

CHAPTER 5

Conclusion

Fifty-six proboscidean samples from Miocene basins in Thailand were carefully screened for microwear analysis but only twenty samples were deemed suitable. Each sample was casted and examined by low-magnification microscopy and scanning electron microscopy.

The Miocene proboscideans were classified into three groups by quantitative microwear analysis; browsers, including *Stegolophodon nasaiensis* and *Prodeinotherium pentapotamiae*; mixed-feeders, including *Stegolophodon* cf. *latidens* and *Tetralophodon* cf. *xiaolongtanensis*; grazers, including *Stegolophodon* cf. *stegodontoides* and cf. *Protanancus macinnesi*.

Browsers are represented by more pits and fewer scratches. The microwear features on the *S. nasaiensis*, which found from Ban Na Sai coal mine, showed all of the varieties of pits, including small, large and puncture, whereas the features of scratches include fine and coarse. The puncture pits suggest that *S. nasaiensis* would be a hard-object consumer, especially hard seed such as *Syzygium* (Sepulchre *et al.*, 2010).

The microwear features on *P. pentapotamiae*, which found from Tha Chang sand pits, show coarse scratch, hypercoarse scratch, small and puncture pits. These suggested *P. pentapotamiae* consumed hard-seed plant such as *Syzygium* but the hypercoarse scratch indicated that *P. pentapotamiae* probably consume high silica phytolith such as Poaceae (Sepulchre *et al.*, 2010).

Grazers are represented by more scratches and fewer pits. *Stegolophodon* cf. *stegodontoides* characterized by only fine to coarse scratches and small pits. The diet of *Stegolophodon* cf. *stegodontoides*, which found from Tha Chang sand pits, composed mainly of grasses, Poaceae. The enamel surface of the cf. *Protanancus macinnesi* comprised largely of hypercoarse scratches and puncture pit. These indicated the dietary of cf. *P. macinnesi* composed of grasses, Poaceae but with higher amount of silica-content (Sepulchre *et al.*, 2010).

Mixed-feeders are represented by the number of microwear between browsers and grazers, and their diet alternate among those of browsers and grazers. All of the *Stegolophodon cf. latidens* samples, which found from Mae Moh coal mine, showed the percentage of pits higher than scratches. High percentage of pits indicate the leaf-dominated diet mainly of Pteridophyte. Puncture pits were found on the enamel surface of MMEL-5, suggesting a close association with hard-object feeder such as Rubiaceae.

The four samples of *T. cf. xiaolongtanensis* from Chiang Muan coal mine show the percentage of pit higher than scratch result consistent with mixed-feeder. The scratches showed varying width from fine to coarse. The pit size is totally small with the absence of puncture pit. This animal may consumed the plant such as Syzygium, Poaceae and Fabaceae (Sepulchre *et al.*, 2010).

The scratch texture of *S. cf. latidens* is coarser than those of *T. cf. xiaolongtanensis*. This may imply that the diet of *S. cf. latidens* composed of higher phytolith content than those of *T. cf. xiaolongtanensis*. The high phytolith content usually occur in seeds and leaves of silicon-accumulating plants.

The paleoecology of each fossil localities could also be predicted by microwear results. The fossil locality of *S. nasaiensis*, Ban Na Sai coal mine, might be the closed areas such as forests and woodlands. The fossil locality of *S. cf. stegodontoides*, *cf. P. macinnesi* and *P. pentapotamiae*, Tha Chang sand pits, might be the open patches and grasslands. The fossil locality of *S. cf. latidens*, Mae Moh coal mine, and *T. cf. xiaolongtanensis*, Chiang Muan coal mine, might be the variety of environments.

The chewing cycle of these proboscideans could be inferred from their microwear orientation. The angles of microwear orientation revealed the jaw movement during chewing. The angles of microwear orientation tend to decrease from browsers to grazers. Browsers exhibited the widest angles of microwear orientation, suggesting the jaw movement of buccal to lingual direction. Grazers exhibited the narrowest angles of microwear orientation, suggesting the jaw movement of anterior to posterior direction. Mixed-feeders exhibited the degree of angles between those of browsers and grazers.

The understanding that proboscideans changed from browsers to grazers during Middle Miocene help arrange the fossil range. The types of feeder of proboscideans were classified on the basis of their quantitative microwear results, whereas the comparative age of these proboscideans were predicted from the angles of microwear

orientation. The wider the angles of microwear orientation, the older the proboscidean were. Within the genus of *Stegolophodon*, species range from the oldest to the youngest as follow; *S. nasaiensis* (browser), *S. cf. latidens* (mixed-feeder) and *S. cf. stegodontoides* (grazer). The results from both quantitative microwear analysis and the angles of microwear orientation confirm that *P. pentapotamiae* (browser) is older than *P. macinnesi* (grazer) and *T. cf. xiaolongtanensis* (mixed-feeder) is slightly older than *S. cf. latidens* (Fig. 5.1).



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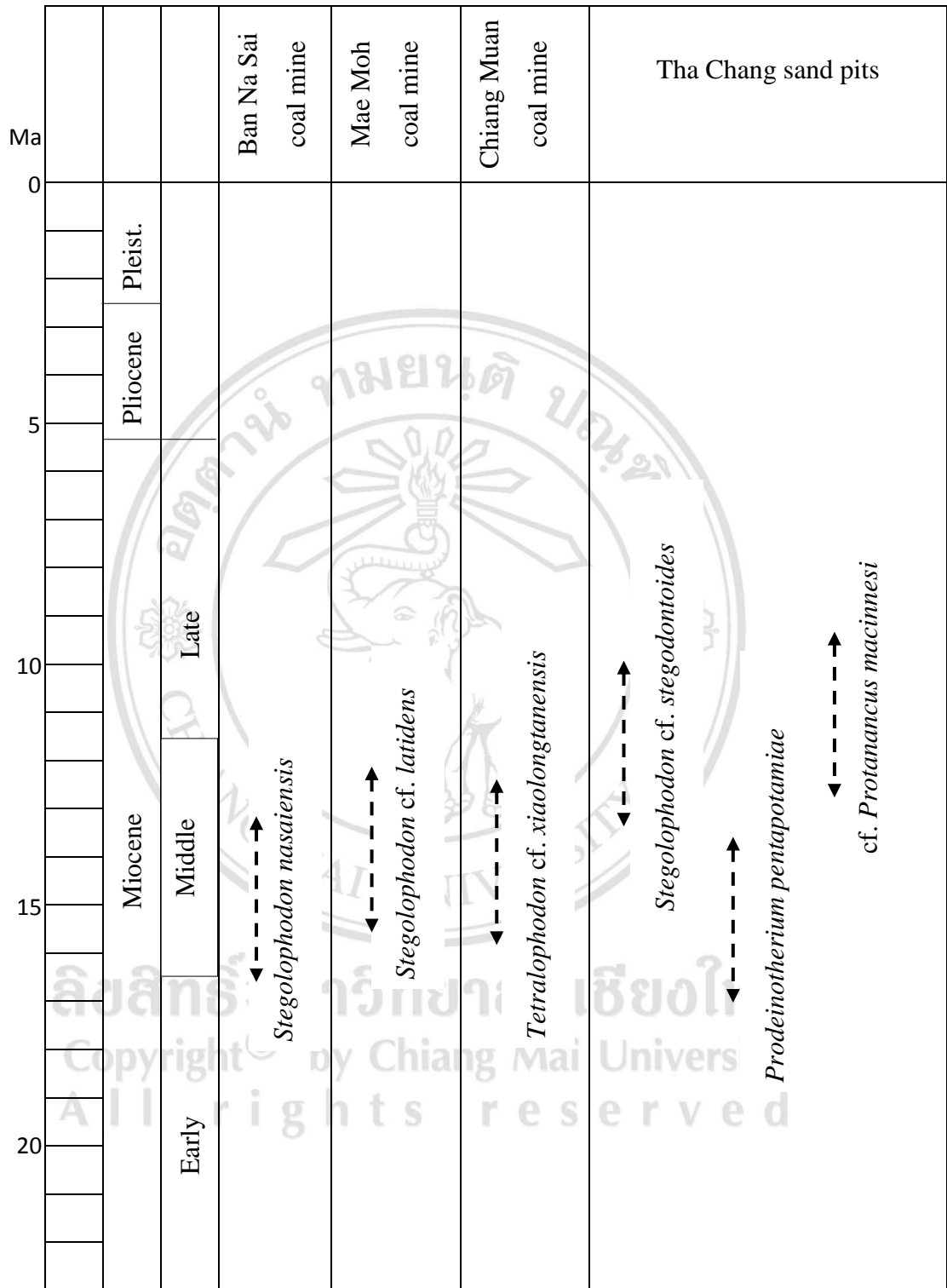


Fig. 5.1 The summary of age of Miocene proboscidean fossils in Thailand from the dental microwear.