

## CHAPTER VII

### DISCUSSION AND CONCLUSION

This chapter provides a discussion and conclusion on the paleoenvironments of the Ban Thung Samed section, based on analyses of ostracod assemblages and thin sections. It highlights the stratigraphic shift from subtidal to deep marine settings, focusing on changes in faunal composition and environmental conditions, and concludes with recommendations for future research directions.

#### 7.1 Discussion

##### 7.1.1 Paleoenvironment of Ban Thung Samed section

The ostracods recovered from the study section were found only in samples 19KT01-07 ranges from the lower to middle subunits. These ostracods belong to 6 suborders, Podocopina, Metacopina, Palaeocopina, Paraparchiticopina, Platycopina, and Eridostraca.

The most diverse group is the superfamily Bairdiocypridoidea from Podocopina, representing 50% of the total species, with 17 species identified. This superfamily includes 4 families: Pachydomellidae (genera *Ampuloides* and *Microcheilinella*), Bairdiocyprididae (genera *Bairdiocypris* and *Baschkirina*?), Rectellidae (genus *Rectella*), and Krausellidae (genus *Pseudorayella*).

The superfamily Bairdioidea is the second most prevalent group, also within Podocopina, contributing 17.6% of the species diversity. This group is represented by 4 species from 2 families: Acratiidae (genus *Acratia*) and Bairdiidae (genera *Bairdia* and *Fabalicypis*), along with Bairdioidea indet.

The superfamily Healdioidea, part of the suborder Metacopina, is represented by the family Healdiidae, with 4 species across 3 genera (*Cytherellina*, *Healdia*, and *Kummerowia*?), accounting for 11.7% of the total species.

The superfamily Aparchitoidea, belonging to the suborder Palaeocopina, is represented by the family Aparchitidae, which includes 3 species from the genera *Aparchites* and *Brevidorsa*, making up 8.7% of the species.

The superfamily Paraparchitoidea, from the suborder Paraparchiticopina, is represented by 2 species from the family Paraparchitidae (genera *Samarella* and *Coelonella*), accounting for 5.8% of the total species.

Only one species from the superfamily Kloedenelloidea (family Knoxitidae), tentatively identified as *Knoxiella* sp., was found in the suborder Platycopina, contributing 2.9% of the total species. Additionally, a single taxon from the suborder Eridostraca, identified as Eridoconchidae indet., also accounts for 2.9% of the species (Figure 7.1).

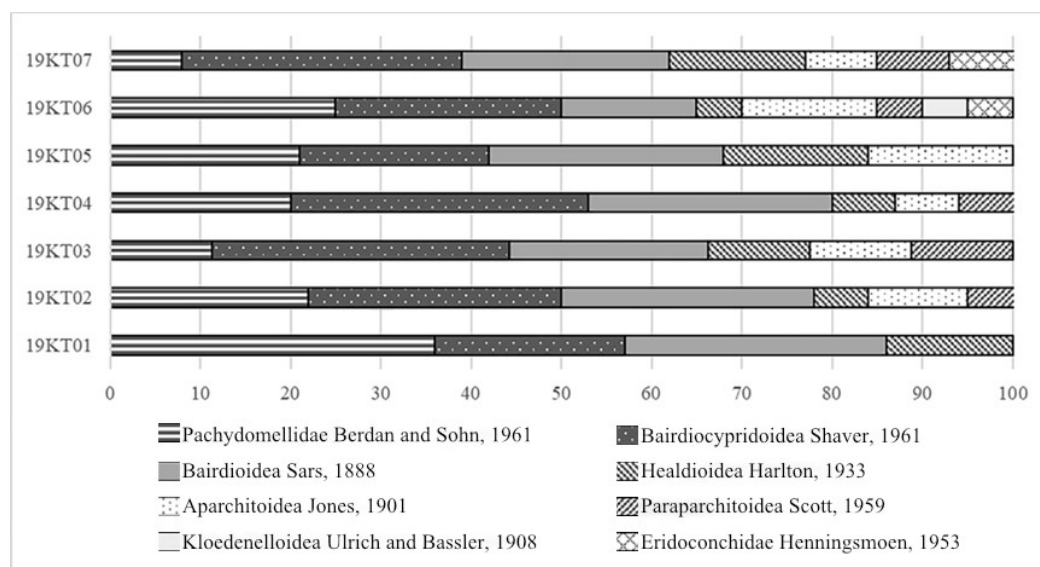


Figure 7.1 Percentage distribution of ostracod species by superfamily and family in the Ban Thung Samed section.

Understanding the taphonomy of fossilized ostracod assemblages is essential for reconstructing paleoenvironments. Ostracod deposition in sediment can be influenced by various factors, with currents being particularly significant. Currents can sort and transport ostracod shells, resulting in assemblages with distinct

characteristics, such as containing only adults, only juveniles, or a high ratio of disarticulated valves to carapaces. Such assemblages are less reliable for paleoenvironmental interpretation, as they do not represent the environment where the ostracods originally lived and died (Boomer et al., 2003). In contrast, the ostracod assemblage in the study section consists entirely of carapaces, with no disarticulated valves, and includes both adults and juveniles (see Promduang and Chitnarin, 2025). This composition suggests deposition in a low-energy current environment, making the assemblage well-suited for paleoenvironmental reconstruction.

The ostracod fauna in the study section is predominantly composed of Bairdiocypridoidea, with Bairdioidea as a secondary group, while Healdioidea, Aparchitoidea, Paraparchitoidea, Kloedenelloidea, and Eridoconchidae are present in minor or rare occurrences. This ostracod assemblage corresponds with the Eifelian Mega-Assemblage (Assemblage III), indicating a shallow marine environment below the fair-weather wave base. The relative proportions of families show minimal variation across sampling levels, suggesting a stable depositional environment. While a small increase in kloedenellids and eridoconchids is observed in samples 19KT06 and 19KT07 (Figure. 7.1), this is not significant enough to indicate a transition to the shallower conditions of Assemblage II. The lack of Leperditicopid ostracods eliminates the possibility of Assemblage 0 shallow environment, while lack of Myodocopid ostracods excludes the pelagic conditions associated with the Entomozoacean Mega-Assemblage. The ratio between Podocopida and Metacopida fluctuates without a clear trend, making it unreliable for interpreting water-depth variations. In the upper section, ostracods disappear, likely due to a change of facies from a carbonate-dominated to a clastic-dominated environment. This shift is less suitable for benthic ostracods, either because the new conditions are unfavorable for their survival or because poor fossil preservation in clastic sediments makes fossil recovery difficult.

The paleoenvironmental interpretation derived from the ostracod assemblage, which covers only the lower and middle subunits, aligns with results from thin section analysis. Both suggest deposition below the fair-weather wave base,

transitioning into deeper water environments in the upper subunit where pelagic organisms dominate. In the upper subunit, where ostracods are absent, the presence of benthic fauna such as trilobites and gastropods, along with bioturbation evidence (burrows) observed in thin section analysis and noted by Itsarapong et al. (2023), indicates that the deep marine environment maintained sufficient oxygen levels to support benthic communities. The evidence suggests this environment was neither anoxic nor dysaerobic until the transition into a tentaculitoid-rich bed with a reduction in benthic fauna in the uppermost part of the section.

This interpretation is further supported by studies from Fortey (1989) and Crônier and Fortey (2006), who identified Early Devonian trilobites such as *Plagiolaria poothaii* Kobayashi and Hamada, 1968 in black shale from Member 1 of the original Pa Samed Formation. These trilobites, with reduced eyes, represent an atheloptic assemblage adapted to deep-water benthic conditions. Boucot et al. (1999) examined Early Devonian brachiopods from original Pa Samed Formation and interpreted the paleoenvironments as deep marine deposits at depths of 150 to 200 meters, influenced by moderate current activity. Their conclusion was based on evidence of disarticulated brachiopod valves and trilobites. However, the interpretation of moderate currents appears to contradict the findings of this study, which suggest deposition under low-energy current conditions. Agematsu et al. (2006a) studied tentaculitoids from the black shale of the original Pa Samed Formation, including evidence from thin sections. The thin section revealed tentaculitoids scattered randomly on the bedding plane, with no signs of sorting or parallel alignment, suggesting deposition under low-energy current conditions. In contrast, the disarticulated brachiopod valves and trilobites reported by Boucot et al. may have resulted from benthic organism activity or could reflect differences in depositional environments between the studied beds, as Boucot et al. did not specify the sampling horizon. Further research is required to resolve these discrepancies.

## 7.2 Conclusion

The study section named “Ban Thung Samed” belongs to revised Kuan Tung Formation of Itsarapong et al. (2023), ranges approximately 50 meters, and well-bedded rocks are continuously exposed. The average bedding orientation is 080°/40 (strike/dip). This section consists of lower, middle, and upper subunits. The lower subunit primarily consists of medium to thick layers of reddish-grey limestone interspersed with thin argillaceous layers. The middle subunit is characterized by medium bedded reddish-grey limestone interbedded with black shale. The upper subunit is composed of sequences of black shales and thin to medium-bedded dark grey limestones, with an increasing proportion of black shales towards the top. The limestone in the study section comprises of fine-grained bioclastic sparse wackestone in the lower and middle subunits includes the lower of upper subunit and for the middle and upper of upper subunit, limestone is classified as bioclastic packed wackestone. Bioclasts in the lower subunit are generally small, measuring less than 1 mm in size, and include tentaculitoids, gastropods, trilobites, and microfilaments. In the middle subunit, bioclasts are more abundant and similar in size to those in the lower subunit, with only a few specimens exceeding 1 mm, the assemblage includes tentaculitoids, gastropods, ostracods, echinoderms, and microfilaments. In contrast, the upper subunit is dominated by tentaculitoids, most of which are larger than 1 mm.

The age of Ban Thung Samed section ranges from Late Silurian to Early Devonian (from late Ludlow to late Pragian or earliest Emsian). Based on the occurrence of Late Silurian – Early Devonian conodont group (*Ozarkodina*, *Belodella*, *Pseudooneotodus*, *Wurmiella*, and *Zieglerodina* and an index fossil *Ozarkodina crispa* in the lower subunit make it late Ludlow. The age of the upper subunit can only correlate with previous works based on the tentaculitoids-graptolites bearing black shale which indicate Early Devonian (late Pragian or earliest Emsian).

A total of 586 complete ostracod carapaces, including both adults and juveniles, were identified, representing 34 species from 17 genera, belonging to 6 superfamilies including Bairdiocypridoidea, Bairdioidea, Healdioidea, Aparchitoidea,

Paraparchitoidea, and Kloedenelloidea. Additionally, 103 conodont specimens were identified, encompassing 7 species from 5 genera: *Ozarkodina*, *Belodella*, *Pseudooneotodus*, *Wurmiella*, and *Zieglerodina*. The tentaculitoid fossils were classified as *Nowakia* sp., *Guerichina* sp., and *Striatostyliolina* sp.

The Ban Thung Samed section records a transition from subtidal conditions below the fair-weather wave base to deeper marine settings dominated by pelagic organisms. The lower and middle subunits supported diverse benthic communities in well-oxygenated environments, while the upper subunit reflects deeper, low-oxygen conditions that reduced benthic fauna.

### 7.3 Recommendations for future studies

1) As previously mentioned, the current conodont sampling is insufficient to precisely determine the Silurian-Devonian boundary, and the upper part of the section is vaguely defined. A more comprehensive biostratigraphic analysis is required to better define these boundaries and enhance our understanding of the stratigraphic transitions.

2) The abundance of conodont elements presents an opportunity for isotopic analysis, which could provide new insights into the paleoenvironment of this section.