

KARST AND CAVES OF THE SHAN PLATEAU IN MYANMAR

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Abstract

The Shan plateau of Myanmar has extensive karst stretching over an area of 500 km x 300 km. Due to its isolated location a systematic exploration for karst and caves is only done since 2009 resulting in ten expeditions surveying 37 km of passages. The areas of Ywangan, Hopon and Pinlaung were systematically investigated while for the areas of Lashio and Kayah state an initial assessment was done. The longest cave in Myanmar is Khauk Khaung (Stone cave) in Ywangan with 4790 m length while Mai Lone Kho is the deepest with -160 m. The identified karst objects are registered in a cave data base containing 600 items. It is publicly shared under a CC license as base for further research. One application used from Flora Fauna International (FFI) is to identify karst based biodiversity areas (KBA) for conservation within the IUCN standards. The project collected 251 specimens

Keywords: Karst, caves, Myanmar, Shan plateau, karst conservation, biodiversity, cave fauna, ecotourism

Introduction

The Shan plateau of Myanmar hosts the most extensive karst of the country and extends over 500 km x 300 km at an average altitude of 1100 m asl. Its isolated location and limited infrastructure resulted in very few speleological expeditions since colonial times focusing mainly on the district of Kalaw. A systematic research of caves and karst features is performed from the Myanmar Cave Documentation Project (www.myanmarcaves.com) since 2009 after receiving permission from the government to enter areas not accessible before. The objective of the international project team is to document the karst and caves as a basis for further research in karst conservation, cave fauna and ecotourism. Therefore all results are consequently published in books and articles and a database has been setup.

The limestone of the plateaus has a thickness of more than 2000 m in places. It is mostly from the Carboniferous to Lower Triassic period, with some earlier Ordovician elements and has underlying Devonian strata. A more detailed stratigraphic assessment has been made by Oo (Oo,2002) who divides the carbonates into two main units: the Thitsipin Limestone Formation passing transitionally upwards into the Nwabangyi Dolomite Formation. The presence of these abundant carbonate beds has a major impact on the scenery in the Southern Shan State leading to a series of north-south oriented limestone ridges along the dominant structural trend. These are separated by basins flowing southward while steep cliffs are dominant at the edge of the plateau towards the lowlands.

Major cave areas

The expeditions focused on the following areas: a.) Pinlaung, 40 km south of Kalaw, b.) Hopon, 25 km east of Taunggyi and c.) Ywangan, 20 km northwest of the famous Pindaya caves. The areas of Lashio, Nyaungshwe and Loikaw have been briefly visited in preparation for future systematic investigations. The largest horizontal river caves are found in Ywangan

with Khauk Khaung (Stone cave) being the longest of about 5 km length with limited prospects for extension. Other river caves are Stone Spring Cave and the Linwe Sink Systems with 1.9 km and 0.9 km length. The hydrogeology of the area is partially understood and further investigations are planned for end of 2015.

The Hopon area has a cluster of river caves around 1 km length with Tham Sam cave the best known as Pa-O tribe pilgrim site with Buddha's and animal statues. A highlight was the survey of Hopon Spring cave known from its popular lakes originating from the spring next to the road with a picture in the museum in Taunggyi. The cave is surveyed to 1.7 km and revealed a top entrance shaft as 2nd entrance. Further prospects are east towards Mong Pun.

The deepest caves of Myanmar are located in the highest karst ridge near Pinlaung at 1700 m asl. The record of 160 m depth has Mai Lone Kho with the shaft Hti Ngut at -157 m depth in the neighbor hill continuing in an active passage. A focus of the 2012-14 expeditions was west of Pinlaung with a large river sinking and predicted to connect with the Namun resurgence (Dunkley, 1989). A system of more than 10 km passage was expected. This was not reached as Namun Spring cave sumps and requires diving while in the Te Toke sink the river proceeds in a narrow canyon at -120 m making it very dangerous to proceed.

The latest findings of a reconnaissance in 2015 to Kayah state are very promising with a large area of tower karst found near Hpruso. This state is located at the southern edge of the plateau and possesses steep drops from the plateau at 1000 to deep cut in rivers at only 150 m asl. Over hundred dolines, partially several km large, are identified on topographic maps and indicate on a large potential of big river systems. The red river cave near Bawlakhe was surveyed to a length of 1.3 km before returning in wide open passage due to bad air. Kayah has the potential of river caves similar to the largest caves of Thailand close by north of Mae Hong Son.

All visited karst objects are registered with identifying numbers and meta data of location, history, access and extend of caves based on surveys. It contains now over 600 objects with 37 km of documented cave passage.

Karst conversation

Large parts of the Shan plateau have a very low population density and are known for one the highest biodiversity in the world. Limestone habitats with caves can be home to uniquely-adapted flora and fauna that have evolved in the special geological, hydrological and associated micro-climatic conditions (Bird life, 2014). In further cooperation with Flora Fauna International (FFI) a systematic assessment based on the new IUCN Standard for identifying Key Biodiversity Areas (KBAs) is planned. The karst data base was therefore made public available under a CC license as base to identify the areas with priority for protection.

Cave fauna

Very few articles are published about cave fauna in Myanmar. A few single records exist from colonial times. In recent times the bat surveys conducted by the Harrison Institution (UK) in cooperation with Yangon University and the spider studies of the Chinese Academy of Sciences are the last published reference (Bates, 2004; Fengyuan, 2014).

Recently a total of 251 specimens in 17 different caves have been collected during two expeditions in 2012 and 2013. The specimens belong to at least 62 different taxa. The typical composition of the cave fauna of Shan State is similar to neighbouring Northern Thailand and Laos. Both, fruit bats and insectivorous bats are found in the caves. They are more abundant than in Laos, but we haven't seen really large colonies like in Southern Thailand or Malaysia.

Rats are commonly encountered in the caves, snakes have been seen a few times and frogs are seen usually in water caves. Top invertebrate predators are the large huntsman spiders of the genus *Heteropoda* and the long-legged cave centipede *Thereuopoda longicornis*. The large huntsman spiders of the genus *Heteropoda* are one of the most conspicuous caves animals and the character species of Southeast Asian caves. Most areas which we have seen have their own cave species. The *Heteropoda* species found in the Shan State is not yet identified, but it is clearly different from *Heteropoda ono*, which has been described as a new species from Southern Myanmar.

Cave crickets of the genus *Diestrammena* or closely related genera are found in almost every cave. They seem to constitute the main prey of predators. As a hemimetabolous insect, they increase gradually in size from a 2 mm hatchling to about 5 cm in the grown-up state, thus offering a fitting prey-size to each predator. Cave crickets themselves are fungus-feeder, grazing the fungus growing on guano and any other organic material in the cave.

One interesting species was found in Namun Spring Cave: *Chilobrachys* sp. a large tarantula (*Theraphosidae*) spider, a group usually not found in caves in Asia. The animals show no cave adaption, but were found in too large numbers and too far away from any possible entrance to be dismissed as accidental visitor.

White fish have been found in Namun Spring Cave and in Ywangan. One species from Ywangan was caught and sent to the university in Yangon. Interestingly no cave fishes have been described from Myanmar so far.

Conclusion and Outlook

A first systematic overview of karst and caves of Myanmar has been achieved after 6 years of research with 37 km of cave passage surveyed and 600 items recorded in a database. In addition an initial assessment for cave fauna was done. Future focus is on Kayah state with an area of dozens of large dolines indicating on large river caves and understanding the hydrogeology of Ywangan area in more detail.

A challenge is the early designation of protected karst areas with high biodiversity in perspective of upcoming infrastructure projects linking the Shan plateau with China and Thailand. This causes increased demand for cement and an industry looking for limestone resources. The tourism industry on the other side aims on high end tourism and is interested in new sites to attract long term visitors. The project contributes with its research towards a sustainable future of the Shan plateau.

Figure 1. Areas marked with limestone on the Shan plateau

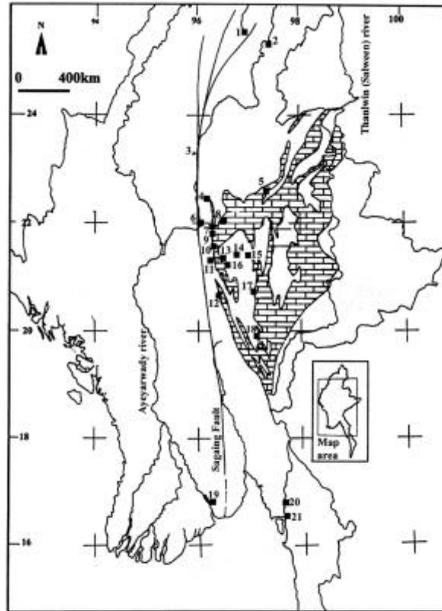


Figure 2. a.) Karst scenery on the Shan plateau with the north-south trending ridges clearly visible beyond Pinlaung town (Photo J. Dreybrodt), b.) Sink of Te Tok Taung (Photo C. Densham)



a.



b.

Figure 3. a.) Tarantula from Namun Spring Cave (Photo U. Etter) and b.) suspected new Heteropoda species (Photo H. Steiner)



a



b

Table 1. Longest caves of Myanmar

No.	Name	District/Township	Length (m)	Year of survey
1	Khauk Khaung (Stone Cave)	Ywangan	4,790	2012-14
2	Namun Spring Cave	Pinlaung	2,628	2013-14
3	Kyet Cave	Loikaw	2,194	2015
4	Yae Htwet Kyote Khine Gu (Stone Spring Cave)	Ywangan	1,917	2014
5	Mondowa Gu	Taunggyi	1,770	1998
6	Hopon Spring Cave	Hopon	1,655	2011
7	Na Gar Gu (Dragon Cave)	Ywangan	1,654	2014
8	White water Buffalo and Tiger Cave	Hopon	1,343	2010
9	Red river cave	Bawlakhe	1,275	2015
10	Happy Monk Cave	Hopon	975	2010

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