CHAPTER III

RESEARCH METHODOLOGY

This chapter outlines the research methodology, encompassing field investigation and sample collection, laboratory work, data analysis and interpretation, and thesis writing and presentation. Fieldwork and sample collection were conducted at the quarry in Ban Thung Samed, Satun Province. Laboratory work involved the extraction of ostracods and conodonts, the preparation of samples for tentaculitoid identification, and thin section analysis. Data analysis and interpretation are described in Section 3.3, while thesis writing and presentation are covered in Section 3.4.

3.1 Field investigation and sample collection

The study section is referred to as Ban Thung Samed section, is named after Ban Thung Samed village. It is located in an abandoned quarry at coordinates 6°58’05"N, 99°46’04"E, on the western side of Highway No. 416, near the 88-kilometer marker, in Ban Thung Samed village, La-Ngu District, Satun Province. It is located about 4 kilometers northwest of La-Ngu Hospital (Figure 3.1).

In total, 21 rock samples were gathered from the study section (see Figure 3.2 for sampling locations). Among these, 12 samples (designated 19KT01-12) were extracted from limestone layers, each weighing around 500 grams. These samples were treated following the hot-acetolysis method (Crasquin-Soleau et al., 2005) for ostracod analysis. Additionally, 8 rock samples extracted from limestone layers (U1L, U1M, U1U, U2L, U2U, U3L, U3M, and U3U) provided by Mr. Jirasak Charoenmit from the Department of Mineral Resources and each weighing about 3 kg, were treated with 10-15% acetic acid (Green, 2001) to extract conodonts. From these conodont samples,

eight limestone samples (U1L-U3U) were selected for thin section analysis, and one dark calcareous shale sample, located near a tentaculitoid-rich bed (19KT12), was collected for the study of tentaculitoids.

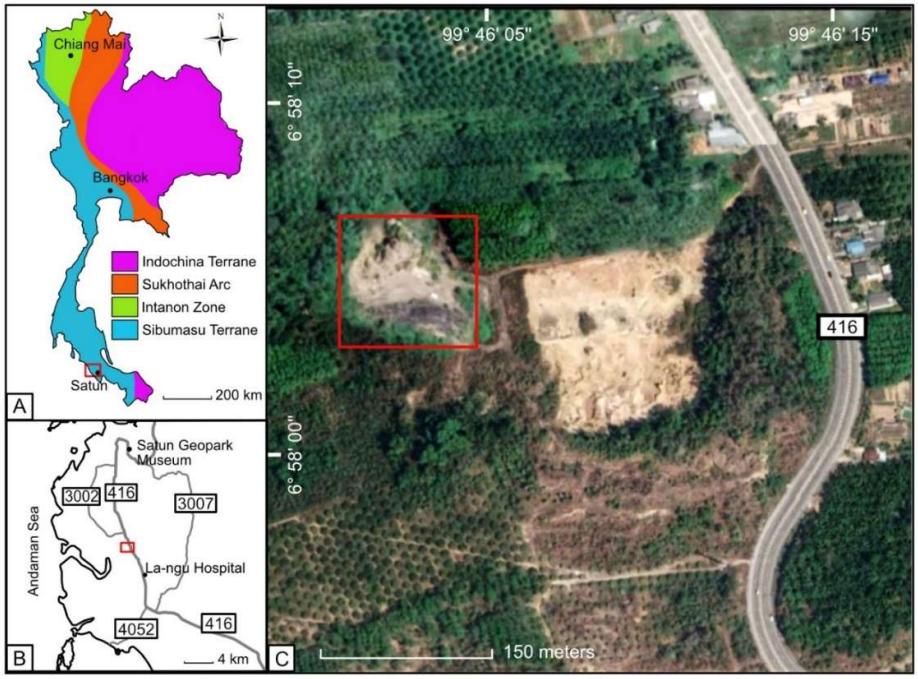

Figure 3.1 Location of the study section.

3.2 Laboratory works

3.2.1 Ostracod preparation

The limestone samples were treated using the hot acetolysis technique, which is suitable for rocks with high carbonate content. Each 500-gram sample was crushed and washed to remove any residue particles. The samples were placed in a glass jar on a hot sand bath at 60-100°C to dehydrate for 48-72 hours, ensuring they were completely dry. Once dried, the samples were covered with 99.99% acetic acid (CH_3COOH) and placed back on the hot sand bath, maintaining a temperature at 60°C. The jar was covered with a lid, leaving a small hole to vent the vaporized acid, and these procedures were performed within an extractor hood. After sufficient residue had formed, typically within 24 hours to several weeks, the residues were sieved using

a series of 0.1, 0.5, and 2.0-mm mesh sieves and then washed, repeated the process to obtain 2 sets of each sample. Once dried, the residue was hand-picked under a stereomicroscope and photographed using a JEOL Neoscope JCM-5000 Scanning Electron Microscope (SEM) housed in Facility Building 10 at Suranaree University of Technology.

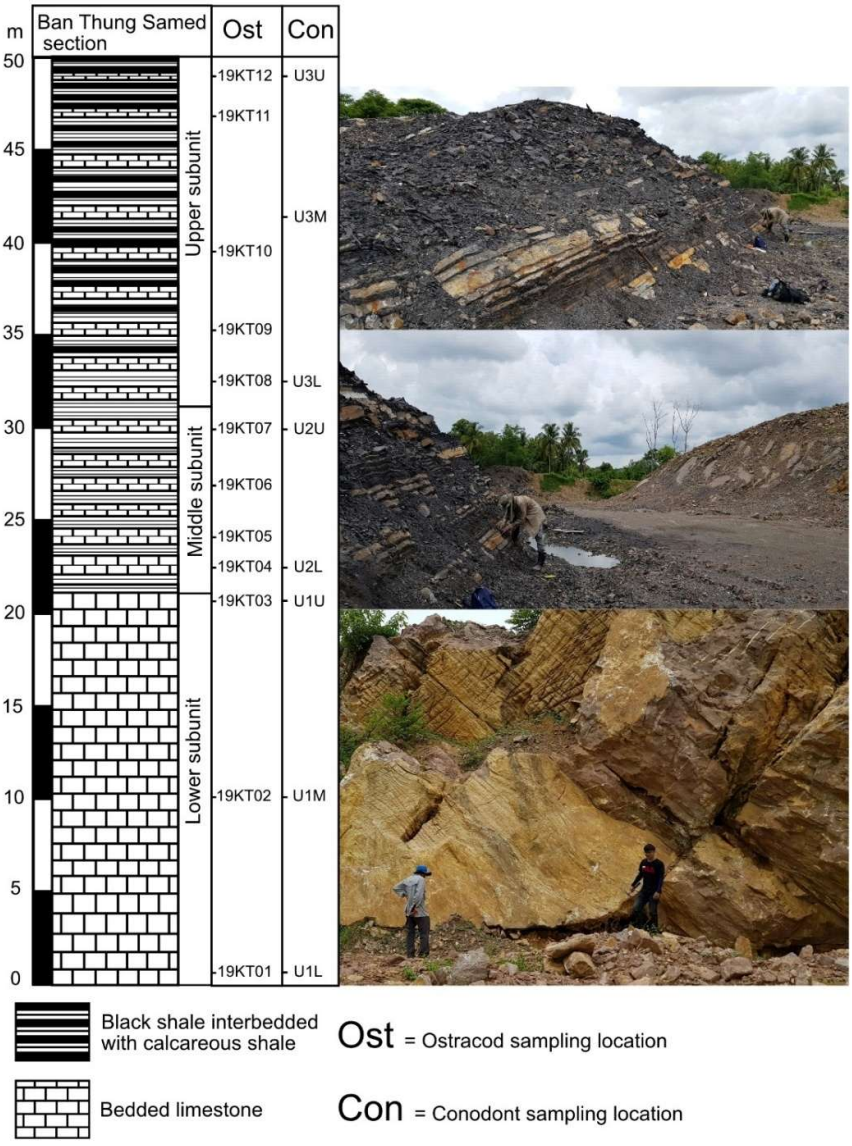

Figure 3.2 Lithostratigraphy of the Ban Thung Samed section, with sampling locations and the outcrop shown on the right.

3.2.2 Conodont preparation

The limestone samples were processed following the method of Green (2001), with modifications. According to Jeppsson et al. (1985), mixing the acid solution with a buffer acid enhances the recovery rate while minimizing sample damage. Green (2001) used a mixture of 10% acetic acid (CH_3COOH) with either sodium acetate (CH_3COONa) or calcium acetate [$(CH_3COO)_2Ca$] in a 100 mL/3–4 mg ratio. The rock samples were submerged in the acid solution, washed, and the residue was collected, with the acid being replaced every eight hours. This process continued for several weeks to obtain a sufficient amount of residue or until the rock samples completely disintegrated.

Due to limitations in equipment, space, and laboratory time, modifications were made to this study. Initially, the limestone samples were broken into 2–3 cm fragments and thoroughly washed to remove any contaminants. They were then placed in a plastic bucket with a lid and dissolved in a 10–15% acetic acid solution (without a buffer solution, as the process was sufficient to yield conodont elements) for seven days. Once the reaction ceased, the residues were wet-sieved using 0.1 mm, 0.5 mm, and 2.0 mm mesh sieves, then rinsed with water to remove any remaining acid (to prevent the recrystallization of calcium acetate on the conodont samples) and dried in hot oven. This process was repeated to obtain two sets from each sample.

Traditionally, the residue material undergoes heavy liquid treatment to separate conodont elements from other debris and concentrate the recovered elements. However, due to the high cost and hazardous nature of heavy liquids, this step was omitted in this study. Instead, the remaining residues were carefully hand-picked under a stereomicroscope. The recovered conodonts were then photographed using a JEOL Neoscope JCM-5000 Scanning Electron Microscope (SEM) housed in Facility Building 10 at Suranaree University of Technology.

3.2.3 Thin section analysis

The rock samples (took some from conodont samples) were prepared for 4 slides of thin sections for each sample from lower subunit (U1L, U1M, U1U from lower, middle, and upper of the subunit respectively); from middle subunit (U2L, U2U from lower and upper of the subunit); and from upper subunit (U3L, U3M, U3U from lower, middle, and upper of the subunit).

The rock sample was first cut into a slab using a diamond saw and then trimmed to the desired size (2×3 cm) for mounting onto a glass slide. The surface of the sample was grinded to achieve smooth and even texture using a grinding machine. To enhance adhesion, the glass slide was pre-treated by polishing with coarse-grained abrasive dust (silicon carbide, SiC) to create a rough surface. The prepared sample was then affixed to the slide using epoxy adhesive. Once the epoxy had fully cured, the mounted sample was processed using a thin sectioning machine to reduce its thickness to approximately 1–2 mm. The section was further polished using fine-grained silicon carbide abrasive dust until the desired final thickness was achieved. The thin sections were studied under polarized-light microscope.

3.2.4 Tentaculitoid preparation

The rock samples were carefully chipped to expose additional tentaculitoid fossils. The surfaces were then cleaned by gently brushing away any dust or debris to ensure clear visibility of the specimens. Once prepared, the samples were securely packed and sent to Dr. Shuji Niko at Hiroshima University, Japan, for identification and photographic documentation.

3.3 Data analysis and interpretation

3.3.1 Ostracod

Ostracods were identified based on their morphology and analyzed to interpret the paleoenvironment of the study section through their assemblages.

3.3.2 Conodont and tentaculitoid

Conodonts and tentaculitoids were identified and analyzed to determine the age of the study section in accordance with global biostratigraphy (Becker et al., 2020).

3.3.3 Thin section analysis

The lithology of the study section was analyzed by the thin section following Dunham's limestone classification (Dunham, 1962) and the depositional environment was interpreted following Flügel (2010).

3.4 Thesis writing and presentation

This dissertation records all research methods and outcomes, with some findings presented at conferences and published in the journal.