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A STUDY OF THE WATERFOWL AT THALE NOI WATERFOWL RESERVE AREA

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ABSTRACT

From 13 October 1975 to 30 March 1976 research was conducted at Thale Noi Waterfowl Reserve Area to determine the occurrance, seasonality and distribution of waterfowl in the area. A total of 30 species was recorded. Observations concerning man's effect on the waterfowl of the area were also made.

Introduction

Waterfowl in Thailand are encountering a fate, similar to all wildlife species in the country. Through habitat destruction and over exploitation, many species which were once common are now becoming rare. At this time Thailand has three species of waterfowl listed by the International Union for the Conservation of Natural Resources (IUCN) as nearing extinction. Because of this, Thale Noi was declared a Waterfowl Reserve Area in 1975. (MINISTRY OF AGRICULTURE AND COOPERATIVES, 1975).

The main purpose of this project was to see what species are found in the area and when and where they are likely to occur. Secondly, life history information is presented where available. Thirdly, to evaluate the disturbance by man and to make recommendations. This research is intended to form a basis for future study of the habitat and waterfowl at Thale Noi.

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Study Area

Thale Noi has an area of approximately 50 square km and is a rich habitat for migratory and resident species. It is also possible that the *Melaleuca* forest north of the lake may have remnant populations of Giant Ibis (*Pseudibis gigantea*) and White-Winged Wood Duck (*Cairina scutulata*) (WELLS, personal communication). Both of these species are listed by IUCN as endangered (VINCENT, 1966).

Thale Noi is a component of the Songkhla Lake lagoonal basin. This basin was formerly a sea lagoon which became seperated from the sea by sand spits that now form the beaches between Nakorn Sri Thammarat and Hua Sai and further south through Ranot and Sathing Phra. Surface drainage and eutrophication then caused the salt water to be replaced by fresh water (HUNTING TECHNICAL SERVICES LIMITED).

Because of the size of the reserve area and the inaccessibility of many regions, the study area was restricted to the streams going to Wat Kiow (temple) and Ban Cow (village), Klong You-an and Klong Luang (streams), and Talae Noi Lake. The area contains 6 distinct habitats for avian species (See Fig. 1 and Table 1):

- Open water section. This bryotrophic lake is shallow; usually between 1 to 2 meters deep. The submergent vegetation is dense but not as dense as in the zone of floating vegetation. The water color is brown and the bottom is covered by a thick detritus layer showing high biological productivity. The total size is dependent on flood conditions.
- 2) Elaeocharis emergent zone The total area of this zone also depends on flood conditions. This zone can be found in the northern and eastern sections of the lake and surrounding marshy areas, such as beside the stream to Ban Cow.

- 3) Melaleuca forest. This forest grows in regions of the former sea lagoon built up by silt accumulation. During the rainy season it occasionally floods to a depth where boat travel is permitted. It is possible that peat swamps similar to those in Narathiwat are in the process of development on the north side of the lake (HUNTING TECHNICAL SERVICES LIMITED). This forest habitat is predominately situated north of the lake but smaller stands are scattered elsewhere around the lake such as beside Klong You-an.
- 4) Rice paddies These zones are usually found close to human habitation. The former habitats are thought to have been either marsh or *Melaleuca* forest. Large expanses can be found southeast, east, and northeast of the lake but fields can be found in any direction. At the end of the study period, new fields were under construction from a region of *Nymphaea*, *Nymphoides*, and other aquatic species at the northwest corner of the lake.
- 5. Wet meadow. This area is under water during times of flooding. Its former habitat may have been *Melaleuca* forest which was cut down to make charcoal. Wet meadow is usually found around human habitation such as beside the stream to Wat Kiow.
- 6. Zone of floating vegetation. This zone mainly differs from the open water section in having denser submergent vegetation and floating vegetation such as Nymphoides and Nymphaea.

This area is predominately on the edges of the lake or in pools surrounded by *Elaeocharis dulcis* or *Eichhornia crassipes*. It can also be found in pools in the *Melaleuca* forest. During times of flooding much of the floating vegetation is under water. HABITAT MAP OF TALAE NOI WATERFOWL RESERVE AREA





- Reserve area boundry.
 - Village
 - Office

Figure 1. Habitat of study area. (modified from Royal Thai Department of Agriculture. 1975. National gazette Vol. 92 (84)

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Habitat No.	1	2	3	4	5	6
Little Grebe	М	Р	8- 22		and a set	Pr
Little Cormorant	Р	Р	Р	М	Р	Р
Chinese Pond Heron		Р	Р	Р	Р	Р
Egrets spp.		Р	Р	М	Pr	
Schrenks Bittern			Р			
Yellow Bittern		Р	Р			Р
Cinnamon Bittern		and plan	Р			
Black Bittern			Р			
Grey Heron				Rector	Pr	
Purple Heron		Р	Р	М	Р	
Cotton Teal	М			М		Pr
Whistling Teal		Pr		М		Р
White-Breasted Waterhen			Р			Р
Moorhen						Pr
Purple Gallinule		Р				
Pheasant-Tailed Jacana						Pr
Bronze-Winged Jacana						Pr
Collared Pratincole				М	М	

Table 1. Habitat preferences of waterfowl species.

Legend present P preferred Pr present during parts of the study period м – Habitats open water areas 1 -Eleocharis emergent zone 2 -Melaleuca forest 3 rice fields 4 wet meadow 5 zone of floating aquatic spp. 6 -

During October and November, the mornings and early afternoons were hot and humid. It often rained late in the afternoon, usually around 1500 hrs. The peak of the rainy season is in December. This gradually gives way to the cold season. February and March became warmer with the arrival of the hot season.

The lake begins to flood in the beginning of November and peaks at the end of January and beginning of February. It then gradually lowers until the next rainy season.

Study Methods

I recorded time, weather, habitat, and conspicuous behavior while making observations. Nonaquatic species such as songbirds were ignored The project was started on 13 October 1975 and ended on 30 March 1976. Most field work was conducted between 0630 hrs to 1200 hrs and 1600 hrs to 1830 hrs. Coverage was sporadic but usually at least four days a week were spent in the field.

All field observations were made with the use of $7x-14\times35$ zoom binoculars or the naked eye from a boat. Observations of the morning and evening flights were made from the office porch on the western shore of the lake (See Fig. 1).

Water level surveys were started in October and again in January but were abandoned because on both occasions the station markers were stolen.

The following list of species follows the names used by LEKAGUL and CRONIN (1974).

Systematic Section

Little Grebe (Podiceps ruficollis)

Grebes were resident to the study area during all months of the study period but their numbers greatly increased in January. During October, November, and December groups of between 1 and 3 individuals could be found in the zone of floating aquatic plants. These birds

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are not very secretive and when frightened prefer to dive or run across the top of the water rather than fly. On 9 January, a large flock of about 75 individuals was encountered on the open water of the lake in company with the Cotton Teal migration. The flock of Little Grebes remained near the Cotton Teal until the teal started breaking up in February. Flocks of this size were regularly seen in different sections of the lake but were usually out in the open water. The smaller flocks or singles usually were in less open areas such as the zone of floating plants. HOLMES and WELLS (1975) report sighting flocks of 50 and 150 individuals respectively at Talae Noi in open water sections of the lake on 28 February 1974 and 22 September 1974. They state that birds were vocal on both occasions. They found the birds in September to be in breeding plumage but in February the plumage condition was not established. In this study, birds were found to be in breeding plumage all months of the study period. During a visit on 13 and 14 December 1973 HOLMES and WELLS (1975) did not record the species and felt that the flooding caused dispersal into surrounding flooded land.

Little Cormorant (Phalacrocorax niger)

Holmes and Wells (1975) sighted 15 individuals on 14 and 15 December 1973 and a larger number on 28 February 1974. During a visit on 22 September 1974 they failed to tally a single individual. They believe that this supports the idea that this species is a migrant in the Malay Peninsula. McClure (1974a) reports that the northern species of Phalacrocoracidae are migratory but most are sedentary or wanderers.

This species inhabited all habitats in the study area including the usually barren open water sections, sometimes resting in large flocks of over 100 individuals. During the floods many congregated over the flooded meadow on the stream going to Wat Kiow.

January through March morning and evening flights were observed (See Fig. 2). Evening flights originated from the south going north and consisted of 300-400 individuals. The flight resembled a tube in that it was 5 or 6 individuals thick and stretched over an area longer than the



Figure 2. Morning and evening flights. No. scale. (Modified from Royal Thai Dept. of Agriculture, 1975. National gazette Vol. 92 (84).)

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lake. Comorants were usually the last species to fly at dusk. They were usually sighted between 1815 and 1830 hrs. The morning flight had no set pattern.

Chinese Pond Heron (Ardeola bacchus)

This species was found in all habitats except for the deeper open water sections.

Morning and evening flights were observed January through March. The evening flight averaged about 15 individuals and went north to south. Some individuals started flying about 1700 hrs but the larger groups of 5-10 individuals were not seen until 1800 hrs. The morning flight north started around 0630 hrs and lasted for about an hour, with the larger groups again flying during the latter part of the period.

Egrets (Egretta spp. and Bubulcus ibis)

Egrets were present at Talae Noi throughout the study period and found in all habitats shallow enough to wade. During the floods many could be found in the rice paddies and flooded meadows as well as in the *Melaleuca* forest and marsh. When the lake is flooded, Egrets are the most frequently encountered birds in the field. During periods of wind and rain several were encountered with their heads held on their backs, probably to reduce the amount of body area exposed to the elements to conserve body heat.

During January large evening flights were observed going northward, from approximately 1630 hrs until dark. Some small groups and singles would cross the lake but most would land at a congregation point on the southern shore. At approximately 1730 hrs there would be increased activity at the congregation point with individuals changing position for no apparent reason. Sometime after 1800 hrs the congregation, containing as many as 70 individuals, would take off heading north. While crossing the lake many individuals had great difficulty flying against the northeast wind. On two occasions in January, individuals were observed to fall in the water only to take off and land on a pole or floating vegetation to dry their wings. During February the birds stop-

ped using the congregation point and the number of individuals in the flight greatly decreased. This may have been caused by lowering of the water level, increased agriculture and grazing around the congregation point, or a change of feeding area. Large flocks of Intermediate Egrets (Egretta intermedia), Little Egrets (Egretta garzetta), and Cattle Egrets (Bubulcus ibis) were already north of the lake feeding in the wet meadow beside the gtream going to Wat Kiow.

At the end of February Little Egrets and Cattle Egrets were in breeding plumage.

Yellow Bittern (Ixobrychus sinensis)

This species, was first sighted in November, was resident throughout the rest of the study period. It is known to have both sedentary and migratory populations (McCLURE, 1974a). Individuals were usually found in tall, thick vegetation along streams. As the water lowered in February and March some individuals ventured out into *Elaeocharis* and *Eichhornia*.

Black Bittern (Dupetor flavicollis)

Individuals of this migrant species were usually found along the streams going to Ban Cow and along Klong You-an in tall, thick vegetation.

Grey Heron (Ardea cinerea)

The population of Grey Herons at Talae Noi appears far smaller in numbers than Purple Herons.

Purple Heron (Ardea purpurea)

During the months of November and December the population appeared to decrease but it is likely that the birds were utilizing other areas because of flooding. Purple Herons nest in the temperate zone and migrates into the Tropics but also has sedentary and migratory populations (McCLURE, 1974a). Some Thai populations apparently

breed in southeast Siberia McCLURE, 1974a). A breeding colony was located at Talae Noi in March by a fisherman but the location was not revealed.

Lesser Adjutant Stork (Leptopilos javanicus)

One individual seen 26 October, feeding in an area of *Elaeocharis*. Villagers said this stork was once very common.

White Ibis (Threskiornis melancephala)

A pair was sighted on 12 March near the stream leading to Wat Kiow. The birds were in a flock of Little Egrets.

Cotton Teal (Nettapus coromandelianus)

Cotton Teal were found at Talae Noi all of the study period but its numbers increased with the arrival of a winter migration in December. During October and November birds were usually found in small flocks of 5-15 individuals in the zone of floating aquatic plants. The migrants remained in large flocks of 100 or more individuals in open water areas, and when approached were hesitant to fly. During January, villagers gather *Eichhornia crassipes* into small, floating islands on the western shore of the lake. Small flocks moved into this new habitat and fed on the surface over the submerged and floating vegetation by filtering organic material.

The migration was at its peak by mid-January with flocks consisting of 300 or more individuals. Males were in breeding plumage. Cotton Teal seem to migrate locally (ALI and RIPLEY, 1968) but some long distance migration has been recorded (McCLURE, 1974a). In February the large flocks begin breaking up into smaller flocks which move back into more secluded areas away from the open water and pairing begins. This species seldom dives to feed and as the water level drops, more submergent vegetation becomes available for feeding in shallow areas. During March mating was observed. "Rape flights" were observed on 24, 25, 27 March. The rape flight consists of 1 or more males trying to

mount a female. The female would then take flight with the males following trying to force the female to the ground to mate. During flight the birds were very vocal.

Whistling Teal (Dendrocygna javanica)

In October Whistling Teal preferred a habitat of small pools with *Nymphoides* and other aquatic species surrounded by *Elaeocharis dulcis*. As the water rose in November this species retreated from the lake to surrounding marshy areas of *Elaeocharis*. About the middle of December as the water lowered it began to use the fringes of the lake, and later advanced to the edge of the open water zone. As the water continued to lower in February and March the species returned to the *Elaeocharis* zone.

Whistling Teal were found in larger and more tightly formed flocks then Cotton Teal (except when the Cotton Teal were migrating). Whistling Teal are partially nocturnal and could often be heard vocalizing well after dark.

Brahminy Kite (Haliastar indus)

Brahminy Kites were found in the study area throughout the study period but ALI and RIPLEY (1968) report local and seasonal fluctuations caused by monsoon and water condition.

These kites were usually seen singly but occasionally in pairs. In March two birds were seen circling at different altitudes, one over the other. Both were vocalizing.

Brahminy Kites were found hunting throughout the day but more commonly just before dusk. They hunt by circling in the air and suddenly swooping to the water to sieze their prey. They were seen devouring prey, which appeared to be fish, during flight. This behavior was also reported by ALI and RIPLEY (1968).

During times of flooding many individuals congregated over the flooded meadow beside the stream to Wat Kiow.

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White-Breasted Waterhen (Amaurornis phoenicurus)

Although not sighted during all months of the study period, the species is believed to be a permanent resident in the area.

Moorhen (Gallinula chloropus)

At Talae Noi the species prefers the floating plant area, where it commonly swims or walks over the floating vegetation.

The Moorhen seems to be both a resident and migrant species, as its numbers have been reported to increase in winter (ALI and RIPLEY, 1969; McClure, 1974b).

Purple Gallinule (Porphyrio porphyrio)

In October, Purple Gallinules were found in loose congregations in expanses of *Elaeocharis dulcis* in the lake. As the water rose in November the birds retreated to the surrounding marshy areas of *Elaeocharis*. By 15 December many individuals were again frequenting the edges of the lake, and came farther out as the water receded.

Aggressive behavior was observed once on 10 January, in a group of 32 individuals. One individual repeatedly chased another, without catching it. This behavior could be related to mating since recently hatched chicks were seen early in March.

Caged individuals were found to eat the leaves of *Eichhornia* crassipes and the inside pulp of *Elaeocharis dulcis*. When eating *Elaeocharis*, the bird would hold the shaft with its foot and bite the shaft, dragging its beak along it, squeezing out the pulp. The discarded shafts can often be found in the marsh, revealing the presence of the species.

Pheasant-Tailed Jacana (Hydrophasianus chirurgus)

HOLMES and WELLS (1975) reported this species as common at Talae Noi during visits in December 1973 and February 1974, but did not note it in September. They report that single individuals in Satun on 20 October 1973 and near Songkhla on 21 October 1974 are the earliest autumn records in southern Thailand. During this study, this species was first tallied on 13 October. This species was usually found in floating vegetation areas.

Evening and morning flights were observed January through March. These flights contained as many as 50 individuals in serveral smaller groups. Morning flights were north to south; evening flights southwest to north. The birds would often stop to feed and rest between the *Eichhornia crassipes* islands on the west shore of the lake during the daily flights. In the evenings the birds started flying about 1630 hrs and groups or singles would fly until dark. In the morning flights began shortly after dawn and continued until about 0730 hrs.

Aggressive behavior was observed on several occasions. On 22 March at 1700 hrs two individuals landed in a flock of Cotton Teal. One individual flew at the other and chased it approximately 50 m. This was repeated three times before the birds disappeared behind vegetation. During flight both individuals were vocal as described by LEKAGUL and CRONIN (1974). One-half hour later the two birds repeated the same behavior and flew across the lake in a northerly direction. This behavior was again seen on 26 March.

By 26 March, one individual had established a territory in a pool with *Nymphoides* and other aquatic plants between the *Eichhornia* islands. When 4 Cotton Teal flew into the pool, they were chased away by the Pheasant-Tailed Jacana but an immature Bronze-Winged Jacana was allowed to feed in the pool. Two min later another Pheasant-Tailed Jacana and a mature Bronze-Winged Jacana were feeding in the pool. When a Cotton Teal landed in the pool it was immediately driven out but the Bronze-Winged Jacana was allowed to feed just a few meters away. Later the other Pheasant-Tailed Jacana and another Cotton Teal were chased away.

Bronze-Winged Jacana (Metopidius indicus)

This species was usually found in pools of *Nymphoides* and *Nymphaea* but in March as the water level lowered individuals could be found in

and around the *Eichhornia crassipes* islands on the west shore of the lake. On two occasions in March individuals were observed to eat the leaves of *Eichhornia*.

Adults were tallied tending flightless chicks three times in October and one time in December. The broods in October consisted of 1,2 and 3 young respectively. The adult in December was tending 1 young. Nesting is believed to begin earlier because independant birds in immature plumage were also sighted in October.

Black-Winged Stilt (Himantopus bimantopus)

A pair was seen wading beside the stream going to Wat Kiow in a wet meadow on 4 February. A pair was also seen at the southern end of Songkhla lake 19 September 1974. This sighting was the third for the area and only the fifth for the Malay Peninsula (Holmes and Wells, 1975).

Collared Pratincole (Glarea pratincola)

This species was seen in wet meadows and dry rice fields.

White-Breasted Kingfisher (Halcyon smyrnensia)

This species was tallied in November and March but it is believed to be a permanent resident in the area, as it is farther north (McCLURE, 1974b; Ogle, 1974).

Black-Capped Kingfisher (Halcyon pileata)

Individuals were sighted on 13, 14, 15 and 26 October and 26 November. This species was not seen again until 28 March. Individuals were tallied in Songkhla on 10 and 13 September when they flew into the Samila Hotel (Holmes and Wells, 1975). McClure (1974b) states that the species is a migrant, probably from southern China, which passes through Khao Yai National Park, Nakorn Ratchasima province in September and October and again in March. It dose not over-winter in the park as it seems to at Thale Noi.

Conclusions

The main problems of conservation of waterfowl at Thale Noi are competition between waterfowl and man for habitat and man's exploitation of the natural resources. In many cases the agricultural and fishing practices carried out at Thale Noi are detrimental to waterfowl. Farming practices such as grazing and burning along with the cutting of *Melaleuca* for charcoal diminishes the quantity and quality of available habitat.

According to villagers at Thale Noi, there are eight villages within the boundries of the reserve area dependent mainly on fishing. In January fishermen gather *Eichhornia crassipes* into small islands along the west shore of the lake. These are formed to congregate fish which fishermen net or electrocute with gasoline-powered generators. Although this new habitat is frequented by Cotton Teal, Little Grebes, Pheasant-Tailed Jacana, Bronze-Winged Jacana, White-Breasted Waterhen, and Yellow Bittern; it is felt it holds little value to waterfowl as nesting habitat because of the amount of disturbance by fishermen, even though this altered habitat is used by some birds for feeding and resting.

The electrocuting of fish was observed to begin in January at the end of the rainy season. It began in the *Eichhornia crassipes* islands on the west shore of the lake near the village but as the water level lowered it expanded to most streams and the large expanses of *Elaeocharis dulcis*. It was not unusual to encounter as many as eleven boats with generators electrocuting fish in a period of 1 hour. I was never allowed to examine the catch but villagers claim that only fish 15 cm or shorter are taken.

Fishermen also construct fish traps consisting of a baited hook attached by a string to an erect stick placed in shallow water. Villagers revealed this is also a favourite method poachers use to trap large wading birds. During the 6 month study, 1 Purple Heron and 1 Black Bittern were recovered from such traps.

Villagers also report that some fishermen poison fish by adding chemicals to the water, but I did not witness this.

The most common method of fishing in the reserve area is by gill nets. This method appears to be detrimental to Little Grebes and possibly other diving species. During the study period, 5 grebes were found entangled in gill nets.

Based on the above findings I recommend:

- 1) Conduct research concerning the affect of fishing by current methods on waterfowl populations
- Closing certain parts of the marsh to fishing during certain times of the year. This would allow greater protection during times of nesting and create undisturbed resting areas.
- Enforcement of fishing laws such as against the use of generators and poisons.

The main problem with rice farming at Thale Noi is that it competes with waterfowl for available habitat. It also increases the possibility of waterfowl coming into a confrontation with man.

Farmers claim that Cotton Teal do much damage to the rice crop. To prevent depredations, farmers use scarecrows, exploding devices, shotguns, and spread large amounts of DDT over the rice fields to poison the birds.

Some farming parctices reduce the amount of available food to waterfowl. Land levelling makes the water a uniform depth which eliminates poorly drained areas where many foods for waterfowl grow. It allows the fallow fields to drain rapidly which causes a reduction of waterfowl foods that prefer a wet habitat. Land levelling also causes a reduction of interfield levees which can provide food and cover for waterfowl (HORN and GLASGOW, 1964).

Based on the above findings I recommend:

- 1) Flood the rice fields after harvest.
- Allow thick vegetation to grow along the edges of the field, canals, and levees.
- 3) Restrict the making of new fields in the sanctuary.
- Stop the use of DDT and other pesticides poisonous to wildlife as a deterent of depredation.
- 5) Conduct research concerning the relationship between rice production and waterfowl depredation at Thale Noi.

Much research has been conducted showing the advantages of tall, dense, undisturbed vegetation to nesting waterfowl (DUEBBERT and KANTRUEL, 1974; KIRSCH, 1969; MILLER, 1971; MILLER, 1972; and NELSON, 1972). These studies show that grazing of nesting cover is detrimental to ground nesting species. The practice of allowing grazing in the fallow fields causes a reduction of food for waterfowl (HORN and GLASGOW, 1964). The ungrazed fallow land can be improved by adding water (HORN and GLASGOW, 1964).

Grazed land attracts fewer nesting attempts than undisturbed cover and hatching success is lower due to agricultural disturbances and predation (NELSON, 1972). MIHELSON (1968) found that duck nesting increased from six to nine times when mowing and grazing was stopped on three islands in a Latvia lake. In his report he stated "the above examples show that in places where breeding ducks is desirable, economic activity is not permissible". KIRSCH (1969) found higher pair populations, nest densities, and nesting success in ungrazed land than in grazed land.

The fallow land and parts of the ground cover in the *Melaleuca* forest are burned annually at Thale Noi. The burning was observed to begin in December with the end of the rainy season. FRITZELL (1975) found that indiscriminate annual burning reduces the quantity and quality of nesting habitat for nesting waterfowl.

Just as indiscriminate burning and grazing are harmful to the quality of nesting habitat, so are long periods of idleness (NELSON, 1972). NELSON (1972) states that every 10 years there is a need for periodic ecological disturbances by burning or mechanical scarification to rejuvenate the productivity of the habitat. MILLER (1971) found that nesting success on land idled 4 years or less was much higher than on land idled 5 years or longer. The use of fire as a tool for ecological management has been described by KIRSCH and KRUSE (1972), FRITZELL (1975), MILLER (1971; 1972), KIRSCH (1969).

Based on the above findings I recommend restricting grazing and burning to areas already used for agriculture.

The reserve area has many other used besides fishing and agriculture. Vegetation from the marsh is gathered as animal fodder and for

human consumption. The *Melaleuca leucadendra* forest, where the larger wading species of waterfowl nest, is being cut down to produce charcoal. This forest provides a major part of the region's fuel supply (HUNTING TECHINICAL SERVICES LIMITED).

Although not as prevelent now as before the area was gazetted a wildlife reserve area, poaching is conducted. Gunshots are frequently heard and waterfowl and their eggs can be purchased in many of the local markets. Villagers revealed that wildbirds and their eggs, in season, still provide part of their diet. Hunting Technical Services Limited stated that possibly the inhabitants of Thale Noi and surrounding areas are over-exploiting waterfowl and their egg supply to below recovery level. Although about 10 years ago they were common, Greater Adjutant Storks (Leptoptilos dubius) and Painted Storks (Ibis leucocephalus) are missing or very rare in the area.

Based on the above findings I recommend:

- Restrict the cutting of the forest to certain areas and conduct research to see how long it takes for Melaleuca leucadendra to rejuvenate.
- 2) Long term quantitative censuses of waterfowl populations.
- Conduct research studying nesting success of birds at Thale Noi.
- 4) Patrol the area to prevent poaching.

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Table 2. Months that species were tallied in the study area. Symbols appearing in the table are:

+ - Tallied

M – 4	Arrival of a migration						
A STATE AND A STATE	OCT.	NOV.	DEC.	JAN.	FEB.	MAR	
Little Grebe	200	ter pitte		-153Y	A sector		
Podiceps rufficollis	+	+	+	М	+	+	
Little Cormorant							
Phalacrocorax niger	+	+	+	+	+	+	
Chinese Pond Heron							
Ardeola becchus	+	+	+	+	+	+	
Egrets spp.							
Egretta spp. and	+	+	+	+	+	+	
Bubulcus ibis							
Yellow Bittern							
Ixobrychus sinensis		+	+	+	+	+	
Schrenck Bittern							
Ixobrychus eurhythmus	+	+					
Black Bittern							
Dupetor flavicollis	+	+	+	+	+	+	
Grey Heron							
Ardea cinerea	+	+	+	+	+	+	
Purple Heron							
Ardea purpurea	+	+		+	+	+	
Lesser Adjutant Stork							
Leptopilos javanicus	+						
White Ibis							
Threskiornis melancepha	la					+	
Cotton Teal							
Nettapus coromandelianu Whistling Teal	is +	+	М	М	+	+	

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	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.
Dendrocygna javanica	+	+	+	+	+	+
Brahminy Kite						
Haliastar indus	+	+	+	+	+	+
Baillions Crake						
Porzana pusilla						+
Ruddy Crake						
Porzana fusca					+	
White-Breasted Waterhen						
Amaurornis phoenicurus			+		+	+
Moorhen						
Gallinula chloropus	+	+	+	+	+	+
Purple Gallinule						
Porphyrio porphyrio	+	+	+	+	+	+
Pheasant-Tailed Jacana						
Hydrophasianus chirurgus	+	+	+	+	+	+
Bronze-Winged Jacana						
Metopidius indicus	+	+	+	+	+	+
Red-Wattled Lapwing						
Venellus indicus						+
Pintail Snipe						
Gallinago stenura					+	
Black-Winged Stilt						
Himantopus bimantopus					+	
Collared Pratincole						11.
Glarea pratincola	+	+			+	+
Common Kingfisher						
Alcedo atthis	-	+				7-
White-Breasted Kingfishe	r	,				+
Halcyon smyrnensia		+				
Black-Capped Kinghsher	-	+				+
Halcyon pileala	T					

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