5.3.4 Mangrove Ecology Survey

(1) Songkhla Lake Entrance

The study area along the entrance of Songkhla Lake is shown in Figure 5.3.4-1 and is mostly covered by communities, agricultural area and shrimp farm etc..

The high density mangrove forest was found at two sites in the mangrove conservation area of Hua Khao sub-district with coordinate 674,488E and 796,032N, and Tinnasulanonda Fishery College (673,234E, 790,527N).

Moreover, degraded mangrove forests were found at Ban Khao Nui area (672,820E, 795,374N and 672,659E, 795,433N) and at Ban Tha Saan area (673,778E, 791,561N, 674,889E, 791,889N and 675,944E, 792,558N).

Mangrove forest at Hua Khao sub-district has been a reforested by Hua Khao Mangrove Conservation Club with present area of 11.2 ha and shall be enlarged up to 32 to 48 ha in the future. The only mangrove species of Kong Kang Bai Yai (*Rhizophora mucronata* Poir.) is planted in this area.

The forest has average tree density of 6,800 trees/ha. It has average sapling density of 700 saplings/ha, average seedling density of 1,550 seedlings/ha and average fuel wood volume of 231.15 m^3/ha (see Table 5.3.4-1).

Table 5.3.4-1 Density of Trees, Saplings and Seedlings in Hua Khao Mangrove Plantation

Tree Species	Tree		Sapling (saplings/ha)	Seedling (seedlings/ha)
	Density (trees/ha)	Average Volume (m^3/ha)		
Kong Kang Bai Yai *Rhizophora mucronata* Poir.	6,800	213.15	700	1,550

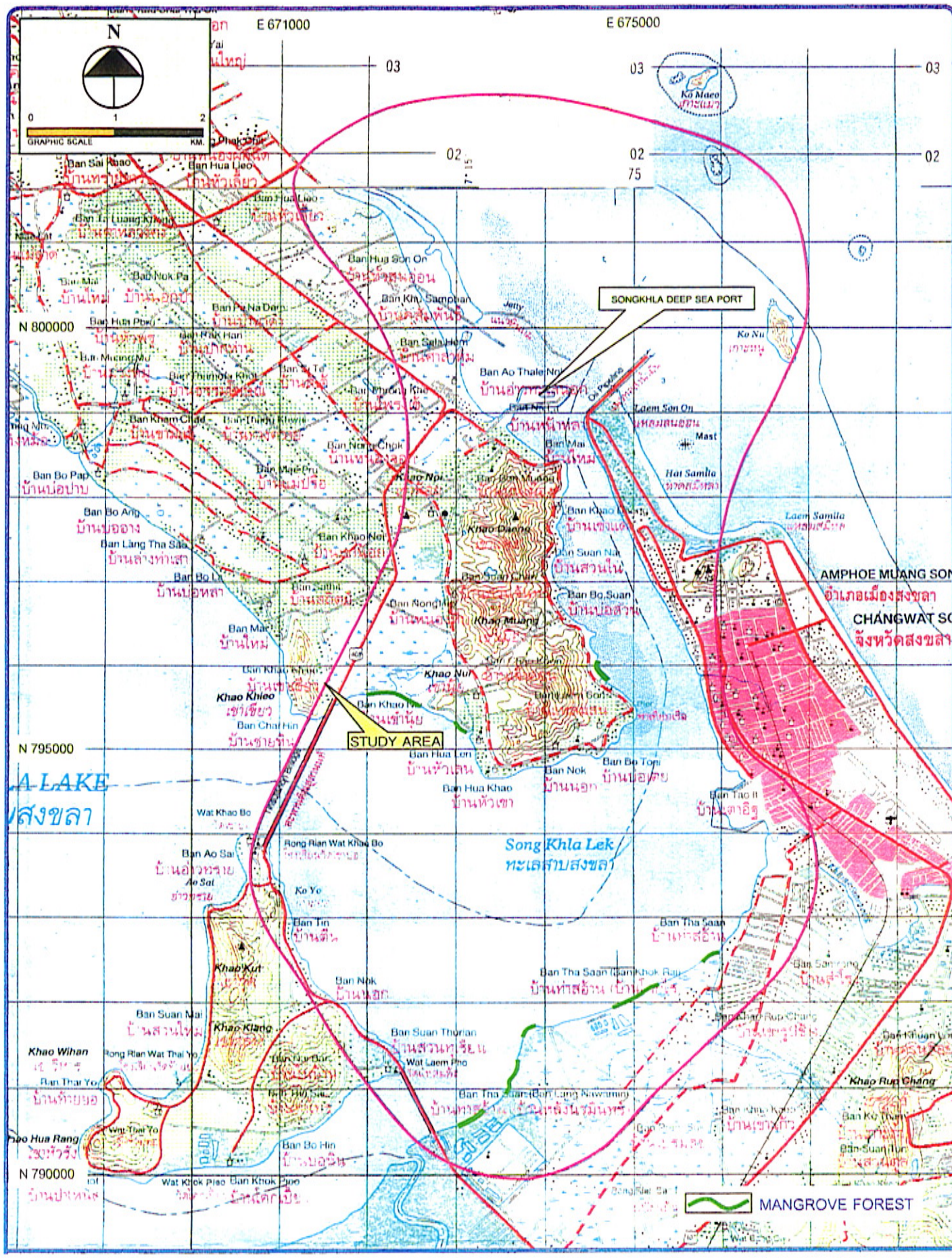


Figure 5.3.4-1 Study Area in the Entrance of Songkhla Lake
(Mangrove Ecology and Wildlife Inventory)

Mangrove forest at Tinnasulanonda Fishery College is a natural mangrove forest with small dense trees, with an area of about 5 ha. The data from sapling plot indicated that there are eight mangrove species of Kong Kang Bai Lek (*Rhizophora apiculata* Bl.), Ta Boon Dam (*Xylocarpus moluccensis* Roem.), Ta Tum Thale (*Excoecaria agallocha* Linn.), Fad Dok Khao (*Lumnitzera racemosa* Willd.), Samae Khao (*Avicennia alba* Bl.), Peng (*Phoenix paludosa* Roxb.), Prong Nhu (*Acrotichum speciosum* Willd.) and Prong Tale (*Acrostichum aurenm* Linn.).

The forest has the average tree density of 740 trees/ha, the highest density : 1,850 trees/ha of Kong Kang Bai Lek., the second:750 trees/ha of Ta Boon Dam. The average sapling density is 90 saplings/ha, the highest density : 250 saplings/ha of Ta Tum Thale. In the case of seedling, the average seedling density is 130 seedlings/ha, the highest density : 250 seedlings/ha of Fad Dok Khao. And the average fuel wood volume is 6.74 m^3/ha (see Table 5.3.4-2).

Table 5.3.4-2 Density of Trees, Saplings and Seedlings of Mangrove at Tinnasulanonda Fishery College

Tree Species	Tree		Sapling (saplings/ha)	Seedling (seedlings/ha)
	Density (trees/ha)	Average Volume (m^3/ha)		
1.Kong Kang Bai Lek *Rhizophora apiculata* Bl.	1,850	14.12	50	200
2.Ta Boon Dam *Xylocarpus moluccensis* Roem.	750	12.48	0	0
3.Ta Tum Thale *Excoecaria agallocha* Linn.	300	1.12	250	200
4.Fad Dok Khao *Lumnitzera racemosa* Willd.	650	3.66	150	250
5.Samae Khao *Avicennia alba* Bl.	150	2.31	0	0
Total (Mean)	3,700 (740)	33.69 (6.74)	450 (90)	650 (130)

In the mangrove forest at Tinnasulanonda Fishery College, the ability of natural plant succession of each species in each class as trees, saplings and seedlings can be compared by using Important Value Index (IVI).

The highest IVI values of tree species, sapling species and seedling species are 114.47 with Kong Kang Bai Lek, 95.56 with Ta Tum Thale and with 80.77 Kong Kang Bai Lek, respectively as shown in Tables 5.3.4-3 to 5.3.4-5.

Table 5.3.4-3 Ecological Characteristics of Trees, Saplings and Seedlings in Mangrove Forest at Tinnasulanonda Fishery College

Scientific Name	Density (individual/ha)	Frequency	Dominance	Relative Density	Relative Frequency	Relative Dominance	IVI
Trees							
1. Kong Kang Bai Lek	1,850	100	0.035	50.00	25.00	39.47	114.47
2. Ta Boon Dam	750	100	0.032	20.27	25.00	36.58	81.85
3. Ta Tum Thale	300	50	0.004	8.11	12.50	4.28	24.88
4. Fad Dok Khao	650	100	0.012	17.57	25.00	13.32	55.89
5. Samae Khao	150	50	0.006	4.05	12.50	6.36	22.92
Total	3,700	400	0.088	100	100	100	300
(Mean)	(740)	(80)	(0.018)				
Saplings							
1. Kong Kang Bai Lek	50	50	-	11.11	20.00	-	31.11
2. Ta Tum Thale	250	100	-	55.56	40.00	-	95.56
3. Fad Dok Khao	150	100	-	33.33	40.00	-	73.33
Total	450	250	-	100	100	-	200
(Mean)	(150)	(83)					
Seedlings							
1. Fad Dok Khao	250	50		38.46	25.00	-	63.46
2. Kong Kang Bai Lek	200	100		30.77	50.00	-	80.77
3. Ta Tum Thale	200	50		30.77	25.00	-	55.77
Total	650	200		100	100	-	200
(Mean)	(217)	(67)					

(2) Sichon River-Mouth

The study area in the river-mouth of Sichon is mostly utilized for residential and agricultural purposes. No mangrove communities were found in the study area. However, mangrove species scattered along the river were confirmed at three sites shown in Figure 5.3.4-2.

Degraded mangrove forests confirmed at Sichon area are at 500 meters from river-mouth (600,203E, 996,675N), at 1 km from river-mouth (600,214E, 996,081N) and at 1.5 km from river-mouth (600,003E, 995,710N).

(3) Bang Ra Pha River-Mouth

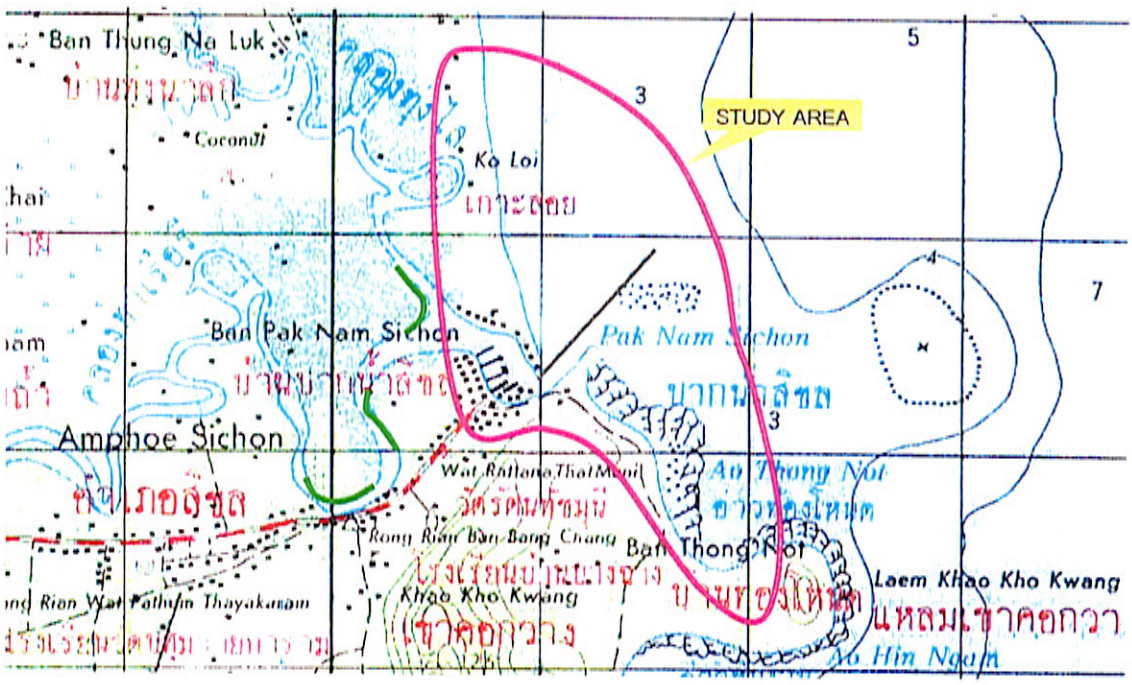
The study area around the river-mouth of Bang Ra Pha includes Bang Ra Pha village in the east, coconut orchard along the beach and mangrove forests standing on the island opposite the river-mouth as shown in Figure 5.3.4-2. Due to river dredging, sediments filled in the mangrove forest make it bad conditions. However, these mangrove forests are usefully used as habitat for mud crab.

The mangrove forest island covers the area of 40.77 ha and including 12 pioneer mangrove species such as Kong Kang Bai Lek (*Rhizophora apiculata* Bl.), Thoa Khao (*Bruguiera cylindrica* Bl.), Pungka Hua Sum Dok Daeng (*Bruguierea gymnorrhiza* Lamk.), Samae Khao (*Avicennia alba* Bl.), Ta Tum Thale (*Excoecaria agallocha* Linn.), Samae Dam (*Avicennia afficinalis* Linn.), Pungka Hua Sum Dok Khao (*Bruguiera sexangula* Poir.) and so on.

The average tree density was 266 trees/ha; the highest density : 963 trees/ha of Thoa Khao, the second:800 trees/ha of Kong Kang Bai Lek. The average sapling density is 404 saplings/ha, the highest density : 1,094 saplings/ha of Kong Kang Bai Lek, the second:781 saplings/ha of Pungka Hua Sum Dok Daeng and Samae Khao. In the case of seedling, the average seedling density is 129 seedlings/ha, the highest density : 463 seedlings/ha of Kong Kang Bai Lek, the second:250 trees/ha of Thao Khao and Pungka Hua Sum Dok Khao as shown in Table 5.3.4-4.

Concerning the mangrove forest ecology for each tree sapling and seedling classes, the highest tree Important Value Index (IVI) is 56.6 with Tua Khao and the highest sapling (IVI) is 48.7 with Kong Kang Bai Lek. This shows that species can reach tree size by natural succession. The highest seedling (IVI) is 63.2 with Kong Kang Bai Lek as shown in Table 5.3.4-5. From the above information, it can be expected that this area will be covered by Kong Kang Bai Lek in the future.

Sichon River-Mouth



Bang Ra Pha River-Mouth

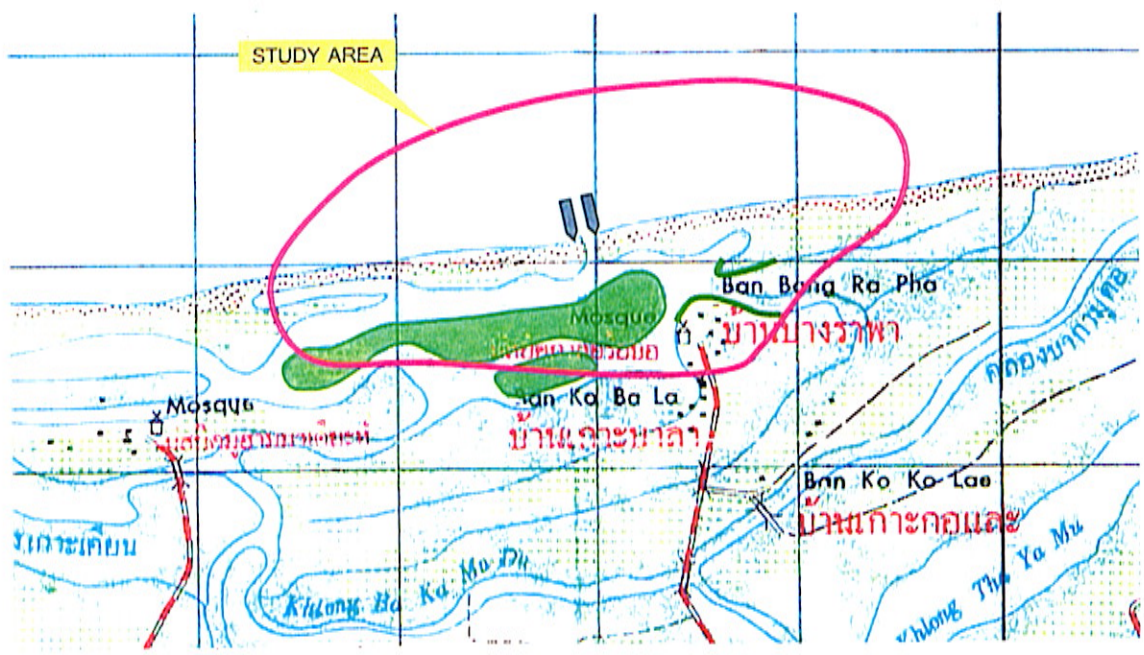


Figure 5.3.4-2 Study Area in Sichon and Bang Ra Pha River-Mouths
(Mangrove Ecology and Wildlife Inventory)

Table 5.3.4-4 Density of Trees, Saplings and Seedlings of Mangrove at Bang Ra Pha River-Mouth

Tree Species	Tree		Sapling (per ha)	Seedling (per ha)
	Density (trees/ha)	Average Volume (m^3/ha)		
1.Kong Kang Bai Lek *Rhizophora apiculata* Bl.	800	18.29	1,093.75	462.5
2.Ta Boon Khao *Xylocarpus granatum* Koen	25	2.18	0	0
3.Ta Boon Dam *Xylocarpus moluccensis* Roem.	125	7.29	0	87.5
4.Ta Tum Thale *Excoecaria agallocha* Linn.	212.5	27.55	468.75	37.5
5.Thoa Khao *Bruguiera cylindrica* Bl.	962.5	11.20	312.50	250.0
6.Prong Khao *Ceriops decandra* Ding Hou	75	1.54	468.75	225.0
7.Prong Daeng *Ceriops tagal* C.B.Robinson	25	0.22	781.25	0
8.Pungka Hua Sum Dok Khao *Bruguiera sexangula* Poir.	162.5	1.02	156.25	250.0
9.Pungka Hua Sum Dok Daeng *Bruguierea gymnorrhiza* Lamk	275	3.21	781.25	125.0
10.Lam Pan Thale *Sonneratia griffithii* Kurz.	50	4.96	0	0
11.Samae Khao *Avicennia alba* Bl.	300	46.45	781.25	112.5
12.Samae Dam *Avicennia afficinalis* Linn.	175	17.03	0	0
Total (Mean)	3,187.5 (265.6)	140.95 (11.75)	4,843.75 (403.65)	1,550.0 (129.2)

Table 5.3.4-5 Ecological Characteristics of Trees, Saplings and Seedlings in Mangrove Forest at Bang Ra Pha

Scientific Name	Density (individual/ha)	Frequency	Dominance	Relative Density	Relative Frequency	Relative Dominance	IVI
Trees							
1. Kong Kang Bai Lek	800.0	87.5	0.038	25.10	15.22	16.07	56.39
2. Ta Boon Khao	25.0	12.5	0.005	0.78	2.17	1.99	4.94
3. Ta Boon Dam	125.0	50.0	0.011	3.92	8.70	4.51	17.13
4. Ta Tum Thale	212.5	37.5	0.038	6.67	6.52	15.84	29.03
5. Tua Khao	962.5	87.5	0.027	30.20	15.21	11.22	56.63
6. Prong Khao	75.0	37.5	0.004	2.35	6.52	1.72	10.59
7. Prong Daeng	25.0	25.0	0.001	0.78	4.35	0.25	5.38
8. Pang Ka Hua Sum Dok Daeng	162.5	37.5	0.003	5.10	6.52	1.36	12.98
9. Pang Ka Hua Sum Dok Khao	275.0	62.5	0.009	8.63	10.87	3.71	23.21
10.Lam Pan Thale	50.0	12.5	0.007	1.57	2.17	2.80	6.54
11. Samae Khao	300.0	62.5	0.065	9.41	10.87	27.24	47.52
12. Samae Dam	175.0	62.5	0.031	5.49	10.87	13.29	29.65
Total (Mean)	3,187.5 (265.6)	575.0 (47.9)	0.237 (0.020)	100	100	100	300
Saplings							
1. Kong Kang Bai Lek	1,093.75	75.0	-	22.58	26.09	-	48.67
2. Ta Tum Thale	468.75	12.5	-	9.68	4.35	-	14.03
3. Tua Khao	312.50	50.0	-	6.45	17.39	-	23.84
4. Prong Khao	468.75	37.5	-	9.68	13.04	-	22.72
5. Prong Daeng	781.25	12.5	-	16.13	4.35	-	20.48
6. Pang Ka Hua Sum Dok Khao	156.25	25.0	-	3.23	8.69	-	11.92
7. Pang Ka Hua Sum Dok Daeng	781.25	25.0	-	16.13	8.69	-	24.82
8. Samae Khao	781.25	50.0	-	16.13	17.39	-	33.52
Total (Mean)	4,843.75 (605.5)	287.5 (35.9)	-	100	100	-	200
Seedlings							
1. Kong Kang Bai Lek	462.5	100.0	-	29.84	33.33	-	63.17
2. Ta Boon Dam	87.5	25.0	-	5.65	8.33	-	13.98
3. Ta Tum Thale	37.5	12.5	-	2.42	4.17	-	6.59
4. Tua Khao	250.0	50.0	-	16.13	16.67	-	32.80
5. Prong Khao	225.0	50.0	-	14.51	16.67	-	31.18
6. Pang Ka Hua Sum Dok Khao	250.0	12.5	-	16.13	4.17	-	20.29
7. Pang Ka Hua Sum Dok Daeng	125.0	12.5	-	8.06	4.17	-	12.23
8. Samae Khao	112.5	37.5	-	7.26	12.50	-	19.76
Total (Mean)	1,550.0 (193.8)	300.0 (37.5)		100	100	-	200

5.3.5 Wildlife Inventory Survey

(1) Songkhla Lake Entrance

Four classes, totally 49 species of wild animals were recorded from the field survey. They are four species of amphibians, 11 species of reptile, 29 species of birds and five species of mammals as shown in Table 5.3.5-1.

16 species of wild animals were recognized as high abundant species. They were two species of amphibian: Black-spined Toad and Rugosed Frog, four species of reptile: Spiny-tailed House Gecko, Common Sun Skink, nine species of birds: Little Egret, Zebra Dove, and one species of mammal: House Rat.

18 species of wild animals were reported as medium abundant species. They were one species of amphibian: Ornate Chorus Frog, four species of reptile: Indochinese Rat Snake, Forest Crested Lizard, 12 species of birds: Great Egret, Common Kingfisher, Black Drongo, and one species of mammal: Common Treeshrew.

15 species of rarely-seen wild animals were all as low abundant animals, which was obtained by interviews. They were one species of amphibian: Dark-sided Chorus Frog, three species of reptile: Malayan Box Turtle, Reticulated Python, eight species of birds: Cattle Egret, Wood Sandpiper, Lesser Coucal, and three species of mammal: Crab-eating Mongoose, Common Palm Civet.

The status of 49 species of wildlife found in the study area were defined by two means: legislative status according to Wildlife Animals Preservation and Protection Act (1992) and conservation status stipulated by International Union for Conservation of Nature and Natural Resources (IUCN), 1996. All animals were defined their status as shown in Table 5.3.5-2.

None of the animals found in this study was defined as reserved animal, while 32 species were recognized as protected species and 17 species as non-protected animals.

32 protected animals were five species of reptile: Malayan Snail-eating Turtle, Blue Crested Lizard, 25 species of birds: White-bellied Sea-eagle, Great Coucal, Black Drongo, and two species of mammals: Crab-eating Mongoose. From the viewpoint of conservation status, White-chested Babbles was only one species found in this area, which was defined as near threatened species.

(2) Sichon River-Mouth

Four families, totally 32 species of wild animals were recorded from the field survey. They are three species of amphibians, eight species of reptile, 18 species of birds and three species of mammals as shown in Table 5.3.5-1.

14 species of wild animals were recognized as high abundant species. They were one species of amphibian: Black-spined Toad, four species of reptile: Spiny-tailed House Gecko, Long-tailed Skink, eight species of birds: Oriental Magpies Robin, Zebra Dove, and one species of mammal: House Rat.

Eight species of wild animals were reported as medium abundant species. They were one species of amphibian: Flap-topped Frog, two species of reptile: Blue Crested Lizard, Forest Crested Lizard, four species of birds: Common Tailor Bird, Common Kingfisher, and one species of mammal: Crab-eating Mongoose.

10 species of rarely-seen wild animals were all as low abundant animals, which was obtained by interviews. They were one species of amphibian: Ornate Chorus Frog, two species of reptile: Indochinese Rat Snake, Reticulated Python, six species of birds: Collared Kingfisher, Common Iora, Lesser Coucal, and one species of mammal: Common Treeshrew.

None of animals found in this study was defined as reserved animal, 19 species were recognized as protected species and 13 species as non-protected animals.

19 protected animals are four species of reptile: Reticulated Pyton, Blue Crested Lizard, 14 species of birds: Brown-headed Gull, Great Coucal, Common Myna, and one species of mammals: Crab-eating Mongoose. No animal of conservation status was found in this area.

(3) Bang Ra Pha River-Mouth

Four families, totally 48 species of wild animals were recorded from the field survey. They were five species of amphibians, 13 species of reptile, 23 species of birds and seven species of mammals as show in Table 5.3.5-1.

15 species of wild animals were recognized as high abundant species. They were five species of amphibian: Flap-topped Frog and Rugosed Frog, four species of reptile: Spiny-tailed House

Gecko, Blue Crested Lizard, four species of birds: White-throated Kingfisher, Streak-eared Bulbul, and two species of mammal: Eurasian Tree-sparrow, Plain-backed Sparrow.

20 species of wild animals were reported as medium abundant species. They were five species of reptile: Long-nosed Whip Snake, Forest Crested Lizard, 14 species of birds: White-vented Myna, Common Kingfisher, Mangrove Blue Flycatcher, and one species of mammal: Lesser Giant Flying Squirrel.

14 species of rarely-seen wild animals were all as low abundant animals, which was obtained by interviews from local people. They were five species of reptile: Clouded Monitor, Reticulated Python, five species of birds: Blue-tailed Bee-eater, Wood Sandpiper, and four species of mammal: Crab-eating Mongoose, Common Palm Civet.

None of animals found in this study was defined as reserved animal. 30 species were recognized as protected species and 18 species as non-protected animals.

30 protected animals are six species of reptile: Malayan Snail-eating Turtle, Blue Crested Lizard, 19 species of birds: Wood Sandpiper, Barn Swallow, Black Drongo, and five species of mammals: Crab-eating Mongoose and Gray-bellied Squirrel. From the viewpoint of conservation status, White- chested Babbles, Malayan Box Turtle and Fishing Cat were found in this area, which were defined as near threatened species.

Table 5.3.5-1 Wildlife Abundance in Songkhla, Sichon and Bang Ra Pha

Class	Total Species	Number of Species in Each Level of Abundance		
		Very Common	Common	Uncommon
Songkhla Lake Entrance				
1. Amphibian	4	2	1	1
2. Reptile	11	4	4	3
3. Bird	29	9	12	8
4. Mammal	5	1	1	3
Total	49	16	18	15
Sichon River-mouth				
1. Amphibian	3	1	1	1
2. Reptile	8	4	2	2
3. Bird	18	8	4	6
4. Mammal	3	1	1	1
Total	32	14	8	10
Bang Ra Pha River-mouth				
1. Amphibian	5	5	0	0
2. Reptile	13	4	5	5
3. Bird	23	4	14	5
4. Mammal	7	2	1	4
Total	48	15	20	14

Table 5.3.5-2 Wildlife Legal Status in Songkhla, Sichon and Bang Ra Pha

Class	Total Species	Number of Species in Each Level of Enforcement		
		Reserved	Protected	Non-protected
Songkhla Lake Entrance				
1. Amphibian	4	0	0	4
2. Reptile	11	0	5	6
3. Bird	29	0	25	4
4. Mammal	5	0	2	3
Total	49	0	32	17
Sichon River-mouth				
1. Amphibian	3	0	0	3
2. Reptile	8	0	4	4
3. Bird	18	0	14	4
4. Mammal	3	0	1	2
Total	32	0	19	13
Bang Ra Pha River-mouth				
1. Amphibian	5	0	0	5
2. Reptile	13	0	6	7
3. Bird	23	0	19	4
4. Mammal	7	0	5	2
Total	48	0	30	18