Chapter 3

Preliminary Data Analysis

This chapter reported the preliminary analysis based on quantities of the blue swimming crab collected each month from the Songkhla Lake ports from 2003 to 2006. In the first Section we showed description of variables used in this study. In Section 3.2 we showed time series plot of the blue swimming crab monthly catches. The distributions of the blue swimming crab catch weight were investigated in Section 3.3. In Section 3.4 we compared the catch weight by gear, month and year. Then we showed time series plot of environmental factors in Section 3.5. The relationship between catch weights and environmental factors were explored in the last section.

3.1 Descriptions of variables

The blue swimming crab catch data were recorded by month, year and gear type used. There were four years from 2003 to 2006, 48 months and three types of gear used as shown in Table 3.1.

Variables	Description
Year	2003, 2004, 2005, 2006
Month	January, February, March, April, May, June, July, August, September, October, November, December
Gear	Trap, Set bag net, Gill net
Air temperature	Average monthly air temperature from January 2003- December 2006
Morning air temperature	Average monthly morning air temperature from January 2003- December 2006
Rainfall	Total monthly rainfall from January 2003- December 2006

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Variables	Description
Relative humidity	Average monthly relative humidity from January 2003- December 2006
Water level	Average monthly water level from January 2003- December 2006

Table 3.1: Study variables

3.2 Time series plot of catch weight

A time series is sequence of observations observed over time, usually at regular intervals. There was 48 month-year records of blue swimming catch from 2003 to 2006. The time series plot of monthly catch weights of blue swimming crab was shown in Figure 3.1. The catch has similar pattern in each year with high values in March with maximum was 31,989.93 kilogram, observed on March 2005. The minimum quantity was 121.6 kilogram, observed on December 2006. Overall catch in 2005 was higher than other years.

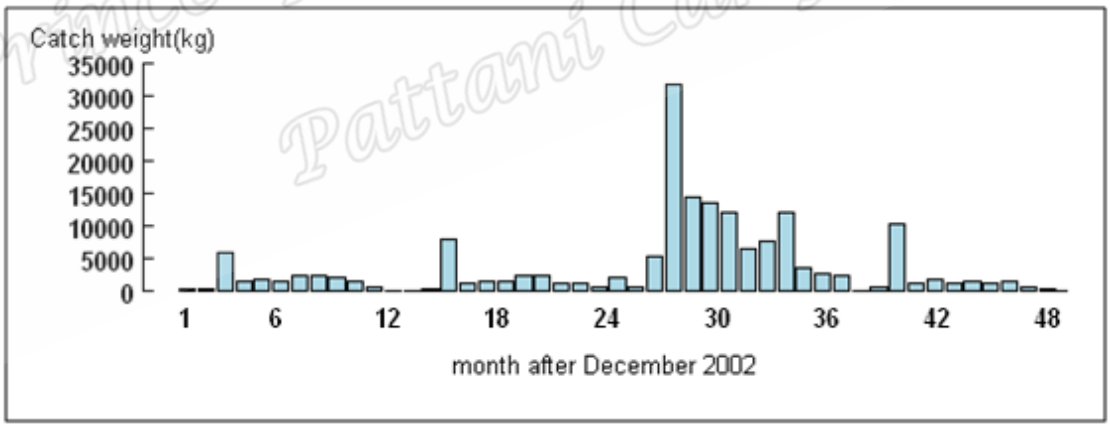

Figure 3.1: Blue swimming crab landed at Songkhla Lake ports during 2003-2006

Figure 3.2 shows plots of monthly catch weight separated by gear types. The catch by trap and gill net had similar pattern. They steadily increased from January and peak around June to August and then steadily decreased to the end of the year. The maximum catch by trap was 2,432 kilogram in June 2005 and the minimum catch was 3.47 kilogram in December

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2006. The maximum catch by gill net was 2,432 kilogram in June 2005 and the minimum catch was 11.58 kilogram in December 2006.

The pattern of catch by set bag net was similar to the pattern of total catch shown in Figure 3.1. The maximum catch by set bag net was 31,190 kilogram in March and the minimum catch was 100.7 kilogram in December 2006.

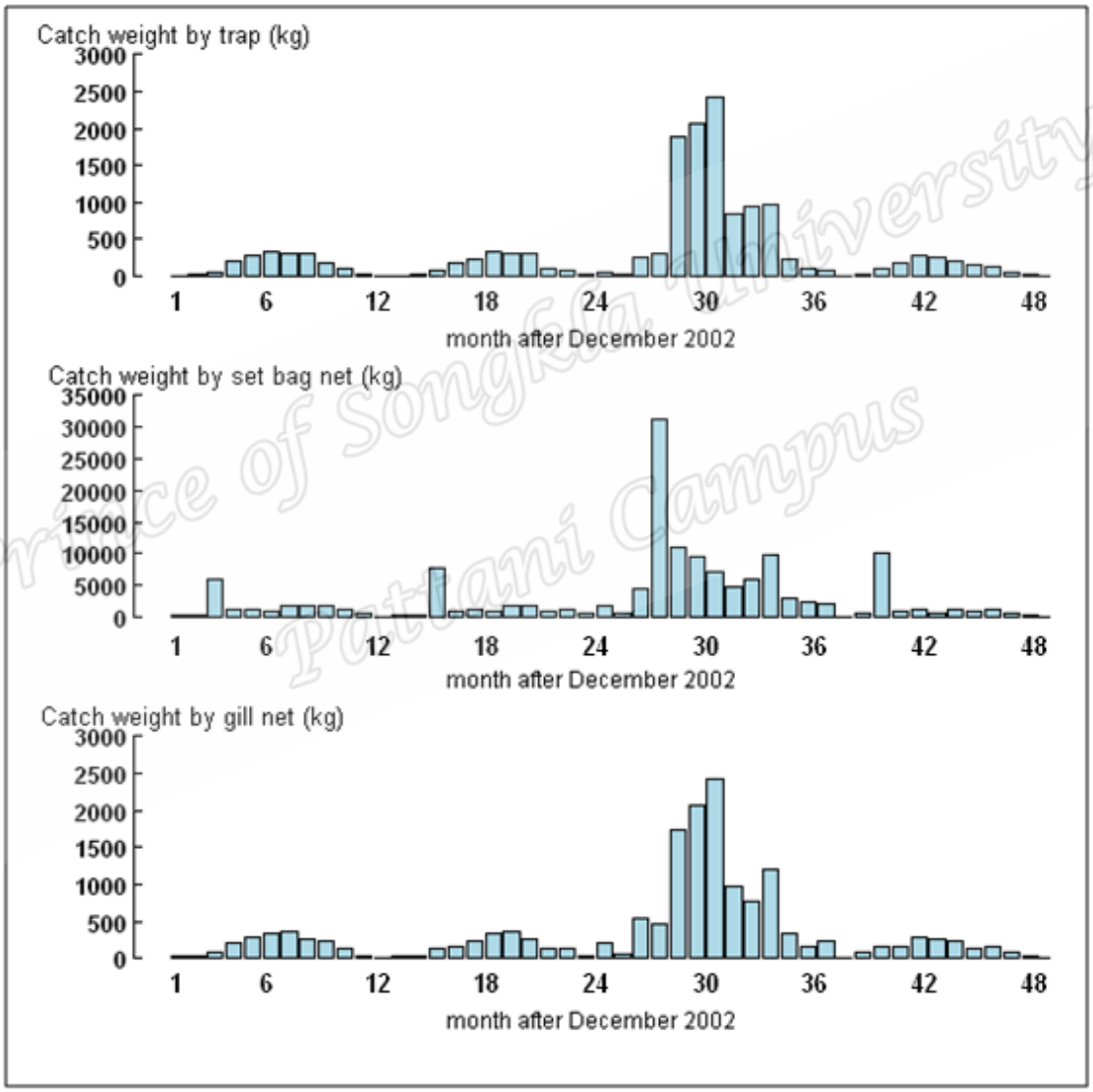

Figure 3.2: Blue swimming crab landed at Songkhla Lake ports during 2003-2006 using trap, set bag net and gill net

3.3 Distributions of the blue swimming crab catch

Data for analysis were the catch weight in kilogram of 48 month-year records from 2003 to 2006 with three gear types comprising 144 observations. Figure 3.3 shows histograms of catch weight before and after transformation. The data transformation aimed to reduce the skewness. In our case we took natural logarithm of the blue swimming crab catch weight. The skewness coefficient for the blue swimming crab catch was 6.31 before transformation and it reduced to -0.03 after transformation.

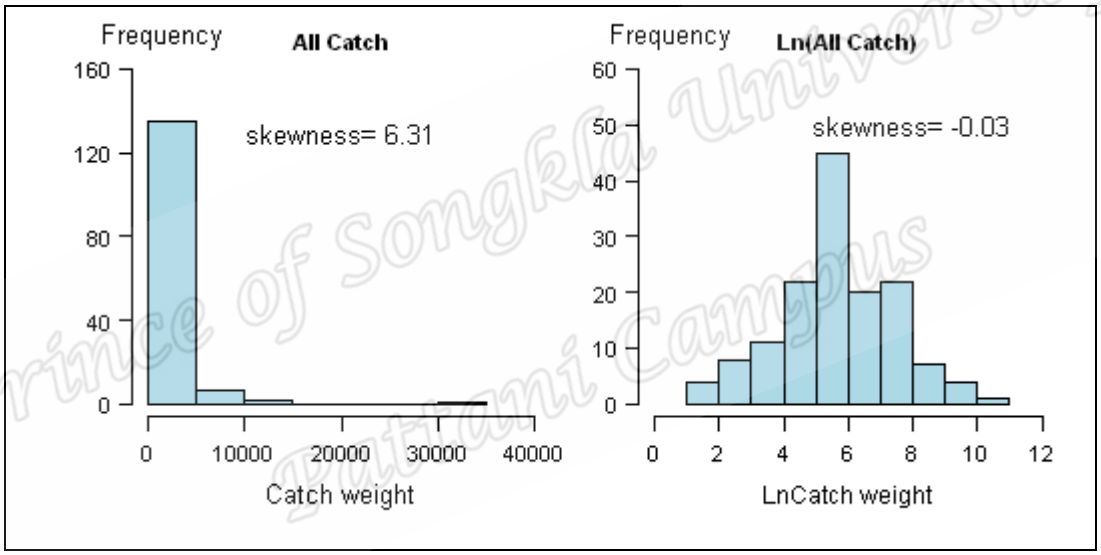

Figure 3.3: Histogram of blue swimming crab catch before and after transformation

Figure 3.4 shows histograms of catch weight separated by gears before and after transformation. The skewness coefficients before transformation were 2.75, 3.71 and 2.65 for the catches by trap, set bag net and gill net, respectively and they reduced to -0.34, 0.97 and -0.07 after transformation. Further statistical analysis was based on natural logarithms of the catch weight.

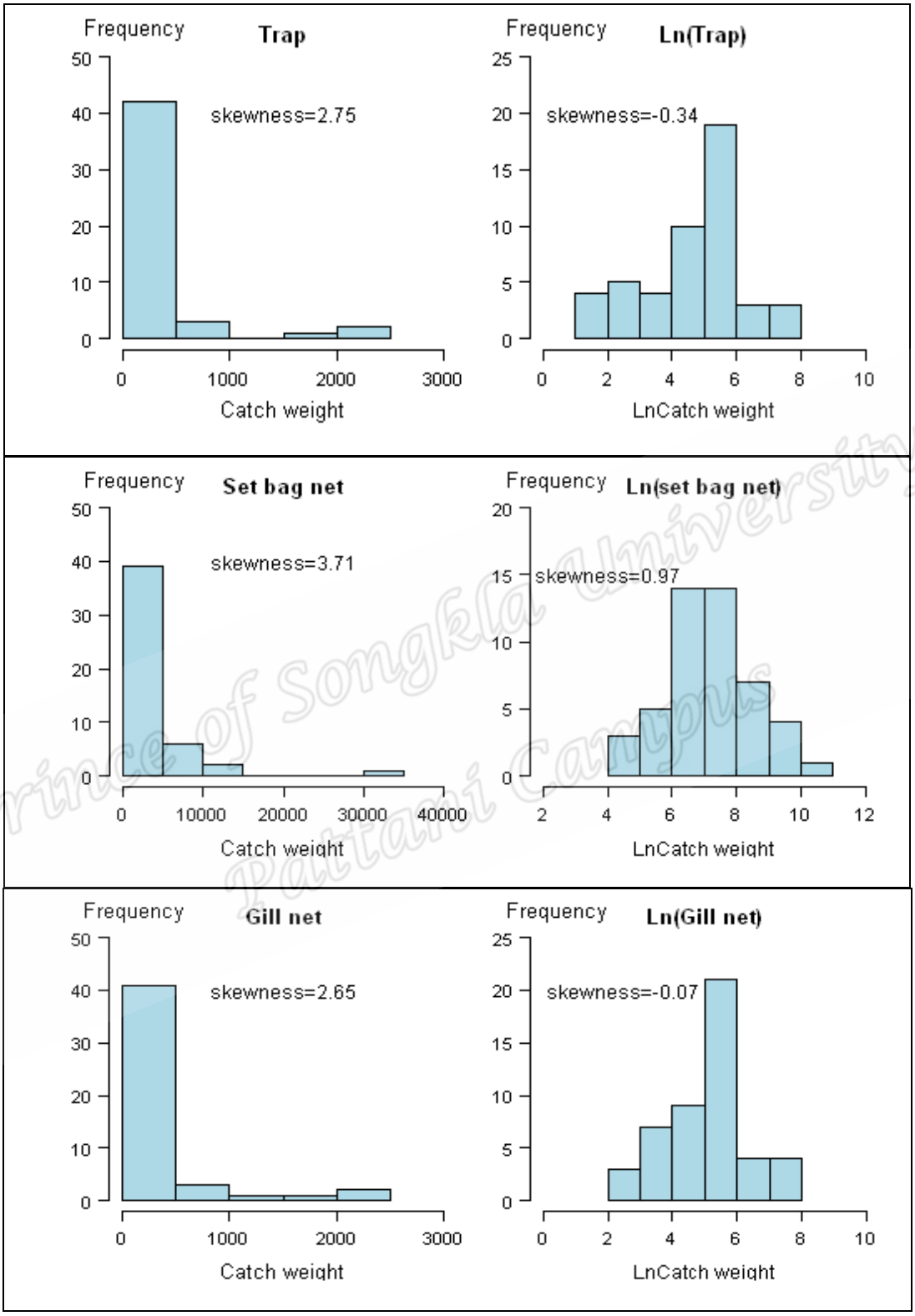

Figure 3.4: Histogram of blue swimming crab catch by trap, set bag net and gill net before and after transformation

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3.4 Box plots of the blue swimming crab catch

In this section we compared the blue swimming crab catch with respect to the gear type used, month of the year and year.

Figure 3.5 shows box plots of natural logarithm of blue swimming crab catch by gears (left panel), year (middle panel) and month (right panel). The codes for gears were 1 for trap, 2 for set bag net, and 3 for gill net. The catch by set bag net was higher than those by trap and gill net. The catch in 2005 had higher than other years. The pattern of catch with respect to month showed that the catch increased from January (coded as 1) to middle of the year and then decreased to the end of the year.

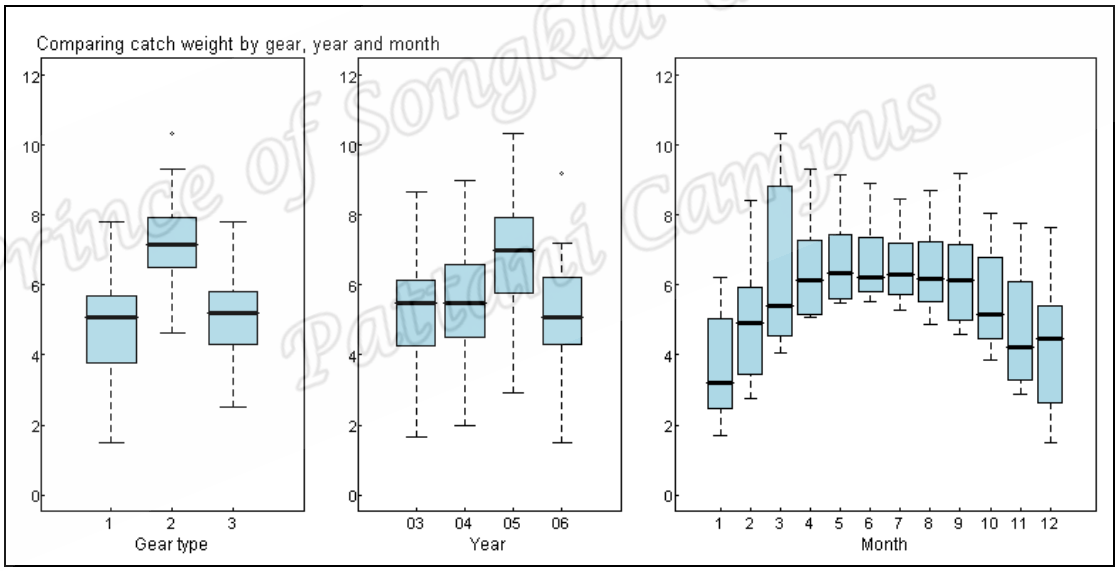

Figure 3.5: Boxplot of the natural log transformed value of the catch separated by gear type, year and month

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3.5 Descriptive statistics and time series plot of the environmental factors

The environmental factors in this study were collected from Southeastern Regional Meteorological Center during 2003-2006. The environmental factors were average air temperatures, morning air temperature, rainfall, relative humidity and water level. The water level was collected from Hydrographic Department Royal Thai Navy.

Table 3.2 shows descriptive statistics (mean, minimum and maximum) of these environmental factors. The mean of four year average monthly air temperature was 27.95 degree celsius and the mean of average morning air temperature was 25.13 degree. The mean of average relative humidity was 77.83 percent. The mean of average water level was 1.05 meter from mean sea - level. The mean of average rainfall was 176.20 millimeters.

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Environmental factors	Minimum	Mean	Maximum
Temperature (Celsius)	25.67	27.95	29.57
Morning Temperature (Celsius)	23.41	25.13	26.35
Humidity (Percent)	71.00	77.83	89.00
Water level (Meter)	0.71	1.05	1.47
Rainfall (Millimeter)	3.10	176.22	1215.00

Table 3.2: Descriptive statistics for environmental factors during 2003-2006

The time series plot of average monthly air temperature and morning air temperature during study period from 2003 to 2006 is shown in Figure 3.6. The average temperature shows peak around 29 degrees celsius in April every year. The morning air temperature shows similar pattern to the average temperature.

The time series plot of monthly relative humidity was shown in Figure 3.7. The monthly relative humidity shows peak around 83 to 89 percent from October to December every year.

The average of monthly water level was shown in Figure 3.8. The water- level shows peak around 1.28 to 1.47 meters, occurred in December and January in the next year.

And the time series plot of total monthly rainfall was shown in Figure 3.9. The monthly rainfall shows peak around 1, 215 millimeters in December 2005.

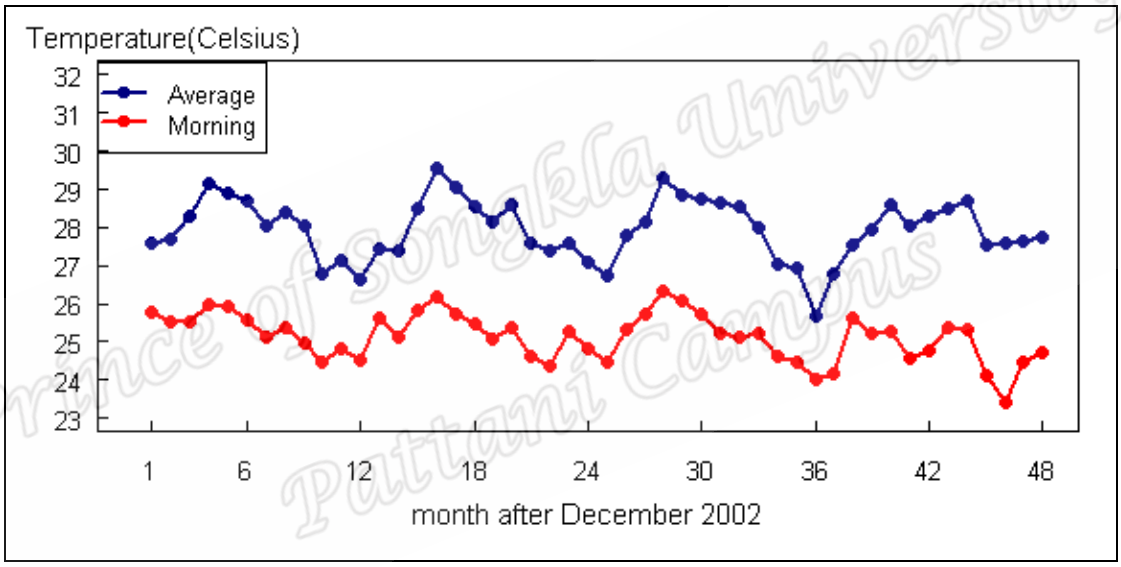

Figure 3.6: Average and morning air temperature range during 2003-2006

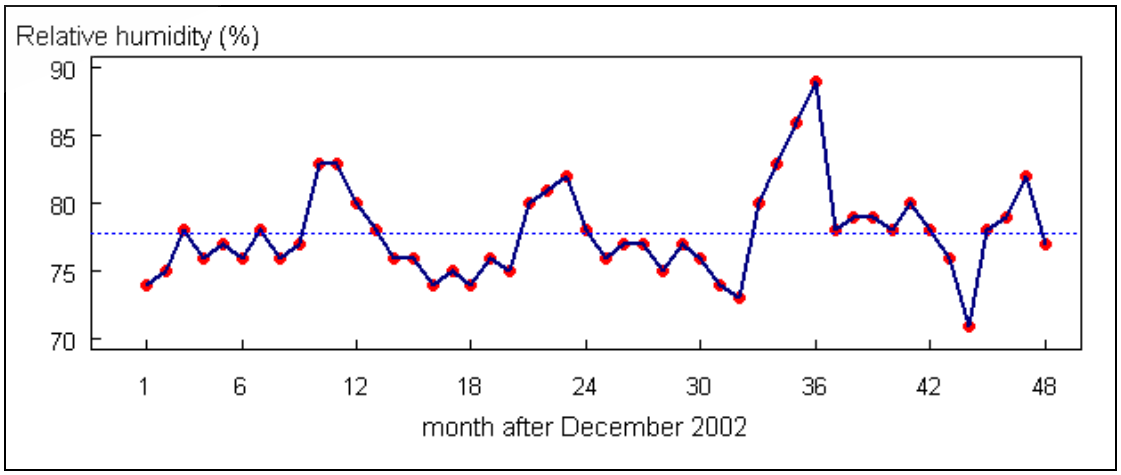

Figure 3.7: Relative humidity ranges during 2003-2006

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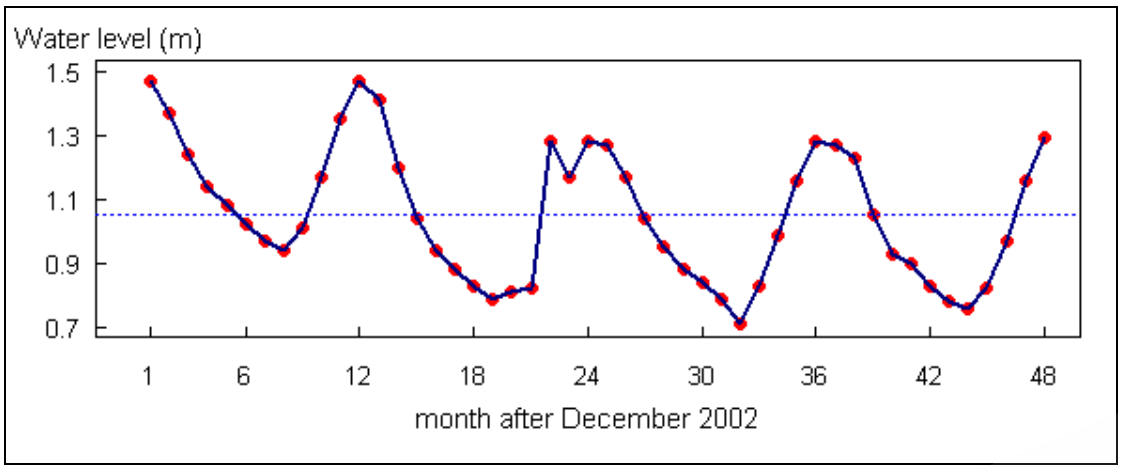

Figure 3.8: Water level ranges during 2003-2006

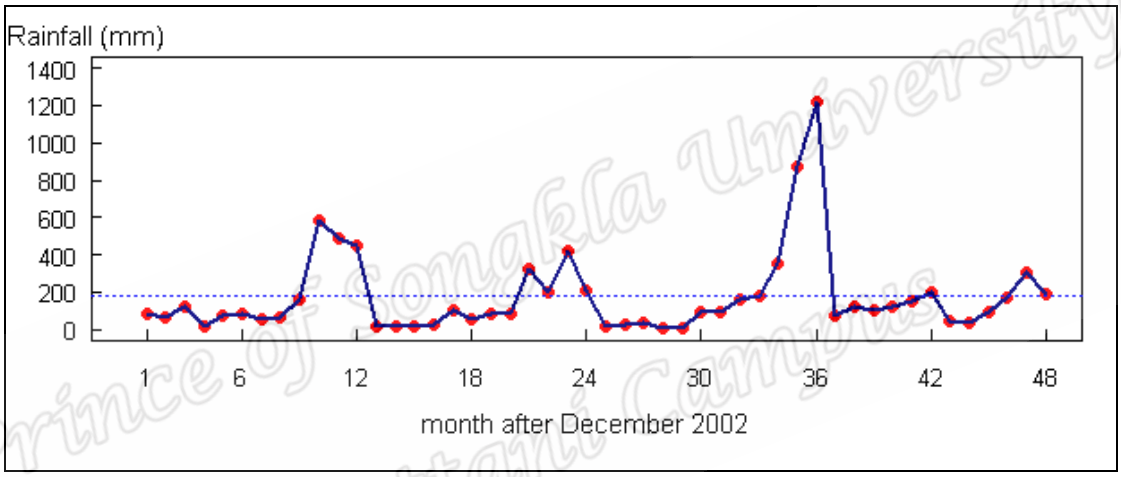

Figure 3.9: Rainfall ranges during 2003-2006

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3.6 Relationship between catch weight and environmental factors

In this section we show the environmental factors related to catch weight using simple linear regression. The r-squared and normal quantiles plots were obtained from the analysis.

Figure 3.10 and Figure 3.11 show scatter plots of natural logarithm of catch weight with average air temperature and morning air temperature. There were positive relation between catch weight and both temperature measurements with p-values less then 0.001. The r-squared for average air temperature and morning air temperature were 15.7% and 8.0%, respectively.

Figures 3.12 shows a scatter plot of natural logarithm of catch weight and relative humidity. The p-value for catch weight and relative humidity was 0.135 and the r-squared is 1.6%.

Figure 3.13 shows a scatter plot of natural logarithm of catch weight and water level. There was negative relation between catch weight and water level with p-value less than 0.001 and the r-squared was 27.7%.

Figure 3.14 shows a scatter plot of natural logarithm of catch weight and rainfall. There is negative relation between catch weight and rainfall with p-value less than 0.001 and the r-squared is 1.1%.

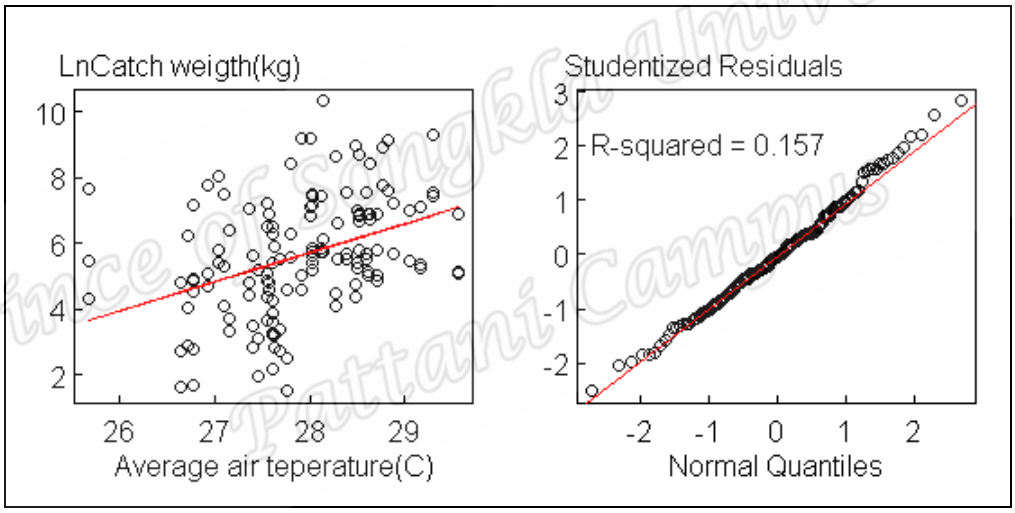

Figure 3.10: Relationship between catch weight and average air temperature

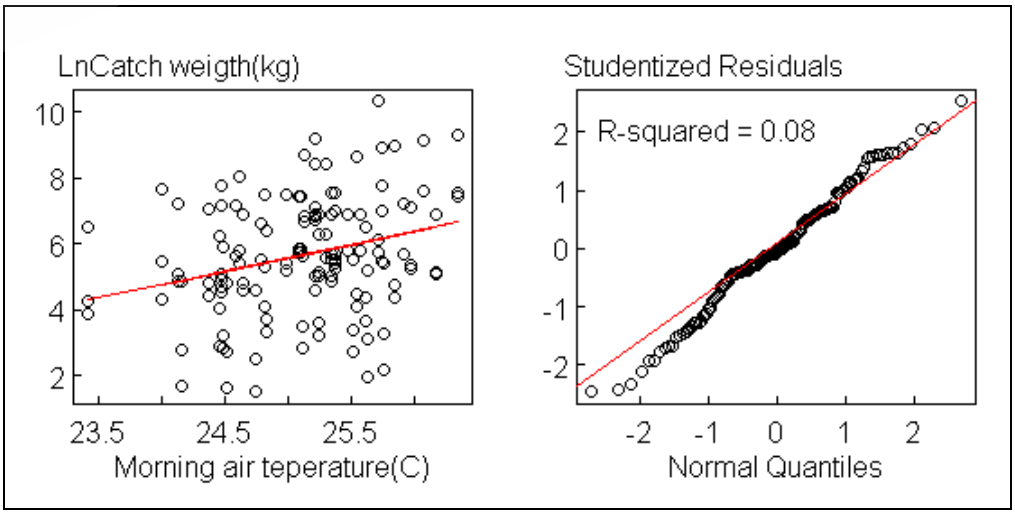

Figure 3.11: Relationship between catch weight and morning air temperature

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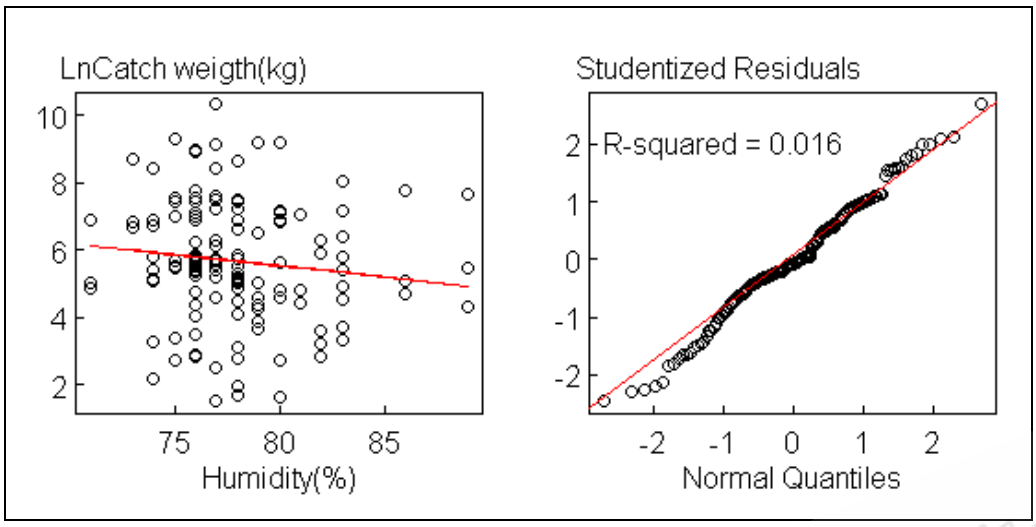

Figure 3.12: Relationship between catch weight and relative humidity

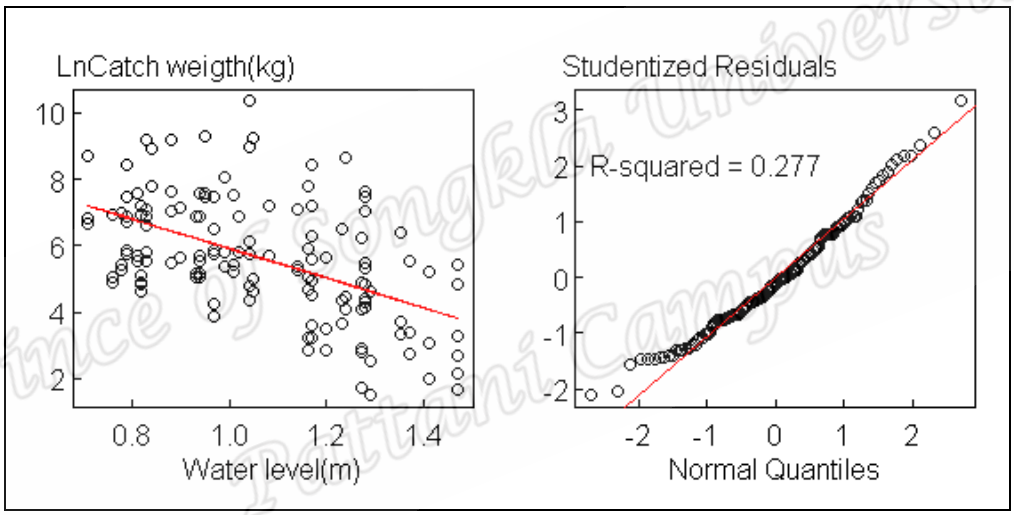

Figure 3.13: Relationship between catch weight and water level

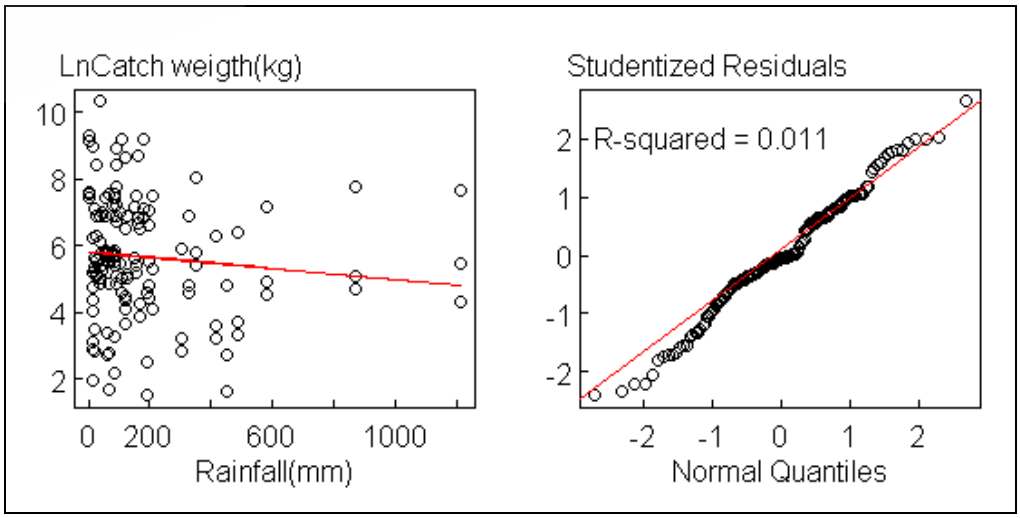

Figure 3.14: Relationship between catch weight and rainfall

Next we show correlation coefficients among environmental factors in Table 3.3. The humidity had high correlation coefficients with rainfall (r = 0.846) and average air temperature (r = -0.709). The correlation coefficient between air temperature and morning air temperature was also high r = 0.751.

Temperature	1.000				
MorningTemp	0.751	1.000			
Humidity	-0.709	-0.582	1.000		
Water level	-0.612	-0.160	0.369	1.000	
Rainfall	-0.655	-0.532	0.846	0.283	1.000
	Temperature	MorningTemp	Humidity	Water level	Rainfall

Table 3.3: Correlation coefficient of environmental factors

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