

Chapter 5

Conclusion and Discussion

In this chapter, the conclusions are presented and discussed. The research objectives are

- (a) to study the relation between salinity and water elevation in Pattani Bay, and
- (b) to develop a statistical model for predicting the salinity in Pattani Bay based on location and water elevation.

A cross-sectional study design is used to measure depth (water elevation) and salinity of the water collected by two boats at different locations on 22 occasions near the Pattani Bay mouth. Measurements were taken from each side of each boat. The data on salinity and the depth were collected in the middle of Pattani Bay approximately 5 kilometers from the Rusamilea jetty in the north-east direction on 30 July 1999. Each boat had 11 occasions to sample the water and measure the water depth. Six readers using three salinometer instruments measured the salinity in each of the 44 water samples, Thus we obtained 264 salinity samples. The response variable is salinity in parts per thousand. The determinants are depth in centimeters, time, latitude and longitude.

5.1 Conclusions

As reported in Chapter 3, the preliminary analysis showed that the depth varies with both time and location. The variation with time is due to the effect of the tide, while the variation with location is due to the fact that the Bay does not have a flat bottom. The minimum depth was measured as 120 centimeters, and the maximum depth was found to be 225 centimeters. The maximum tidal variation at any location was seen to be 75 centimeters. The salinity in Pattani Bay during the study period varied in the range of 19 to 29 ppt. Moreover, the salinity depends on occasion (time and location) and measuring instrument. One of the three salinometers used gave readings that were consistently higher, by 0.8 ppt, than the other two.

In Chapter 4 regression analysis was used to investigate linear trends for the outcome. The location is expressed in terms of latitude and longitude, but the result showed that there was only a relationship between salinity, latitude and depth. The slopes of the linear relations between salinity, time and longitude were not statistically significant, although slight negative relations were observed. Multiple regression models were fitted, thus taking account of all the explanatory variables.

The results showed that the full model comprised depth, time, latitude and longitude. The percentage of the variation accounted for by all four predictors was 57.79%. However, when we fitted a final model with longitude ($p=0.03$) removed, the percentage of the variation in the final model accounted for by the three remaining variables was reduced only slightly to 57.02%, with a residual standard deviation of 1.268. This regression model is relatively uncomplicated, and may be expressed as follows:

$$\text{Salinity (ppt)} = 15.4461 + 0.036 \text{ depth (cm)} + 0.386 \text{ time} + 1.7242 \text{ latitude}$$

5.2 Discussion

This study found that the salinity is determined by the water elevation in the Bay, time, and location (latitude) in the Bay. Salinity is strongly related to the water elevation as well as latitude in Pattani Bay. Because the six readers had shared the three instruments, the instrument three was read by reader five and six. The value of salinity measured by using the instrument three was different from those measured by the other two, as shown in Figure 3.19. This is possibly due to not well calibrated of the instrument three before use. As the salinity values were obtained by repeated measurement, the reliability of the data should be considered by using Generalized Estimating Equations or GEE (The GENMOD procedure, 2001:website).

This result, though limited to a relatively small region of the Bay during a very short period of time, is important, because of the lack of knowledge of the factors affecting salinity in Pattani Bay. Even though salinity has been measured routinely in the past, and has been investigated by a number of authors (see, for example, Arpharattanakhun, 1998), their precise determinants are still largely unknown. Although Khokiattiwong et al (1991), Nelson et al (1994) and Panutrakul (1996) have

recently studied the distribution of salinity in other locations in the Malay peninsula (Phang Nga Bay, Selangor and Klang estuaries, and Phuket Bay, respectively), these determinants remain inconclusive.

The most intensive data collection exercise involving salinity undertaken in Pattani Bay was carried out on successive weekends in May and June 1996 over two periods of 25 hours at six locations (see Srichai et al, 2001). Figure 5.1 shows a graph of these salinity measurements plotted against water elevation (using a relative rather than an absolute scale) at the location closest to the region in the Bay covered the present study. Note that these results are inconclusive, undoubtedly due to poor measurements of salinity. (Note the high variability in the salinity measurements, even after several unbelievable observations were excluded.) However, the measurements on salinity taken during the May period are consistent with the results of the present study.

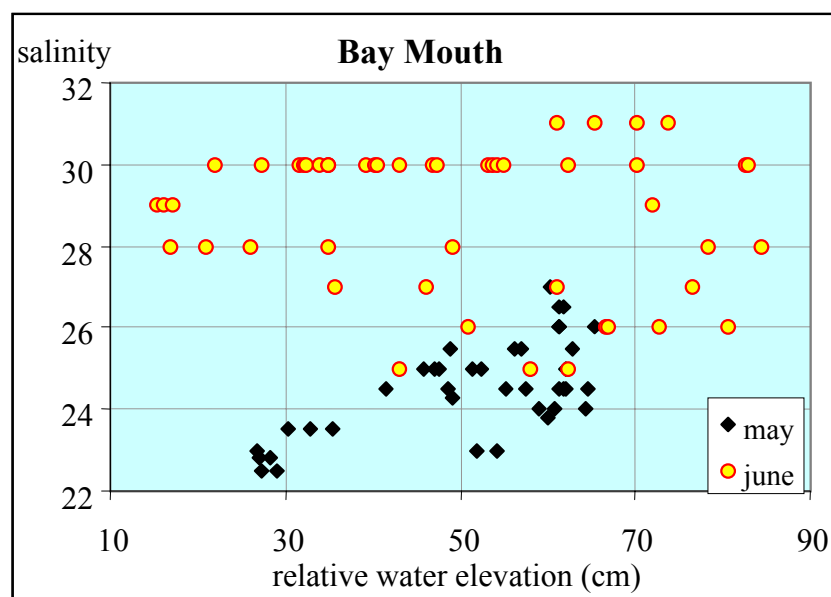


Figure 5.1: Salinity data collected by Srichai et al (2001)

5.3 Limitations

There were a number of limitations in our study, as follows.

1. Measurement of salinity was taken on a single day within a relatively small area near the mouth of the Bay. It would be better to conduct the measurement over one month period at different season, in different tide period (7-9 am, 1-3 pm, 4-9 pm) and at different locations parallel to the coast line.
2. Not taking into account the flow of the water into the Bay (discharge) reduces the relevant information.
3. It would be useful to conduct the measurement on other related basic physical variables, including water movements (level and its rate of change, and currents speed), and water temperature.