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Butterfly Species List: Factors that Determine the List for A Forest

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When we go butterfly watching, or butterflying, we should list the species seen. Here we focus butterflying in the forest habitat. What are the factors determining the list of butterfly species seen in a forest? From my experience and perspective, these factors are:

1. Size of habitat	The bigger the area the larger the number of species. A bigger area has more micro-habitats and thus more species adapted to those micro-habitats. Bigger areas too provide more resources especially food and more mating partners. Without enough partners, inbreeding occurs resulting in genetic diseases and could lead to species die-out. Thus, bigger areas have a more complete ecosystem. A given area in a bigger more complete ecosystem has more species and population abundance than say that same area as an island when surrounded by development.
2. A varied habitat	Example, a forest consisting of primary forest and secondary forest has more species than just one or the other habitat. On the other hand, we have to consider this: say a forest is initially primary, then a part is cleared and replaced by scrub vegetation; the primary part would now have less species (the less the area the less species abundance. E.g., 90% less area, species are halved) but an increase from the scrub parts. Is the total species list now (primary + scrub) greater than the original species list (noting that primary forests have a greater species diversity than scrub or any other)?
3. Maturity of forest	Mature forests have more species than young forests than overgrown plantations. Mature forests have the complete structure of a tropical forest – the top-most emergent layer, the canopy below, the upper, middle, and ground levels. Each layer provides its own micro-habitats with its own species (some may overlap). The presence of ground mammals such as wild boar (and thus leeches) is a sign of a mature forest. Overgrown plantations, e.g. rubber, have a simpler structure, and with many trees of a single species (rubber) lack the varied micro-habitats. (This applies to monoculture plantations too.) They too usually lack ground mammals like wild boar and thus no leeches.
4. Wetter forests have more species than drier forests	Wetter forest have more vegetation and thus more food and places to hide from predators. Drier forests are usually smaller forests often surrounded by development i.e., a drier and hotter outside environment. Rivers and streams running in a forest help to make it a wetter forest.



5.

The number and variation of trails

More trails will go through more micro-habitats and thus more species. Open trails in a forest render forest and forest edge species. Narrow trails under shade more likely render forest species that do not venture to the forest edge for sunlight. But note that more trails disturb the ecosystem, e.g. by making the ground compact and thus not suitable for life under it, and of course, trails destroy the vegetation. This reduces the number of species. There is then an optimum number of trails for a given forest to obtain the optimum species list.

6.

The number and variation of visits

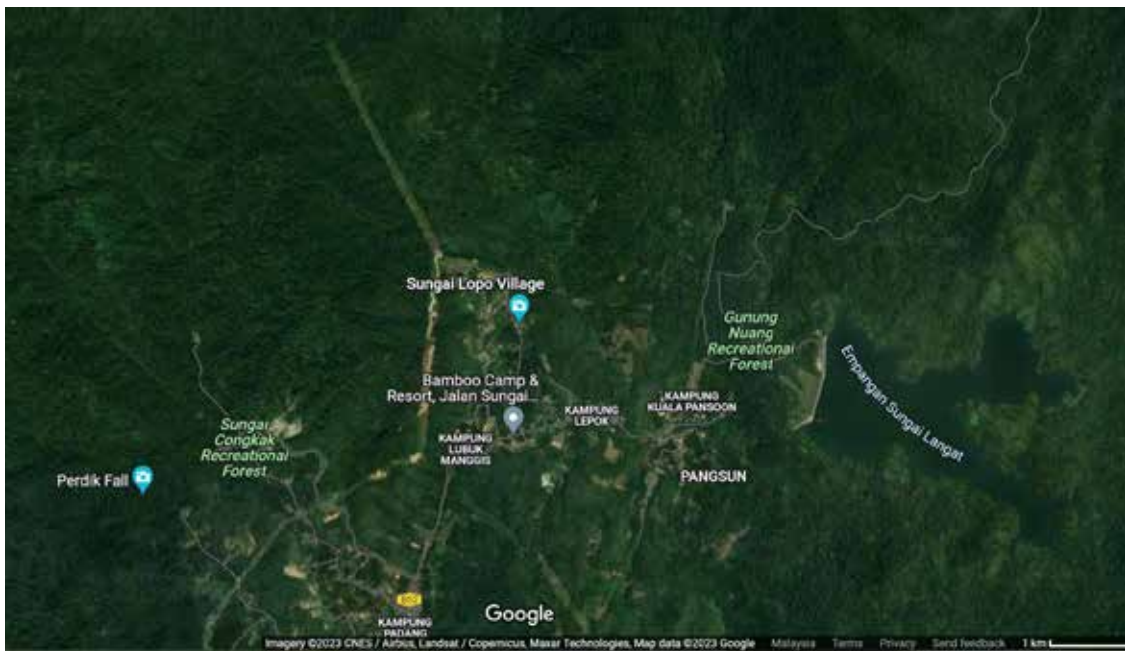
The more visits taken will produce more species especially if spread-out throughout the year considering flowering and fruiting seasons as well as dry and wet seasons.

7.

Number of observers

Butterflies react to movement. Thus, more observers may result in butterflies not settling down, not perching to be photographed or viewed. But more observers detect more butterflies. A compromise is called for. Possibly not more than 3 if observed within narrow trails.

The Pangsun-Congkak-Perdik complex is a good example that shows that the bigger the area the larger the butterfly list especially if the habitats are varied. This forest complex in inland Selangor is a continuous forest with Perdik in the south-west, Congkak in the middle and Pangsun (Gunung Nuang Recreational Forest or Taman Eko Gunung Nuang as stated at the gate to the forest) in the north-east. See Map 1. This complex extends to the forests of the Titiwangsa Main Range.



Map 1. Perdik-Congkak-Pangsun forest complex of Selangor.



Perdik is a good mature forest, the best of the complex.

At its entrance, there is a single track big enough for a single car for 500m. Here we can see forest species that come to the forest edge (F,FE). At the end there is a single track wide enough for a single person for about 2 km ending in Sg Semungkis area of which I've tracked 1 km of it. This trail is good spotting forest-shade species (F). Congkak is a good recreational forest where trees are not very big with a car track in open forest with little ground vegetation on one side of the track for 800m. Here most species are forest species that visit open ground (F,FE). After that, to the left, there is a single-person wide trail to Bukit Cenuang of about 2 km.

On the right there, across a stream, is another longer trail that I've not tried. But note that the butterflies listed here for Congkak do not include those from this trail. They are still to be identified. Pangsun at its entrance is an overgrown pine plantation with a rich ground vegetation. Within it is a single track big enough for a car (i.e. for F,FE species) for 300m, 2 tracks for a single person for a total of 800m (for F species). Also, a single car-sized "dusun track" on the left of the main area through mostly orchards with some mature forests for 3 km (again for F,FE).

Above:
Perdek, a good mature forest.

Opposite page:
Top to bottom:
Congkak, a single person-wide trail to Bukit Cenuang.

Pangsun, main track from the entrance to the Taman Eko Gunung Nuang park.





Wild boar marks were seen with some leeches present in all three forests.

Pangsun-Congkak-Perdik: 102 species with 93 F+ species, 19 F only species

Pangsun: 53 species with 46 F+ species, 10 F only species

Congkak: 38 species with 37 F+ species, 5 F only species

Perdik: 38 species with 35 F+ species, 7 F only species

The Shah Alam Community Forest (SACF), 79 species (in total, 95 but 16 identified only to genus or family level) with 55 F+ species, and 28 F only species, illustrates a few of the above factors for the species count. For a small forest, 160 Ha, this is a good list. See Map 2.



Map 2. SACF, showing its trails in white, flanked by development to the left and right, with Bukit Cherakah Forest Reserve to the north, separated by the Pesiaran Mokhtar Dahari, and Taman Botani Nasional Shah Alam to the south.



One reason is, it is connected to the Taman Botani Nasional Shah Alam (TBNSA, 640 Ha of mainly good forest) to the south, and to the north the Bukit Cherakah Forest Reserve (BCFR, 1620 Ha of good forest) albeit separated by a wide road, the Pesiaran Mokhtar Dahari. SACF is a relatively small forest but a large part of it is very good forest with big trees and thus provide more species.

Wild boar marks were seen and a few leeches were present. (Animal surveys have shown that tapirs are present). It has many and varied trails – open and shaded. And many trips were made: 18 in total with 10 together with a bird survey team of 4-5 observers that helped to spot the butterflies (Nov- Dec), and 8 on my

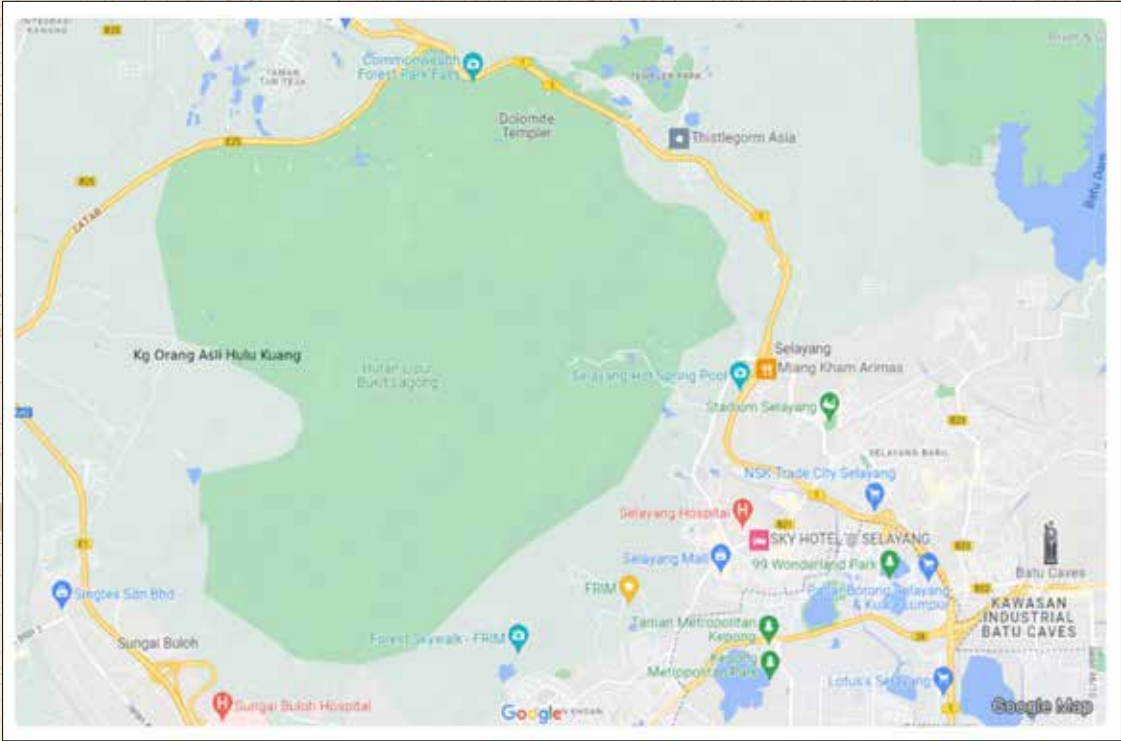
own (Apr-May). The negative factor was it was bordered on two sides by “development” making it quite a dry forest.

The SCAF list of 28 forest-shade species compared to the bigger complex Pangsun-Congkak-Perdik’s 19 is due to the higher number of shaded trails as well as the higher number of trips, and observers.

To better SACF ecosystem it should be connected to BCFR via a wildlife crossing over the Persiaran Mokhtar Dahari. 12 tapirs have been killed trying to cross the road in the last decade. The fence separating SACF from TMNSA should be dismantled to allow for free movement of wildlife, enabling better resources and more mating partners.

SACF, Backyard Trail.
A small area but with mature big trees, the biggest among all the Selangor-KL forests.





Compare SACF to Bukit Lagong with its 81 species including 53 F+ species, 25 F only species and SACF's equivalent numbers of 79, 55 F+ and 28 F. This is about the same numbers for all categories. For Bkt Lagong's much bigger area (3700 Ha, bigger even than BCFR-SACF-TBNSA complex at about 2500 Ha), it produced only about the same numbers as SACF. See Map 3. This is due to BL's forest being younger, without the big trees of parts of SACF; a much smaller number of trails that do not penetrate across the whole forest; a smaller number of trips, 11 (versus SACF's 18), where only on 3 trips (versus SACF's 10) was another person accompanying (for a bird survey, versus SACF's 4-5 persons) helping to spot butterflies. Wild boar marks were seen and leeches were present. It would not be a surprise if in reality there were more species in Bkt Lagong than SACF even though it was a younger forest than SACF.

Map 3. Bukit Lagong Forest Reserve, an island forest, surrounded by roads.

Update on Bukit Lagong 31/3/2023: After four more trips in Feb and March, i.e. 16 trips in total, and discovery of a new trail of about 2 km (a single person trail under shade i.e. good for forest only species) the species count is: Bukit Lagong, 105 total with 87 F+ species, 38 F only species, and, SACF, 79 species with 55 F+ species, and 28 F only species. There are a few more trails still not covered in Bukit Lagong which could bring up the species count further.



Pangsun's good numbers are intriguing: 53 species with 46 F+ species, 10 F only species. As mentioned, it is an overgrown pine plantation. But unlike Bkt Kiara's overgrown rubber plantation it has a luxuriant ground vegetation, i.e., not a dry forest. (Pines do not have luxuriant foliage unlike rubber trees and thus light can reach the ground storey. The presence of a good-sized stream also helps.) This helps to have a bigger species list. Also, apart from the overgrown pine plantation it has a dusun/swidden agriculture land which is quite green. Another factor, it is not an island forest surrounded by development; it is connected to bigger forests all the way to the Titiwangsa. Other factors are a good number of varied sized trails, and many trips were taken even though earlier trips were mainly for birding. There is also the possibility of minerals on the trail off the entrance because there are always butterflies on it. Male butterflies "puddle" for minerals necessary for their sperms to be healthy.

Bukit Lagong, its forest was last logged 1985, so the forest is quite good.



Templer Park (Taman Rimba Templer) is also intriguing with 37 species including 35 F+ species and 16 F species obtained in just 5 trips. This, for a small survey area of secondary forest with a lot of bamboo. See Map 4. Note, BLFR is across Jalan Rawang. Thus, it is quite surprising to obtain such a good list of species. The rich luxuriant trails, although few, help: It is a one-person sized track running along a good-sized stream initially quite open due to lack of tall trees

with a rich ground vegetation for 400m continued by a shaded trail also with a rich ground vegetation, but still not many big trees, of 500m to a waterfall, i.e., a wet forest. (Also, a poorer single-person trail along a ledge, mostly relatively open, of 400m that exits to Jalan Ipoh.) It helps too that the forest is connected all the way to the Titiwangsa. Wild boar marks were seen, and leeches present. More trips varied across the year would produce more species.



Left:
Map 4. Templer Park (Taman Rimba Templer) with Bukit Lagong Forest Reserve across from Jalan Rawang.

Bottom:
Templer Park, a wet forest. A stream running through it.





Bukit Kiara, 34 species with 30 F+ species and 8 F species, is an example for overgrown plantations, more typical than Pangsun's. It is an overgrown rubber plantation of 190 Ha. See Map 5. It seems like a decent enough count but to get this number required 13 trips on its many trails, mostly shaded ones. It helps too that it is flanked by a golf course on its south-east side (as opposed to being flanked by "development"), and in the north by the Sungai Pencala Malay Reserve land which is mainly orchard thus cooling Bukit Kiara. Otherwise, it is surrounded by development and thus it is quite a dry forest with many trails having low vegetation and thus low species count. No wild boar marks seen and no leeches present.

More species could be had from areas north of the Bkt Kiara peak which for lack of time was not surveyed.

Bukit Kiara would be a richer forest if it could be connected to Kota Damansara Community Forest (325 Ha) via a wildlife/flora passage through Sg PENCHALA. See Map 6. This should be a priority. Also, a closely knit fence there that prevents wildlife movement and thus affecting the ecosystem should be removed.

Bukit Kiara, a dry overgrown rubber plantation although this area is quite luxuriant being near a stream.

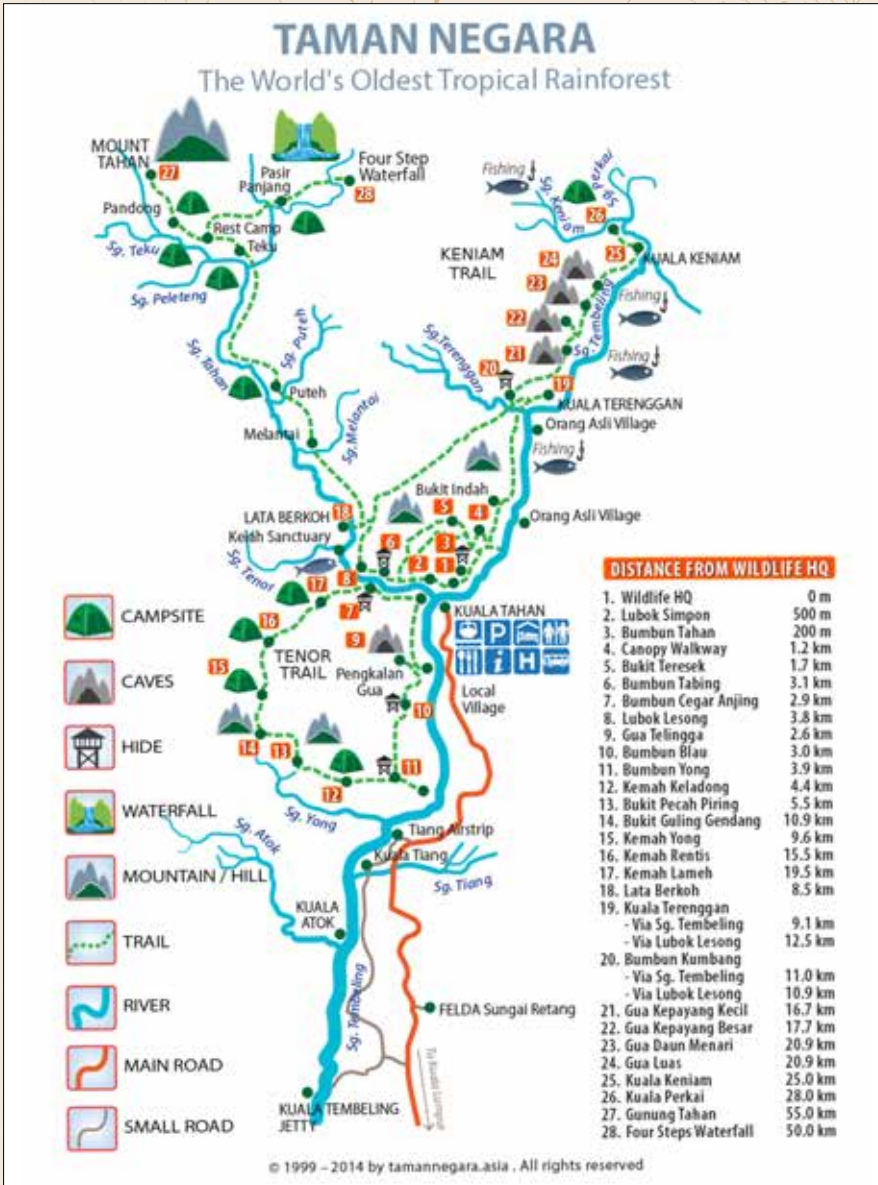


Taman Negara Kuala Tahan, 85 species with 81 F+ species and 21 F only species, is worth a mention. Total area is 434,000 Ha but the trails covered were at most of 5 km from Park HQ. See Map 7. Many trips were made (before 2015) but mainly focused on birds with butterflies as an opportunistic activity. Forest is mainly primary with a small swampy Swamp Loop. Ground vegetation is moderate as in typical primary forests since not much light penetrate the upper layers. Wild boar and other ground mammals were present, and leeches were abundant. Given that butterflies were only photographed as a secondary activity, the numbers, especially the shade butterflies (which needed more search), were good. No doubt there are more butterflies to be had.

Taman Negara Kuala Tahan, a primary forest of mature big trees.



Map 7. Taman Negara Kuala Tahan.



Obtaining a fair species count across different forests

To compare fairly the number of species across different forests the following factors are necessary:

1. Same number of visits.
2. Visits are done at the same time of the year to take into account the seasons.
3. Same team members i.e. same skills, same number of observers etc.
4. The same number and length of trails if this is within our control (usually, not).

When have you reached the maximum number of species for an area?

When new visits don't add new species: the total number of species have plateaued. 🐼

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