

## Chapter 6

### Relationship between birds and environmental factors

#### Diversity of Birds and Environmental Factors

Four environmental factors, i.e. temperature, precipitation, humidity and day-length were used to predict diversity of birds. Multi-correlation analyses were used in this thesis.

Coefficients of multi-correlation between environmental factors and numbers of species and numbers of birds are presented in Table 6.1.

**Table 6.1 Coefficients of multi-correlation in 4 different habitats.**

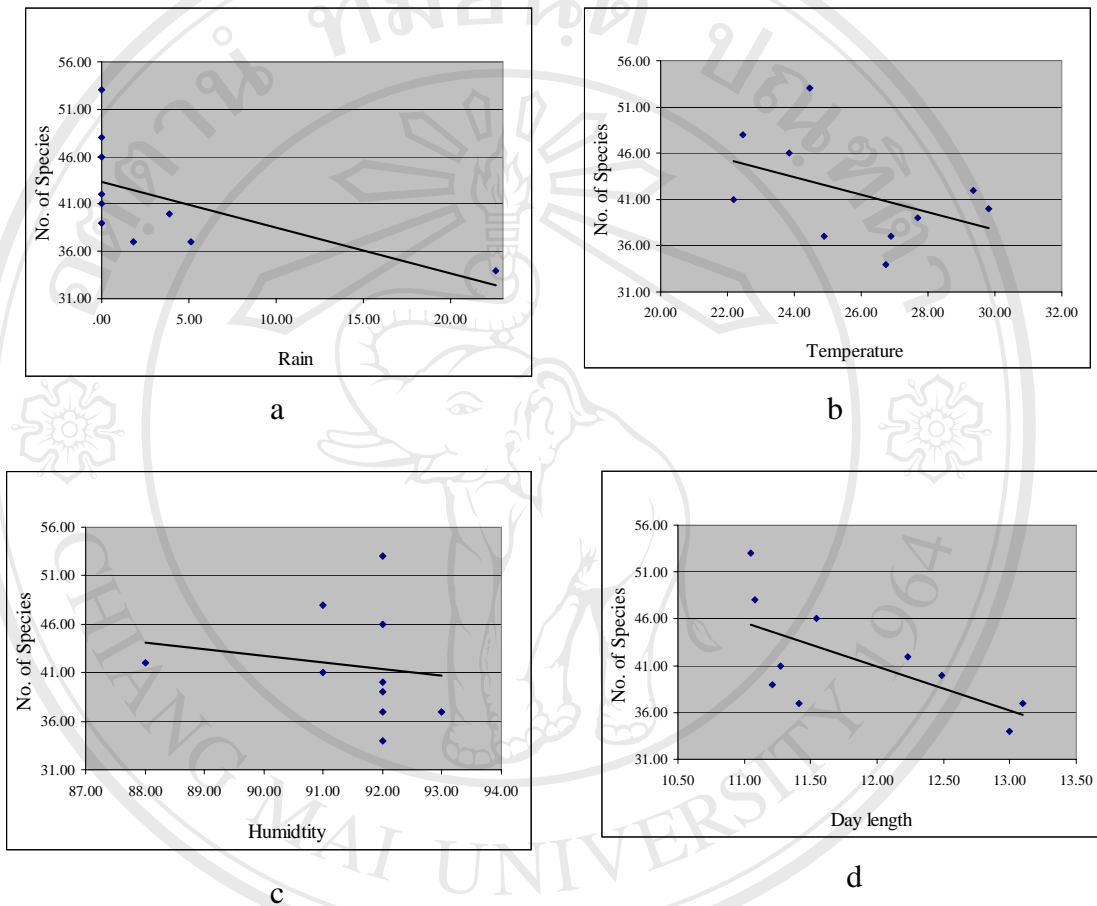
Forest types	Multi-correlation coefficients	
	No. of species	No. of birds
GL	0.706	0.842
DF	0.556	0.717
DDF	0.731	0.801
DEF	0.638	0.417

Environmental factors (temperature, precipitation, humidity and day-length) were positively correlated to numbers of species and number of birds in every habitat. However, GL was the habitat where species of birds was more dependent on environmental factors than other habitats.

Environmental factors were individually used to predict numbers of species in each habitat. A practical and computerized statistic program SPSS version 9.1 was

employed to calculate regression analysis from species of birds in each study area with environmental factors. The following are results of calculation:

**1. Relationship between birds and environmental factors in GL**



**Figure 20** Relationship between species of birds and environmental factors in GL

No. Species =  $42.3032 - 1.3488 \text{ Rain}$ ,  $R^2 = 0.487$ ,  $p = 0.012$ .....(1)

No. Species =  $877.439 - 64.351 \text{ Temperature} + 1.2181$ ,  $R^2 = 0.195$ ,  $p = 0.376$ .....(2)

No. Species =  $-8130.7 + 3.0282 \text{ Humidity}^2 - 0.0224 \text{ Humidity}^3$ ,  $R^2 = 0.849$ ,  $p < 0.001$ .....(3)

No. Species =  $3203.26 - 520.02 \text{ Daylength} + 21.2513 \text{ Daylength}^2$ ,  $R^2 = 0.404$ ,  $p = 0.097$ ....(4)

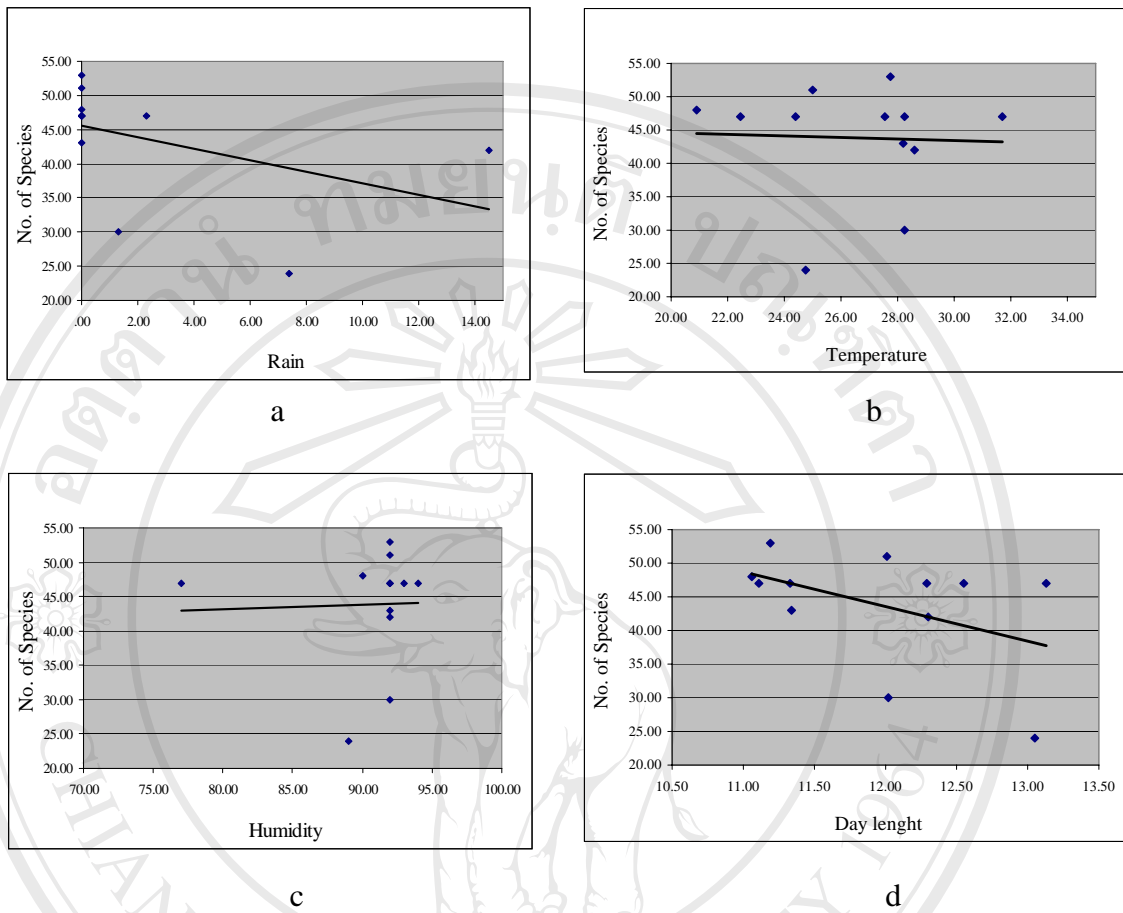
Figure 20 can explain the relationship between species of birds and environmental factors in GL at probability of 95%. The number of species was significantly correlated to rainfall and humidity (Figure 6.1a). The coefficients of determination of humidity made this equation 84.9% ( $R^2=0.849$ ), higher than coefficients of determination of rainfall at 48.7% ( $R^2=0.487$ ). The relationship can be elucidated from these equations.

1.1 From (1) species of birds in GL has a negative correlation with rainfall. That is to say that if quantity of rainfall decreases the number of bird species increases. Or the other way, if quantity of rainfall increases the number of bird species decreases. This correlation with rainfall volume explained 48.7% and this situation occurred 99.8 times in 100.

1.2 From equation (3), species of birds in GL has a positive correlation with humidity. When humidity increases, species of birds increase and then when humidity decreases species of birds decrease. This correlation with humidity explained 84.9% and this situation occurred 99 times in 100.

1.3 Temperature and day length were not statistically related to species of birds in GL in equations (2) and (4).

**2. Relationship between birds and environmental factors in DF**



**Figure 21** Relationship between species of birds and environmental factors in DF

No. Species = 47.5930 - 5.5553Rain + 0.3550Rain<sup>2</sup>, R<sup>2</sup> = 0.629, p = 0.012.....(5)

No. Species = 165.179 - 9.3126Temperature + 0.1765Temperature<sup>2</sup>, R<sup>2</sup> = 0.047, p = 0.806....(6)

No. Species = 1755.74 - 40.616Humidity + 0.2392Humidity<sup>2</sup>, R<sup>2</sup> = 0.228, p = 0.313....(7)

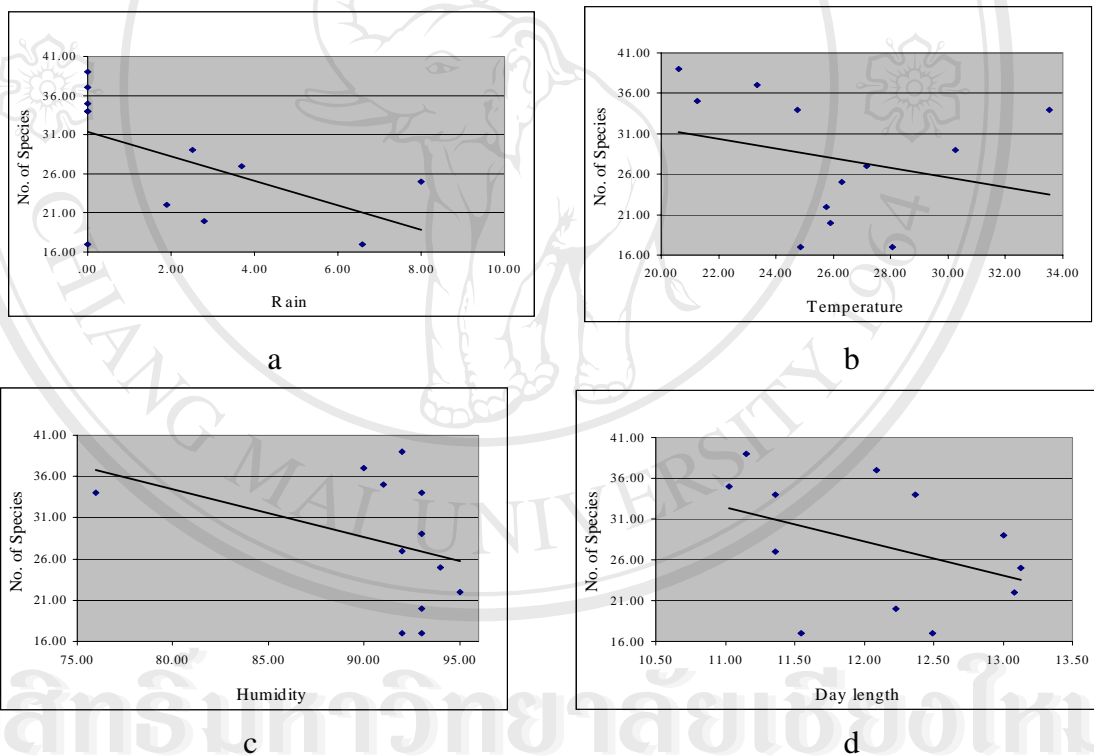
Ln (No. Species) = 5.4651 - 0.1428 Day length, R<sup>2</sup> = 0.206, p = 0.137..... (8)

Figure 21 can explain relationships between species of birds and environmental factors found in DF at probability 95%. The species of birds were significantly correlated with rainfall. The coefficients of determination of rainfall made this equation 62.90% (R<sup>2</sup> = 0.629). The relationships can be elucidated from the equations.

2.1 In equation (5) species of birds in DF has a negative correlation with rainfall. That is to say if quantity of rainfall decreases species of birds increase. On the other hand, if quantity of rainfall increases species of birds decrease. This correlation with rainfall volume explained 62.90% and this situation occurred 88 times in 100.

2.2 Temperature, humidity and day length did not significantly affect diversity of birds in DF in equations (6), (7) and (8).

**3. Relationship between birds and environmental factors in DDF**



**Figure 22** Relationship between species of birds and environmental factors in DDF

No. Species = 31.2992 - 1.5526Rain,  $R^2=0.302$ ,  $p=0.064$ .....(9)

No. Species = 280.854 - 18.617Temperature + 0.3361Temperature<sup>2</sup>,  $R^2=0.564$ ,  $p=0.024$ .(10)

No. Species = -1032.1 + 25.8701Humidity - 0.1558Humidity<sup>2</sup>,  $R^2=0.304$ ,  $p=0.196$ ...(11)

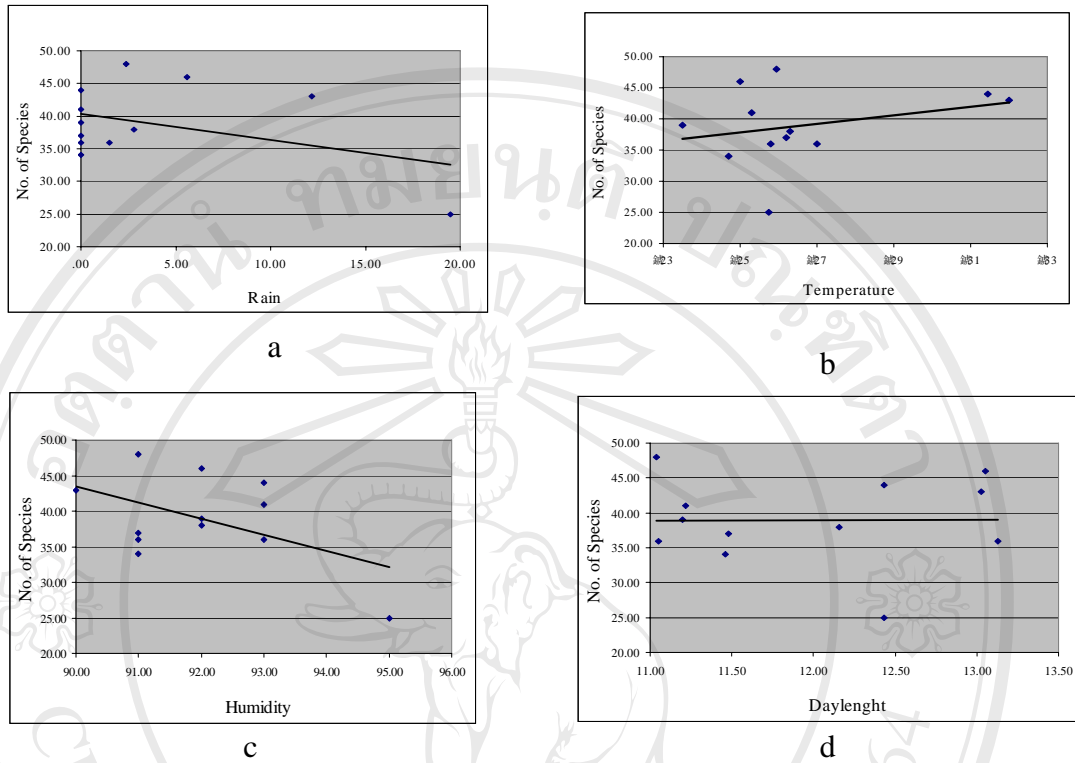
No. Species = -24.198 + 627.695Daylength,  $R^2=0.179$ ,  $p=0.170$ ..... (12)

Figure 22 can explain the relationship between species of birds and environmental factors found in DDF at probability 95%. The species of birds were significantly affected by temperature. The coefficients of determination of temperature made this equation 56.40% ( $R^2=0.564$ ). The relationship can be elucidated from equations.

3.1 From equation (10), species of birds in DDF had a negative correlation with temperature. That is to say that if temperature decreases species of birds increase. On the other hand if temperature increases species of birds decrease. This correlation with rainfall volume explained 56.40% and this situation occurred 86 times in 100.

3.2 The rainfall, humidity and day length did not significantly affect species of birds in DDF in equations (9), (11) and (12).

**4. Relationship between birds and environmental factors in DEF**



**Figure 23** Relationship between species of birds and environmental factors in DEF

No. Species =  $-38.0620 + 2.0539\text{Rain} - 0.1390\text{Rain}^2$ ,  $R^2 = 0.649$ ,  $p = 0.009$ ..... (13)

No. Species =  $20.5906 + 0.6895\text{Temperature}$ ,  $R^2 = 0.082$ ,  $p = 0.367$ ..... (14)

$\text{Ln}(\text{No. Species}) = 9.9805 - 0.0688\text{Humidity}$ ,  $R^2 = 0.290$ ,  $p = 0.071$ ..... (15)

No. Species =  $946.127 - 154.04\text{Daylength} + 6.3841\text{Daylength}^2$ ,  $R^2 = 0.180$ ,  $p = 0.409$ ..... (16)

Figure 23 can explain the relationship between species of birds and environmental factors found in DEF at probability 95%. The species of birds were significantly related with rainfall. The coefficients of determination of rainfall made this equation 64.90% ( $R^2 = 0.649$ ). This relationship can be elucidated by the equations.

1. In equation (13) species of birds in DDF have a positive correlation with rainfall. That is to say if rainfall decreases species of birds also decrease. On the other hand if rainfall increases species of birds increase. This correlation with rainfall volume explained 64.90% and this situation occurred 99.1 times in 100.

2. The temperature, humidity and day length did not significantly correlate with species of birds in DEF in equations (14), (15) and (16).



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