

CHAPTER VI

DISCUSSION

This chapter intends to discuss about palaeoenvironment by using lithology and sedimentary structure. Moreover, freshwater bivalves from the Sao Khua Formation are determined.

The Sao Khua Formation in the Phu Wiang area was interpreted as meandering river system (Meesook, 2000) deposited in semiarid to arid climatic condition (Hahn, 1982; Meesook, 2000). In the present study, lithostratigraphical columnar section, lithology, sedimentary structure, and palaeontological features were used to analyze the depositional sub-environment. The description of morphological features and depositional sub-environments of meandering river system follows Einsele (1992) for palaeoenvironment interpretation (Figure 6.1). The description and interpretation of five molluscan localities were described below.

The Phu Wiang molluscan locality consists of three shell beds i.e. the lower bed (PW-M-1/1), the middle bed (PW-M-1/2), and the upper bed (PW-M-1/3). The lower shell bed is thin and fragmented within sandstone and thick sequence of cross-bedded sandstone. This can be interpreted as point bar deposit. The flat sheet of gravel (shell fragments) was the result of rapid transported which resulted in lengthy downstream sheet. After the set of cross-bedding sequence, lithology changed to cross-lamination and laminated fine-grained sandstone which may be interpreted as levee sub-environment deposited. Then, the lithology changed to alternation of mudstone, laminated fine-grained sandstone, and caliche layers, which is interpreted as floodplain deposits in semiarid to arid climatic condition. Caliche layer might be developed by rain infiltration, which leaches dissolvable ion downward. Whereas evaporation and capillary groundwater flow during arid periods concentrate the same ions near the surface. The middle shell bed (PW-M-1/2) is abundant bivalves in conglomeratic sandstone overlain on lime-nodule conglomerate that is interpreted as channel deposit. According to primary results on palaeoecology of the shell bed, both articulated and disarticulated shells were found without preferred orientation. The reconstruction of palaeoenvironment and event of this shell bed can be proposed as the outer side of the river which was eroded until reaching the underlain mudstone bed. This event might be occurred by big flood and transported gravels, dead shells, and living shells, were deposited in the channel near the outer side as mixed assemblage. After, the channel moved inside, this shell bed was overlain by floodplain deposits again. The upper shell bed (PW-M-1/3) is mud-nodule conglomeratic sandstone. According to fossil orientation, articulation, *etc.* the dead shells might be transported not far from their habitat and rapidly deposited in the channel. The overlying bed is laminated fine-grained sandstone with numerous burrows. This fining-upward sequence can be interpreted as abandoned channel.

The Phu Wiang molluscan locality 2 and 3 (PW-M-2; PW-M-3) may have the same depositional environment as PW-M-1/2 because of their similarities of lithology and bivalve assemblages.

The Phu Wiang molluscan locality 4 (PW-M-4) is the shell bed in mudstone. The fossils were found as internal mould of articulated valves which they may be buried in situ in floodplain pond, dried out in dry season.

The Phu Wiang molluscan locality 5 (PW-M-5) is shell bed in mud-nodule conglomeratic sandstone. This shell bed is interpreted as deposited in channel and the overlying fining-upward sequence can be interpreted as abandoned channel.

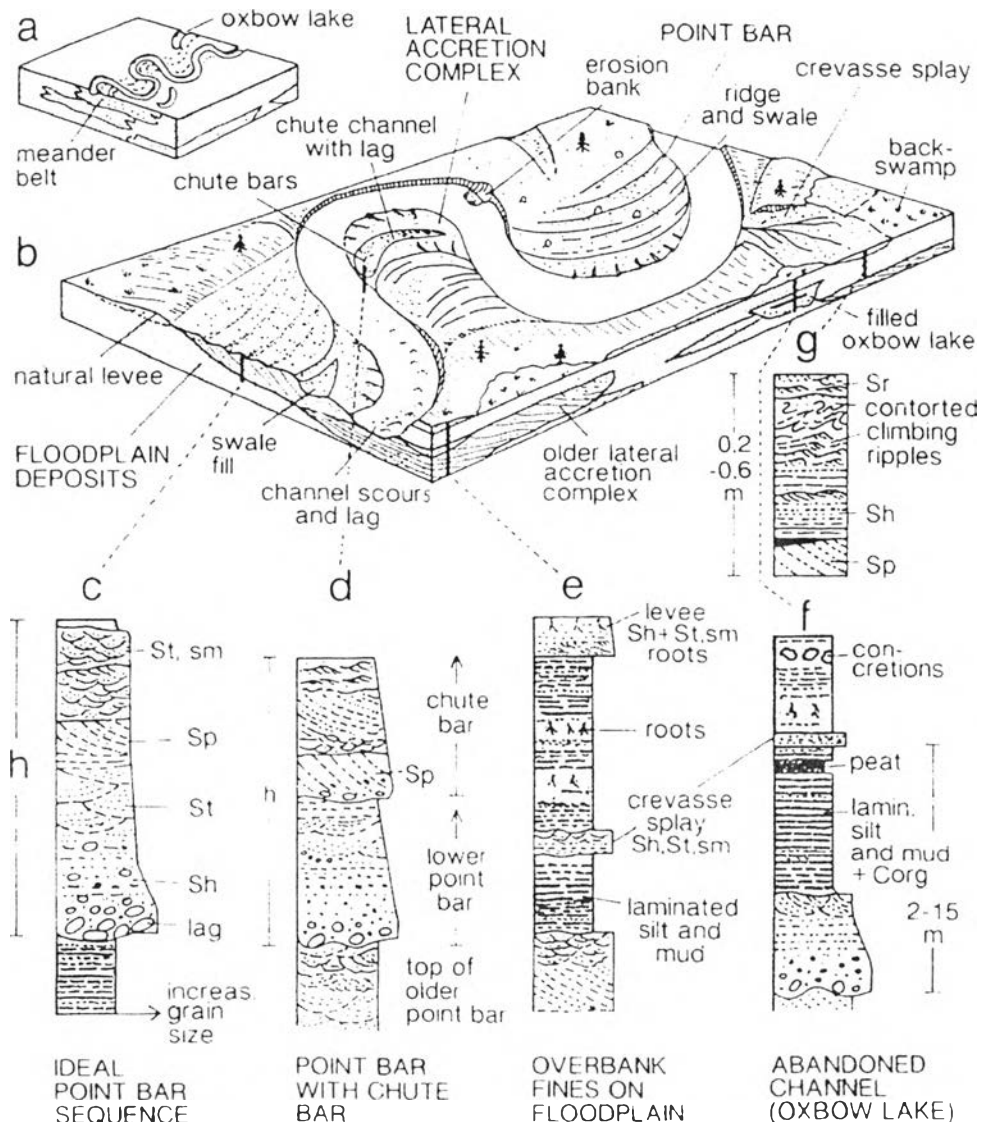


Figure 6.1 Meandering river system. **a** Formation of sandy meander belt within a flood basin. **b** Different sub-environments of meandering channel. **c-g** Characteristic vertical sections of the youngest sediments of the flood basin. **h** One fluvial cycle. Sr Ripple mark and small scale stratification. Sh Horizontally stratified sand. Sp Planar cross-stratified sand. St Trough cross-stratified sand. sm small-scale (after Einsele, 1992).

Palaeoecological studies were performed using a block sample of 25x25x20 cm. accordingly, 145 shells were found. They contain 9 morphospecies which the most abundant species is Unionids *gen. et sp. indet.* Its size frequency distribution show high mortality in young shells and gradually decreased in older shells.

Mytilinae gen. et sp. indet. was found in PW-M-1/2, PW-M-1/3, PW-M-2, and PW-M-3. They can be compared with *Mytilus (Pachymytilus) rectangularis* found in calcareous conglomerate from the type section of the Sao Khua Formation at Km.

39.04 on Nong Bua Lamphu-Udon Thani Highway. This taxon can be used as key bed for correlation in this study.

The recent *Mytilus* spp. were found only in marine habitat, but their affined genus *Limnoperna* spp. in the same family live in freshwater habitat in the river system which distribute in Thailand, Laos, Cambodia, and Viet Nam (Brandt, 1974). The shape of *Limnoperna* spp. is similar to *Mytilus* spp. but differs in size, *Limnoperna* is smaller and their length range from 18-23 mm. According to the recent evidence, *Limnoperna* spp. might be deducted as descendants of Cretaceous freshwater Mytilinae *gen. et sp. indet.*, which evolved their shell decreasing in size.

The fossils of *Unio* sp. cf. *U. samplanoides* were found only in mudstone of flood plain deposit. It indicated that this species was still water habitat such as ponds, lakes, ditch *etc.* The similarity of shell outline, shell shape, and habitation of *Unio* sp. cf. *U. samplanoides* with the recent Thai bivalve *Pilsbryoconcha exilis* is very interesting point. The recent species live in all kinds of still water. Therefore, the recent freshwater bivalve should be studied concentrating particularly on their different environments.

Three species of trigonal shape unionids are different with each others by their hinge teeth morphology. So the evidence of hinge teeth with no crenulations can not be confirmed the name *Trigonioides* sp. for this trigonal shell shape.

The fascinating sculpture of v-shape ridge in *Nippononaia mekongensis* may have function for its livelihood, which no answer for this sculpture. However, the recent Thai freshwater bivalve genus *Scabies* shows zigzag lines in v-or w pattern, which is slightly similar to *Nippononaia*. Thus, *Scabies* may be used as the modern analog to test the function of v-shape sculpture in *Nippononaia*. It should be noted that *N. mekongensis* and *Unio* sp. cf. *U. samplanoides* were reported to occur in Khok Kruat Formation by Kobayashi (1963, 1968) which is younger (Aptian-Albian). However, the previously mentioned Sao Khua Formation in this location may be change to the Khok Kruat Formation.

According to the freshwater bivalves found in this study, the dominant species are trigonal unionids that belong to family Unionidae. They can not be examined the correct name in the present study. Therefore, the Unionids and *Unio* assemblages were given for the channel floor deposit bivalve of locality PW-M-1/3 and PW-M-5, and floodplain deposit bivalves of locality PW-M-4, respectively.