Potential Natural Blood Cockle (*Anadara granosa*) Spawning Ground Based on Coastal Physical Disturbance during Great Diurnal Tide in Kapar, Selangor, Malaysia

By:

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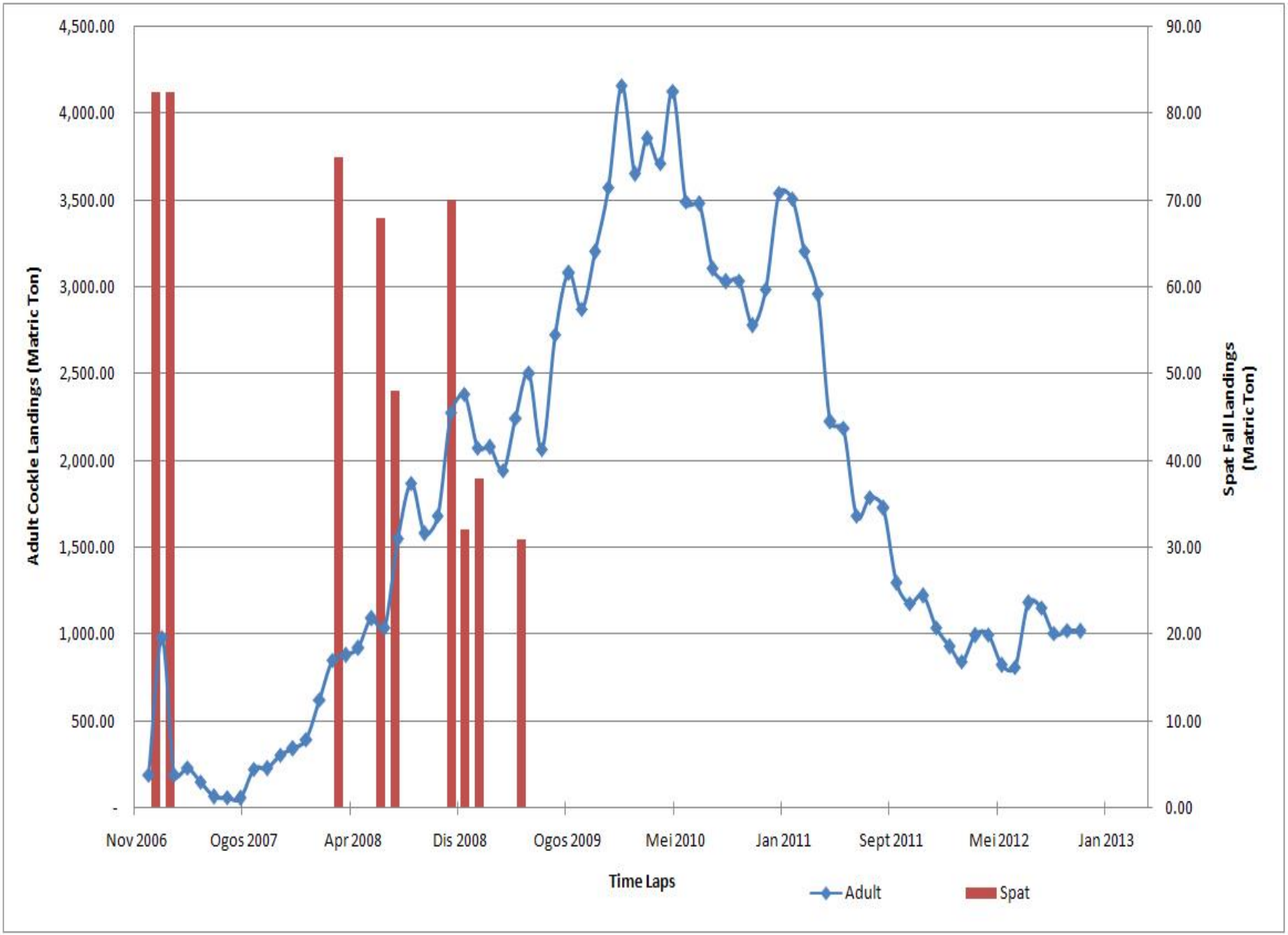
Introduction

- Coastal waters of Selangor (Kuala Selangor and Sungai Buloh) has been known for cockle culture since 1970s
- Prior to the year 2007, Selangor was the third largest cockle landings in Malaysia
- **Cockle Farm Project (CFP)** was launched in 2007 offering 200 x 50Ha commercial cockle lots throughout 115 km coastline from Bagan Nahoda Omar in the northern towards Kapar in the southern
- The project aim is to bust Selangor's adults cockle landings
- Adult cockle landings start to double in 2008 until its peak in 2010

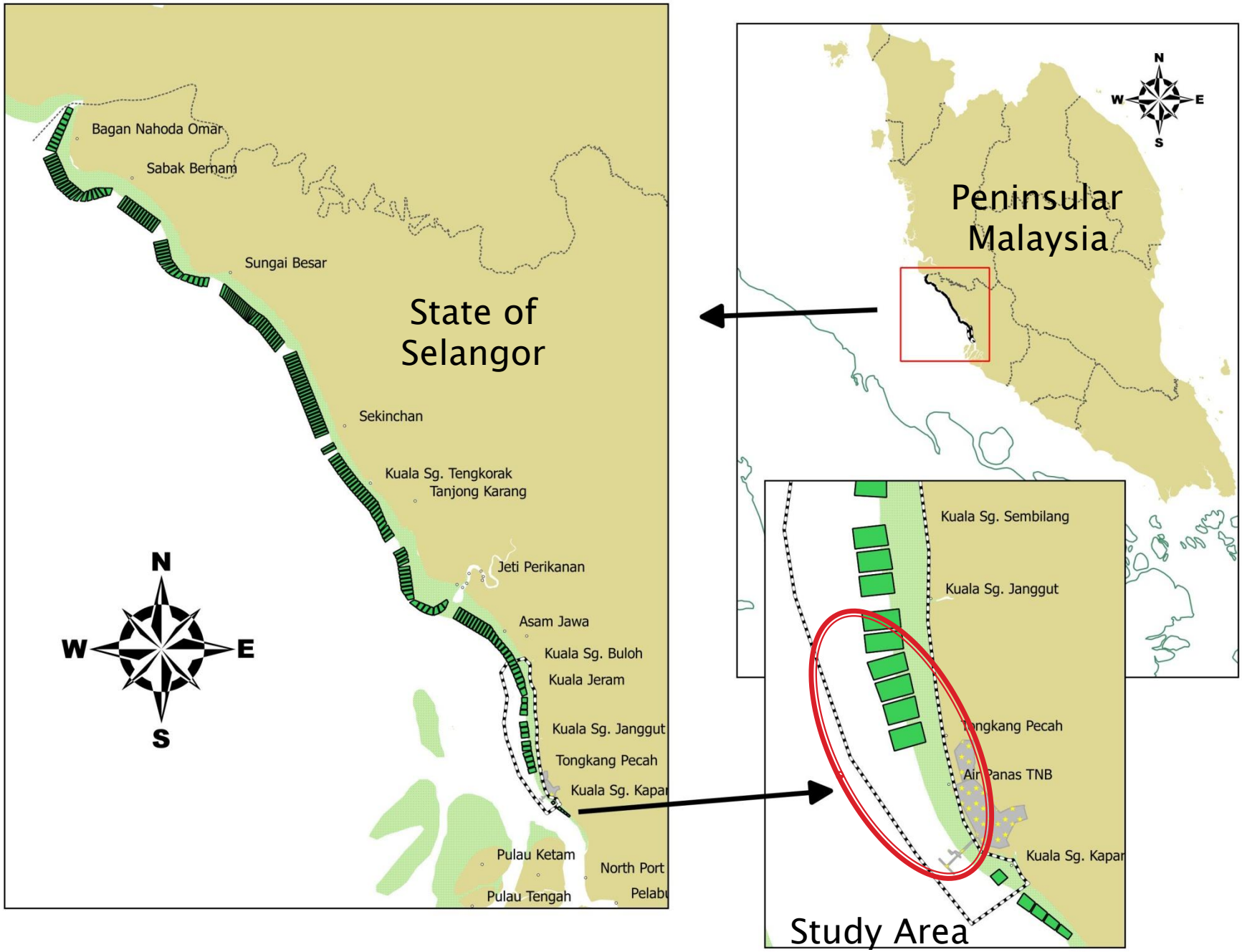

4,500.00
4,000.00
3,500.00
3,000.00
2,500.00
2,000.00
1,500.00
1,000.00
500.00
-
Adult Cockle Landings (Matric Ton)
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Spat Fall Landings (Matric Ton)
Nov 2006
Ogos 2007
Apr 2008
Dis 2008
Ogos 2009
Mei 2010
Jan 2011
Sept 2011
Mei 2012
Jan 2013
Time Laps
Adult
Spat

Introduction

- Problem Statement:
  - What caused the spatfalls landings to drop although the size of cockle culture areas have been increased
  - What is the relationship between coastal processes and cockle recruitment
- Research Objective
  - Based on coastal processes approach, the study is aim to evaluate the temperature profile within the cockle culture lots associated with cockle spawning

Methodology

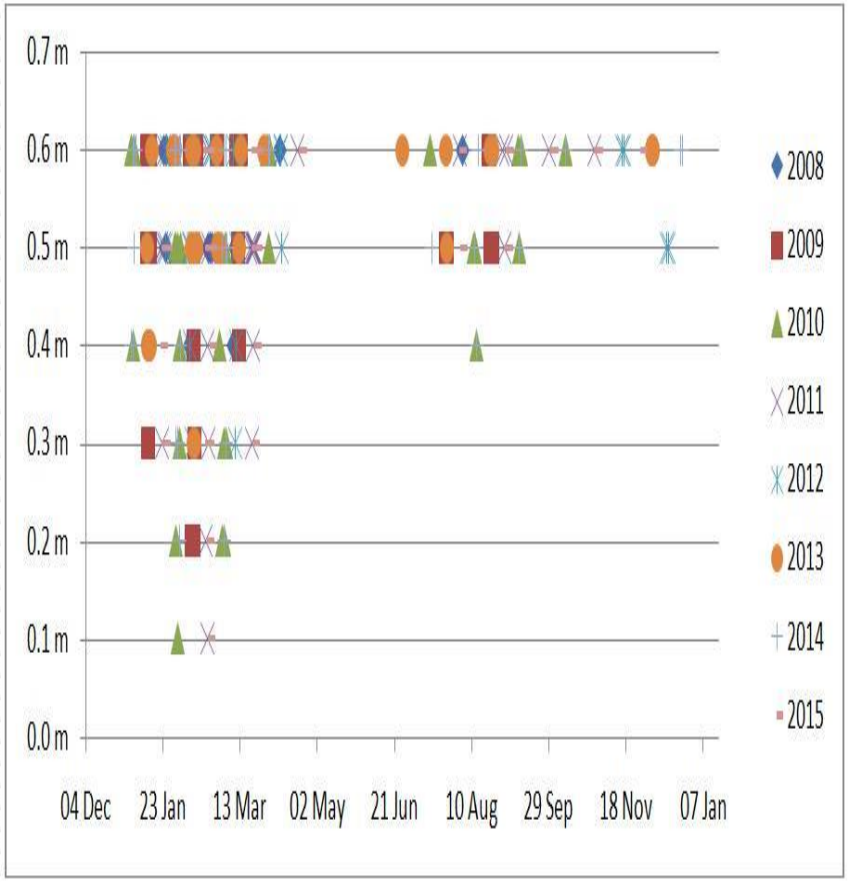
- Study Area – Kapar, Selangor
- Equipment used: GPS, YSI 6600 Multi-probes, Veleport Current meter 106, Single beam Ceestar Echo-sounder, Trimble DGPS, HydroPro Software, Surfer V.9., QGIS, Garmin MapSource, SPSS, Microsoft Xcel and Office
- All equipment are calibrated prior sampling


Bagan Nahoda Omar
Sabak Bernam
Sungai Besar
State of Selangor
Sekinchan
Kuala Sg. Tengkorak
Tanjong Karang
Jeti Perikanan
Asam Jawa
Kuala Sg. Buloh
Kuala Jeram
Kuala Sg. Janggut
Tongkang Pecah
Kuala Sg. Kapar
Pulau Ketam
North Port
Pulau Tengah
Pelabu
N
W
E
S
Peninsular Malaysia
Kuala Sg. Sembilang
Kuala Sg. Janggut
Tongkang Pecah
Air Panas TNB
Kuala Sg. Kapar
Study Area

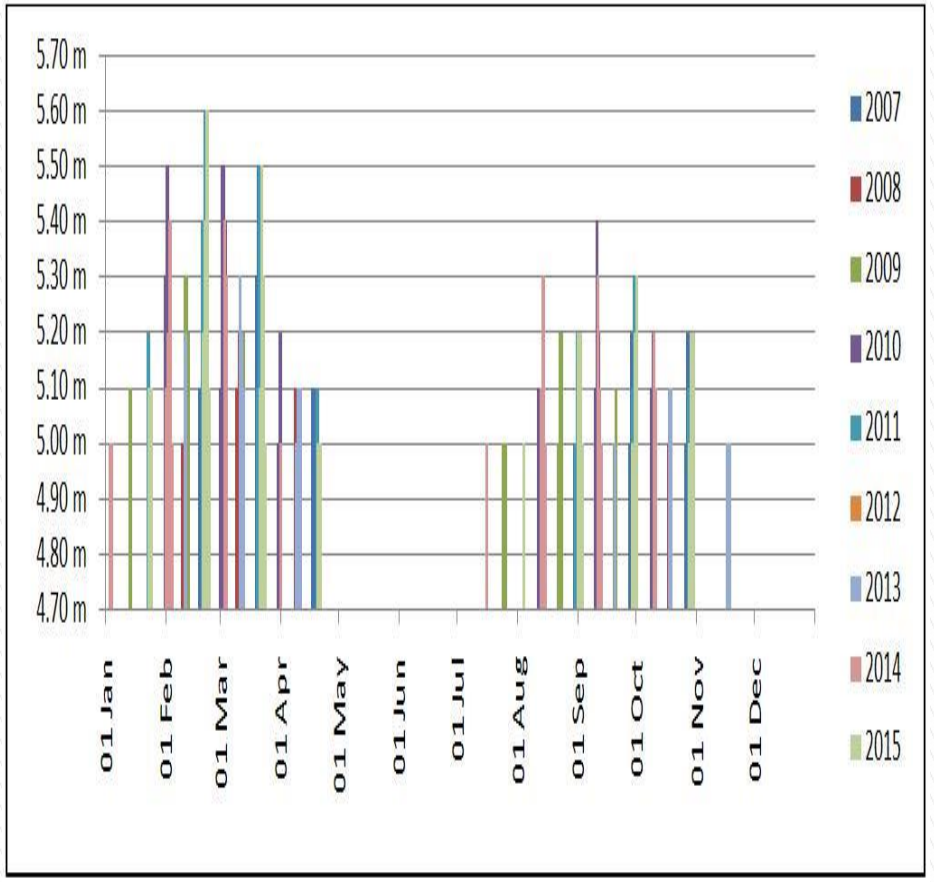
Methodology

- Sampling for physical characteristics (Primary data) was conducted from January 2010 – March 2011 and February – May 2015
- Secondary data (Tide Table, Volume 1) were obtained from 2007 – 2015
- Bathymetry sounding was completed in 2010, overlaid with chart published by RMN

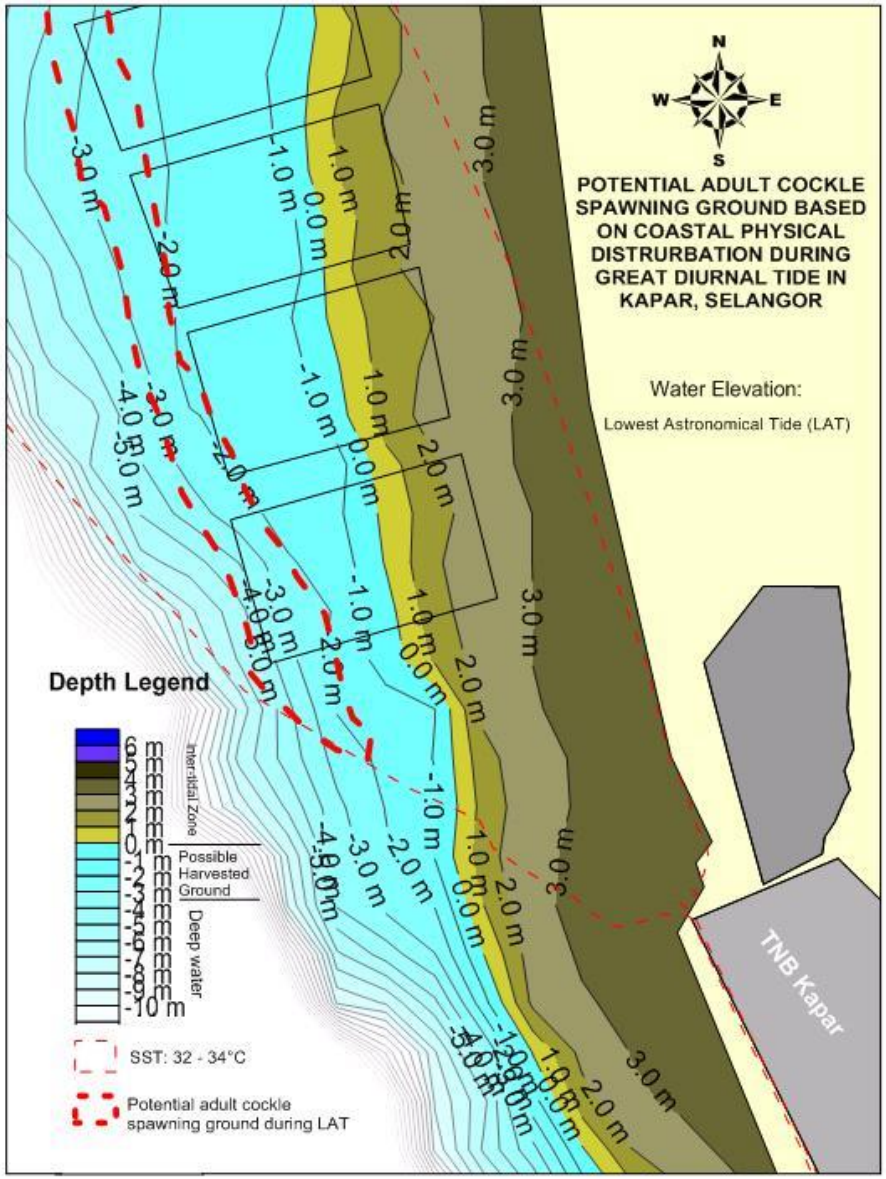
Results

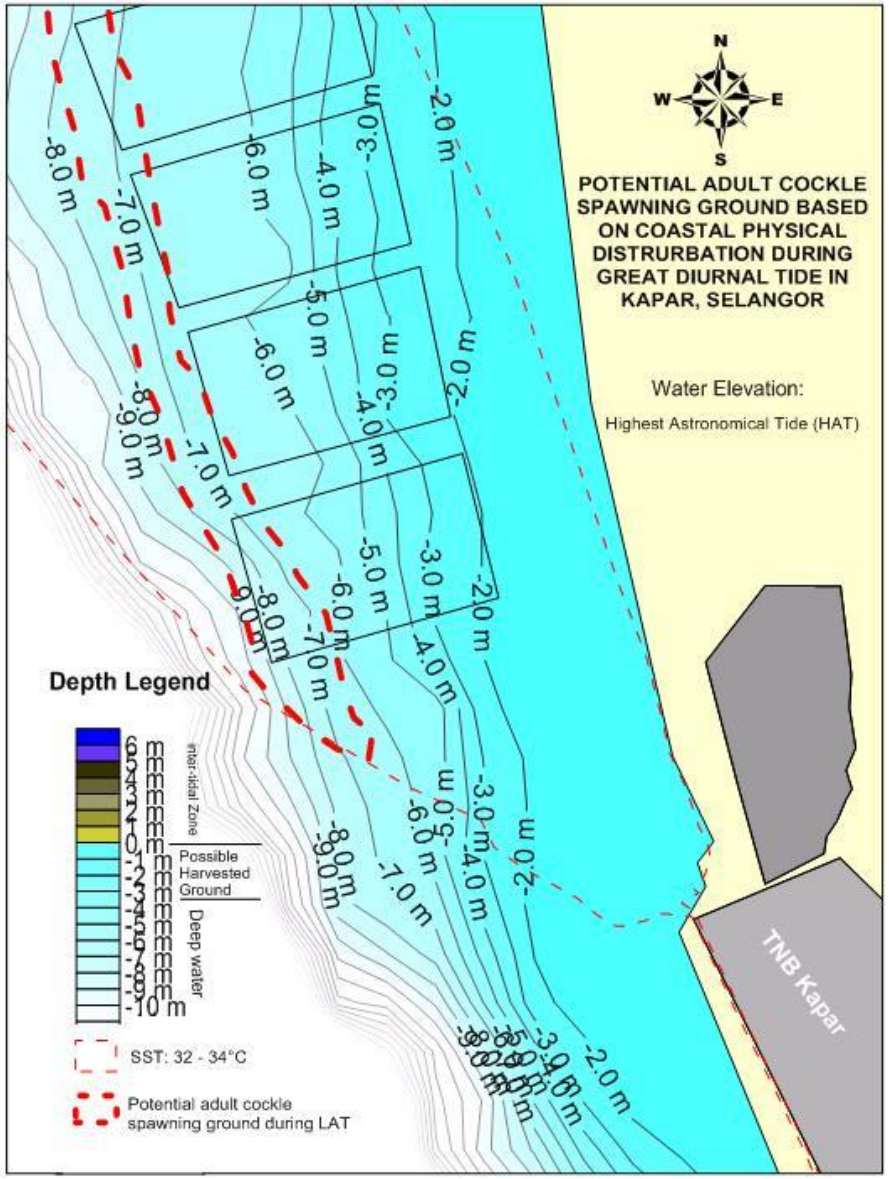


Lowest Astronomical Tide, LAT

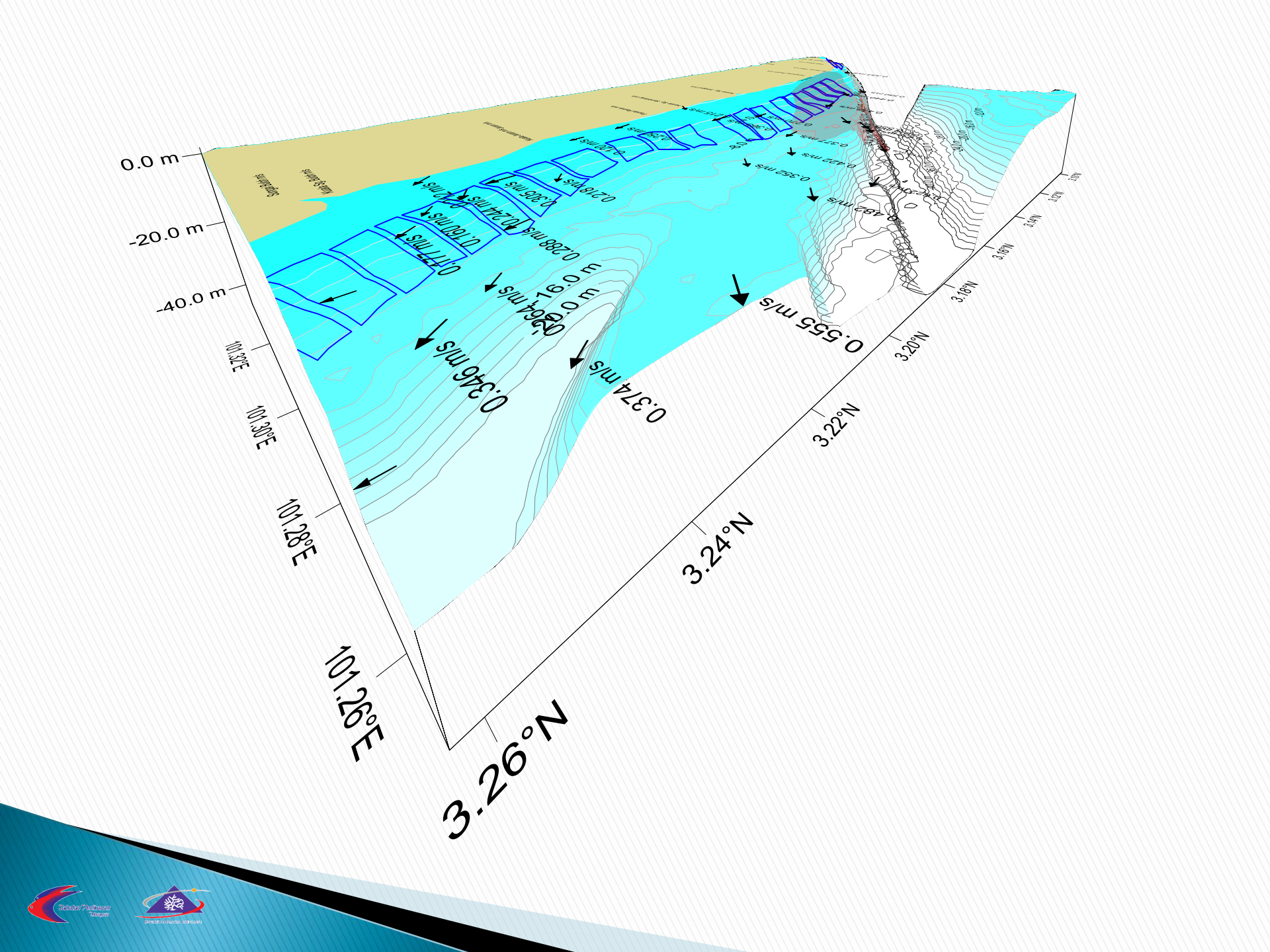


Highest Astronomical Tide, HAT

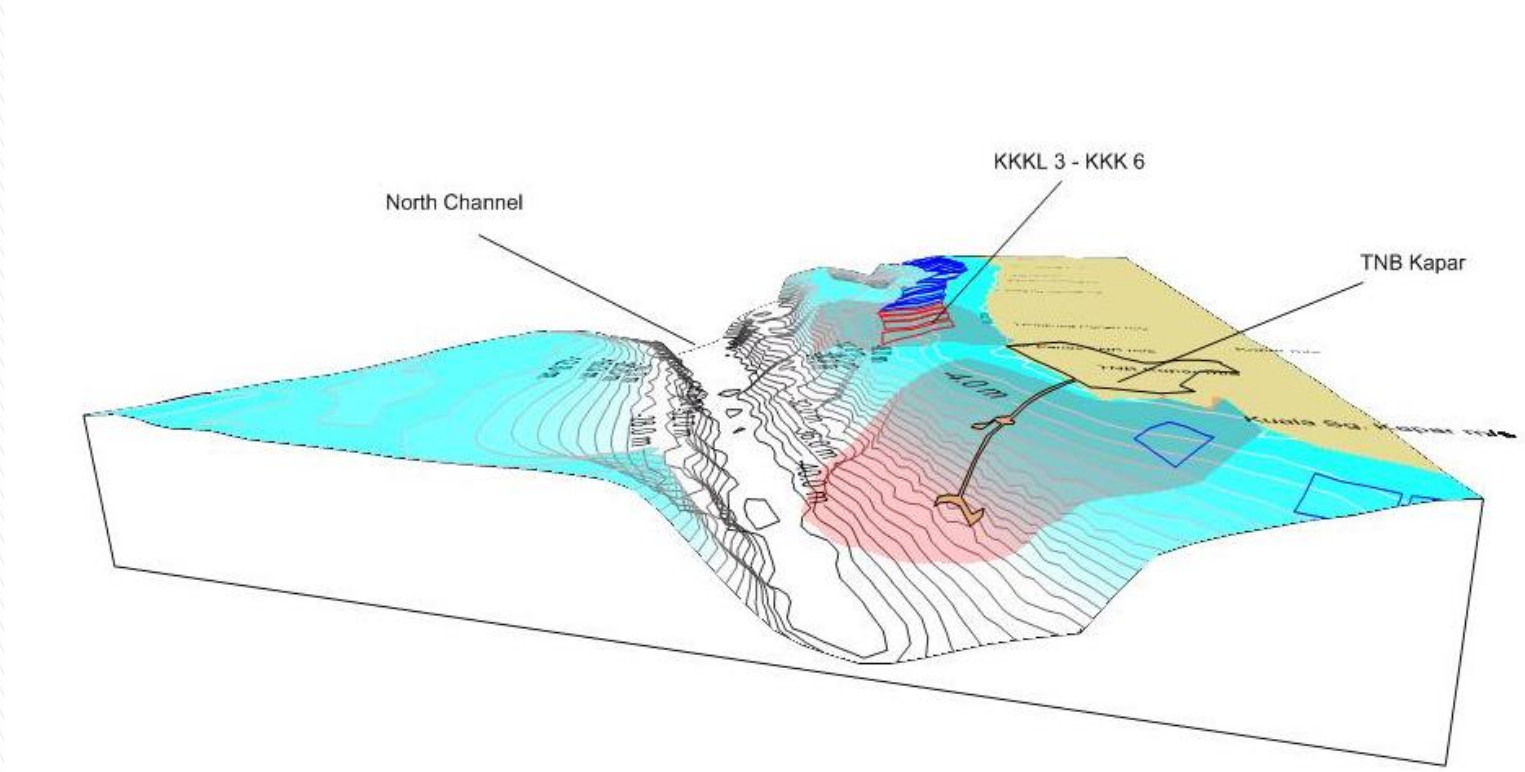


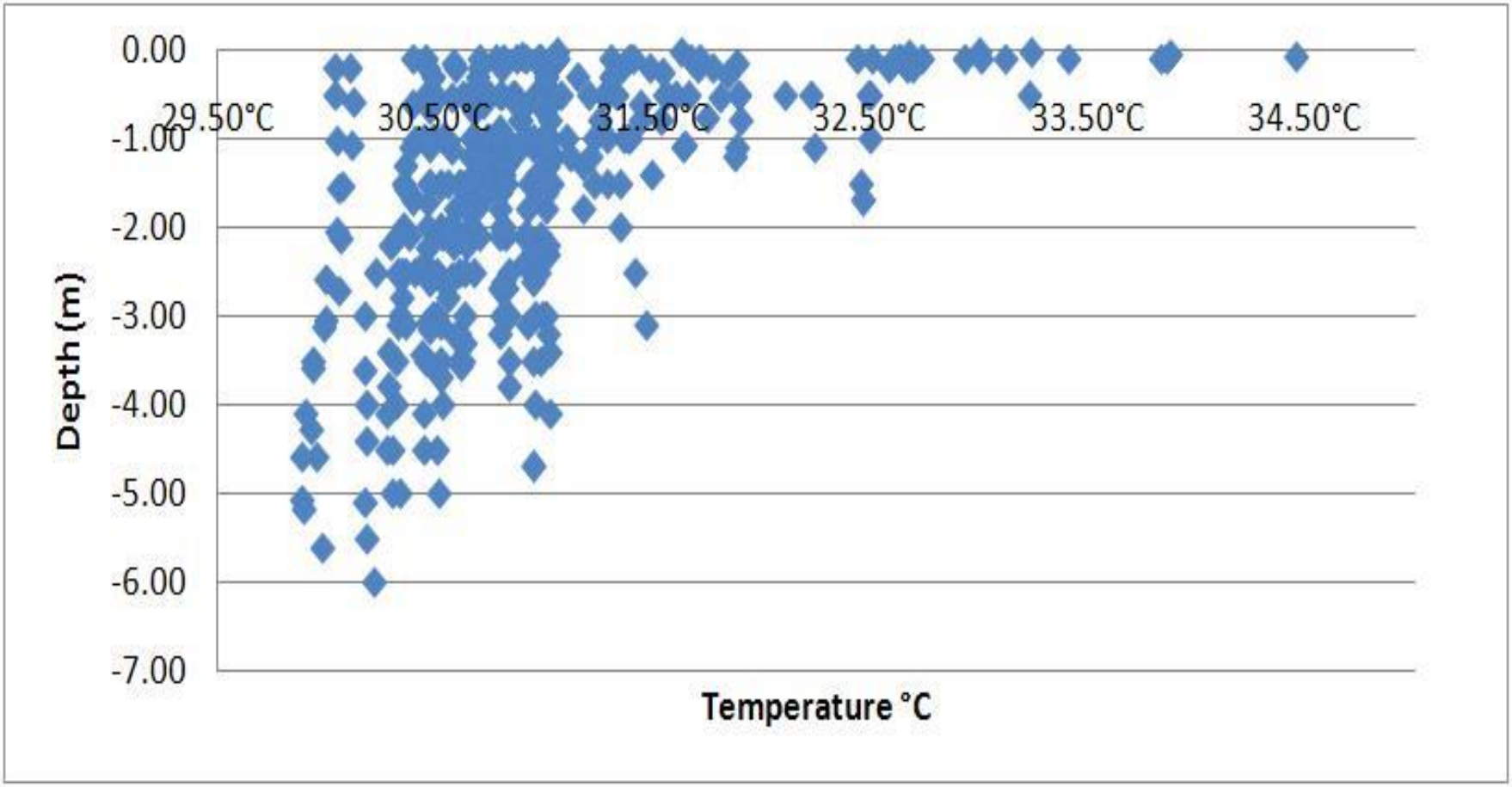


- Predicted Lowest and Highest Astronomical Tide

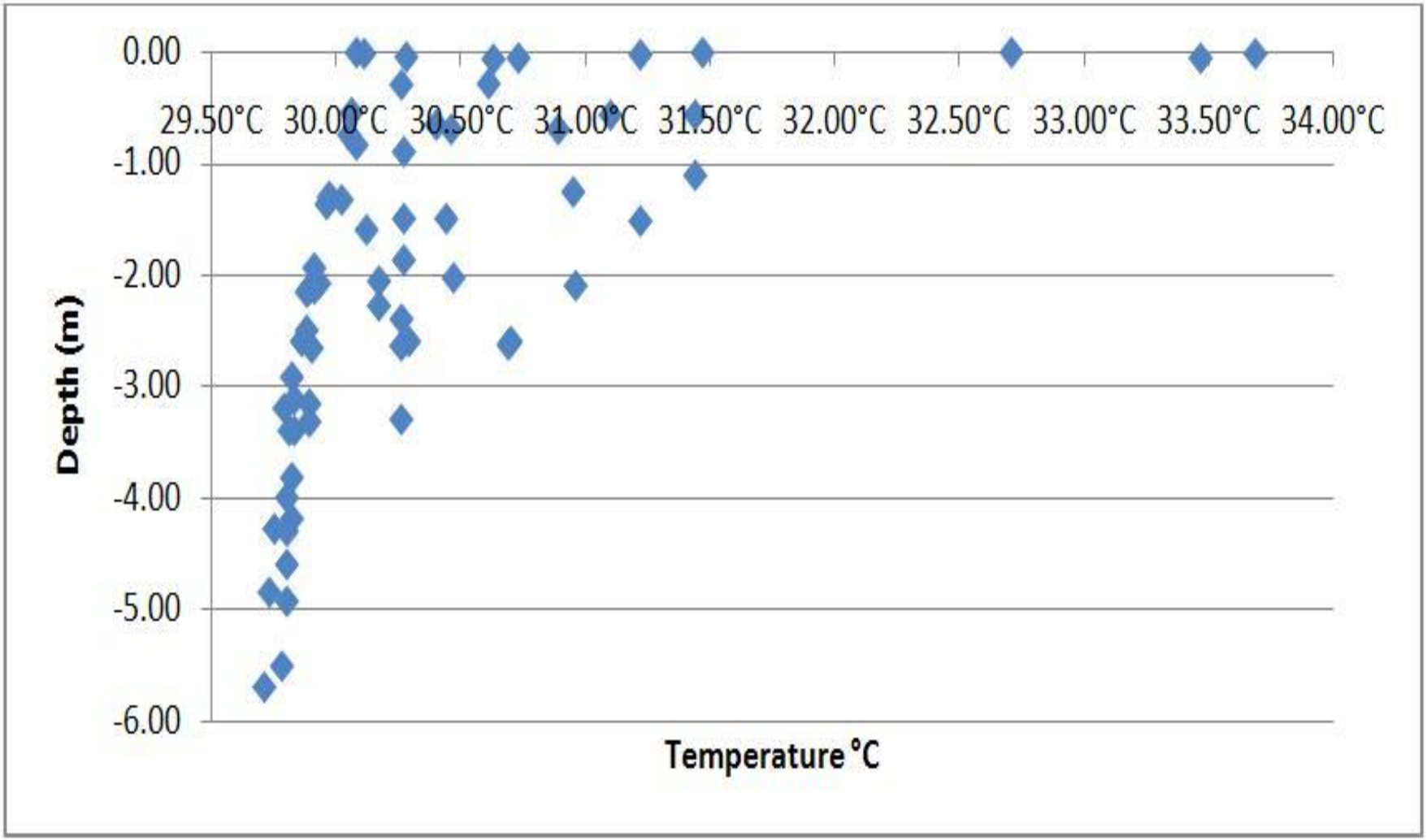

0.0 m
-20.0 m
-40.0 m
101.32°E
101.30°E
101.28°E
101.26°E
3.26°N
3.24°N
3.22°N
3.20°N
3.18°N
0.346 m/s
0.374 m/s
0.555 m/s
16.0 m
20.0 m


Sg. Buloh
31.00°C
30.80°C
30.60°C
30.80°C
31.00°C
31.20°C
31.40°C
31.00°C
31.20°C
30.80°C
31.00°C
30.60°C
30.80°C
30.60°C
30.40°C
30.40°C
30.20°C
Kuala Sg. Janggut
An intensive Temperature profiling sampling was conducted here during high tide elevation and typical tide elevation.
Tongkang Pecah
Air Panas TNB
N
S
W
E


KKKL 3 - KKK 6
North Channel
TNB Kapar



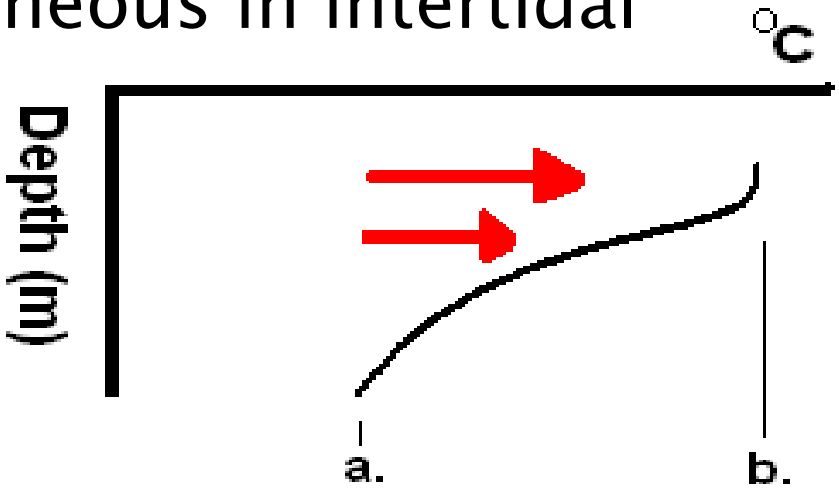
- Temperature profile during Spring water

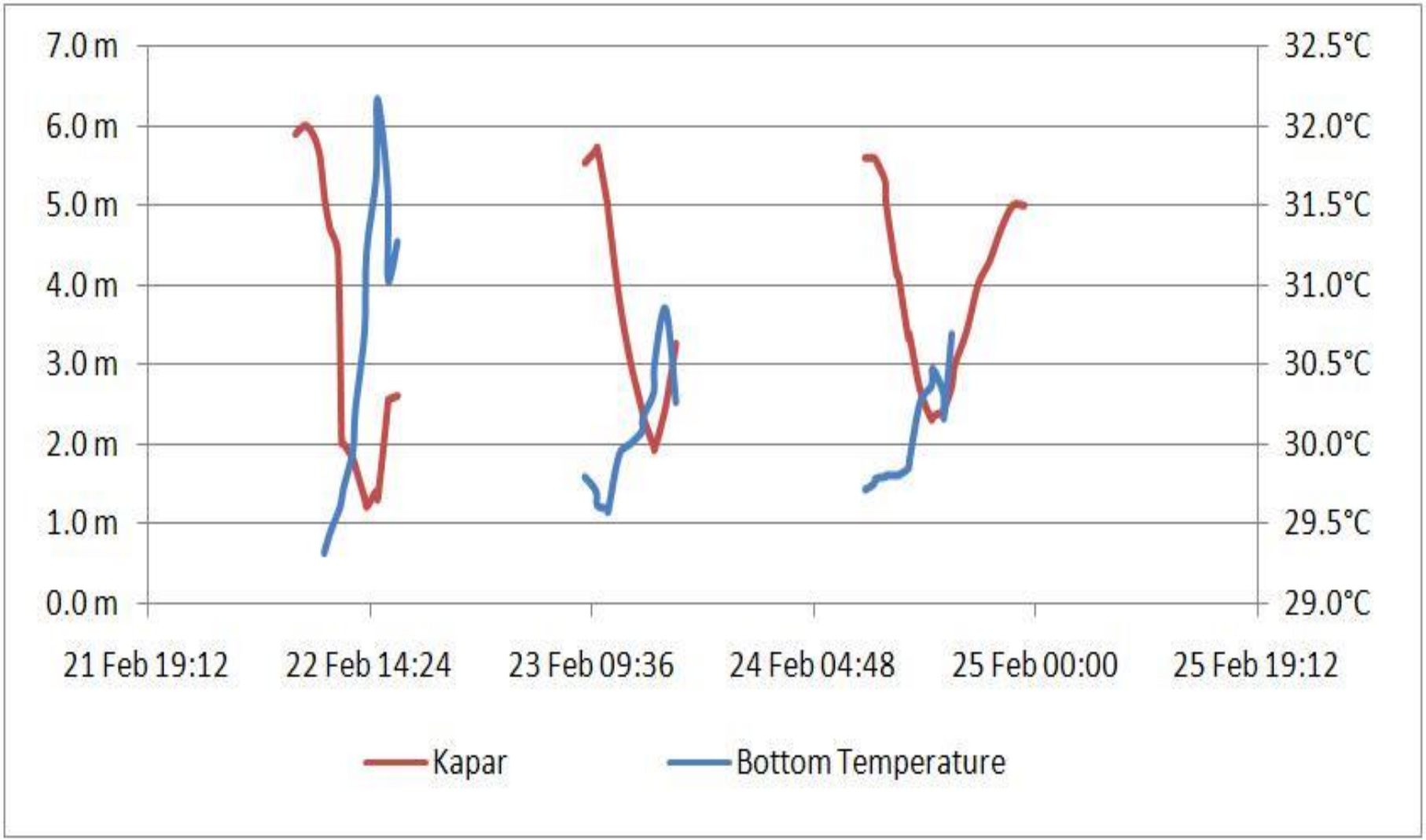


- Temperature profile during Neap water

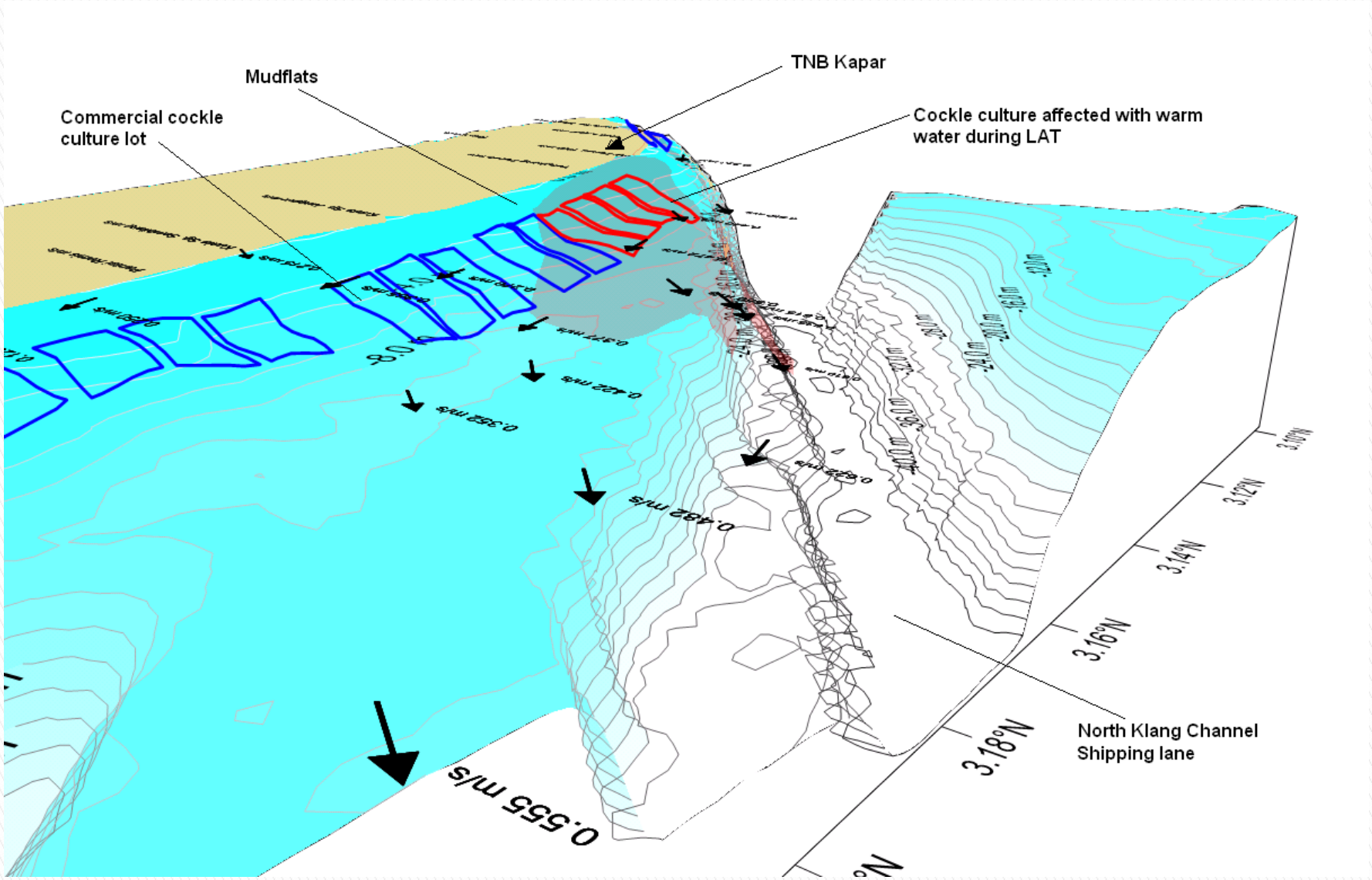
Discussion

- SST and Temperature profile interact with water elevation
- Typical bottom temperature will be low (a), but during LAT the temperature may be increasing to (b).
- This condition is applicable to location where it received warm water run-off and deep water where it will be shallow during its LAT
- Temperature is homogeneous in intertidal waters



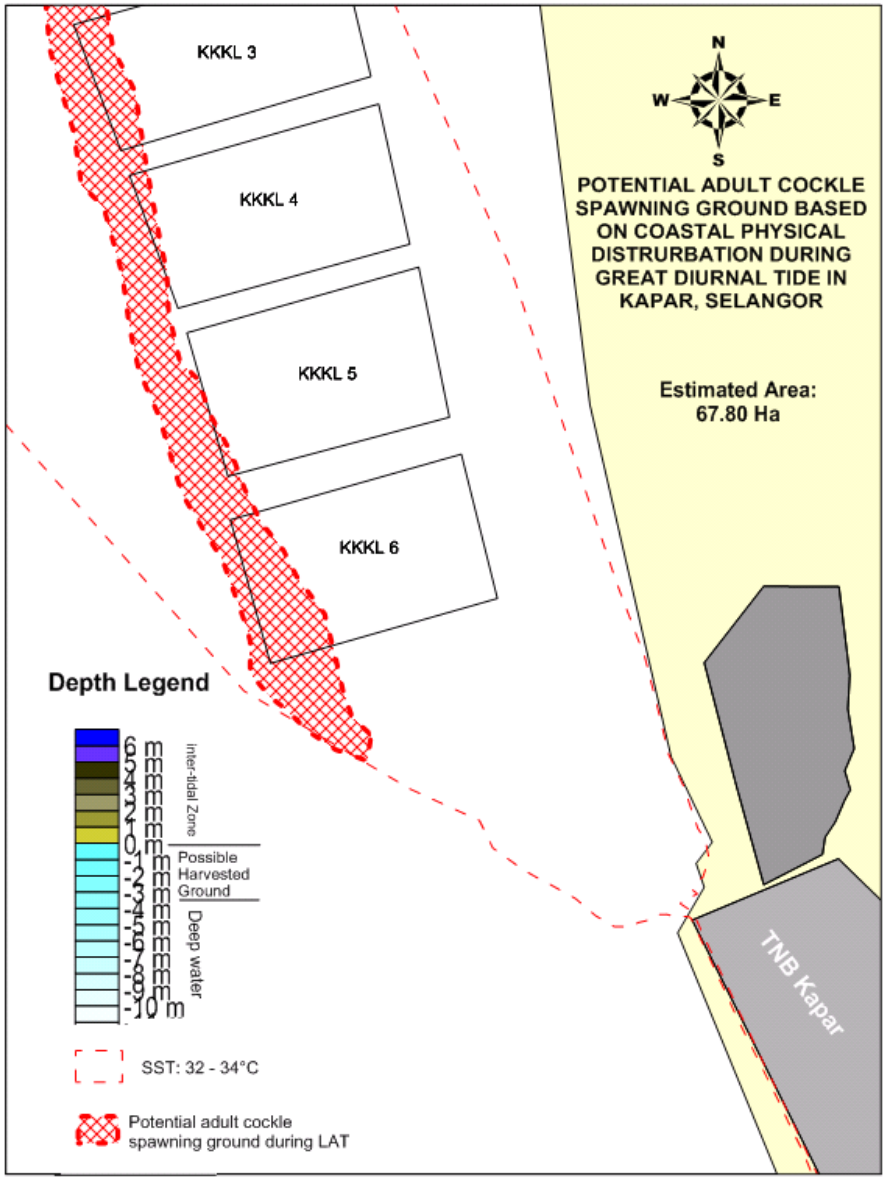


SST Vs. Bottom Temperature during LAT


Mudflats
TNB Kapar
Commercial cockle culture lot
Cockle culture affected with warm water during LAT
0.555 m/s
0.482 m/s
0.8
3.18°N
3.16°N
3.14°N
3.12°N
North Klang Channel
Shipping lane

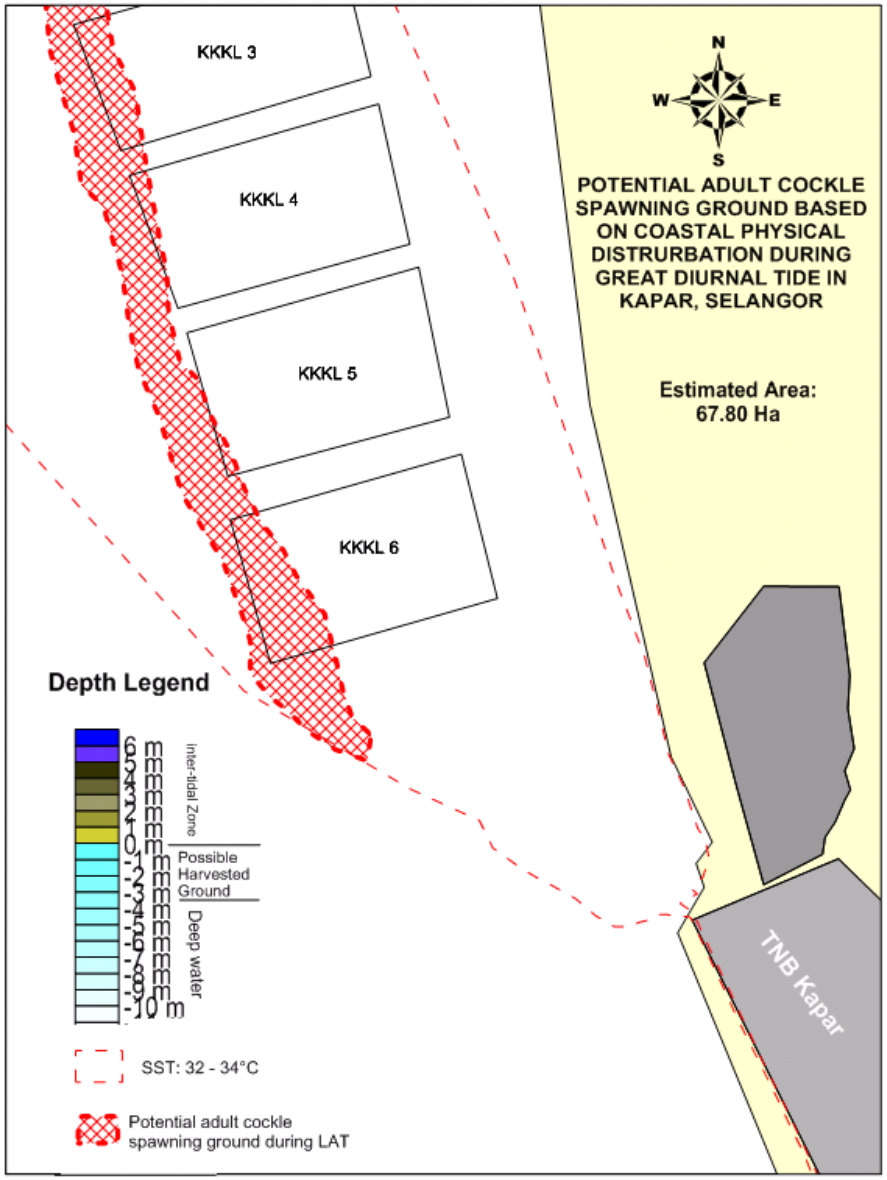
Discussion

- The results suggested an area that associates for cockle spawning
- The identified area was abandoned for cockle culture due to its depth
- This area was a culture site at the begin of CFP
- Data suggested that spatfall landing and occurrence was high between 2008 – 2009



Discussion

- Restocking of adults cockle (>25mm) with adequate volume could promote major spatfall in coming LAT
- Water depth protects this adult cockle from harvest
- Thus securing the recruitment process



Conclusion

- The results suggested that bottom temperature intermittent at specific depth of cockle culture lots in Kapar during GT condition is associated with cockle spawning

References

Domitília Matiasa, Sandra Joaquima, Ana Margarete Matiasa, Paula Mouraa, Joana Teixeira de Sousaa, b, Paula Sobralc, Alexandra Leitãoa. 2013. Elsevier Aqua. 406-407: 52-61

Farhana Mohd Ghani, Devakie M. Nair, & Siti Azizah Mohd Nor. 2010. Study on the Genetic Structure of Anadara granosa Spats in Malaysia Based on Cytochrome Oxidase 1 Gene Sequence. Proceedings of the 7th IMT-GT UNINET and The 3rd International PSU-UNS Conferences on Bioscience

Haslaniza et.al. 2010. The effects of enzyme concentration, temperature and incubation time on nitrogen content and degree of hydrolysis of protein precipitate from cockle (Anadara granosa) meat wash water. Int. Food Res. Journal. 17:147-152

M.J. Broom. 1982. Analysis of the Growth of Anadara granosa (Bivalvia: Arcidae) in Natural, Artificially Seeded and Experimental Populations. J. Marine Ecology - Progress Series. 9:69-79

Norma Afiati. 2004. GONAD MATURATION OF TWO INTERTIDAL BLOOD CLAMS Anadara granosa (L.) AND Anadara antiquata (L.) (BIVALVIA: ARCIDAE) IN CENTRAL JAVA. J. Coastal Development. 10(2): 105-113

References

Ng Fong Oon. 1986. Growth and Mortality of the Malaysian Cockle (Anadara granosa L.) under Commercial Culture Analysis through Length-Frequency Data. FAO. BOBP/WP/47

P. Mutiah, K.A. Narasimham, C.P. Gopinathan and D. Sundarajan. 1992. Larval Rearing, Spat Production and Juvenile Growth of the Blood Clam Anadara granosa. J. Mar. Bio. Ass. India. 34(1&2): 138-143

S. Deen. 2006. Technical Feasibility Study of an Aquaculture Facility for Common Cockle Species in the Netherlands. A Preliminary Design, which includes a Functional and Physical Architecture of a Land-based Aquaculture Facility for Common Cockle (Cerastoderma edule L.) Species in the Netherlands. University of Twente.

Shahnaz JAHANGIR, Ghazala SIDDIQUI*, Zarrien AYUB. 2014.Temporal variation in the reproductive pattern of blood cockle Anadara antiquata from Pakistan (northern Arabian Sea).

Shigeru Nakao, Hirotaka Nomura and Mustafa Kamal Bin Abd. Satar. 1989. Macrobenthos and Sedimentary Environments in a Malaysian Intertidal Mudflat of the Cockle Bed. Bull. Fac. Fish. Hokkaido Univ. 40(4): 203-213

Siti Nazatul Izura & Tan Kim Hooi. 2008. Shaping The Future of Cockle Industri in Malaysia. National Fisheries Symposium (NAFIS) 2008. Kuala Terengganu.

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Thank You