

Characteristic of Former Beach Ridge Plains from Remote Sensing Data at Chumphon Estuaries, Southern Thailand

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Abstract

Chumphon coastal zone in southern Thailand owns its very long coastline and the coastal area preserves spectacular geomorphological landforms especially beach ridge plains. The old set of beach ridge plain was recognized clearly from satellite images in which it is located almost 10 km far away inland from the present shoreline. This geographic setting of beach ridge plain can be inferred the rising and falling of sea-level in the past. Not only series of beach ridges we recognized, the old lagoon, old tidal flat, and old intertidal flat were also seen farther inland. They show the progradation seaward direction.

Keywords: Coastal geomorphology, Chumphon, Beach ridge plains

1. INTRODUCTION

The study in history of sea level change with close relation to the evolution of coastal landforms can be indicated from the progradation of beach ridge plains; the plains that were possibly deposited at the same time of the mid to late Holocene marine regression (Choowong et al., 2004). At Pak Nam, Chumphon there has been mentioned that the Holocene sea level transgression has reached about 10 km inland (Choowong, 2002b). Thus, the formation of coastal plain in this area may be related to the history of sea-level change and the evolution of the coastal landforms. Additionally, the western coastal area of the Gulf of Thailand, particularly at Chumphon exhibits various geomorphological differences which these geomorphological features may own its individual depositional style that reflected the difference in direction of longshore current.

2. OBJECTIVE AND METHODS

The interpretation of aerial photograph and satellite images is one practical way to recognize the orientation of beach ridge plain here at Pak Nam. Not only the recent geomorphology can be seen from the aerial photograph and satellite image, but the relict coastal landforms that are located far away inland can also be recognized clearly. The aerial photographs applied to this study are approximately 1:50,000 scales officially produced by the Royal Thai Survey Department, 1998 covering Amphoe Muang, Changwat Chumphon. The aerial photographs include the area number 0066, 0067, 0068, 0069, 0070, 0118, 0119, 0120, 0121 and 0122 (Figure 1). After aerial photograph interpretation, the coastal geomorphological mapping in the field was done with special attention to classify and describe each of interpreted landform. All maps were done by ArcMap program.

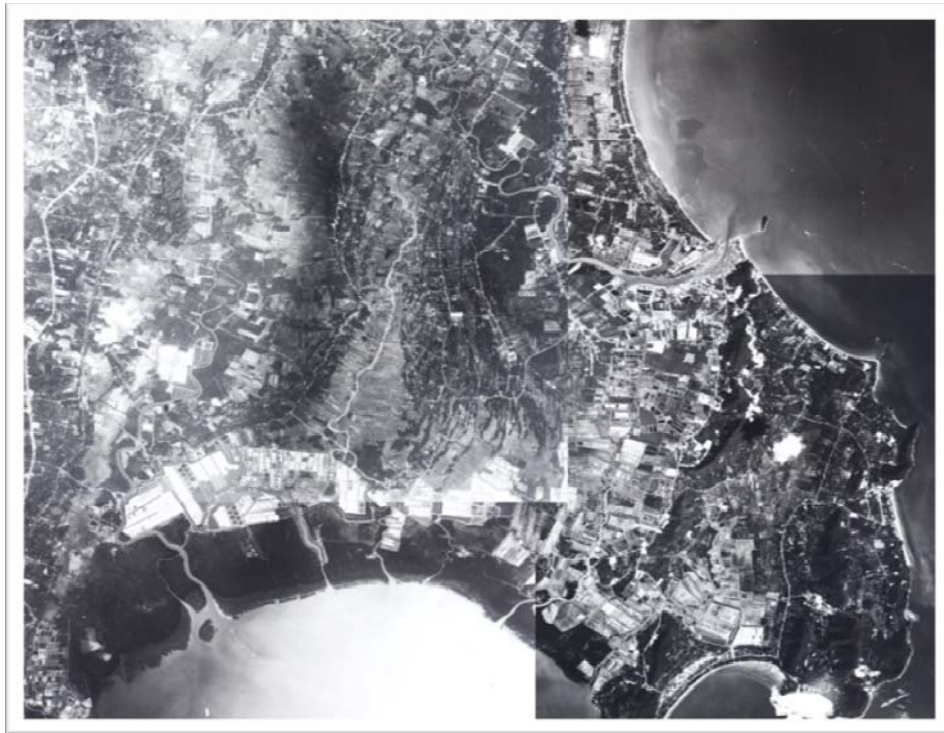


Figure 1. Mozaic of aerial photographs covering the study area (not to scale) (modified from Thai Survey Department, 1998).

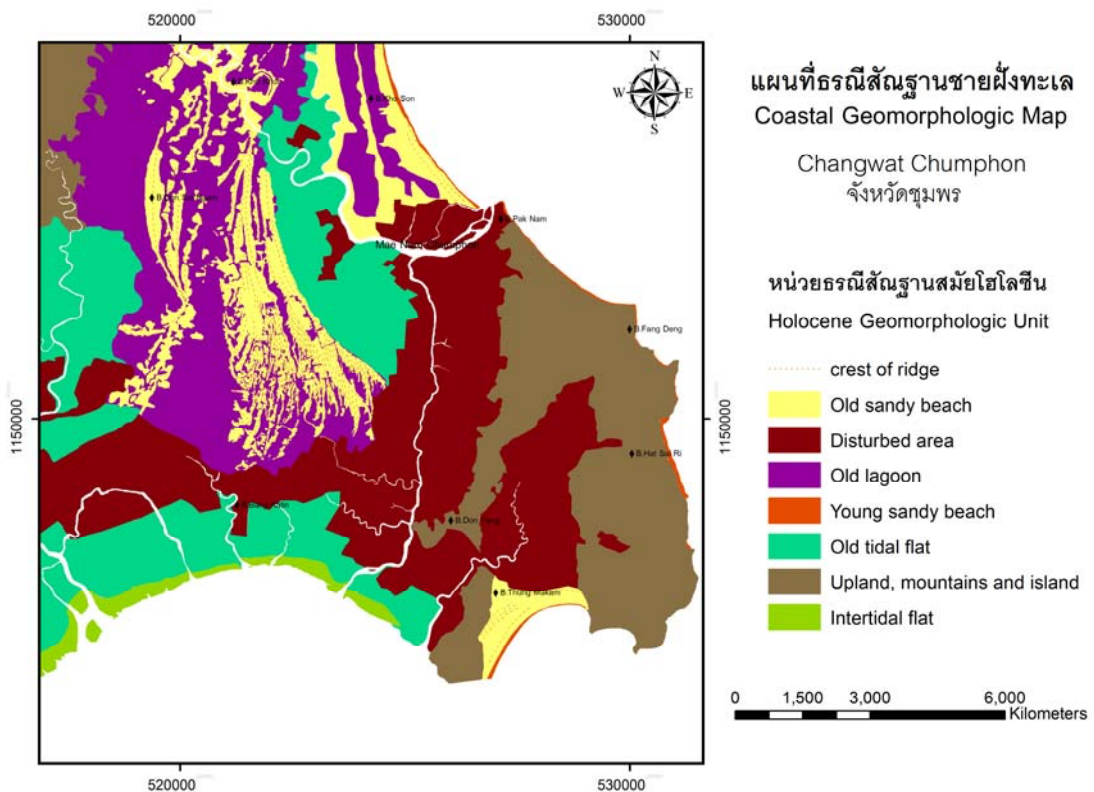


Figure 2. Interpreted coastal geomorphological map of Pak Nam Chumphon, Amphoe Muang, Chumphon.

3.1 Classification of landforms

The aerial photographs interpretation of geomorphological landform can be divided into 6 units as follows:

3.1.1 Old sandy beach

Three different beach ridges are re-defined as entirely wave formed deposits which are most commonly formed during high wave conditions and/or elevated water levels (Hesp et al., 2005). Old sandy beach ridge shows dark gray color curve line, and it branch out to many line in one series of beach ridge. It is irregular

topography. We recognize at least 3 series of beach ridge plains here where they show different direction of longshore current. The direction of longshore current of the inner beach ridge series is oriented in northward direction and at the end it split into four small beach ridge lines. Longshore direction of the middle and outer beach ridge series changed to southward direction, and there is extensive of small beach ridges at the end of each series. The area in between beach ridges is commonly displayed as old lagoon. The elevation of former beach ridge is 4-5 m higher than the present beach at the shoreline.

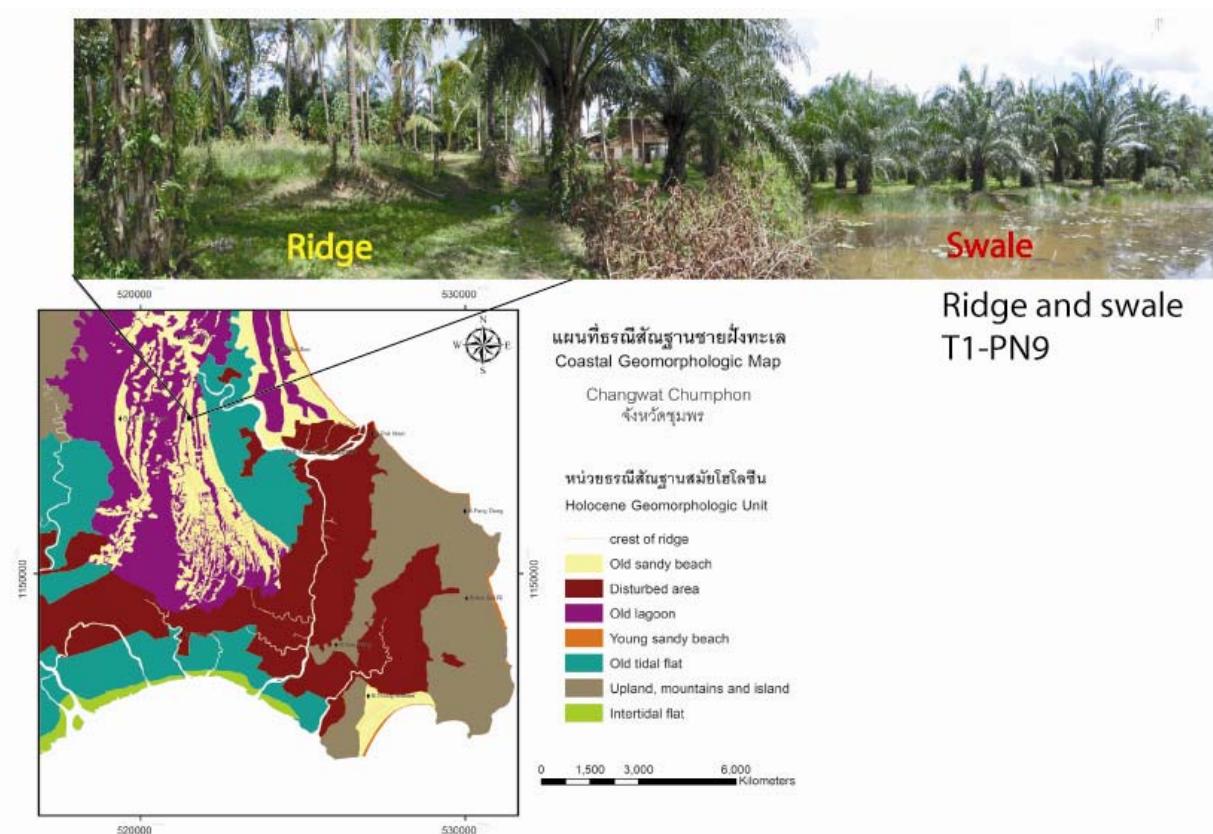


Figure 3. Old sandy beach (beach ridge) and old lagoon (disturbed swale) in inner ridge series.

3.1.2 Old lagoon

Old lagoon can be seen in light gray color and flat topography. The former lagoon in some regions is disturbed by aquaculture area (shrimp farm) and man-made canal. It is commonly located

between old sandy beaches. This landform are composed of mud, sandy mud confound with shell, shell fragments and peat. Almost of old lagoon is being made as agriculture palm forest. Some areas we found oyster shell fossil and other shell fossil.

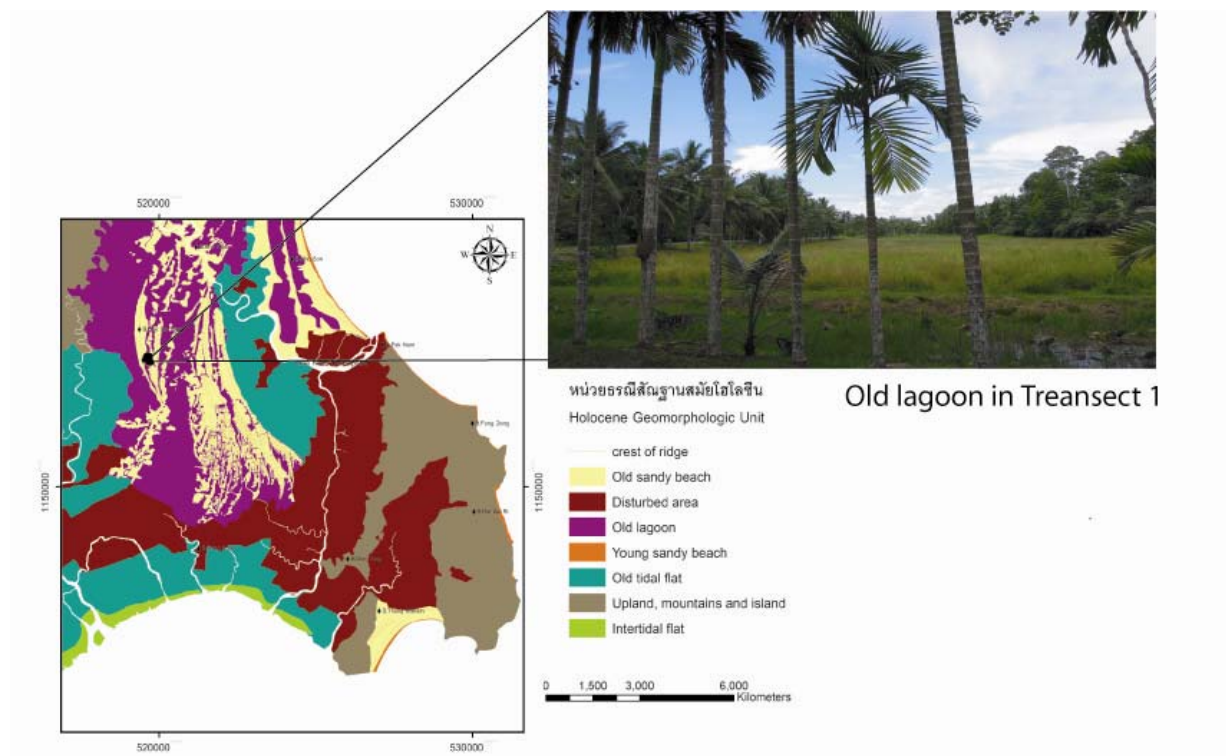


Figure 4. Old lagoon in between old sandy beaches is commonly composed of muddy sand and mud with some peat fragments.

3.1.3 Young sandy beach

Young sandy beach is white color, long and narrow line at the present shoreline. Its geomorphology is contributed by headland as Khao Matsi, and it is sandstone headland. Younger

sandy beach is located at Ao Pak Hat, Hat Pharadon Phap, Had Sai Ree and Ao Thung Kham Yai. Young sandy beach is commonly gentle slope and is composed of laterite and lateritic granule. The younger beach ridges occur parallel with the shoreline.

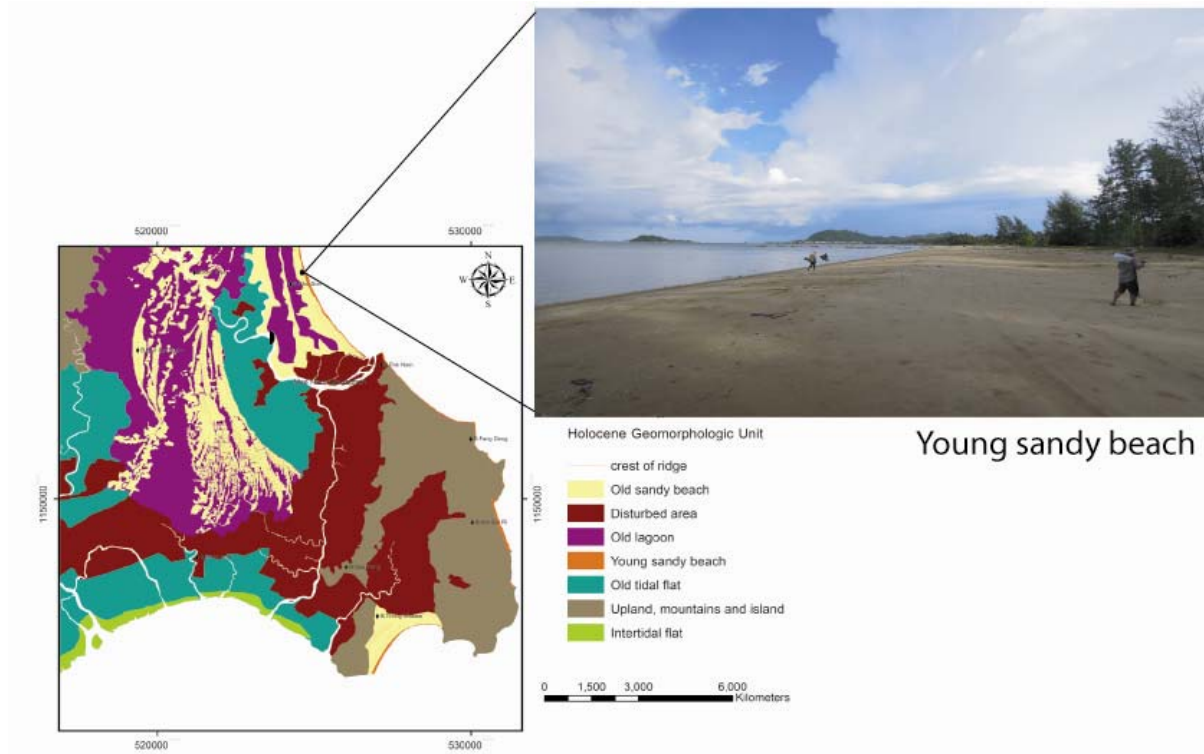


Figure 5. Young sandy beach in Ban Kho Son is gentle slope to seaward.

3.1.4 Old tidal flat

Old tidal flat can be seen in gray color and flat topography in aerial photo. This area has been affected by incursion of sea water via tidal inlet. Mud sediments with shell fragment are dominated. The evidence of shell fragments indicates former tidal flat environment (Sinsakul, 1988).

3.1.5 Mountains

Jurassic pebbly sand stone, sandstone, siltstone hill are exposed in the eastern part of the area. These mountains are in NE-SW area in Lam Thab Formation (Ridd, 2012).

3.1.6 Intertidal flat

Inter tidal flats can be seen in light gray color and are located in coastal wetlands. Inter tidal flat forms when mud is deposited by tides or rivers. Intertidal flat may be viewed geologically as exposed layers of bay mud, resulting from deposition of estuarine silts, clays and marine animal detritus. This geomorphological feature is composed of tidal channels.

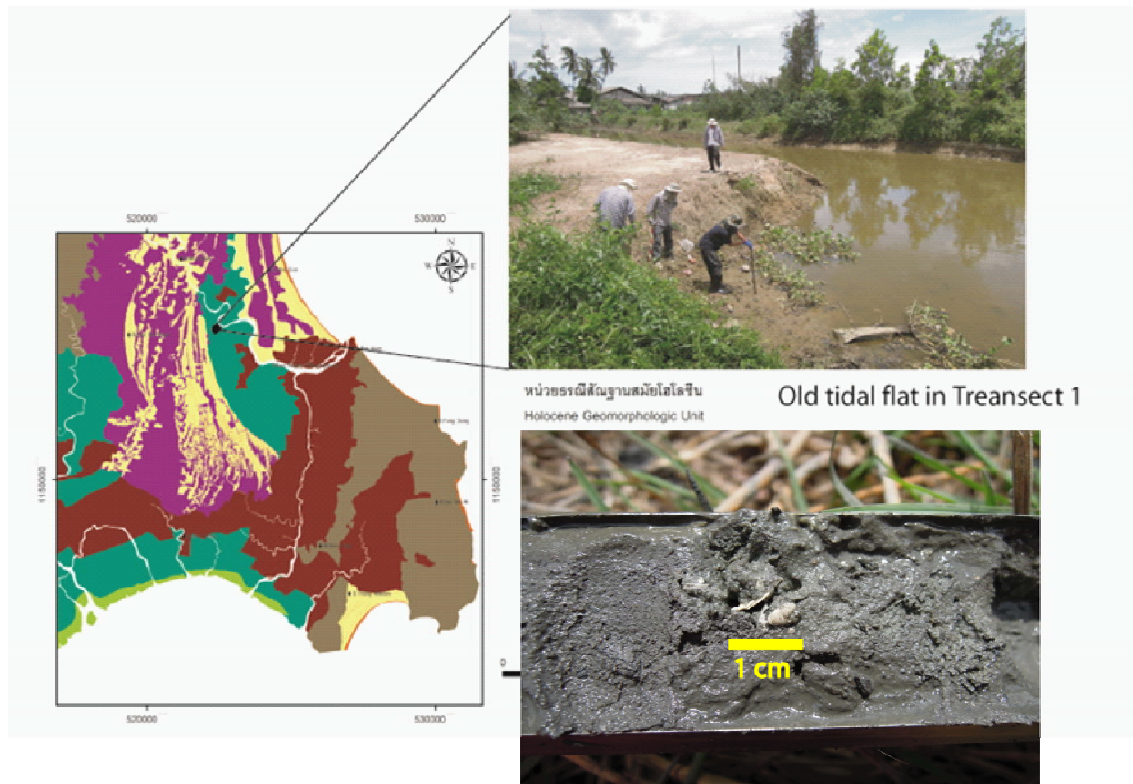


Figure 6. Old tidal flat compose mainly of gray-dark gray mud may be and found shell and shell fragment.

3.2 Sedimentology of beach ridge and swale

The sedimentological study in Pak Nam Chumphon area has been done by collecting sample in different landforms. Old sandy beach and old lagoon are interested in this study and hand augers were carried out. The average depth of the drilling is approximately 300 cm. The basic description of sediment samples was recorded during fieldwork based on lithologic description that is described from the oldest layer in bottom to the youngest layer at top soil. Inner most beach ridge (old sandy beach) are found at station T1-PN1. The location of beach

ridge, UTM grid of 519617 E 1153469 N on map sheet number 4829 IV (Amphoe Maung Chumphon). The 400 cm is the total thick and depth of the core. It can be described into 8 layers as shown in figure 6.

Old lagoon location is located at UTM grid of 519649 E 1153504 N on map sheet number 4829 IV (Amphoe Maung Chumphon). The total depth of the core is the 190 cm. It can be described into 2 layers and some layers were disturbed from human and animal as shown in Figure 7.

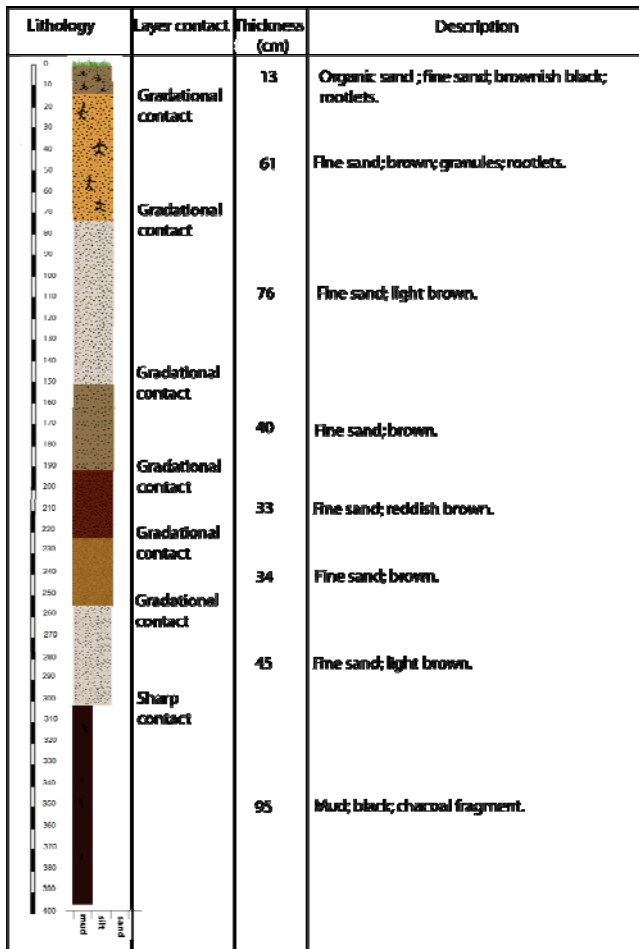


Figure 6. The lithologic log of inner most old beach sand at station T1-PN1.

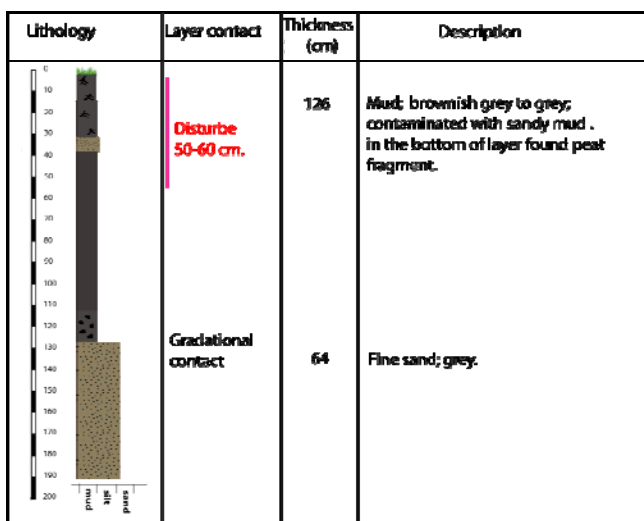
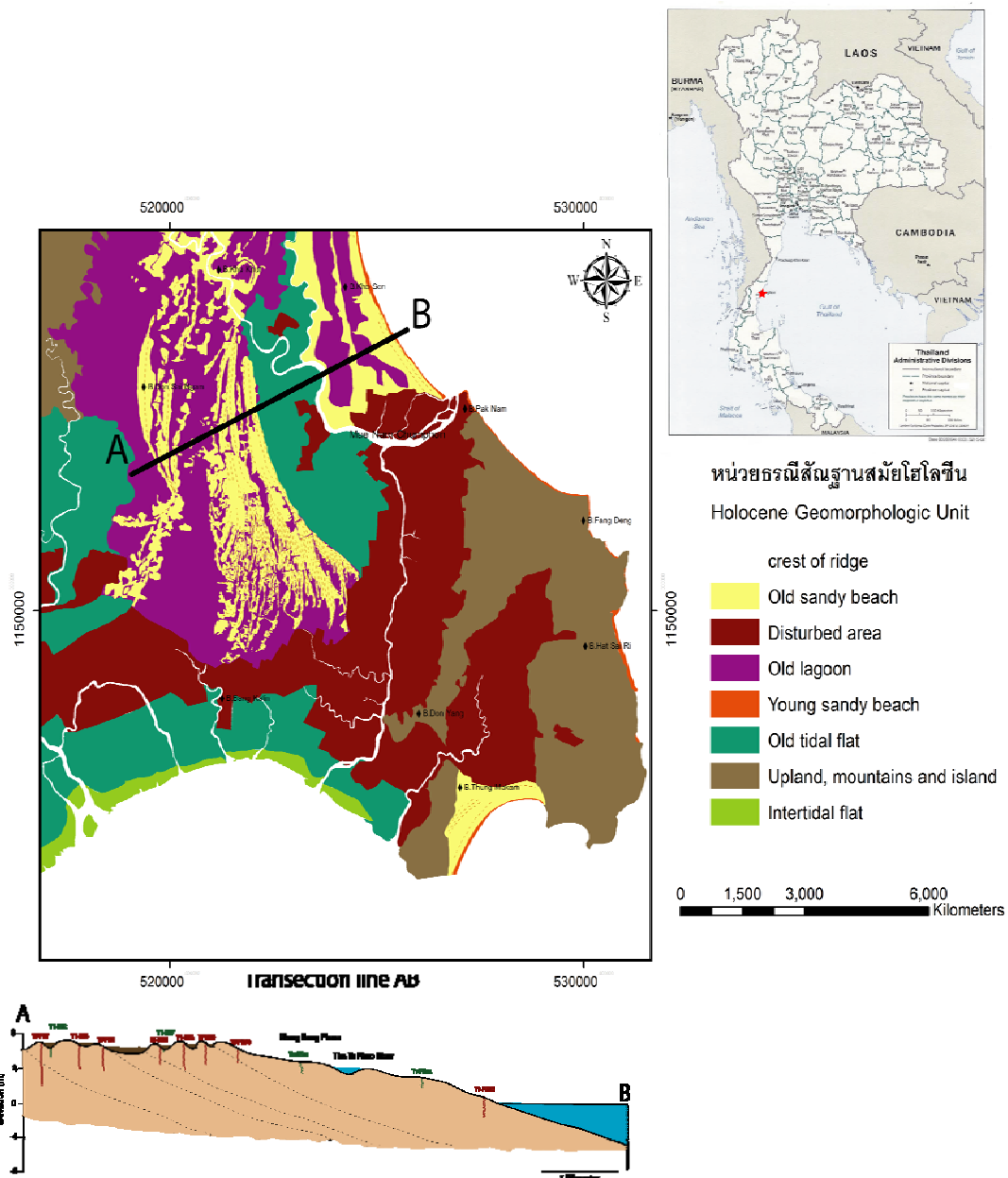


Figure 7. The lithologic log of old lagoon at station T1-PN2.

The cross section shows elevation of each landform relate to the present mean sea level in Pak Nam Chumphon area is shown in figure 8. It shows the progradation of beach ridge to seaward direction. Shell

fossils were also recorded in some small swamps between ridges. These shell assemblages indicate shore or near shore environment.



4. CONCLUSIONS

The geomorphological classification of coastal landform of the area, has led to following conclusions:

1. The coastal geomorphology can be divided into 6 units as old sandy beach, old lagoon, young sandy beach, old tidal flat, upland and mountain, intertidal flat and it can be related with sea level change.
2. The evident of shell and peat fragments indicates former tidal deposit (Sinsakul, 1988). Broken shell fragments in the marginal area indicate a relatively shallow, near shore environment.
3. Aerial photo interpretation is first key to reveal historical change and can be help to detect the longshore current direction using trend of former beach ridge that prograding to seaward.

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