



# **GEOLOGY, ECOLOGY AND BIOGEOGRAPHY OF LARUT MATANG AND KUALA SEPETANG MANGROVE FOREST**

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# OUTLINE

**INTRODUCTION**

**PROBLEM STATEMENT**

**OBJECTIVE**

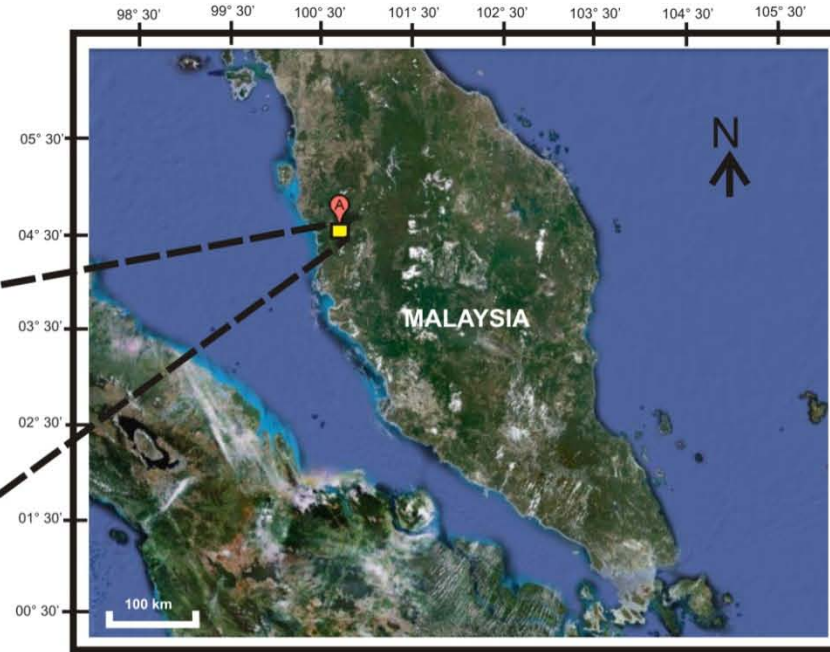
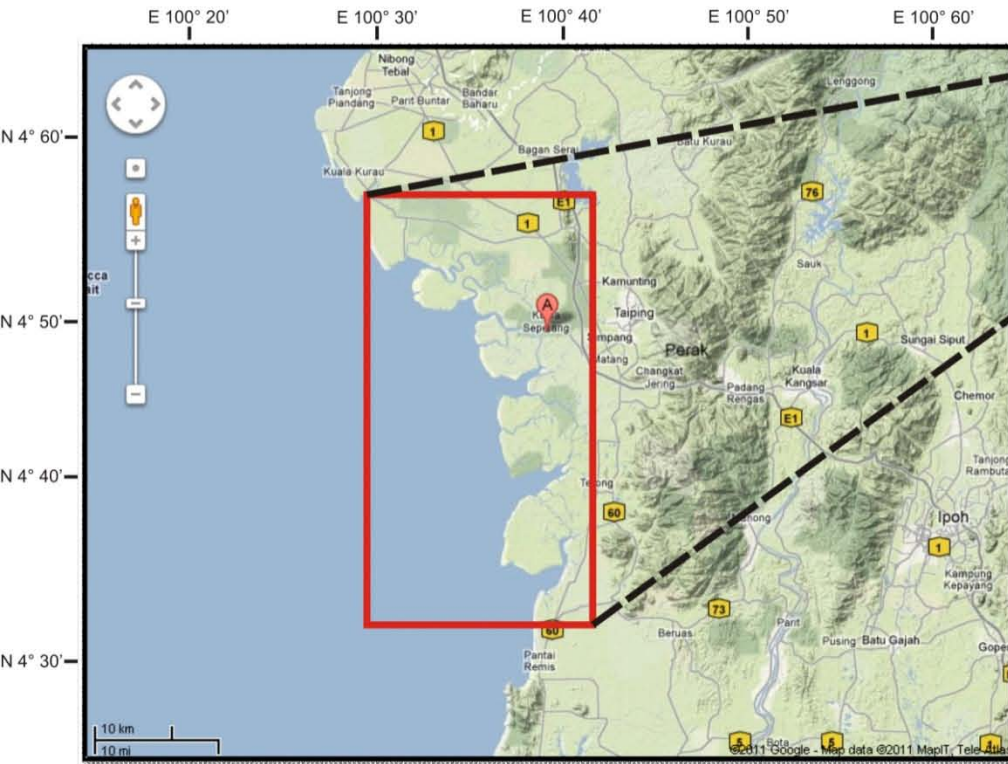
**RESEARCH BACKGROUND**

**METHODOLOGY**

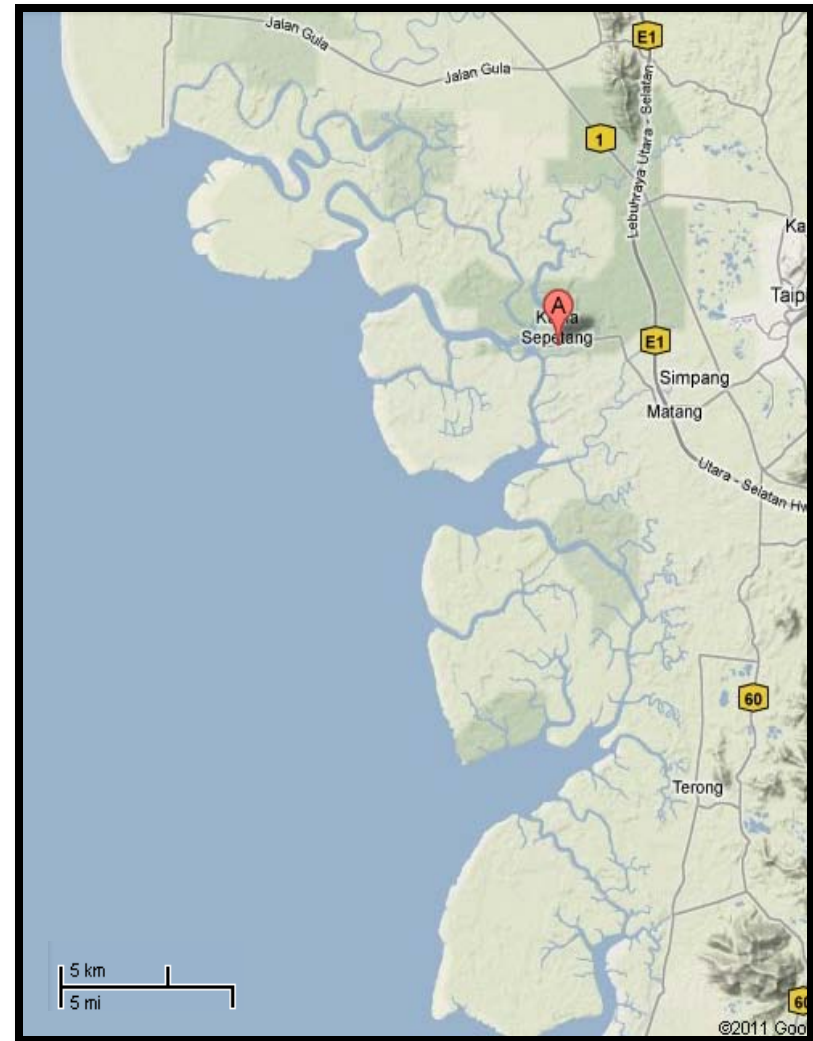
**RESULT / DISCUSSION**

**CONCLUSION AND FUTURE DIRECTION**

# INTRODUCTION



- Located about 17km from Taiping, Perak.
- Fringed by a continuous mangrove belt.
- The mangroves stretches from Kuala Gula in the north to Pantai Remis in the south  
→ forms Matang Mangrove Forest Reserve
  - Covers more than 40,000 hectares
  - Designated as Permanent Forest Reserve in 1906.
- Mangroves are an important form of coastal forest in Malaysia.
  - Act as a buffer zone between the sea and the shoreline .
  - Absorbing the shocks of waves and storms while filtering excess sediments.





## **PROBLEM STATEMENT**

How the Holocene sea level fluctuations has impacted on the evolution and development of the mangrove forest.

# OBJECTIVES

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graph TD; A[OBJECTIVES] --- B[To analyze the geology of the coastal plain of Larut Matang and Kuala Sepetang.]; A --- C[To investigate the ecology of mangrove forests of the research area.]; A --- D[To map and describe the biogeography of the species of mangrove and the peat forest.]; A --- E[To investigate the response of the mangrove forest to Holocene sea level change.];
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**To investigate the ecology of mangrove forests of the research area.**

**To map and describe the biogeography of the species of mangrove and the peat forest.**

**To investigate the response of the mangrove forest to Holocene sea level change.**

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graph LR; A[RESEARCH BACKGROUND] --- B[GENERAL GEOLOGY]; A --- C[ECOLOGY AND BIOGEOGRAPHY]; A --- D[LATE QUATERNARY SEA LEVEL CHANGE];
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**RESEARCH  
BACKGROUND**

**GENERAL GEOLOGY**

**ECOLOGY AND  
BIOGEOGRAPHY**

**LATE QUATERNARY  
SEA LEVEL CHANGE**

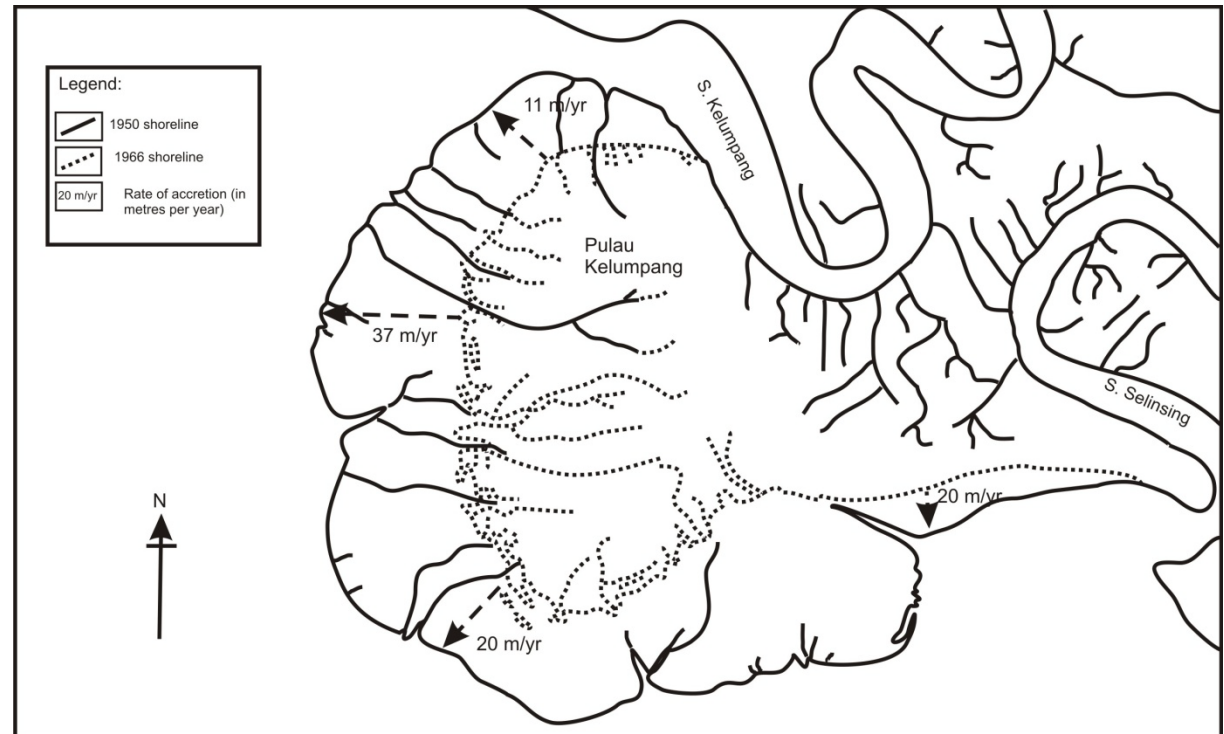
# (A) GENERAL GEOLOGY

- Located at a receptive zone
  - Situated near a river system which constantly feeds an influx of pollen.
  - Major rivers:
    - Sungai Gula, Sungai Kelumpang, Sungai Selinsing, Sungai Sangga Besar, Sungai Sepetang, Sungai Jaha, Sungai Terung and Sungai Jarum Mas
- Covered by a layer of unconsolidated Quaternary alluvium.
  - mainly peat with minor intercalations of clay and silt, sand, and gravel
  - The underlying bedrock is predominantly sedimentary rocks (shale, mudstone and sandstone) and their metamorphic equivalents.



- A comparison of the topographic map between year 1950 and 1966 was made to indicate the accretion of mangrove shore.

- Fastest accretion: Pulau Kelumpang.
- High sediment supply brought in by the rivers draining the hinterland areas.



The headland of Pulau Kelumpang depicted from 1950 and 1966 aerial photograph (from Kamaludin bin Hasan)

Depositional Environment	Descriptions	
	Lithology	Palynological characteristic
Shallow marine offshore	Clay, silt, sand. Shell & plant remains.	Moderate pollen content mangrove species > 40%
Deltaic, lagoonal & estuarine	Clay, silt, sand, rare gravel. Plant & sometime shell remains.	Moderate – rich pollen content mangrove species 40 to 60%
Mangrove	Clay, silt, peat, rare sand & gravel. Shell & plant remains.	Moderate – rich pollen content mangrove species >40% Rhizophora >50%
Back mangrove	Clay, silt, sand, peat, rare gravel. Plant remains.	Moderate – rich pollen content Rhizophora <40%
Freshwater swamp	Peat is the major component. Clay, silt, sand, gravel (minor).	Moderate rich – rich pollen content. Mangrove species: <i>Palmae</i>
Peat swamp	Peat	Rich pollen content. Absent or very low mangrove and <i>Palmae</i> constituents.

## (B) ECOLOGY AND BIOGEOGRAPHY

- Biogeographic distribution: inter-tidal region between the sea and the land in the tropical and sub-tropical regions.
- $SLR >$  Peat accumulation speed: mangrove will submerge in the sea and die.
- Peat accumulation: combination of physical and biological process.

Bruguiera zone  
(White mangrove)

Avicennia zone  
(Black mangrove)

Rhizophora zone  
(Red mangrove)

Lagoon

Pneumatophores

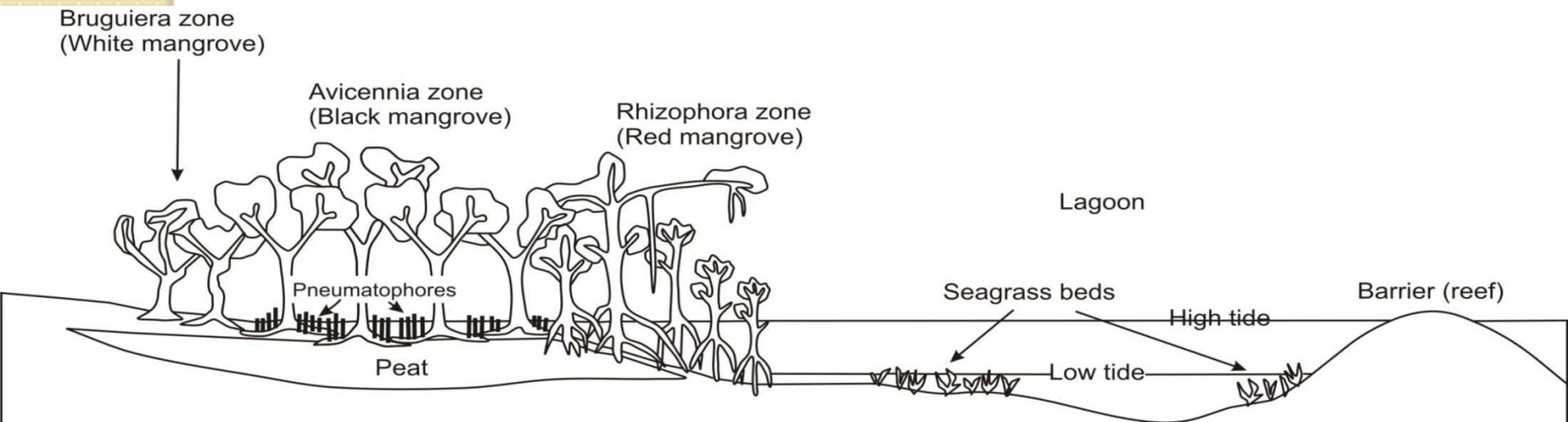
Seagrass beds

Barrier (reef)

Peat

High tide

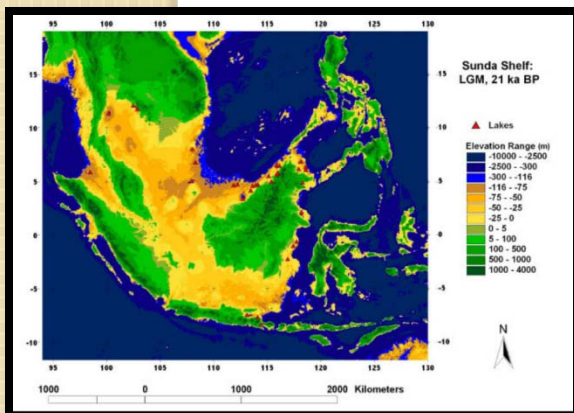
Low tide



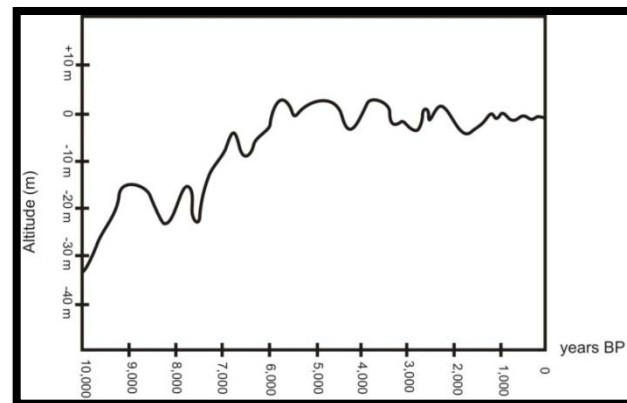
# (C) LATE QUATERNARY SEA LEVEL CHANGE

## Perspective of sea level change during the Holocene:

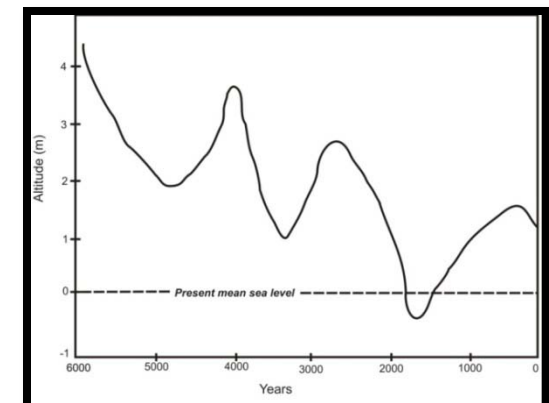
- Sunda land was stable during the Quaternary
- Above sea level for the past 15,000 years.
- Peninsular Malaysia and Sumatra formed a continuous land mass.
- Holocene transgression happened, causing the whole Peninsular Malaysia to be inundated
- Coastal plains evolved.




• Sunda Shelf, Sathiamurthy, 2006



• Fairbridge, 1961.

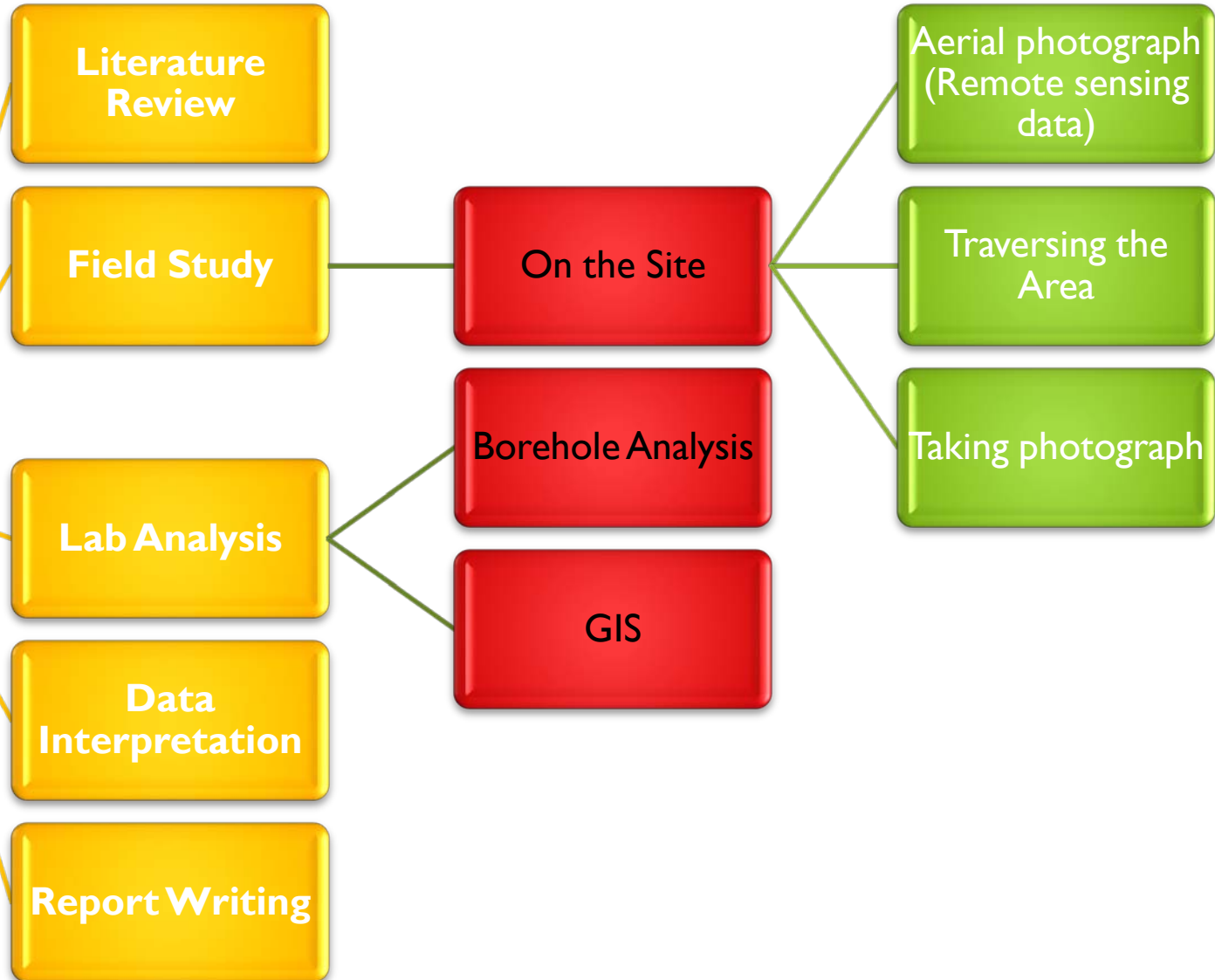


• Tjia, 1980.

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- The Matang mangroves were estimated to be developed in no more than 7,000 years.
    - 15,000 years ago Peninsular Malaysia was above sea level
    - Sea level rise was rapid for the next 8,000 years when the present level was reached about 7,000 BP.
    - Sea level rose to another 5 meters above the present level about 4,500 BP – mangroves on the seaward side of Matang were totally drowned.
    - Sea level then dropped to its present level.

# METHODOLOGY

## METHODS





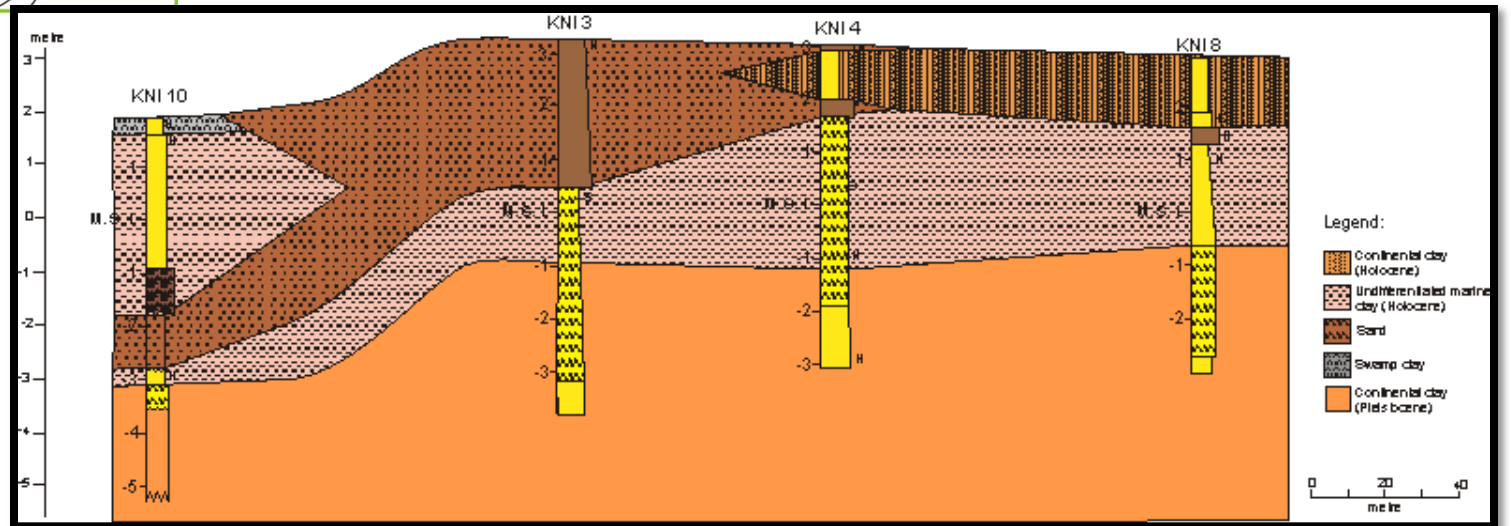
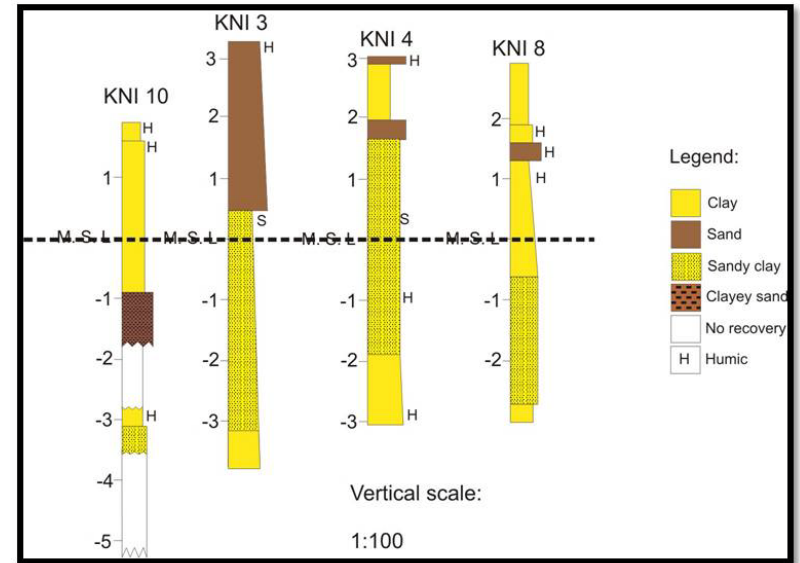
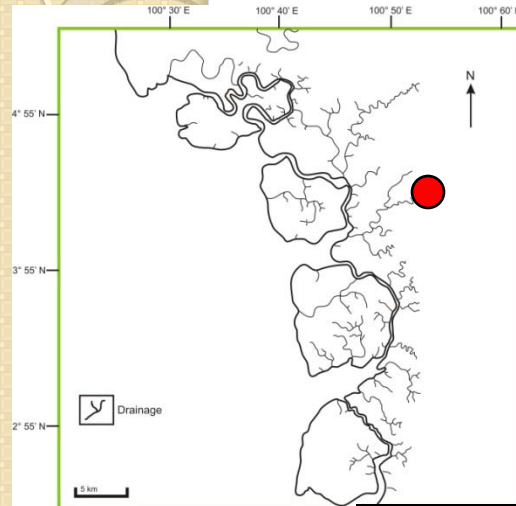


- Replanting mangrove trees.



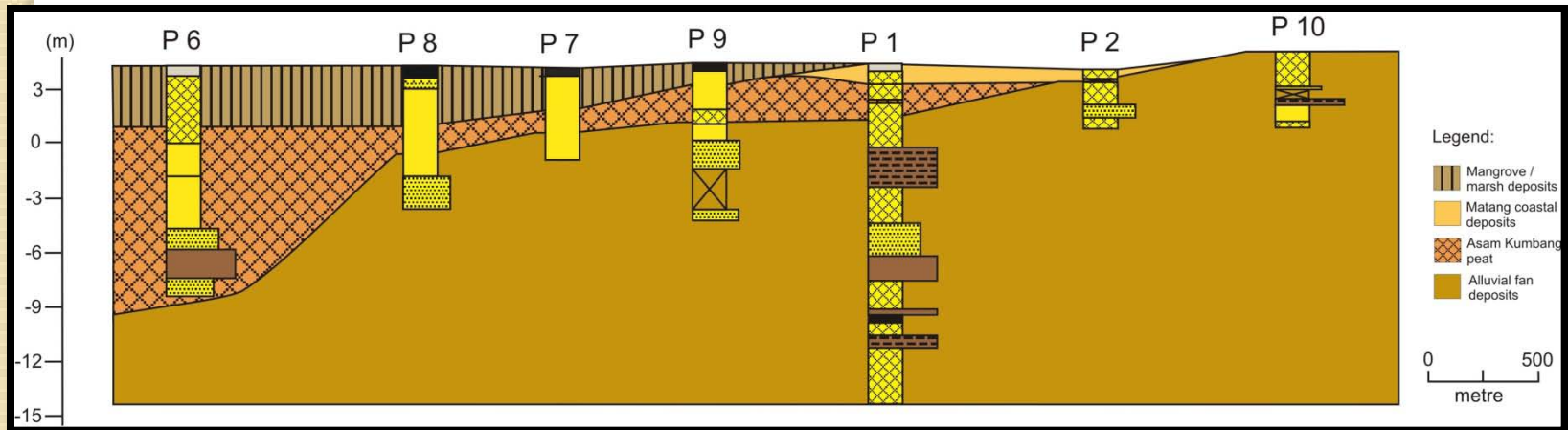
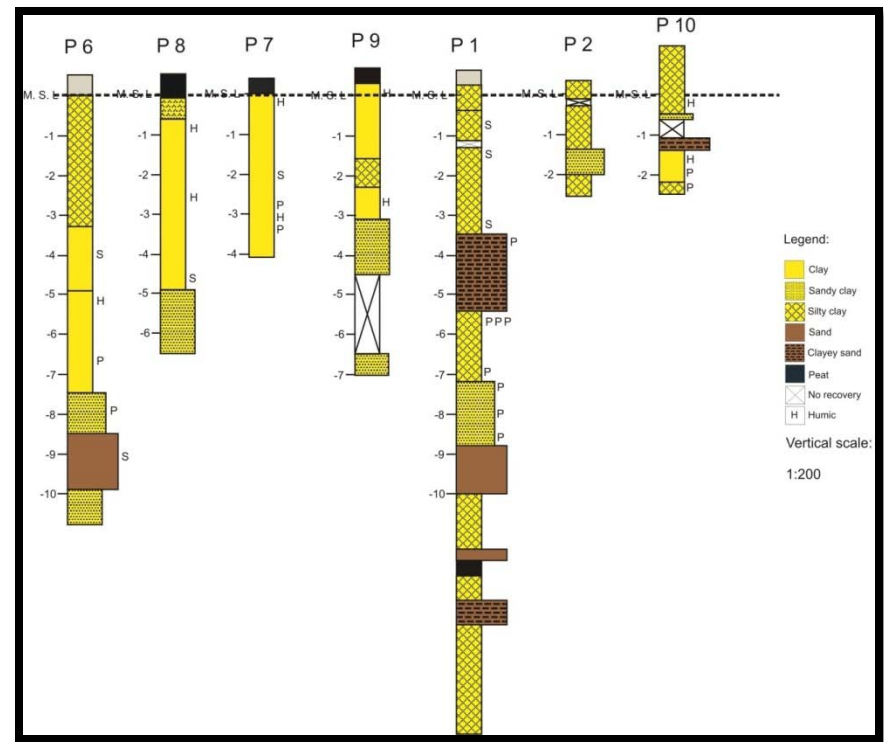
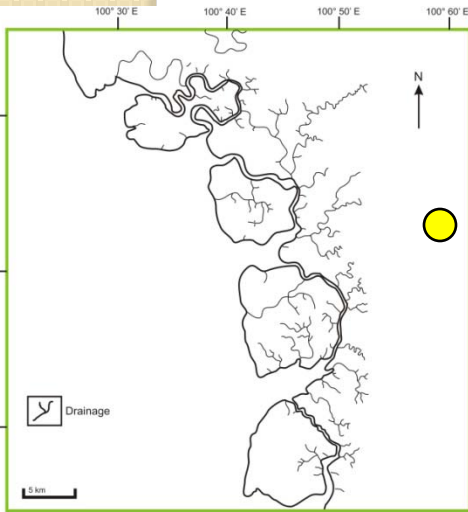
# RESULTS & DISCUSSION

- Kota Ngah Ibrahim, Matang, Perak.



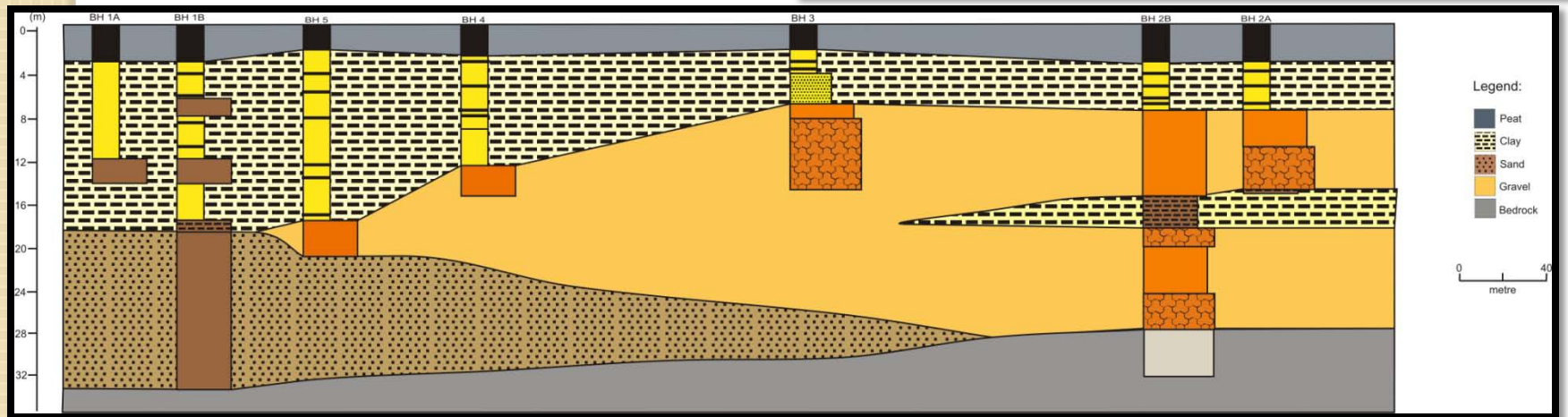
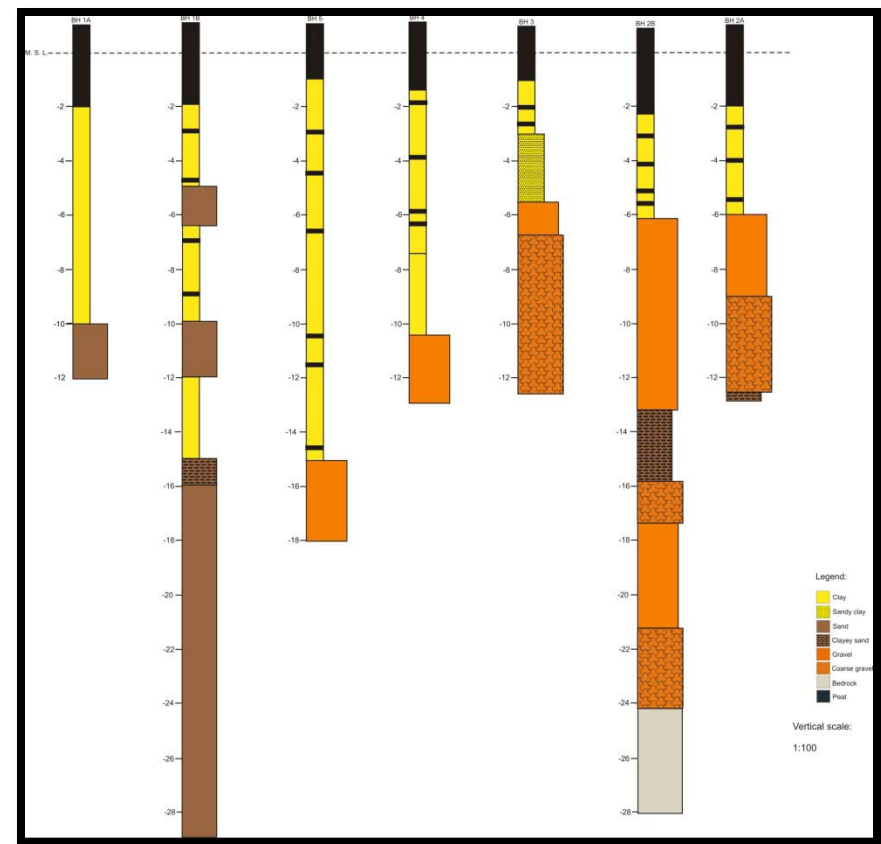
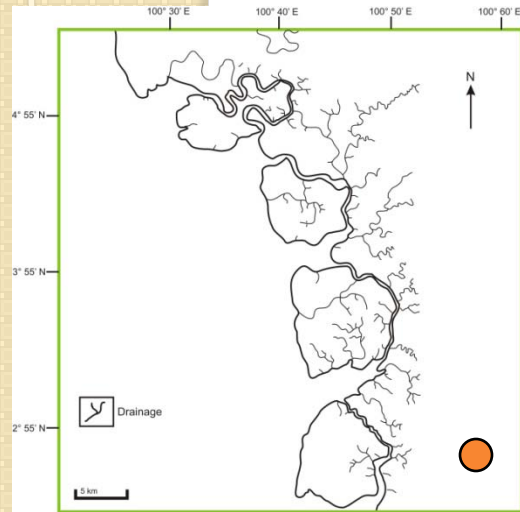
- Cross section West – East (modified from Kamaludin bin Hasan)

# Port Weld - Taiping

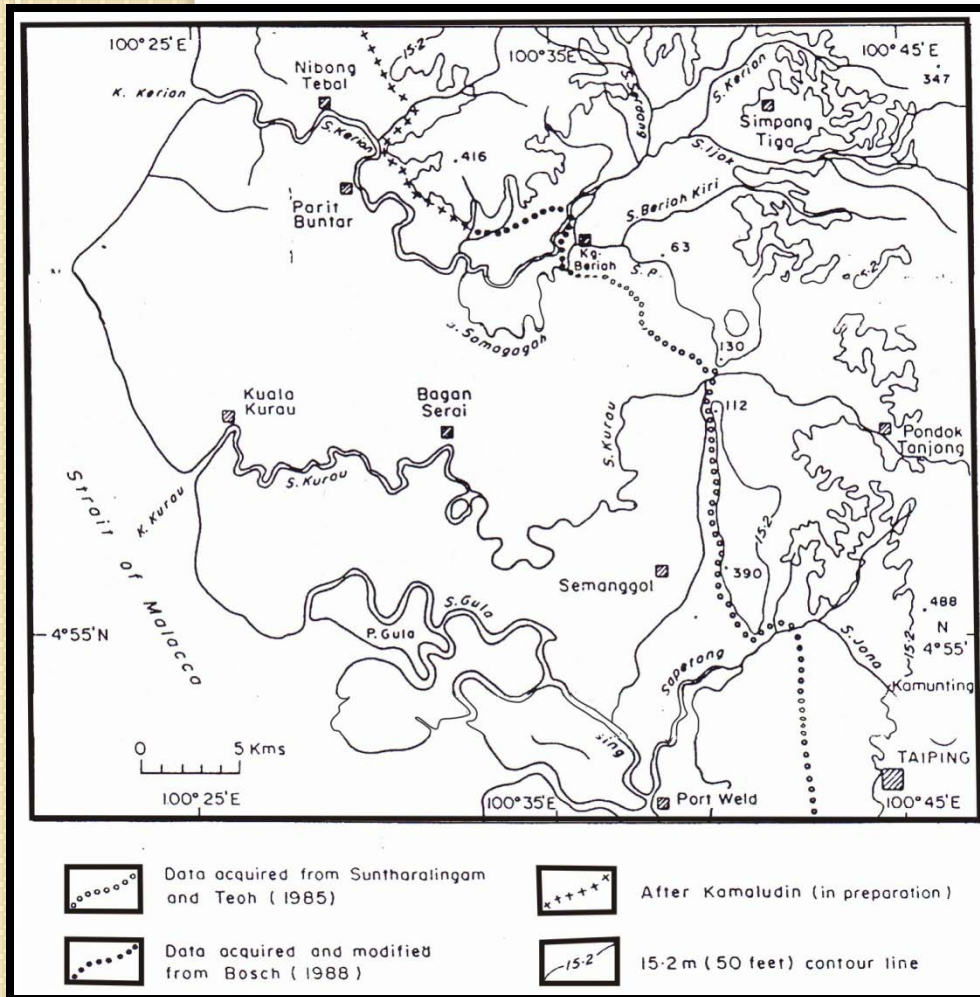


- Cross section West – East (modified from T. Suntharalingam and Teoh Lay Hock, 1978)

• Titi Gantung, Bota.



• Cross section North – South (modified from Abd Rashid Bachik)



- Correlation were made by Suntharalingam and Teoh (1985) and Bosch (1988).
- Bosch (1988) derived the boundary mainly from aerial photographic interpretation.
- The inland mangrove edge is interpreted as the position of the shoreline in the area about 5000 years ago from base of peat.

- The inland shoreline limit of the mangrove sediments (Kamaludin bin Hasan, 1993)

# CONCLUSION

- East side of the research area is mainly dominated by clay, whereas the southern part area is generally dominated by sand and gravel.
- Peat layers were found mostly in southern part of the research area.
- Very few boreholes have been drilled mainly due to poor accessibility.

# FUTURE DIRECTION

- To assess mangrove vulnerability to sea level rise:
  - Measure trends in the change in mangrove surface elevation to determine how sea level is changing relative to the mangrove surface;
  - Acquire analysis of historical remotely sensed imagery to observe trends in changes in position of mangrove margins.
- Cores collected at the sites are the key to an accurate reconstruction of sea level history, because these sites have a small tidal range.
- Focus more on site investigation, aerial photographs, and data analysis.



THANK  
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