

***Nycticebus coucang* in Singapore: Presence, Taxonomy and Conservation**

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ABSTRACT

The presence of *Nycticebus coucang* in Singapore is doubtful, and there have been publications expressing such doubts. This study tries to establish the presence of native lorises in Singapore, and the possibilities that sightings might be escapees. Night surveys, craniometric tests to compare lorises from the regions surrounding Singapore, and external morphology comparisons from photographs were used to test our hypothesis that there are native lorises and that they live in a mixed native-exotic population. Correlation was done to test if rate of reported sightings are due to pets, which was indicated by rate of international confiscations. Lorises were found in Nee Soon Swamp Forest and one of them is definitely exotic, being an Indochinese species. Correlation was 95% for sightings versus international confiscations, suggesting many lorises in the wild now could be exotics. Craniometric results are inconclusive as to whether native lorises do exist, it would require international cooperation to understand our lorises through large scale genetic and field studies and stem the influx of pets. Unfortunately, many hurdles stand in the way of the science that is required to help us understand our biodiversity here in Singapore.

INTRODUCTION

This investigation aims to: 1) identify forest patches in Singapore with lorises; 2) collect basic ecological information on the censused population; 3) determine the taxonomy of the specimens in Singapore, and ascertain if a given loris is native or otherwise, and the proportion of released pets in the wild population. We hypothesised that Singaporean slow lorises do exist, but amongst a mixture of native and exotic lorises. We further hypothesise that anecdotal reports can be attributed to release of lorises by traders and/or owners. To test the hypotheses, surveys for lorises were conducted, and trafficking data and anecdotal reports were tested for correlation.

Thai, Indochinese, Riau and Javanese lorises can be easily identified from external morphology. However, *N.coucang* from Sumatra, Peninsula Malaysia (henceforth called “Malayan”) and possibly Singapore cannot be distinguished this way. Hence, craniometric data was gathered from museum specimens to obtain differentiating factors.

RESULTS

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Night Surveys

Lorises were spotted on two separate surveys, the second being supported by multiple photographs and a video clip. The first sighting, although unsupported by the same level documentation, was thought, on the basis of its much quicker movements, and location high up in the canopy, to be *Nycticebus pygmaeus*, which, if it is true represents an example of a smuggled pet.

The transect length at NSSF was 2.8km, and was surveyed three times for a total effort of 8.4km, yielding an encounter rate of 0.24 lorises per kilometre. However, as only one of the two is known to be *N.couang*, encounter rate of *N.couang* is then only 0.12 per kilometre. When all the sites are combined, 58.3km were surveyed in total, with an encounter rate of 0.017 *N.couang* per kilometre.

Craniometric Analyses

The principal components analysis reveals the close relation between Malayan, Riau Islands and Pulau Tekong. The plot suggests that Sumatran lorises are separable from Malayan and Riau Island lorises. Thai, Bornean and Javan lorises were readily differentiable from the rest. It also indicates that the specimens of unknown origin came from Malaya or the Riau Islands.

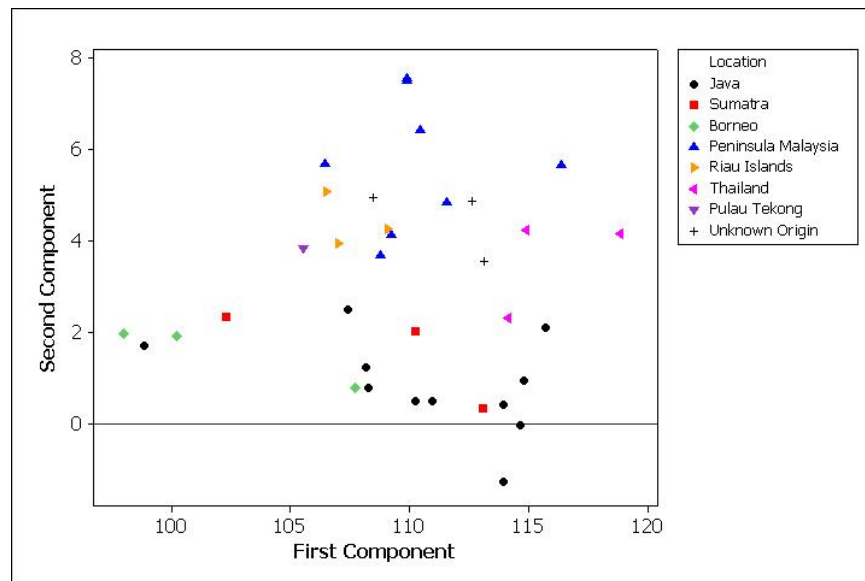


Figure 1: The first two axes of the Principal Components Analysis applied to the data set of 8 locations and 12 out of 13 measured variables. One variable (Interorbital width) was omitted due to sexual dimorphism.

Out of 12 measures, seven were showed to be significant by the Kruskal-Wallis test. Mann-Whitney pair-wise comparison was then used to identify traits that differed significantly between specific pairs. Sumatran specimens seem to be undifferentiable from the Riau specimens. The Riau and Malayan specimens significantly differed in four of the seven dimensions tested. *Nycticebus bengalensis*, *N.menagensis* and *N.javanicus* were clearly differentiable from the rest.

Trade and Trafficking Data and Anecdotal Reports

Figure 2 shows a chart on which values of the annual total numbers of international confiscations are plotted together with the number of sightings and local confiscations. Values of four three-year blocks (1996-1998, 1999-2001, 2002-2004, and 2005-2007) were correlated, and it was found that there was a 95% correlation of the two sets of data in those 12 years. When the same method was applied from 1990 onwards, the correlation was still high, at 85%.

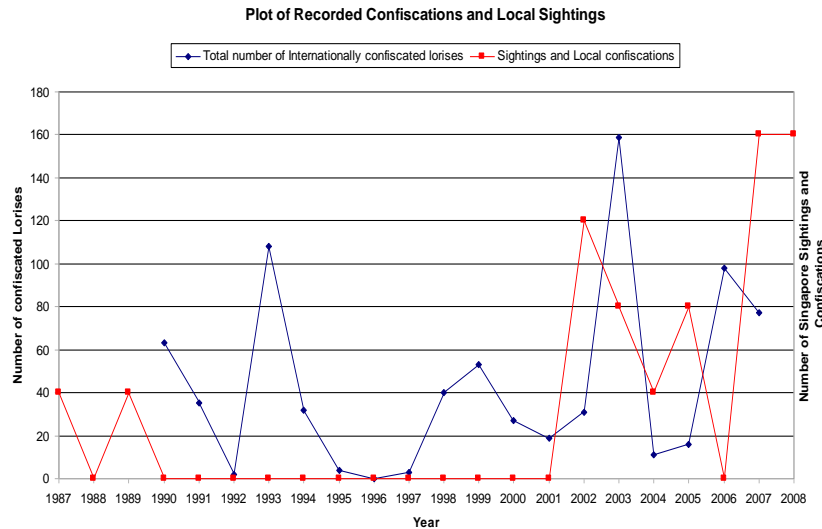


Figure 2: Chart plotting both international confiscations and local sightings and confiscations. Especially high correlation between these two data sets is observed from 1996.

Analyses of Morphology of Lorises in Pictures Taken in Singapore

There seems to be quite a wide range of variations among slow lorises that have been spotted and photographed. This might suggest the possibilities of hybridization either in the wild or when in captivity with traders.

DISCUSSION

Slow lorises feed on insects and small vertebrates, usually other, smaller insectivores, like geckos, and such a diet requirement may draw them to the edge of the forest where these are more abundant (Johns, 1986). They are also lunar-phobic (Gursky, 2003; Trent *et al*, 1977) which could indicate their aversion to bright lights. The level of development, density of human population and amount of traffic throughout Singapore, ensures that bright lights are shining nearly everywhere on the island. Regular fogging of private estates and military and recreational facilities would also have impacted the insect populations in these areas, reducing the availability of food resources. Nee Soon Swamp Forest is a rather unique site in this case as it is comparatively undisturbed. The lack of

proper, dry paths and its relative inaccessibility (it is nearly 4 km from the nearest public car-park) have made human traffic to the area at night extremely low. There is also no development next to it, unlike in Bukit Timah and other places. All these might explain the higher likelihood of lorises surviving there.

The craniometric analyses in the current study suggest that lorises can generally be differentiated by braincase height, with the notable exception of the Sumatra and Riau Islands pair. However, Sumatran lorises have a different pelage colouration, than the orange-brown colour of the Riau Islands lorises, so that would be an obvious differentiating criteria. *Nycticebus coucang* from the different biogeographic regions are still considerably similar to each other. Sumatra and Peninsula Malaysia have been separated since the Holocene (Meijaard, 2003) and from that, coupled with stable climatic conditions (Gathorne-Hardy *et al.*, 2002), one would expect difference from evolutionary divergence (Meijaard, 2003). The results in general were comparable to Groves (1998), where *N.menagensis*, *N.javanicus* and *N.bengalensis* were separable from *N.coucang*.

Our study suggests that trade in slow lorises in Singapore are still probably going on and at higher rates and traders might have become more organised, and might have been able to collect lorises from the wild in larger numbers and devised strategies to export them. There is a high level of correlation between the numbers of sightings recorded on Singapore Island the number of international confiscations. This could be because of the use of Singapore as a transit point between range states and client states.

At this point of time, it is not possible to tell if there really is a Singapore slow loris. Trapping and genetic studies need to be carried out on a large scale, and cooperation is required on many fronts: 1) to stop the entry of exotic lorises; 2) to gather biological resources for genetic data; 3) to gain access to field sites and 4) to update confiscations data to allow complete understanding of the severity of the trade

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