

## 2. STUDY AREAS

### 2.1 The study areas

There were more than 640,000 km<sup>2</sup> of peat swamp areas in Thailand. Most of them distribute in southern and some in eastern Thailand. In the past, there were 647,071.95 km<sup>2</sup> scattering in Narathiwat, Suratthani, Trang, Nakhonratchasima, Pattani, Yala, Songkhla, Phangnga, Chumphon, Phuket and Krabi provinces. The biggest Thai peat swamp was in Narathiwat (453,360 km<sup>2</sup>), but, due to the anthropogenic disturbances, this area had been decreased to 80,000 km<sup>2</sup> in 1985 and 16,000 km<sup>2</sup> in 1991. This showed high average rate of peat land decreasing at 9,600 km<sup>2</sup> per year. Another well known Thai peat land is Ban-Mai-Khao peat swamp in Phuket province, which is now greatly breaking down and is being destroyed by several anthropogenic activities. Therefore, in order to investigate the effect of disturbances on the biodiversity in peat swamps, this research was carried out in Ban-Mai-Khao peat swamp.

(see:[http://www.wildlifefund.or.th/07\\_Habitats/03\\_peatswam\\_forest/peatswam\\_forest00.html](http://www.wildlifefund.or.th/07_Habitats/03_peatswam_forest/peatswam_forest00.html) and <http://www.zyworld.com/NAKARIN/HTMLbirdhabitat.htm#peat>)

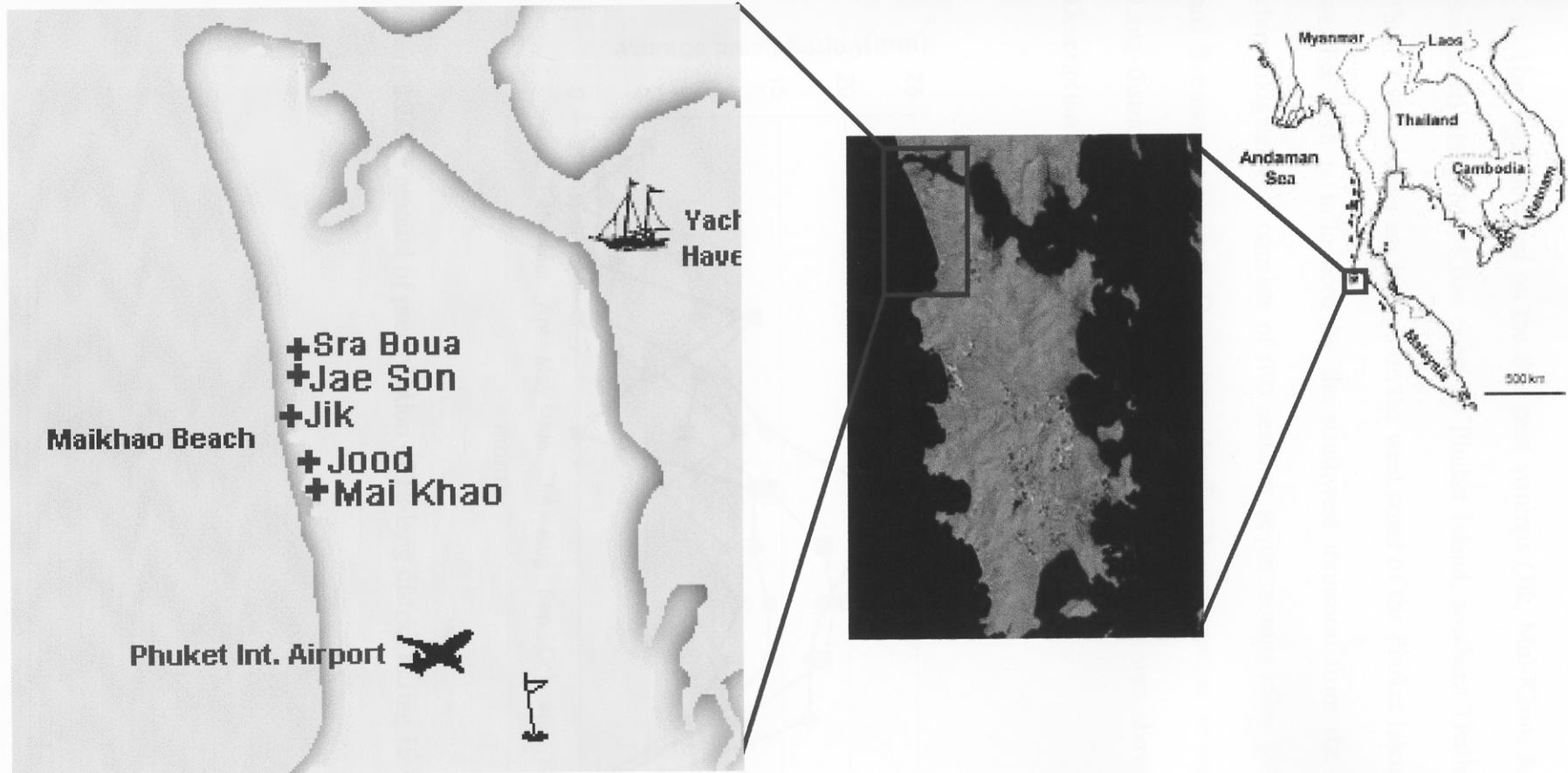


Figure 2.1 Map of Thailand showing the location of five coastal peat swamps (Mai-Khao, Jood, Jik, Jae-Son and Sra-Boua) along Maikhao beach on Phuket Island, southern Thailand.

This work focused on the five peat swamps (Jik, Mai-Khao, Jood, Jae-Son and Sra-Boua) along Mai-Khao coast on Phuket Island, southern Thailand (Figure 2.1). These five swamps are located on the west coast of the Phuket Island, Thailand. The weather here is influenced by the southwest monsoon from the India Ocean. A climatological year consists of two seasons, seven months rainy (May – November) and five months summer (December - April). The information on precipitation of Ta-Lang district of Phuket province during 1995 – 1999 was shown in Figure 2.2. Description of all peat swamps are following.

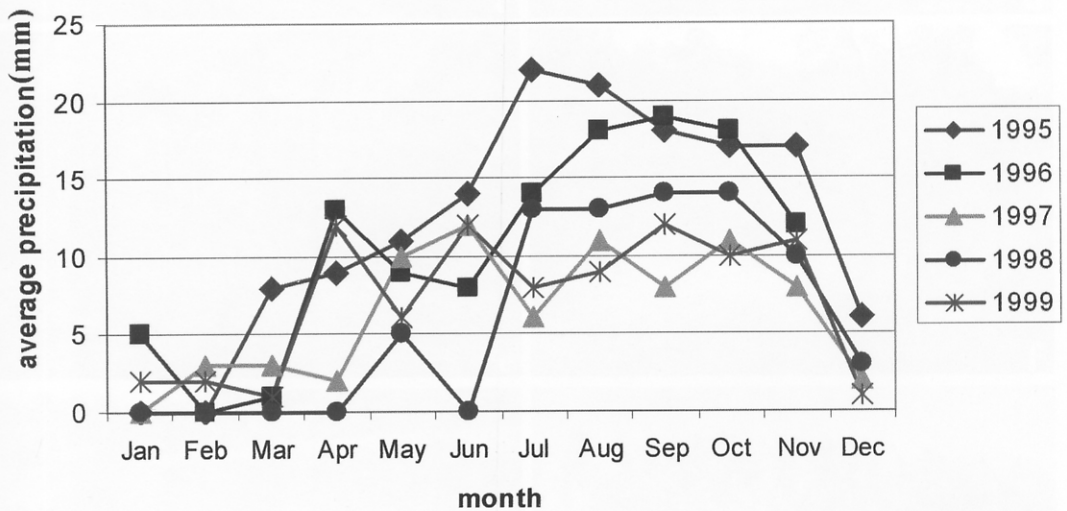


Figure 2.2 The amount of precipitation of Ta-lang district during 1995-2000.

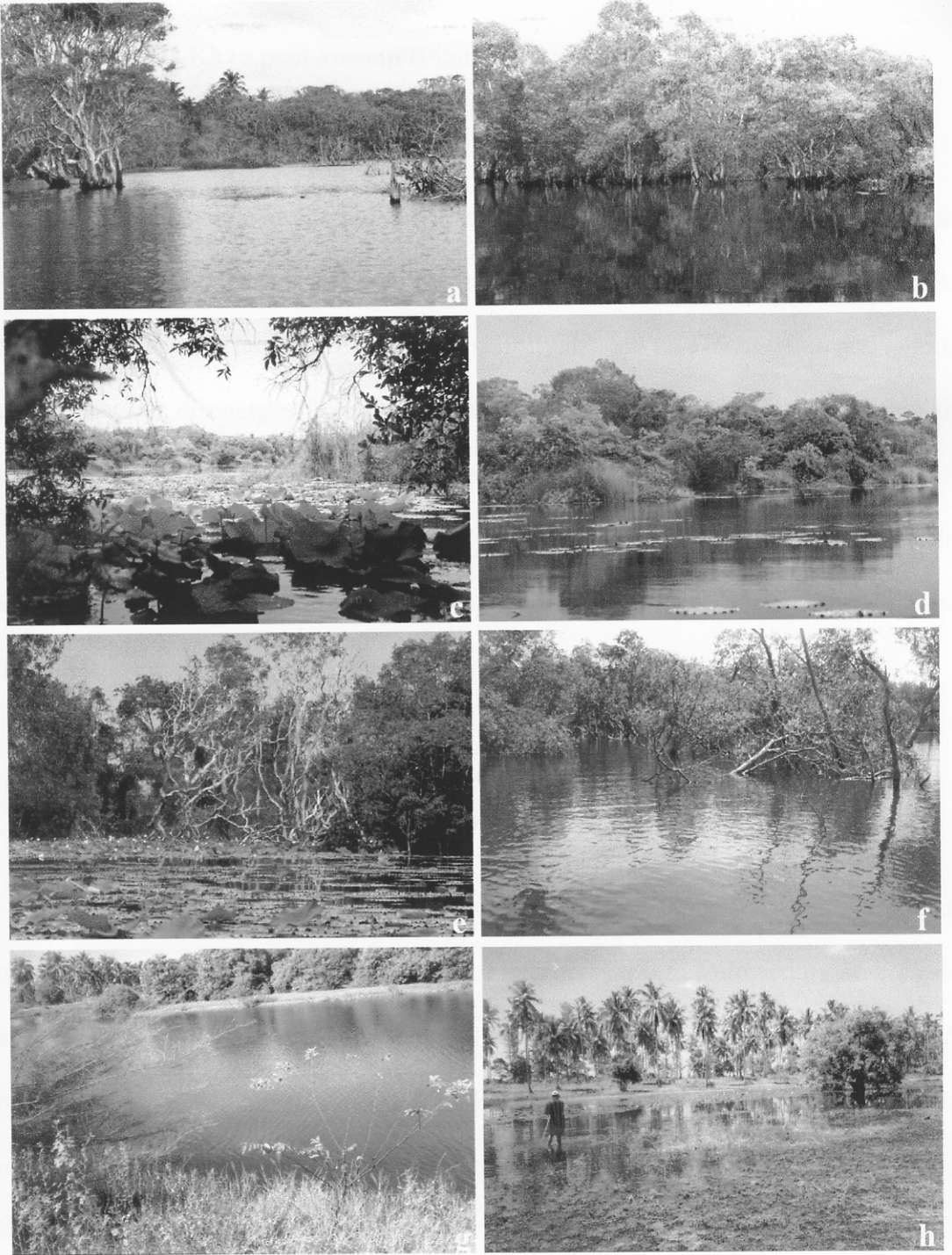


Figure 2.3 Coastal peat swamp areas along Mai-Khao beach in Phuket province, southern Thailand (a: Mai-Khao, b: Jood, c, d, e: Jik, f, g: Jae-son, h: Sra-Boua).

### 2.1.1 Mai-Khao peat swamp (Figure 2.3a)

Location: (8° 07.21'N - 8° 07.40'N, 98° 17.34'E - 98° 17.44'E)

This peat swamp has an area of 64 m<sup>2</sup>. The dominant vegetation are *Melaleuca cajuputi* Powell followed by *Scolopia macrophylla* (Wright and Am.) Clos. Water was brownish in color. Acidity and salinity depend on precipitation and amount of saline water discharges from shrimp farms, which are located nearby. During the summer season, the water dried away especially at the edges, but still remained in the center of the swamp. Nowadays, there is a saline water effect on vegetation in this area and result as *M. cajuputi* Powell, *Nymphoides indicum* Kuntze and littoral grasses have disappeared.

### 2.1.2 Jood peat swamp (Figure 2.3b)

Location: (8° 07.65'N - 8° 07.75'N, 98° 18.21'E - 98° 18.29'E)

Another disturbed peat swamp by shrimp farms has an area of 80 m<sup>2</sup> of land. The dominant vegetation was *Fucus microcarpa* L.f., followed by *M. cajuputi* and *S. macrophylla*. Some of the water is cover by *Eichhornia crassipes* Solms, *N. indicum* Kuntze and *Ottelia alismoides* Pers.. Acidity and salinity depend on the precipitation and the amount of saline water release from shrimp farms, as in Mai-Khao peat swamp. The open water area in this peat swamp fragments into small water bodies during the dry season.

### 2.1.3 Jik peat swamp (Figure 2.3c, 2.3d and 2.3 e)

Location: (8° 08.62'N - 8° 07.77'N, 98° 18.33'E - 98° 18.40'E)

This peat swamp is the largest pristine permanent peat swamp on Phuket Island, 123.2 m<sup>2</sup>. Seventy percent of the area was occupied by 49 species of vegetation, which is dominated by *Alstonia pneumatophora* Baker ex Den Berger, followed by *M. cajuputi* Powell and thirty percent of the area is covered with water. The majority of the water body is covered by water lilies, *Utricularia aurea* Lour. and submerged grass in littoral zone. No disturbance from human activities here. In the past, Jik peat swamp had been proffered by the government to dredge for irrigation but the project was halted. Freshwater is acid and being brownish in color.

### 2.1.4 Jae-Son peat swamp (Figure 2.3f and 2.3g)

Location: (8° 09.28'N - 8° 09.70'N, 98° 18.08'E - 98° 18.24'E)

This peat swamp was modified to a 320 m<sup>2</sup> reservoir by dredging around, but holding 80 m<sup>2</sup> of some peat swamp vegetation and land at the center. The capacity of this reservoir is 669,130 m<sup>3</sup>. The flora community in the central part is composed of *M. cajuputi* followed by *F. microcarpa*, *Syzygium zelanicum* (L.) DC. and *Rhodomyrtus tomentosa* (Aiton) Hassk.. Jae-Son is completely freshwater and no brownish in water. There were no floated or submerged plants in this area. In the dry season, the water may dry out and the ground may emerge.

### 2.1.5 Sra-Boua swamp (Figure 2.3h)

Location: (8° 09.87'N - 8° 09.94'N, 98° 17.87'E - 98° 17.88'E)

This swamp holds on 10 m<sup>2</sup>. An observation of geographical and physical features of this area, Sra-Boua swamp could have been a peat swamp before, because its location was on the same line of other peat swamps. Then, this area was gradually changed and became shallower by time, through natural succession. Sra-Boua swamp was full of water lilies, *Nymphaea nouchali* Burm., and was enclosed by agricultural areas. Sra-Boua swamp was completely dried during the summer season. Unfortunately, this area was completely dried out during the sampling period, because of the construction of a hotel near by (since June, 1999).

## 2.2 Water qualities in the peat swamps

Table 2.1 shows some parameters, which were measured during sampling period from November 1999 to February 2001, from five peat swamps along Mai-Khao coast on Phuket Island. Temperature was not different among the areas. The highest dissolved oxygen value was noted from Sra-Boua (14 mg.l<sup>-1</sup>), while the lowest value was noted in Mai-Khao (0.17 mg.l<sup>-1</sup>) and Jood (0.2 mg.l<sup>-1</sup>). The highest pH was recorded in Mai-Khao (9.21). Regarding salinity, the five peat swamps can be classified into two types: freshwater (Jik, Jae-Son and Sra-Boua) and brackish water (Mai-Khao and Jood). The salinity is positively related with conductivity, so high conductivity values were measured in Mai-Khao and Jood. Due to mass of filamentous algae, the highest turbidity was recorded from Sra-Boua. Besides, the

highest phosphate and nitrate were recorded from Sra-Boua and result in high Chlorophyll a in this area.

### **2.3 Anthropogenic activities in the coastal peat swamps**

According to the data on physical and chemical measurements in table 2.1, the five coastal peat swamps can be divided into four groups with respect to their disturbances. The first one is Jik peat swamp, which has little or no effect of human activities. The other three have an anthropogenic activity from salinisation in Mai-Khao and Jood peat swamps, transformation to reservoir in Jae-Son peat swamp and eutrophication in Sra-Boua peat swamp.

#### **2.3.1 Aquaculture in Mai-Khao and Jood peat swamps**

The information of water qualities information in Mai-Khao and Jood peat swamps, they had been recorded as freshwater habitats (Chittapun and Pholpunthin, 1999). Nowadays the aquaculture farms has been increased nearby extensively, result in increasing the amount of saline water being discharge into the peat swamp. Consequently, Mai-Khao and Jood peat swamps become brackish. This salinization result in dead vegetation and environmental changes, especially in water qualities (Table 2.1). Higher salinity brings about higher conductivity and alkalinity. Moreover, there are soluble inorganic from the residual of shrimp food releasing together with the saline water. This is a source of eutrophication, as a result in the widely length of dissolved oxygen and Chlorophyll a values.



Table 2.1 Some parameters from five peat swamps along Mai-Khao coast on Phuket Island, measuring during sampling period from

November 1999 to February 2001

Peat swamps	Temperature (°C)	Dissolved Oxygen (mg.l <sup>-1</sup> )	pH	Salinity (ppt)	Conductivity (×10 <sup>-2</sup> mS. cm <sup>-1</sup> )	Turbidity (NTU)	Nitrate (×10 <sup>-2</sup> mg.l <sup>-1</sup> )	Phosphate (×10 <sup>-2</sup> mg.l <sup>-1</sup> )	Chl <i>a</i> (×10 <sup>-2</sup> mg.l <sup>-1</sup> )
Jik	27.2 - 32.9	2.15 - 7.5	5.05 - 7.43	0	3.5 - 7.4	3 - 37	3.8 - 75	2.7 - 4	0.04 - 8.91
Mai-Khao	26.7 - 36.5	0.17 - 9	5.59 - 9.21	1.4 - 7.4	280 - 1300	4 - 151	4 - 100	2.2 - 5	0.14 - 18.4
Jood	26 - 37.7	0.2 - 12.76	5.41 - 7.81	0.9 - 5.1	192 - 920	1 - 63	0.5 - 260	0.2 - 0.5	0.48 - 15.9
Jae-Son	24.3 - 35.4	3.25 - 9	5.2 - 8.16	0	2.7 - 10.2	2 - 60	1.5 - 230	2.1 - 5.2	0 - 16.3
Sra-Boua	26.7 - 34.8	3.03 - 14	5.53 - 7.82	0 - 1	8.1 - 26.9	17 - 374	41 - 290	2.5 - 5.4	2.1 - 23.4

### **2.3.2 Transformation in Jae-Son peat swamp**

Jae-Son peat swamp was modified into a reservoir by digging around a peat swamp resulting in a changed of environmental conditions and water qualities. Although there is the vegetation remaining in the central part, its structure is change and it is reduced in size. In addition, there are no brownish in color and acidity as the fundamental character of peat swamp (Table 2.1). As reservoir, there is high amount of run off water, which comes from many areas. This contaminated water, which can be observed by nitrate and phosphate values, sometimes lead to eutrophication, high chlorophyll a value.

### **2.3.3 Agriculture in Sra-Boua peat swamp**

Sra-Boua peat swamp was surrounded by agricultural areas. Therefore, the swamp may contaminated by fertilizes and pesticides. In table 2.1, high value of nitrate and phosphate were measured at here. The amount of nitrate and phosphate provide an essential inorganic substance for rapidly growing filamentous algae, consequently high value of Chlorophyll a was measured. Moreover, the greenish water results in high dissolved oxygen and turbidity values. After the nutrient was exhausted and slightly light can penetrated, the algal start decreasing and dissolved oxygen was used in decomposition. Then, DO and turbidity were lower measured. According to the Organization for Economic Co-operation and Development (OECD) boundary values for trophic classificffation system, general biological and physical characteristics of eutrohpic areas are frequent occurrence of algal blooms, high relative quantity of green and blue-green algae (*Oscillatoria*), often shallow water body and poor water usage (Ryding and Rast, 1989). From this, Sra-Boua was identified as a eutrophic swamp.