

5. Cave Restoration & Monitoring

There are more than 11 recorded limestone caves within the Pin-Supu Forest Reserve (PSFR). Many of these caves in the Supu Complex have unique cave formations, ancient artefacts, and specialised cave fauna, all of which are significant and specialised features of HCV 3.0 for PSFR.

KOPEL began active conservation and restoration efforts in the Supu Limestone Caves in 2010 after receiving support from Sabah Wildlife Department to manage and restore the swiftlet population within the caves.

Since the year 2010 KOPEL has appointed four forest rangers full time, to monitor and protect the caves in the Supu Limestone Complex. The rangers are based at Supu Camp, to maintain a permanent presence at the caves and impede encroachment into the caves, whilst maintaining the facilities and trails. Prior to KOPEL’s work in this site, there was no scientific monitoring of the caves. In 2018 KOPEL formed a short-term partnership with The Rufford Foundation to make scientific cave exploration under the project of, *Cave biodiversity conservation in Lower Kinabatangan, Sabah, and Malaysian Borneo*. The study detail is described below:

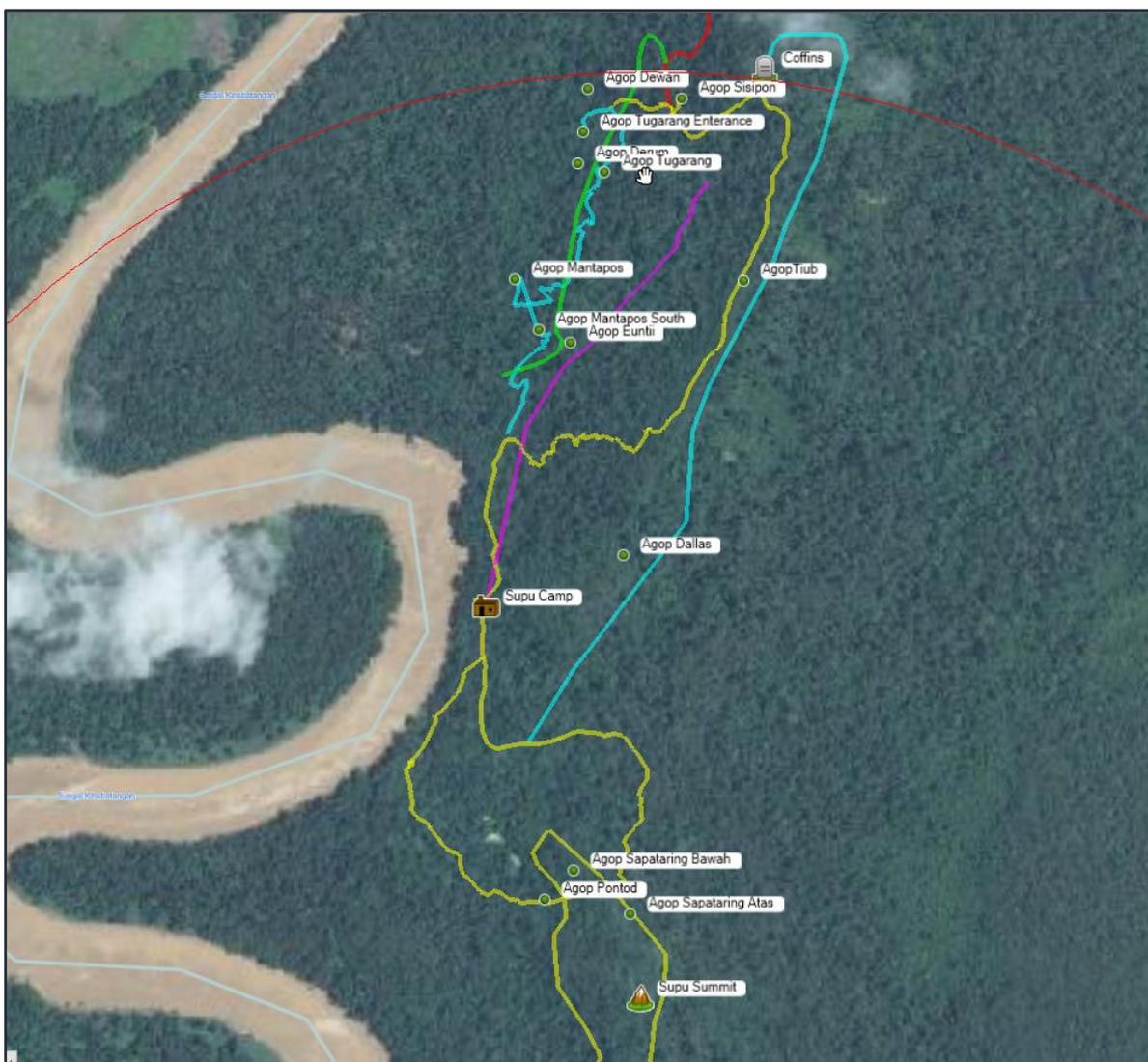


Figure 36: Location Limestone chamber in supu cave

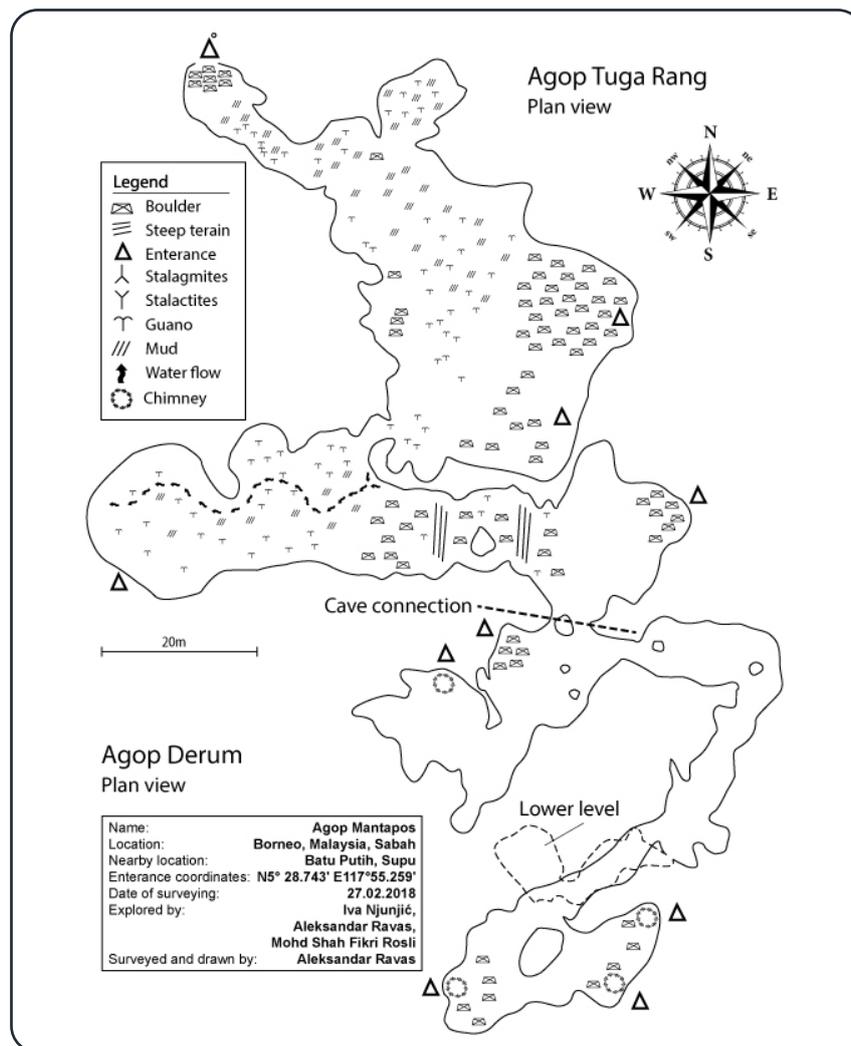


Figure 37: Cave mapping plan from The Rufford Foundation Study (Plan View)

Cave and Karst fauna conservation in Pin Supu Forest Reserve

- I. The first phase of the project involved the training local conservation staff regarding basic cave survey techniques, including cave mapping & sampling of cave fauna. Phase 1 involved, exploring Supu limestone hills, mapping a selection of caves and compiling information on the history of cave-use via interviews with local people. This field work also involved specimen collection to establish baseline data on species richness and endemism of cave-adapted beetles and Micromollusks in the area.
- II. The second phase of the project was the identification of the material and data collected and the analysis of the data collected during the first phase of the project. Combining the data collected in the field with existing materials at University Malaysia Sabah will support the development of organized inventories for each cave, alongside measure species richness, and create maps of cave endemism. The work in this phase involved local collaborators wherever possible. The purpose of this involvement was to disseminate information and build local skills in analysis techniques alongside the creation of promotional materials to be used for educational activities and public presentations.
- III. The last phase of the project focused on education and raising environmental awareness. Two sessions were organised to share information on the process and findings about cave life were delivered to local primary school students from Batu Puteh. Also, an excursion was organised to the caves for local school students to explore hands on involvement of young school students in bio

speleological investigations. The purpose being to provoke an interest in disciplines associated with cave explorations. Towards the end of the project, findings were presented to staff and students at KOPEL, Danau Girang Field Centre, and University Malaysia Sabah. Other invitees were conservation officers from the Sabah Wildlife Department, Sabah Forestry Department, and the Minerals & Geosciences Department at UMS.

Important caves access trails were mapped out to prepare for the scientific exploration in Supu Cave. Cave mapping within selected caves used specially modified laser rangefinder combined with and connected to mobile phone apps, the chambers of three cave were mapped out in this exploratory phase. Example cave map is shown in Fig XX above.

Swiftlet Nest Monitoring

Swiftlet Nest surveys were not conducted from 2013 – 2018. Nest counts were started again in March 2019. The results below (figure 29, below) are a summary of the nest counting work. The methodology of the nest surveys involves (a) counting all nest within the caves, (b) counting nest with eggs or young swiftlet (these are left undisturbed and untouched), and (c) collection of abandoned nests. The outcomes of the nest counting survey is shown in figure 38 below. The Caves Agop Tugarang, Agop Sisipon and Agop Dalas have the highest nest counts – approximately 20 nest per cave.

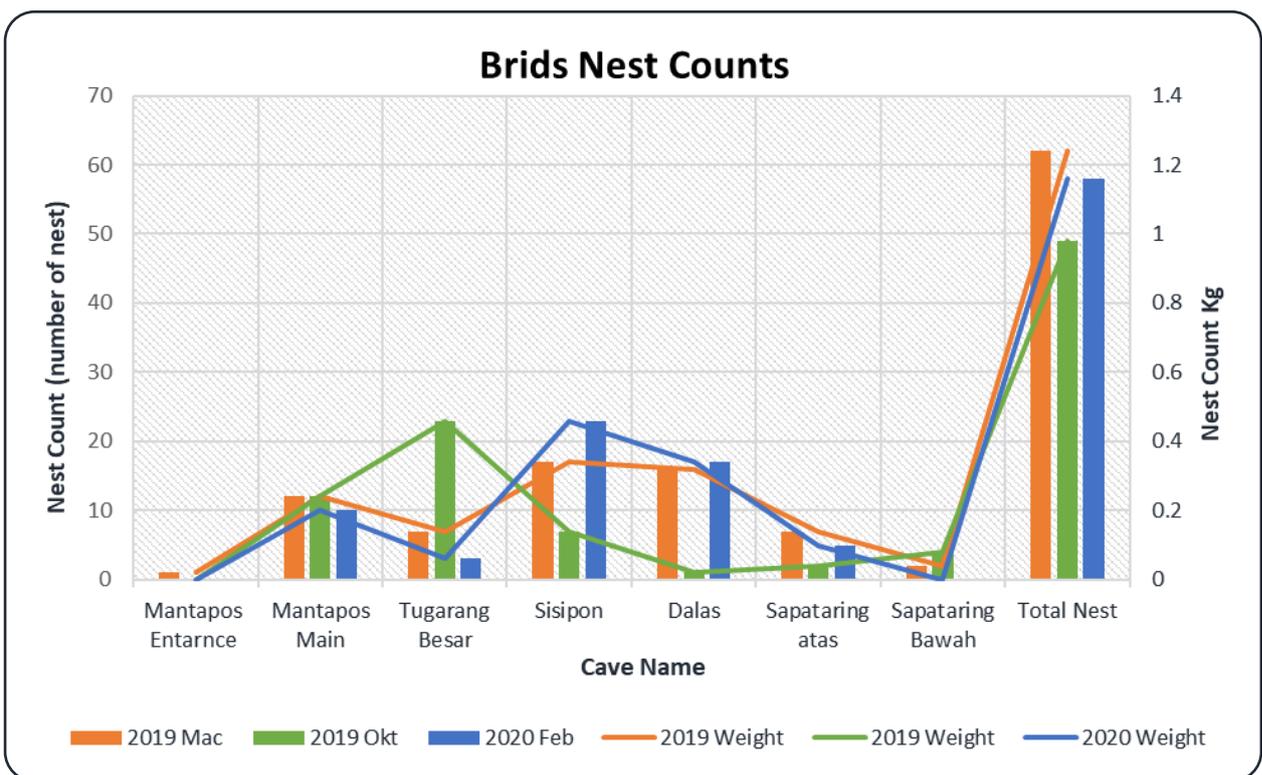


Figure 38: Birds nest counts from 3x Survey 2019-2020

Management Implication

- I. Based on the overall outcomes of the preliminary cave fauna survey, it is understood there is considerable lack of knowledge and research into unique habitats such as the limestone caves, hence it is recommended that the monitoring be expanded to cover all aspects of cave fauna and cave conservation in the future. The data and results can be used to improve the practice in management and monitoring the caves into future.

- II. Results of nest count monitoring shows a notable increase in the population of nesting swiftlets in the caves of the Supu Limestone Complex. This is considered a positive indicator for conservation efforts within Pin Supu Forest Reserve.
- III. From a management perspective the increase in nest count is also a positive indicator of the health of the forest ecosystem within PSFR and is likewise considered a positive indicator of forest protection efforts across the reserve.
- IV. The monitoring and subsequent fluctuation of nest counts across the year demonstrated illegal intrusions were being carried out in the caves. The intrusions were reported to Sabah Forestry Department; however, lack of evidence is thwarting further action or prosecution of the offenders. Additional security interventions have been established to prevent intrusions from recurring.
- V. The cave monitoring program involves 100% the local community hence supports (a) local awareness-raising, (b) employment benefits to the local community, and (c) inclusivity of local community in the co-management of Pin Supu Forest Reserve. This is already providing opportunity for environmental education of local school students in 2018. It is recommended that the cave environments and monitoring program be an ongoing part of environmental education programs in the future.

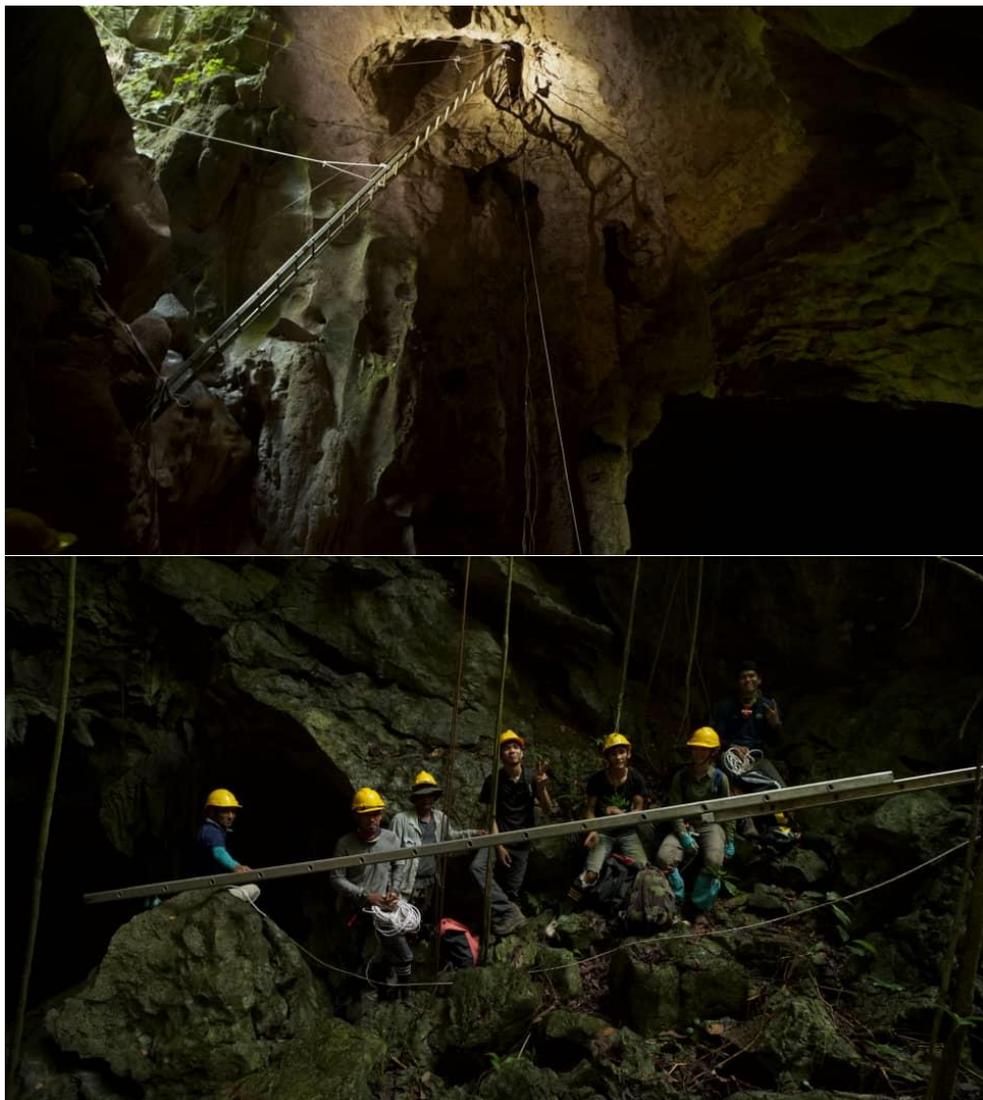


Figure 39: Birds nest survey