

MIXED-SPECIES ASSOCIATION AMONG MALAYSIAN PRIMATES DURING THE COVID-19 OUTBREAK IN GENTING HIGHLANDS, PENINSULAR MALAYSIA

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Abstract: This is the first report to elucidate primate mixed-species association during Covid-19 outbreak in Malaysia. The observations were carried out at Genting Highlands between 14-24th April 2020 using *ad libitum* sampling. Five Genting Highlands primate species were observed at approximately 66 observation hours which include *Symphalangus syndactylus* (siamang), *Trachypitecus obscurus obscurus* (dusky langur), *Presbytis siamensis siamensis* (Malayan pale-thighed surili), *Macaca nemestrina* (southern pig-tailed macaque), and *Macaca fascicularis* (long-tailed macaque). Primates in Genting Highlands were seen interacting among themselves during the third phase of the MCO. Siamangs, dusky langurs, and long-tailed macaques were observed sharing space and interacting in an old section of Genting View Resorts that is currently under renovation. Malayan pale-thighed langurs were also observed approaching this area. During the third phase of the MCO, siamangs, dusky langurs, long-tailed macaques, and pig-tailed macaques consumed fruits of the fig tree (*Ficus benjamina*), which last for only one week. Strict controls on public movement are believed to have created environmental conditions that enabled Genting Highlands primates to move and interact freely among themselves.

Keywords: Movement Control Order, COVID-19, Malaysian primates, mixed species association.

Introduction

After initially appearing in Wuhan City, Hubei Province, China, SARS-CoV-2 unfortunately made its way to Malaysia. COVID-19 was confirmed in Malaysia on January 25, 2020, having been brought into the country by a Chinese tourist from Wuhan, who traveled from Singapore to Johor Bahru on January 22, 2020 (CPRC, 2020). In the first wave of infections, only 22 positive COVID-19 cases were recorded and this was followed by 11 days of zero reported cases. However, an explosive second wave of infections began on February 27, 2020, and an astonishing 651 cases had been reported by March 17, 2020 (Figure 1).

The Government of Malaysia immediately announced and implemented the Movement

Control Order (MCO) under the Prevention and Control of Infectious Diseases Act 1988 and the Police Act 1967. The MCO came into force on March 18, 2020 and severely restricted the movement of the public and prevented gatherings nationwide. It closed all kindergartens, public and private schools, public and private higher learning institutions, and government and private premises (except those providing essential services), limited overseas travel, limited foreign visitors and tourists to Malaysia and many other restrictions (Prime Minister's Office of Malaysia, 2020). Despite enforcement of the first phase of this historical and unprecedented order (March 18, 2020–March 31, 2020) throughout the country, the number of new COVID-19 cases continued to increase, only plateauing occasionally (Figure 1). This caused the government to subsequently

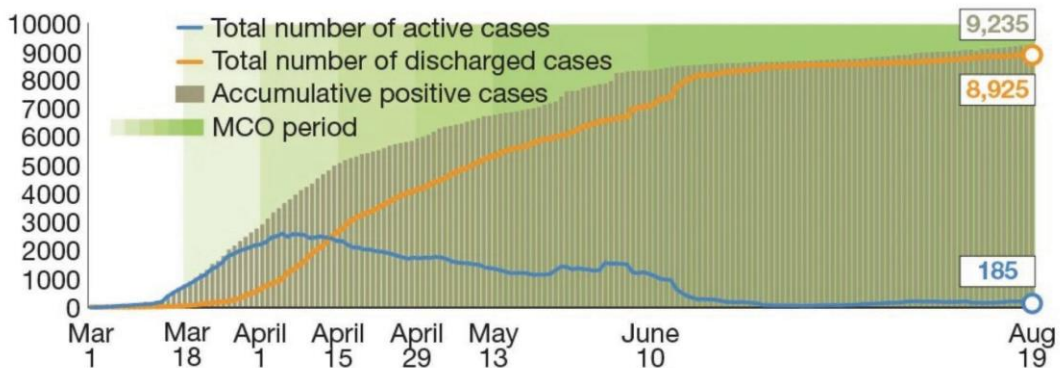


Figure 1: COVID-19 cases in Malaysia (The Edge Markets; data from the Ministry of Health, updated Aug 19, 2020)

extend the MCO into a second phase (April 1, 2020–April 14, 2020), third phase (April 15, 2020–April 28, 2020), fourth phase (April 29, 2020–May 3, 2020), conditional MCO phase (May 4, 2020–June 9, 2020) and recovery MCO phase (June 10, 2020–August 31, 2020). As of August 19 2020, a total of 9,235 positive cases, 8925 cured and 125 deaths have been recorded in Malaysia.

Effects of COVID-19 lockdowns worldwide on wildlife

The COVID-19 pandemic and consequent lockdowns have had a major impact on wildlife worldwide. Decreases in human pressure and movements due to lockdown measures have reduced stress on wildlife. Wild animals have been roaming freely in the absence of humans. For example, the sika deer that normally live in Japan's Nara Park were seen roaming in adjacent cities (The New York Times, 2020). In Wales, mountain Kashmiri goats wandered onto the streets of Llandudno town (The Guardian, 2020). In Spain, boars were spotted in the city center of Barcelona (Strait Times, 2020). In the Chilean capital of Santiago, a puma was spotted in the deserted streets (CNBC, 2020). Meanwhile, in Malaysia, a Malayan tapir was seen wandering the streets of Kuantan, Pahang (AsiaOne, 2020). In the same city, a wild boar was spotted roaming around a neighborhood

(AsiaOne, 2020). In Terengganu, a group of wild elephants was seen near a gas station and a single wild elephant was also sighted outside a hospital in Kluang, Johor (AsiaOne, 2020).

The COVID-19 pandemic has also affected non-human primates worldwide in many ways. Urban non-human primates, such as macaques, have been exhibiting altered behaviour during COVID-19 lockdowns. For example, in India, Rhesus macaques in the temple town of Ayodhya have been reported attacking visitors due to starvation (National Herald, 2020). It was also reported that Rhesus macaques in India assaulted a laboratory assistant and escaped with a batch of coronavirus blood tests (Sky News, 2020). In another case, a macaque was seen holding onto the string and reel of an airborne kite (New York Post, 2020). In terms of other species, a gray langur was seen running along a deserted road in Ahmedabad, India (Forbes, 2020). In Thailand, hundreds of long-tailed macaques overran the capital of Lop Buri in search of food after a decline in tourism during the pandemic (Bangkok Post, 2020). Meanwhile, in Malaysia, long-tailed macaques were seen swimming in a condominium pool in Tanjung Bungah, Penang (The Star, 2020). Herein, here, we reported a letter to editor a brief survey of primate mixed-species association in Genting Highlands during the MCO period.

Materials and Methods

Study site and field sampling

Genting Highlands (3°25'25"N 101°47'36"E) is located in Bentong District, Pahang, about 50 km from the capital city of Malaysia, Kuala Lumpur (Ng *et al.*, 2012). Genting Highlands is synonymous with entertainment, hospitality, and tourism as well as nature. The observation area of the present study was at Genting View Resort, Genting Highlands, now known as GVR. The old section of the resort was under renovation, although work stopped when the MCO was instituted on March 18, 2020. The primate observations in the present study were carried out between 14th-24th April of 2020 (11 days) using *ad libitum* sampling with 66 hours of observation (Altmann, 1974) from an apartment block occupied by one of the authors, which is fronted by an untouched patch of forest that is part of the forest lands owned by Genting Malaysia. The data before MCO was also obtained based on selected observations between early 2018 and early March of 2020. The behaviours such as intra- and inter- species interaction and feeding were observed. Plants eaten by primates were identified based on photographs and reconfirmed by plant expert (Dr Shamsul Khamis) from Universiti Kebangsaan Malaysia (UKM).

Result and Discussion

Primate communities of Genting Highlands

Of the 66 hours of observation, five species of primate have been recorded in Genting Highland: *Symphalangus syndactylus* siamang, *Trachypithecus obscurus obscurus* dusky langur, *Presbytis siamensis siamensis* Malayan pale-thighed langur, *Macaca nemestrina* pig-tailed macaque, and *Macaca fascicularis* long-tailed macaque (Table 1, Figure 2). There is one territorial siamang family (Ramses group) that inhabits this forest section and this family has been seen on the perimeter of the forest on many occasions but does not stray far into the resort compound. The dusky langur is a more frequent visitor than the Malayan pale-thighed langur. Both pig-tailed macaques and long-tailed macaques were observed daily in the forest and resort compound during the study period.

Apart from primates, many bird species were sighted, including eagles, hornbills, barbets, bulbuls, forest pigeons, malkohas, kingfishers, and woodpeckers in addition to more common birds such as starlings, magpie-robins, swallows, and sparrows. Wild boar, squirrels, and shrews were also occasionally sighted. When the MCO was enforced, human movements immediately ceased on the main roads of Genting Highlands, at Genting Highlands Resorts and the Awana Hotel, in the shopping areas in Goh Tong Jaya and Genting Permai, and within the GVR

Table 1: List of Malaysian primates found in Genting Highlands with IUCN, International Union for Conservation of Nature red list category

No.	Species	Common name(s)	Local name(s)	IUCN category
1	<i>Presbytis siamensis siamensis</i>	Malayan pale-thighed langur, white-thighed surili	Lutong Ceneka Lutong Kakoh	Near threatened
2	<i>Trachypithecus obscurus obscurus</i>	Dusky langur, dusky leaf monkey, spectacled langur	Lutong Celak Lutong Chengkong	Endangered
3	<i>Macaca fascicularis</i>	Long-tailed macaque	Kera	Vulnerable
4	<i>Macaca nemestrina</i>	Southern pig-tailed macaque	Beruk	Endangered
5	<u><i>Symphalangus syndactylus</i></u>	Siamang	Siamang	Endangered



Figure 2: Primates of Genting Highlands: a) *Symphalangus syndactylus*, b) *Macaca fascicularis*, c) *Macaca nemestrina*, d) *Presbytis siamensis siamensis*, e) *Trachypitecus obscurus obscurus*)

compound. Security check points were strictly manned and only essential traffic was allowed through, especially to and from Genting Highlands.

The prevailing weather from the beginning of the first phase of the MCO (March 18, 2020) to the middle of May 2020 was very fair with many consecutive clear, sunny days and blue skies. This offered many picturesque sunrises and sunsets and a number of rainbows with some rain during the evenings and nights, though generally not every night (Figure 3). There were also many clear nights and the full moon and stars were clearly visible with the naked eye during this period (Figure 3). The temperatures during the day were generally a little warmer than average and the relative humidity was lower than average during this period. There was also generally less mist and heavy fog during this period than usual, although there were some misty mornings after the rain in the early hours. The nights were cool but not cold (below 20 °C) due to the warmer and drier conditions during the days.

Mixed-species association among primates in Genting Highlands

Before the MCO

Before the MCO, primates in Genting Highlands appeared active and undisturbed despite the presence of humans, development, and busy roads. Siamang family groups could be seen enjoying their morning routines, calling, roaming freely, and feeding calmly. As siamang family groups consumed the fruits, shoots, and leaves of trees in Genting Highlands (such as *Ficus* sp. and *Caryota* sp.), it can be concluded this area provides the habitat required for siamang to survive. As development occurs almost every year in Genting Highlands, siamang are considered to be very adaptive to the compact forest environment, which is fragmented by roads and buildings. The development does not only occur within the resort compound, but also surrounding the resorts. Most of the siamang family groups in Genting Highlands are increasing year by year in terms of individual



Figure 3: Environmental conditions during the Movement Control Order, as seen from the observer's apartment balcony

numbers, which bodes well for the survival of the species. There are about 12 established family-groups that had been recognised living nearby the forest edges. The numbers in each family-groups were between two to five individuals. However, the exact number of family-groups including the unseen is expected to be more than that. In several cases, siamang family groups have been observed crossing roads and cable car lines. Other species of Cercopithecinae and Colobinae can be seen along the main roads in Genting Highlands and in nearby residential areas.

During the MCO

In the present study, a dusky langur was observed interacting socially with a long-tailed macaque (Figure 4). This interaction was observed on April 17, 2020, during the third phase of the MCO, and involved an individual dusky langur and an individual long-tailed macaque playing at GVR. This kind of close interaction between these species was rarely seen before the MCO. Encounters between

two groups of Cercopithecidae observed before the MCO always led to aggressiveness, possibly due to competition for space and food resources (Valenca-Silva *et al.*, 2014). Mixed-species association among the Cercopithecidae, especially involving dusky langurs and long-tailed macaques, has been reported in several locations in Peninsular Malaysia as their distribution ranges are sympatric (Md-Zain & Ch'ng, 2011; Md-Zain, 2019; Taufet-Rosdi, 2020). Ruslin *et al.* (2019) reported that there are 59 plant species that are consumed by both dusky langurs and long-tailed macaques, and the dietary overlap is the highest for fruits. Thus, as space and food were commonly shared between Cercopithecinae and Colobinae, it was not surprising to observe social interaction between these subfamilies in the present study. Nonetheless, the interaction was very interesting and occurred exclusively during the third phase of the MCO. Such interaction had also been observed in Bukit Malawati, Kuala Selangor where silvered-leaf monkeys shared their habitat with long-tailed macaques (Hambali *et al.*, 2016).

Other interactions were observed during the third phase of the MCO between Hylobatidae and Cercopithecidae. Individual siamangs were seen to approach dusky langurs and long-tailed macaques on separate occasions at GVR (Figure 5). The interactions were by no means aggressive; the siamangs were trying to get closer to the other species.

Feeding behaviour was among the daily activities observed. Most Genting Highlands primates fed on fig trees (*Ficus benjamina*). These trees are an important food resource for nearly 80% of Genting Highlands primates. MacKinnon and MacKinnon (1980) studied the effects of diet and seasonality on feeding behaviour in coexisting populations of *M. fascicularis* and *T. o. obscurus* in secondary dipterocarp forest and found limited dietary overlap between the species.

In the present study, *F. benjamina* fruits were consumed in one week especially for two consecutive days (April 14, 2020 and April 15, 2020) at the end of the second phase and the

beginning of the third phase of the MCO (Figure 6, 7). The fig trees began fruiting early in the first phase of the MCO. Group members ate together. On April 14–15, 2020, a group of pig-tailed macaques (20 individuals), dusky langurs (10 individuals), and long-tailed macaques (12 individuals) gathered together to eat the fruits of a fig tree. However, these Cercopithecidae groups left the tree as siamangs of the Ramses group (four individuals) approached to feed. Ramses group is one territorial siamang family groups that inhabits this forest section. This family has been seen on the perimeter of the forest on many occasions however, they do not stray far into the resort compound. Additionally, a group of Malayan pale-thighed langurs made their approach, although they consumed only leaves. In addition to feeding activities, social activities such as grooming and playing were observed during the MCO (Figure 8). Grooming and playing are group bonding activities that are more common in langurs and macaques (Md-Zain & Ch'ng, 2011; Ampeng & Md-Zain, 2012).



Figure 4: Mixed-species association between *T. obscurus* and *M. fascicularis* during the Movement Control Order on April 17, 2020.



Figure 5: Interactions between *S. syndactylus* and *T. obscurus* (April 15, 2020) and between *S. syndactylus* and *M. fascicularis* (April 17, 2020)



Figure 6: Genting Highlands primates; *Sympalangus syndactylus*, *T. obscurus*, *M. nemestrina* (from top left to right) and *M. fascicularis* (bottom middle) on a fruiting *Ficus benjamina* fig tree (April 14, 2020 and April 15, 2020) and *Presbytis siamensis* (bottom left) on a *Cinnamomum iners* tree (April 24, 2020)



Figure 7: Genting Highlands primates; *T. obscurus* (from top left to top middle), *S. syndactylus* (right), *M. nemestrina* (bottom left and middle) on a fruiting fig tree (April 14, 2020 and April 15, 2020)



Figure 8: Grooming and playing in *M. fascicularis* (Top left) and *T. obscurus* (Top right and bottom left) (April 18, 2020) and (April 19, 2020)

Conclusions

When primate density is high in certain areas, mixed-species association may occur. Such associations were observed among Genting Highlands primates during the COVID-19 outbreak in Malaysia. As human activities decreased during the pandemic, primates extended their ranges into a construction site. Social behaviours such as approaching, playing, and grooming among the primates were observed, especially during the third phase of the MCO. The primates were also observed sharing food resources.

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