



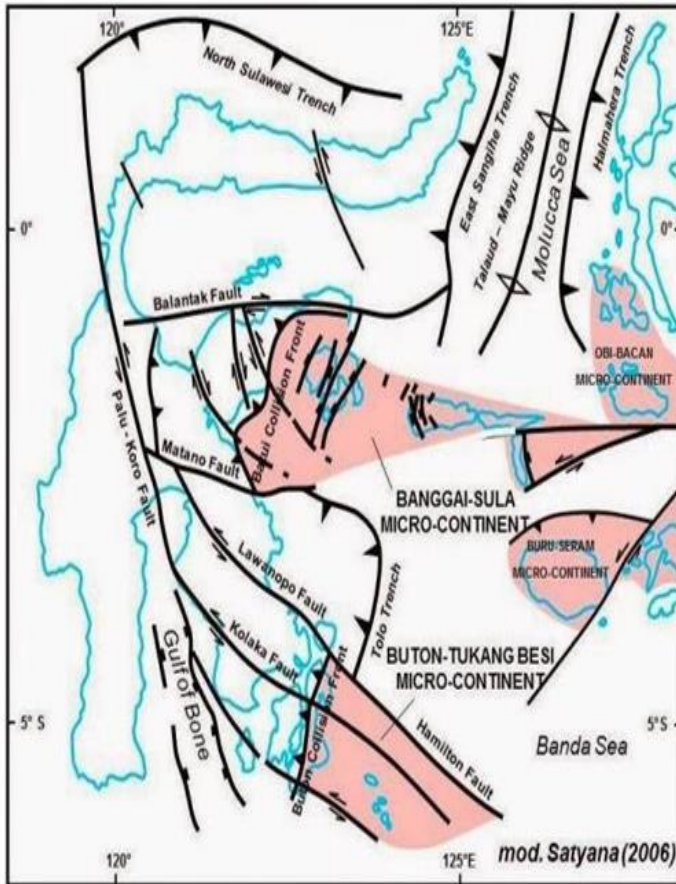
International Expedition
In Banggai Kepulauan - Banggai Laut

**ASIAN TRANS DISCIPLINARY KARST
CONFERENCE 2024**
SPECIAL REGION OF YOGYAKARTA

OVERVIEW

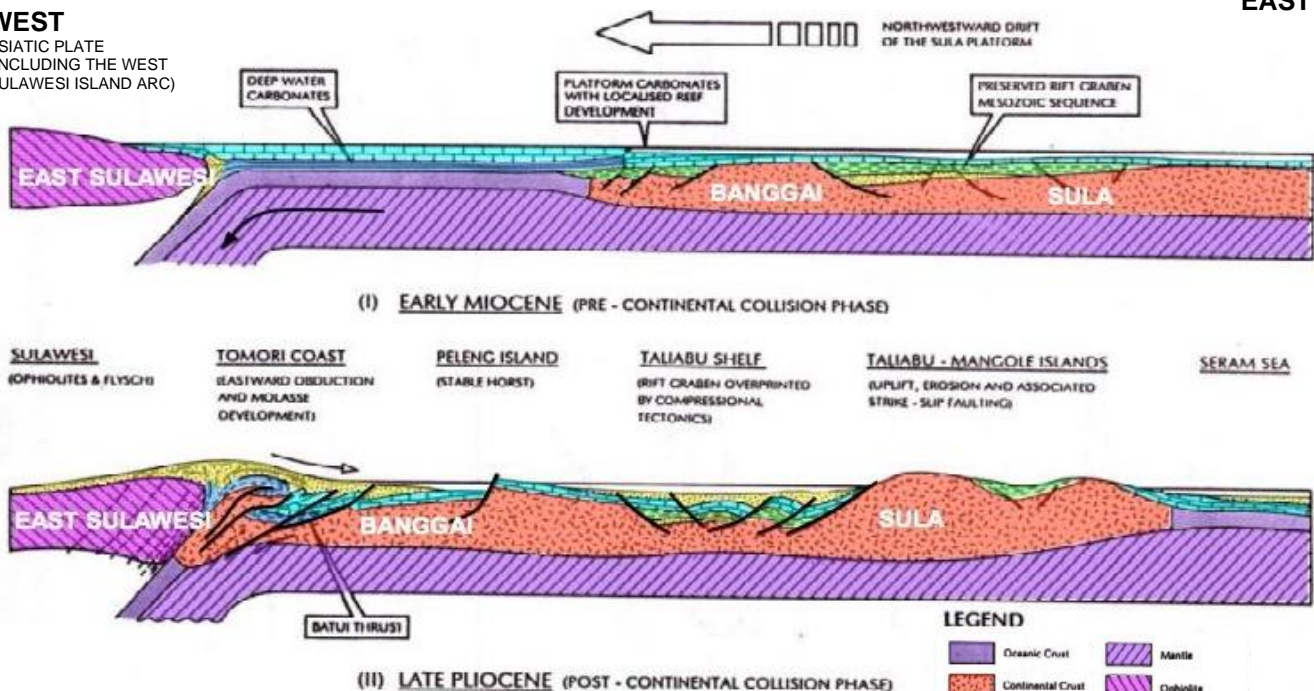
Banggai Kepulauan and Banggai Laut, together with the surrounding archipelago, are part of the Banggai-Sula microcontinent, which has been advancing westward from Australia-Guinea since the late Mesozoic period (Garrard et al, 1988). Peling Island, the primary carbonate island, is made up of two formations: the Peling Formation and the Salodik Formation. The area has a submerged cave with crystal-clear streams, vertically deep cenotes, subterranean rivers, and crystal-clear lakes. Other karst islands have complementing features such as marine lakes and atolls. Furthermore, only few research studies have been undertaken in this field up to present time. Accordingly, there are numerous unique phenomena is waiting to be investigated.

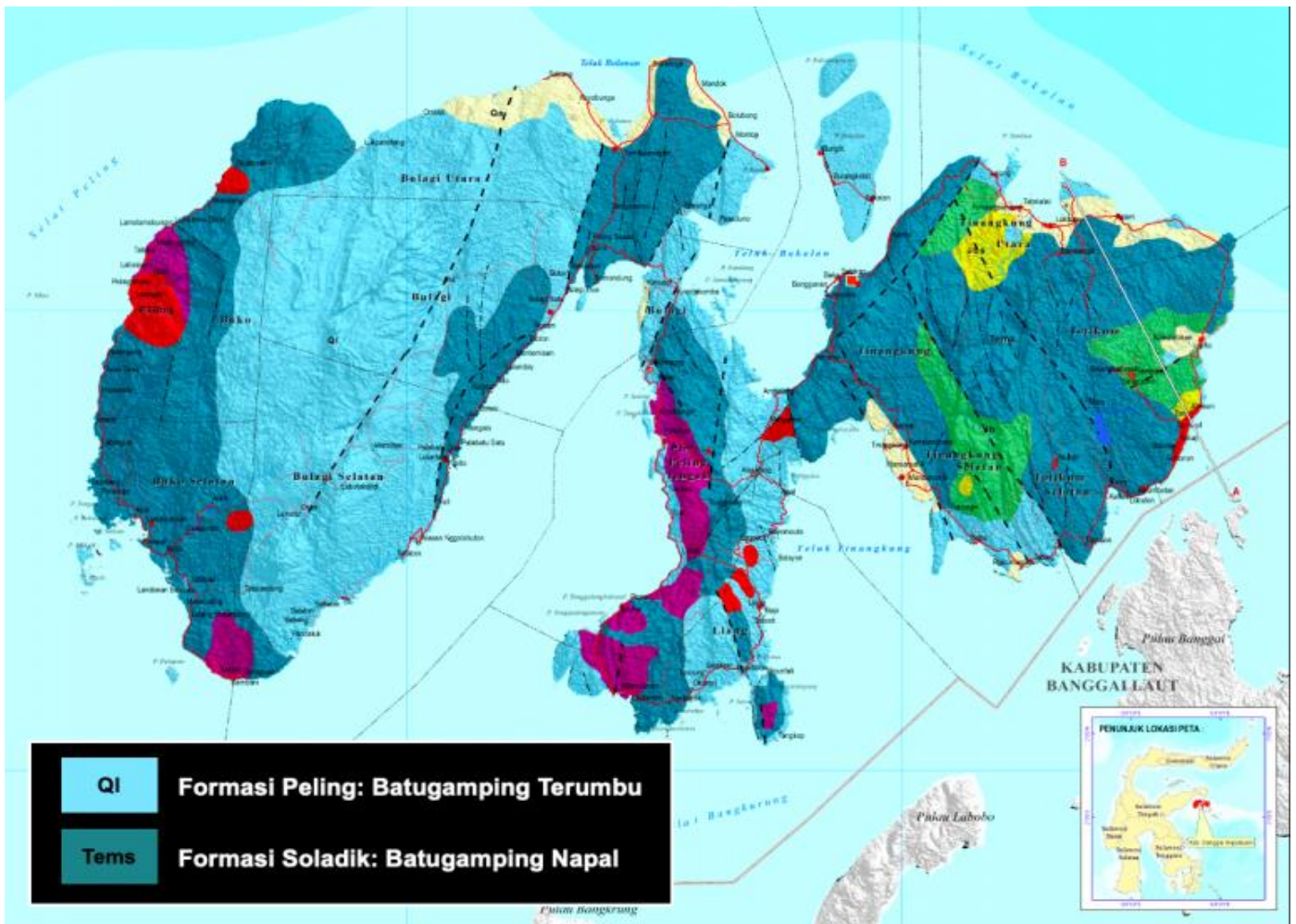
Figure 1 Sulawesi Regional Tectonic Pattern (Satyana, 2006). **Figure 2** Tectonic development of the Banggai-Sula microcontinent collision (Garrard et al., 1988 on Satyana & Zaitun, 2016).



WEST
ASIATIC PLATE
(INCLUDING THE WEST
SULAWESI ISLAND ARC)

EAST





There are currently very few speleological expeditions specific to the Carbonate Islands of Indonesia resulting many unknown detailed information. Regardless of its geological intricacy, Indonesia's plate collision phenomenon is fascinating. Careful research will reveal phenomenon from the inimitable oceanic-karst terrain, which is rich in biodiversity, and unique geological phenomena.

This expedition is initiated by UGM Karst Research Group and was a part of Road to International Karst and Cave in 2021 under patronage of Asian Union of Speleology and Federation of Indonesian Speleological Activities. The International Union of Speleology and Eurospeleo were also invited to join this event.

Biodiversity speaking, Banggai Kepulauan is the home to a variety of exotic and unique animals (as seen in Figure 4). There are also other numerous protected exotic animal creatures, such as Kuai Cuscus (*Ailurops ursinus flavissimus*), the Kailong (*Megapodius bemsteinii*), Banggai Snake (*Calamaria banggaiensis*), and Banggai Flying Lizard (*Draco Rhytisma*). This ecological diversity is dispersed among 900 MDPL forests, the lowlands, coral reef regions, and in the series of enormous and magnificent atolls in Banggai Laut oceans.



Additionally, the cultural trail of Banggai Kingdom (sultanate in the past) is also fascinating enrichment for this Banggai Kepulauan-Banggai Laut region. Henceforth, it is also critical to advocate the area to be declared as geopark and world heritage site to preserve those all-incredible features within.

Objectives

The main objective of this exploration is to increase and discover the value of this marine karst and carbonate island. This will be carried out through:

1. Finding and exploring new caves, including terrestrial (dry) and submerged (underwater) caves, and cave diving expeditions.
2. Study the karst hydrology on Carbonate Island, Karst Lake on Carbonate Island, Vertical Cenotes, Marine Lake, and Atolls.
3. Geological mapping of micro tectonic movements in eastern Indonesia
4. Speleogenesis on Carbonate Island
5. Biospeleology and Phylogeography
6. Small Island Community, Cultures, and Maritime Archaeology Investigation
7. Tourism planning on Small Carbonate Island

Location

Speleonesia Expedition: Banggai Kepulauan-Banggai Laut

This expedition will be focused to two main locations: Banggai Kepulauan (as the primary Carbonate Island) and Banggai Laut (as the small Carbonate Island, Marine Lakes, and Atolls). Each location will be elaborated in the next sub-chapter.



Figure 4 Expedition location: Banggai Kepulauan and Banggai Laut



Figure 5 One of vertical cenotes locally called “Sumur O’ang”, North Bulagi (Photo by Anto Scout) **Figure 6 [left & right]** cave diving at Goa Susundeng, Pandaluk, South Bulagi (Photo by Anto Scout)

BANGGAI KEPULAUAN

Banggai Kepulauan is 85% karst with 97% protected area and classified as an Essential Ecosystem Area (KEE) by the Ministry of Environment and Forestry. This island is exclusively one of the only four KEE Karsts in Indonesia. The Banggai Kepulauan are made up of two limestone formations: the Peling Formation (west-side) and the Salodik Formation (east-side).

In the past, BRIN conducted a 10-day exploration in 2017 and discovered 17 terrestrial and submerged caves, 7 karst lakes (2 of which are tidal freshwater lakes at high altitudes), and 112 karst springs distributed across the east, centre, and west. Later, rapid exploration by the KKN-UGM 2023 Team obtained additional information in the form of 3 vertical cenotes, one of which has approximately 50m vertical distance from the tip to the water

surface and 35m deep below the water surface. Another exploration in this occasion was cave diving in Susundeng Cave.

In-depth exploration is significantly required to fully understand the phenomenon of Banggai Kepulauan as the primary karst island. The exploration requires mobile group outfitted with terrestrial cave exploration, mapping, Single Rope Technique (SRT) sets, and cave diving equipment. Most activities will be taken place on land; however, some trips are performed along the coast by boat.

Exploration will take roughly 6 days and the participant may need to spend the night in the field in a flying camp. Some assignments might require the group to be divided into two: land and cave diving teams.



Figure 8 Small islands view from Popisi Hill, Banggai Lau (Photo by Hendrie Adji Kusworo)



Figure 7 [left] human remain found in the one of terrestrial cave in Banggai Laut; locally believed originated from the war era. There is no study confirmed this yet, **[right]** one of “unknown” submerged cave, Banggai Laut

BANGGAI LAUT

Banggai Laut is a series of small karst islands, which have small island karst caves (terrestrial caves and submerge caves), marine lakes, and atolls.

There has been extremely limited exploration in this area except for a one-month exploration by an Indonesian and foreign marine biology team in 1994. It is speculated that the caves in Banggai Laut are dominated by submerged (underwater) caves.

Exploration in the Banggai Laut ideally will be conducted by boat on a LoB (Live-on-Board) basis, with multiple flying camps either on the beach or in the local village.

Most of the exploration activities most likely will feature cave diving, while terrestrial cave investigation will may also be taken place. Participants who will join the cave diving explorations are expected to have a full cave diving certificate with sufficient expertise. Exploration in the Banggai Laut is estimated to take about 6 days

HOW TO GET THERE



Figure 9. Banggai Expedition mobility illustration

The airport hub is in Makassar, with flights to Luwuk Airport in Banggai district, on Sulawesi Island's mainland. The journey will be continued for 4 hours by ferries directly to Salakan, Banggai Kepulauan. The group will be greeted with a welcome dinner and cultural performance by the Regent of Banggai Kepulauan.

The mobile expeditions will be conducted in Banggai Kepulauan. The accommodation alternative is by staying in local community-owned guest houses, as well as flying camps in various locations. Logistics are simple to obtain, even in these remote locations. In some cases, the caves in this area will be reached by boat.

The subsequent expedition is to Banggai Laut. The journey from Banggai Kepulauan to Banggai Laut will be carried out by boat, which will be used as transportation throughout the expedition. The Regent of Banggai Laut will also greet the group with a welcome dinner and a cultural performance.

The expedition will mostly be executed by boat to explore around the ocean water. The group will be staying in a local guest house, and flying camp. Diving equipment will be transported also on the boat. Participants are expected to have at least an advanced level diving certificate. For those who is intended to take part in the submerged caves exploration, they shall possess the Full Cave Diver competence.

EQUIPMENT



We will come across a vertical passage and an underground river. Hence, the Single Rope Technique (SRT) method is essentially required. We also require cave mapping equipment and GPS.

To explore underwater caves, cave diving kit is required, which should be brought by personnel. There will be support for scuba diving tanks supply (compressors). Most locations have phone and internet service, except for a few remote zones in Banggai Laut. Hence, satellite phones can be useful, particularly during an emergency. Nevertheless, the boat does have a communication radio. We will provide cooking tools and diesel generator for the electric supply in the camp.

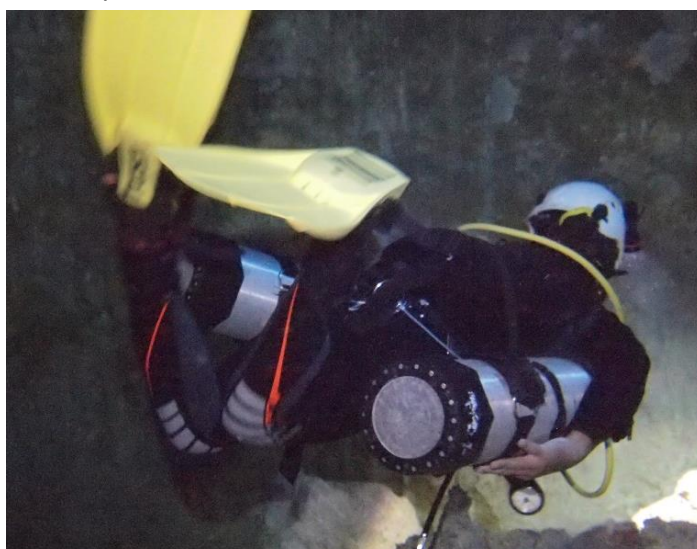


Figure 10 . SRT on one of vertical cenotes Sumur O'ang, Bulagi (Photo by Anto Scout) Figure 11 . Cave Diving in Gua Susundeng (Photo by Anto Scout).

SPECIFIC GOALS

In Banggai Kepulauan, exo-karst phenomena will be explored in the form of tidal karst-lakes at high altitudes (Estevelle phenomenon), which has never existed in Indonesia. If the expedition can confirm, this will be a new discovery. Subsequently, freshwater karst-lakes in coastal areas will also be explored.

The group will be challenged to explore vertical cenotes (up to 50 meters of vertical caving), which will demand vertical caving and cave diving skills. The water inside the cenote is predicted to be significantly deep, hence it requires technical diving competence and equipment.

The caves need to be mapped, including the underwater caves. Aside from that, spring water and resurgent springs will be identified and mapped.

Terrestrial caves on small islands, underwater caves, marine lakes, atolls, and other karst phenomena in the Carbonate Island will be explored in Banggai Laut.

Mapping and exploring underwater cave biota will be an interesting discovery which potentially lead to further research.

Studies on aspects of the Banggai-Sula microcontinent's movement in this area are likely to yield new scientific findings and strengthen the area's use as an international geopark.