, through four visits to Macritchie Reservoir Park. Each macaque was observed 8 times for 45-60 seconds intervals at 9am, 2pm and 5pm. The results indicate that females spend more time foraging and feeding as compared to their male counterparts, and juvenile macaques are generally much more active than the adults. This could be due to males being more dominant and efficient than females in feeding, and juvenile macaques looking for better feeding grounds to gain nutrients for growth. In conclusion, macaques of differing gender and age spend their time differently at different times of the day.

Group No. 39: “Study of the behavioral patterns of plantain squirrels (*Callosciurus notatus*) at different times of day”

Ng Sili Gernelle (FAS3), Choong Shi-Xian Natalie (FOS2), XiaLu (FOS4), Justin Chua Jia Jin (FOS3)

Symposium II (04 April 2016)

Our study seeks to investigate if different times of day affect the behavioural patterns of Plantain squirrels (*Callosciurus notatus*). With the use of focal and all occurrence sampling, we observed their behaviours including; locomotion, grooming and foraging at three prominent times (morning, afternoon and evening). We attempted to assess which behaviours are more prominent with respect to the time of day, while keeping as many environmental factors of our study i.e. field and day of week, constant. One of our main findings shows that Plantain Squirrels forage more frequently in the day. Our study further analysed their foraging behaviour by examining their posture when feeding, and found that a suspended downward posture is adopted more frequently than a sitting one. We concluded that while plantain squirrels are diurnal animals, some interesting traits exhibited could be due an adaptation to its surrounding and explored them accordingly.