181. A Norian Conchostracan from the Basal Part of the Khorat Group in Central Thailand

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The Khorat series was primarily denominated to include all of the Mesozoic formations in Thailand and considered to be Jurassic-Triassic in age (Brown *et al.* 1951). From the view point of tectonic development, however, I pointed out that the marine Triassic and Jurassic formations in the median and western zones of Thailand should be eliminated from the typical display of the Khorat series in the Khorat plateau in her eastern part (Kobayashi, 1960, 1964). Then it was found that the Khorat group thus restricted yields the Cretaceous *Trigonioides-Plicatounio* faunas in the upper part (Kobayashi, 1963, 1968).

Recently "Lampang group" was proposed for the marine Triassic of Thailand (Javanaphet, 1969), since ammonoids and other fossils in the age from Anisic to Carnic were found in the marine formation at the Mae Moh east of Lampang (Pitakpaivan, 1955, Kummel, 1960). While the group incorporates with older rocks in the construction of the older Mesozoic folded mountains, the Khorat group whose facies is limno-paralic is nearly horizontal or gently undulated. Therefore it is extraordinarily important to determine the age of the lower limit of the Khorat group.

Because Conchostracans have been reported to occur in the older Mesozoic formations in Yunnan, Laos and North Viet Nam (Kobayashi, 1954), it was some ten years ago that I advised some geologists to pay special attention on the Khorat group for searching the kind of fossils. At length the fossil in question was discovered at Nam Phrom Dam in the Nam Pha formation which was newly proposed for a local basal unit of the group.

Through the courtesy of Dr. Buravas I could examine some of the Conchostracan specimens. Fortunately enough one of them was a typical left valve of *Euestheria mansuyi*. This valve has a subovately elliptical outline truncated by a long dorsal margin; umbo is almost terminal on the margin, lying near the anterior extremity of the valve. Growth lines are numerous, very close-set one another except for the umbonal area where their interspaces are more or less wide. Fine radial lirae are seen in some interspaces. Compared to the holotype of this species this form is a little less ovate, its dorsal margin slightly

longer and the maximum height of the valve lies somewhat anteriorly. These minor differences are, however, insufficient for specific distinction.

Euestheria mansuyi Kobayashi ($\times 7$)
from Nam Phrom Dam, Northwest Khorat Plateau, Thailand.

Estheria minuta by Mansuy, 1912, in fig. 3a on pl. 10 for which I proposed *Euestheria mansuyi* (Kobayashi, 1954) was accompanied by *Gervillia alloucheryi* and *G. haloensis* at Moncay in Eastern Tonkin, Viet Nam. The so-called *minuta* horizon was first correlated to the Lettenkohle, but later it was noted that this *mansuyi* bearing red formation merges laterally into the Noric beds in the P'ou Haut arc (Fromaget, 1941). While the Nam Pha form belongs to *E. mansuyi*, *Estheria* cfr. *minuta* by Mansuy (1921) from a shale of Ban Hoc in Western Tonkin is an elongate form more allied to *Euestheria kawasaki* (Ozawa and Watanabe) than to *E. mansuyi*.

According to Bunopas (1971) the Nam Pha formation 550 m thick is composed of calcareous grey and brown siltstone and sandstone interbedded with grey to dark grey argillaceous limestone in the lower part, but it transmits into calcareous grey and red siltstone, mudstone, shale and red argillaceous limestone in the upper part of about 300 meters' thickness. At Ban Lui Lai the formation is in fault contact with the Permian formation and nowhere their original boundary has as yet been found. *Euestheria mansuyi* was contained with fragmentary plant leaves in greenish grey muddy limestone and siltstone beds in the lower part of the upper Nam Pha formation.

On the east side of the ridge-making Permian rocks the Huai Hin Lat formation occupies the basal part of the Khorat group. It con-

sists of shale and sandstone in the upper 100 meters' thickness and of limestone conglomerate in the lower 40 meters. There the latter overlies the Permian formation unconformably (Iwai *et al.* 1966). The following plants were collected from the middle part of the upper Huai Hin Lat formation.

Equisetites arenaceus (Jaeger) Schenck

Equisetites naitoi Kon'no

Clathropteris meniscoides Brongniart

Todoites goeppertianus (Münster) Krasser

Nilssonia thailandica Kon'no and Asama

Anomozamites minor (Brongniart) Nathorst

Elatocladus sp.

According to Kon'no and Asama (1973) the age of the Huai Hin Lat flora is evidently late Triassic, probably pointing more strongly to older Noric than Carnic. Thus, the Noric age of the *Euestheria mansuyi* of the Nam Pha formation is in support of their conclusion on plant fossils.

The Triassic crustal movement which I denominated "Akiyoshi orogeny" in Japan in 1935 bears great importance in geology of Eastern Asia as well as Southeastern Asia, as discussed already in 1956 and 1972. Now it is well ascertained that, caused by the movement, a considerable palaeogeographic change has taken place in the Burmese-Malayan geosyncline and in East Thailand the limno-paralic Khorat group commenced to deposit in the basin behind the folded arcuate mountains of the Carno-Noric age.

Finally, I record my cordial thanks to Dr. Saman Buravas, Director General of the Department of Mineral Resources, Bangkok for submitting me the long expecting fossils and to Dr. I. Hayami of the University Museum, University of Tokyo for assistances in this study.

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