

### BEHAVIOURAL ASPECTS OF THE WHITE-WINGED DUCK *CAIRINA SCUTULATA* IN THAILAND

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#### ABSTRACT

Thirteen protected areas were selected to be surveyed for the presence of White-winged Ducks *Cairina scutulata* based upon previous, recent observations of the species. During the survey only six birds were observed. However, the number of local reports of *C. scutulata* was very high in several areas, with observations in the Khao Phanom Dongrak Range, the Petchabun Range and from western Tenassarim. Data on habitat use, group size, activity patterns, feeding, breeding, moulting and mortality were collated. Local reports indicate that the species suffers heavy mortality from hunting in the dry season.

#### INTRODUCTION

The White-winged Duck *Cairina scutulata* was formerly widespread in South-east Asia, with confirmed records from India, Bangladesh, Myanmar, Laos, Vietnam, Cambodia, Malaysia, Indonesia and Thailand since 1840. At the beginning of 1992, however, the known surviving world population numbered only 210 individuals (GREEN, 1992), although few surveys had been conducted. Records since 1980 showed that *C. scutulata* was still relatively widespread in that it survived in at least six countries but its distribution is highly fragmented (GREEN, 1992).

At the start of 1992, Thailand had a small known population of *C. scutulata*; since 1980 it had been reported from the Peninsula, the North-east, South-west and possibly the South-east. Population estimates were based on very limited data. In addition, there were a number of poorly surveyed forested areas that were known to have the potential to hold populations (GREEN, 1992).

This project follows a detailed study of the status and conservation needs of the White-winged Duck conducted by the Wildfowl and Wetlands Trust in association with the Asian Wetland Bureau and the International Council for Bird Preservation. The populations were considered to be under continuing threat from hunting, habitat destruction and possibly pesticides. There were urgent needs to clarify the status and distribution of *C. scutulata* in Thailand and define measures to enhance the survival of remaining populations. This survey was organized to fulfill these needs, and hence to implement some of the recommendations in the conservation plan for the species presented by (GREEN, 1992).

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Our knowledge of the biology of *C. scutulata* in the wild is limited. During the course of the field surveys, it was also hoped that behavioural data for this elusive species would be collated. This paper summarizes these findings.

The aims of the survey were:

- to collect information from interviews with people living in or on the periphery of selected protected areas to establish the current distribution and size of surviving populations of *C. scutulata* in Thailand.
- to collect data from local reports and field excursions on habitat use and behaviour of the species.
- to identify major threats to the remaining populations of the species.
- to identify conservation measures necessary to promote the long-term survival of remaining populations of the species.
- to identify one or more sites suitable for intensive research of *C. scutulata* biology.

## METHODS

Twelve protected areas were initially selected as candidate sites to be surveyed for the presence of *C. scutulata*, based on previous sightings or reports of the species (GREEN, 1992). Three sites, namely Khao Yai National Park, Khao Soi Dao Wildlife Sanctuary and Ao Phang-nga National Park, were rejected, as either being well surveyed sites with very few records or deemed to have little suitable habitat. Other sites, such as Huai Sala Wildlife Sanctuary, were included because of local reports in adjacent protected areas. Further sites such as Umphang Wildlife Sanctuary were surveyed because of reports gathered during the course of the survey. The final list of selected sites included:

Umphang Wildlife Sanctuary	27/03/1993 – 02/04/1993.
Mae Wong National Park	14/10/1992 – 18/10/1992.
	24/03/1993 – 25/03/1993.
Thung Yai Naresuan Wildlife Sanctuary	02/04/1993 – 13/04/1993.
Phu Khieo Wildlife Sanctuary	21/07/1992 – 05/08/1992.
	31/01/1993 – 10/02/1993.
Nam Nao National Park	13/12/1992 – 16/12/1992.
	26/01/1993 – 31/01/1993.
Phu Jong Na Yoy National Park	26/08/1992 – 10/09/1992.
	04/11/1992 – 10/11/1992.
Yot Dom Wildlife Sanctuary	27/10/1992 – 04/11/1992.
Khao Phra Vihan (ungazetted)	28/10/1992.
Khao Phanom Dongrak Wildlife Sanctuary	19/09/1992 – 22/09/1992.
Huai Sala Wildlife Sanctuary	22/09/1992 – 01/10/1992.
Khao Ang Ru Nai Wildlife Sanctuary	02/07/1992 – 11/07/1992.
Kaeng Krachan National Park	20/02/1993 – 27/02/1993.
Chalerm Pha Kiet Wildlife Sanctuary	01/06/1992 – 15/06/1992.

Each site was visited for a provisional period of approximately two weeks. At each protected area, two basic survey methods were used. Much data were collected through interviews in which forestry officials, local villagers and, occasionally, soldiers stationed in or near protected areas in the border regions were questioned as to the presence of *C. scutulata* in the respective parks and sanctuaries. Forestry officials were interviewed at headquarters and through visits to sub-stations, which were usually located on the periphery of protected areas.

Interviews with local villagers were conducted through identifying villages in close proximity to the parks or sanctuaries on 1:50,000 land classification maps. A variety of ways were used to locate villagers for interviewing. Most often, driving randomly through targeted villages located groups of men sitting together outside houses or shops/restaurants. Sometimes forestry officials could direct the surveyors to individuals who were good sources of information. Hunters, whether still active or not, tended to be the best sources of information. On occasion, the surveyors first visited the village headman to clarify the nature of the work, and gained both confidence and respect from other villagers. Very occasionally, a middleman was used to follow up a sensitive report. Unmarked vehicles (without the RFD emblem) or motorcycles were sometimes used to reduce protected area/local people resentment. Provision of cigarettes also assisted information collection. Soldiers were interviewed when their presence was made known to the surveyors while roaming protected area boundaries.

Interviews tended to follow a sequence of questions on the following topics:

- i) whether or not the locals familiar with *C. scutulata*, locally known as Ped Ka. At this stage a bird guide (LEKAGUL & ROUND, 1991) was presented to the locals, opened at the page picturing *C. scutulata*, and the two species most likely to be confused with the species, namely Comb Duck *Sarkidiornis melanotos* and Lesser Whistling Duck *Dendrocygna javanica*.
- ii) details of the bird's size, colouration (particularly white wing patches) call and location of the sighting were used to confirm the identification as *C. scutulata*.

When the surveyors were 99% confident that the interviewee had seen the species a further set of questions were asked on the following topics:

- iii) where the observation was made. A 1:50,000 land classification map (1977–1979) of the protected area was used to try to pinpoint the waterbody at which the sighting was made, with a grid reference, where possible.
- iv) the year, month and/or season of the sighting.
- v) the time of the sighting.
- vi) the number of birds seen.
- vii) the behaviour of the birds when sighted.
- viii) the nature of the habitat when the sighting was made; if it was a river, its width, depth and permanence.
- ix) whether or not young birds or nests had ever been observed.

Almost all data presented in this report comes from such local information, and only data considered very reliable are included. In all areas where there appeared to be a large population of birds present, virtually every male villager (hunter) was familiar with the species.

Confusion with other species was possible, particularly Comb Duck *Sarkidiornis melanotos* and Lesser Whistling Duck *Dendrocygna javanica*. However the combination of size, call, habitat, time of year of observation, as well as reference to the field guide confirmed the identification.

On some occasions a number of villagers sitting together in a group reported that they had seen birds on different occasions. In these circumstances it was virtually impossible to control the questioning and get satisfactory interviews to confirm identifications fully.

Occasionally villagers were interviewed who had not encountered the species in the immediate vicinity, but who could clearly remember seeing the species in the past at another location. Observation of *C. scutulata* was so striking that villagers could remember seeing large ducks perhaps many years ago and many kilometres from the location of the interview.

At protected areas where large numbers of observations were reported, field surveys were undertaken to assess the habitat and to observe birds. These excursions lasted 2–7 days. Surveys were focused on small permanent waterbodies or stretches of streams and rivers; the latter included walking along the river/stream beds for long distances. Detailed descriptions were made of the waterbodies during these surveys.

## RESULTS

During the course of the field surveys it was extremely difficult to observe birds. The species is notoriously elusive, partly because of its crepuscular/nocturnal habits. Moreover, every protected area suffers from intensive poaching, so reducing the birds' densities and making them more wary. Evidence of these illegal activities, particularly shooting, was witnessed at every protected area in which field surveys were undertaken. For example, at Phu Jong Na Yoy National Park, five hunting parties were encountered in a two-day period. Furthermore, three of the sites with high numbers of birds reported, all located in the Khao Phanom Dongrak Range, are saturated with land-mines which made access very difficult. As a result of these factors, only six birds were encountered during the survey at four locations.

However, the number of local reports of *C. scutulata* was very high in several areas, with observations in the Khao Phanom Dongrak Range, the Petchabun Range and from western Tenasserim. Based on the local reports, supported by field surveys to assess habitat quality, minimum population estimates for *C. scutulata* were made. The populations estimated in the Khao Phanom Dongrak Range were 10 pairs in Phu Jong Na Yoy National Park, 5 pairs in Yot Dom Wildlife Sanctuary, 2+ pairs in Khao Phra Vihan, 5+ pairs in Khao Phanom Dongrak Wildlife Sanctuary and 10 pairs in Huai Sala Wildlife Sanctuary; in the Petchabun Range 10 pairs in Phu Khieo Wildlife Sanctuary and 2 pairs in Nam Nao National Park; and in western Thailand, 5 pairs in Thung Yai Naresuan Wildlife Sanctuary and 2 pairs in Umphang Wildlife Sanctuary. Two pairs are thought to survive in or around

the boundary of Chalerm Pha Kiet Wildlife Sanctuary.

Other than at Chalerm Pha Kiet the surviving populations identified are restricted to three regions, all of which are in upland areas. The geological features, which directly affect the hydrology of the overlying watercourses, are key factors for the presence of two of the populations at least, these being the populations of the Khao Phanom Dongrak range and the Petchabun Range.

The Khao Phanom Dongrak range appears to support birds in virtually every waterway. Every river is regularly transected by rock stratifications. These formations reduce water-flow at the height of the wet season (May to October) and decrease run-off during the dry season (November to April). The presence of these features is due to the dip-angle of folding of the mountain range; the different rates of erosion of the inter-layered beds of sandstone (hard) and siltstone (soft) give rise to the natural dams and the stagnant waterbodies—where the rock has been eroded away—respectively. The angle of folding is not the same in the range found to the west which may account for the apparent absence of the species in sites such as Khao Yai, Thap Lan and Pang Sida National Parks.

Similarly, the plateau of Phu Khieo Wildlife Sanctuary, covering 610 km<sup>2</sup>, has relatively flat terrain, which results in slow runoff, and may have relatively high precipitation because of its elevation. Birds were recorded breeding in Phu Khieo in several river systems and some forest ponds/swamps. Two pairs were reported from the lowland watercourses of the contiguous protected area, Nam Nao National Park. In western Thailand, birds were also recorded in Thung Yai Naresuan Wildlife Sanctuary and Umphang Wildlife Sanctuary, being part of the same population, although a detailed assessment was not undertaken.

A few records were obtained from Chalerm Pha Kiet Wildlife Sanctuary (Pa Phru Wildlife Sanctuary) and Kaeng Krachan National Park. However, the species was considered to be virtually extinct at both these sites, although the latter site is extensive and may have a scattered population near the Myanmar border. No records were obtained from Mae Wong National Park, possibly because of the steep terrain, or from Khao Ang Ru Nai Wildlife Sanctuary which may have been due to the lack of suitable habitat or suitable tall emergent trees that provide nesting sites.

The estimated densities for the populations in the Khao Phanom Dongrak range and on the plateau of Phu Khieo Wildlife Sanctuary appear to be the lowest for any population of *C. scutulata* in the world, but these may be underestimates.

### Habitat Use

*C. scutulata* appears to favour two distinct types of wetland habitat: slow moving streams/streams, and forest swamps. In the Khao Phanom Dongrak Range the hills are gently sloping. Field surveys were conducted to five locations in Phu Jong Na Yoy National Park, four of which had reports of *C. scutulata*. All these waterways were very similar, periodically dammed by hard, stratified rock (sandstone) traversing the direction of flow, effectively slowing the water current and creating an almost static waterbody (which in fact is where the siltstone has been eroded away) stretching several hundred meter (Figs. 1, 2).

The narrow waterbodies surveyed in the Khao Phanom Dongrak Range were also very straight, which may allow a large bird such as *C. scutulata* to take off and land easily, and may reduce the risk of predation. CHAMBERS (1990) also noted that *C. scutulata* seems to favour areas with a clear escape and approach route with a good view of the immediate surroundings. However, other data show that the bird can rise vertically from very small waterbodies on occasion. A bird flushed from a small stream near Lam Saphung in Phu Khieo Wildlife Sanctuary flew from a very concealed waterbody. Similarly, three ducks were flushed from a tiny forest pond near Bung Mon, Phu Khieo. On two further occasions at Bung Mon, the ducklings were located in very dense *Saccharum* grassland, presumably accompanied by at least one adult until flushed.

The plateau encompassed within Phu Khieo Wildlife Sanctuary provides streams and small rivers with mild gradients and also supports a number of forest swamps. Of the forest swamps marked on the 1:50,000 maps, Bung Mon (Fig. 3) was permanently inundated following the construction of a dam at one end of the site; and only two sites, Bung Kho and Bung Waeng, offered suitable waterbodies where ducks could breed. Most other clearings were undergoing a phase of plant succession, being covered with grass, sedges, ferns and young saplings. Other small waterbodies, too small to be marked on the map, also offered suitable habitat for breeding. *C. scutulata* also utilizes larger waterbodies, such as Lake Lakatu in Thung Yai Naresuan Wildlife Sanctuary covering over 300 ha (Fig. 4) and Bung Fad, Umphang Wildlife Sanctuary, covering 130 ha. Both sites are located above 700 m. Both lakes were reported to be over 10 m deep.

Amongst the local reports there were marked peaks of encounters during the dry season, notably from the larger rivers at each site. For example, there were sightings from the Lam Dom Yai separating Phu Jong Na Yoy National Park and Yot Dom Wildlife Sanctuary, and observations from the Huai Nam Phrom separating Phu Khieo Wildlife Sanctuary and Nam Nao National Park. This may be because more villagers/hunters go into the forest in the dry season. However it seems more likely that there is a localized movement of birds in the dry season, as a result of other smaller sites deeper in the forest drying up.

This movement is also reflected in a slight increase in frequency of observations during the dry season in agricultural land and wetlands outside the forested protected areas (see Fig. 5). Similar movements of ducks in the dry season to feed collectively on suitable water, such as open swamps, have also been reported in Assam, India (MACKENZIE, 1976).

### Group Size

*C. scutulata* was most usually reported singly (n=46), or in pairs (n=90) (Fig. 6). this supports the idea of a monogamous mating system, and is consistent with a long term pair bond. Such a strategy would reduce predation, particularly if the pair were territorial, having intimate familiarity with stretches of water contained within the territory. Larger groups were seen mostly outside the breeding season, when young birds may well have been present, or at a time when the birds may have been forced to congregate on remaining waterbodies at the height of the dry season.



Figure 1. Huai Ngae Muang, located two kilometres from Laos inside Phu Jong Na Yoy National Park, is a typical upland waterway frequented by the ducks in the Khao Phanom Dongrak Range.



Figure 2. White-winged ducks are frequently observed on the Lam Dom Yai, the river which segregates Phu Jong Na Yoy National Park and Yot Dom Wildlife Sanctuary. This is Wung He, one of the longest stretches of slow-moving water on the river.



Figure 3. Bung Mon, Phu Khieo Wildlife Sanctuary. This is one of the regular breeding sites for the ducks in the country.



Figure 4. Bung Lakatu, in northern Thung Yai Naresuan Wildlife Sanctuary, is one of the largest waterbodies which the ducks inhabit.

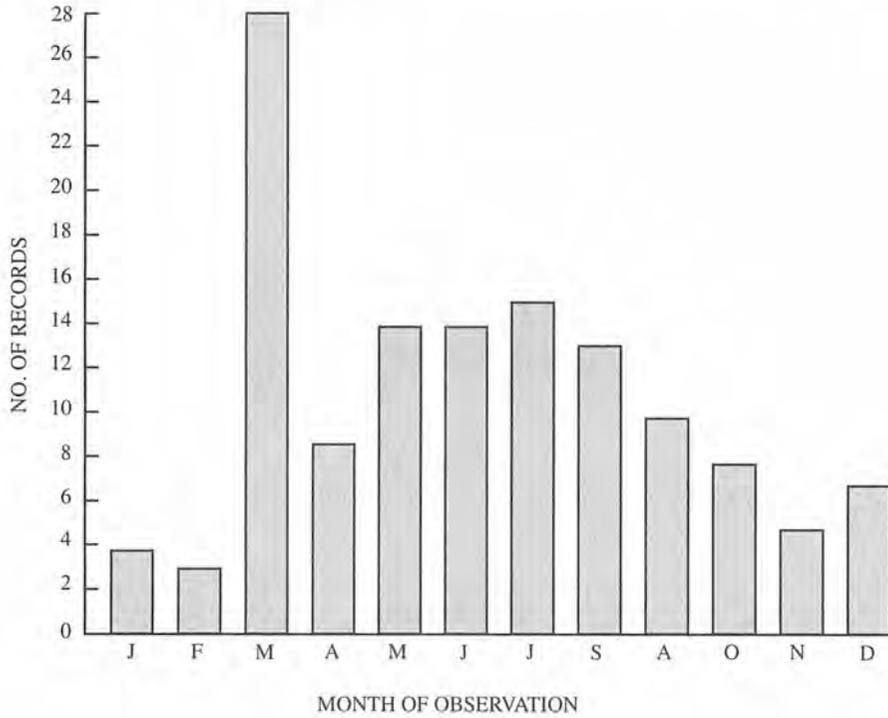


Figure 5. Seasonality of *C. scutulata* observations.

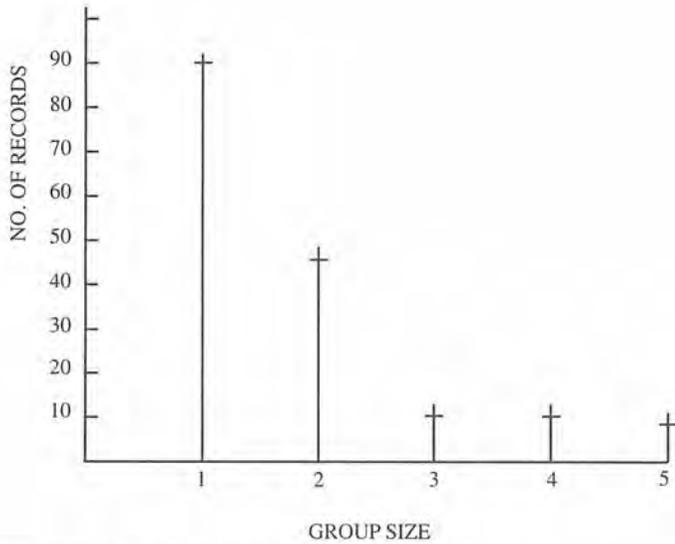


Figure 6. Group Sizes of *C. scutulata*, based on all sightings.

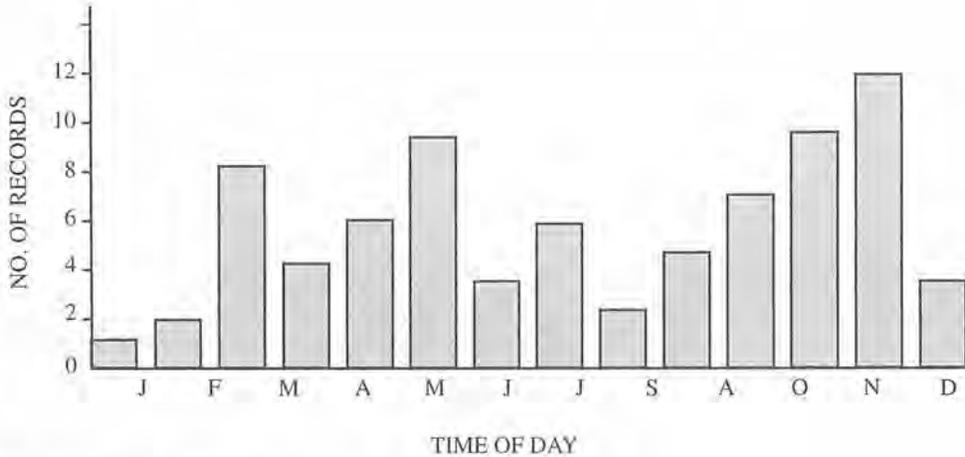


Figure 7. Diurnal Activity of *C. scutulata*, based on all sightings.

### Diel Rhythm

Analysis of the local reports did not reveal a clear pattern of the daily activity of the species (Fig. 7). Encounters were made throughout the morning and in the late afternoon. Birds were rarely encountered early in the morning, perhaps because the villagers were preoccupied. Most authors describe that *C. scutulata* has peaks of locomotory and feeding activity at dawn and dusk (GREEN, 1992).

There has been some uncertainty as to how nocturnal the species is. Interesting observations were made at Bung Lakatu, indicating that the bird is at least active on moonlit nights. Birds were heard at 0300 h at night in April 1993. The following night they were heard calling at 2030 h, and observed feeding under a full moon at 2245 h, and then later heard and seen in flight at 0130 h and 0345 h respectively the same night. Birds were observed at night on two other occasions. A pair were seen swimming on the Ta Goi reservoir, Khao Phra Vihan at 2200–2300 h; whilst one was shot at night on the Huai Sangkot, Khao Phanom Dongrak—visibility must have been good. Similar observations have been made at Way Kambas, Sumatra, where birds were noted to feed at night only when there was a full moon; on moonless nights, the birds rested (NOOR, 1991).

### Feeding

Very little information was gathered on the feeding behavior of the ducks. This may have been partially due to the extreme alertness of the species, which prevented long periods of observations, or it may be that the locals either forgot or ignored the ducks' behaviour. On one occasion, a bird was observed to eat a wild fig at Nam Nao. Feeding at night by dabbling on the water surface was observed for 30 minutes under a full moon at Lake Lakatu.

### Breeding

All previous literature has indicated that *C. scutulata* is an obligate hole-nester (MACKENZIE & KEAR 1976, HOLMES 1977, LAMBERT 1988). One nest, with six to seven young, was found in a hole of a *Dipterocarpus* sp. in Phu Phan District, in about 1979. A second nest was found again in 1979 25–30 m above the ground in a *Dipterocarpus* sp. in Khao Phanom Dongrak Wildlife Sanctuary.

One nest was located at Bung Mon, Phu Khieo in 1989 in a dead tree within the impoundment, some 10 m from the bank. It was 1 m above the water level in the base of the rotting trunk. The tree had previously drowned following inundation.

The timing of breeding could only be gauged from reports where ducklings were reported. In 1992, small ducklings were observed on two occasions at Bung Mon, Phu Khieo, in mid-June. In the same year, small ducklings were also seen in June at Huai Klang, Phu Khieo. At Khao Phanom Dongrak ducklings were reported to still be in the nest in about August. Ducklings were observed in the nest in July/August near Phu Phan National Park. These sightings indicate that the species may begin nesting in the late hot season (April), before the onset of the monsoon, rains. Birds were often seen singly or in pairs, suggesting a monogamous breeding system.

Brood size could only be gauged by observations of young. Approximately six young were heard at Bung Mon, Phu Khieo. Five to six ducklings were seen at Huai Klang, Phu Khieo. At least five ducklings were seen on the Lam Dom Noi, Phu Jong Na Yoy in 1985. One villager reported seeing at least six ducklings in the nest at Huai Sangkot, Khao Phanom Dongrak. At Huai Satod, Phu Pan, six or seven ducklings were seen at the nest.

Local reports indicated that the female provides most of the parental care alone. On two occasions when ducklings were located at Bung Mon, Phu Khieo, a single adult took to the wing and circled around overhead in an anxious state, calling. On three other occasions at the site, a single adult bird was flushed and appeared to leave the wetland, close to where the rest of the family party were thought to be present. Observations from Way Kambas National Park, Sumatra also noted that sightings of adult with young invariably concerned one adult, presumed to be the female (EKSPEDISI, 1990). The reason for this may be that the male would increase the risk of drawing the attention of predators to the brood by staying very close to them; by remaining not too far away the male can warn of danger from a certain direction.

### Mortality and Threats to Survival

Shooting probably causes very high mortality throughout Thailand, taking a high toll in the population in the Khao Phanom Dongrak Range. A total of 18 fledged birds were reported killed to the surveyors from all sites. Of these, at least eight birds were shot on the periphery of the protected areas in the dry season, in the small impoundments, in the wetland ponds or in the rice fields. All the birds were shot by local villagers except two, which were reportedly shot by Khmer soldiers in 1987. One was also caught on a fish hook in Huai Sala reservoir, Huai Sala, in 1988. Corpses of birds were reported at Huai Mak and Huai Hu Chang, Phu Jong Na Yoy, both in 1992.

There are signs that villagers are becoming more environmentally aware. For example, on 11 August 1992 the superintendents of Phu Jong Na Yoy National Park and Yot Dom Wildlife Sanctuary jointly organized a ceremony where some 300 guns were handed over to the provincial authorities (deputy-governor) by local villagers, a growing practice in protected area management. Although partly symbolic, a proportion of the local villagers refrain from hunting.

Birds are also killed by other means. Two birds were reported killed on fish hooks, whilst ducklings or young birds are captured and kept in captivity. An all-embracing awareness campaign is essential to reduce this heavy toll.

### Further Research

Phu Khieo Wildlife Sanctuary and Phu Jong Na Yoy National Park provide opportunities for further research. The site at Bung Mon, Phu Khieo Wildlife Sanctuary, has high potential for intensive research to undertake a detailed ecological study of the species; the site also has a globally significant population. The eastern portion of Phu Jong Na Yoy National Park—free of land-mines—offers an opportunity to study breeding pairs characteristic of the globally significant populations in the Khao Phanom Dongrak Range, and provides a focus for conservation in this region of Isarn.

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## REFERENCES

- BARTON, C.S. 1914. A short list of birds from the Raheng District. *J. Nat. Soc. Siam* 1: 105-109.
- BLACK, J.M. 1991. Reintroduction and restocking: guidelines for bird recovery programmes. *Bird Cons. Int.* 1: 329-334.
- CHAMBERS, A. 1990. The White-winged Wood duck, *Cairina scutulata*, in the Way Kambas National Park. Unpublished report of the Southampton University Expedition.
- ENDERLEIN, P. AND J.F. MAXWELL. 1976. A preliminary report from an attempt to find evidence for the presence of the Kouprey *Bos sauveli* in eastern Thailand and a recommendation to the Government of Thailand to set aside the Dongrak Mountain Range for Conservation Purposes. FAO, Bangkok. 7 pp.
- GREEN, A.J. 1992. The Status and Conservation of the White-Winged Wood Duck *Cairina scutulata*. *IWRB Spec. Publ.* 17, Slimbridge, U.K. 115 pp.
- GRETTON, A. 1990. Recent Reports. *Oriental Bird Club Bulletin* 11: 48.
- HOLMES, D.A. 1977. A report on the White-winged Wood Duck in southern Sumatra. *Wildfowl* 28: 61-64.
- HUSAIN, K.Z. AND M.N. HAQUE. 1982. *The White-Winged Wood Duck Project*. Report to the University Grants Commission, Dhaka.
- KAMOLNORRANATH, S. 1991. *Captive Management, Breeding and Conservation of the White-winged Wood Duck Cairina scutulata with Special References to Thailand*. Unpublished Diploma Thesis.
- LAMBERT, F. 1988. *The Status of the White-winged Wood Duck in Sumatra, Indonesia. A preliminary assessment*. PHPA-AWB/INTERWADER Report No. 4
- LEKAGUL B. AND P.D. ROUND. 1991. *A Guide to the Birds of Thailand*. Saha Karn Bhaet, Bangkok.
- MACKENZIE, M.J.S. 1975. WWF project 406: *White-winged Wood Duck Status Survey in Assam 1975*. Unpublished Report.
- NAKHASATHIEN, S. AND B. STEWART-COX. 1990. Nomination of The Thung Yai-Huai Kha Khaeng Wildlife Sanctuary. Submitted to the World Heritage Commission, UNESCO. Bangkok.
- ROYAL THAI FOREST DEPARTMENT, National Parks Division. 1988. *A Management Plan for Phu Jong Na Yoy National Park*. Royal Forest Department, Bangkok. 31 pp. (In Thai)
- PARR, J.W.K., P. LAOTHONG AND G. RUANGSREE. 1993. A survey of White-winged Wood Duck in Thailand. *Spec. Publ. of Wildfowl and Wetlands Trust, Slimbridge, U.K.* 73 pp.
- PHENGLAI, C. AND C. NIYOMDHAM. 1990. *Flora in Peat Swamp Areas of Narathiwat*. Sombun Press, Bangkok. 368 pp. (In Thai)
- ROUND, P.D. 1988. Resident forest birds in Thailand: their status and conservation. *ICBP Monograph* 2, Cambridge, U.K. 211 pp.
- ROUND, P.D. 1990. White-winged duck. *Bangkok Bird Club Bull.* 7: No. 11.
- JINTANUGOOL, J. AND P.D. ROUND 1989. Thailand (pp. 667-736 in Scott, D.A., *A Directory of Asian wetlands*.) IUCN, Gland, Switzerland and Cambridge, U.K. xiv + 1181 pp.
- EKSPEDISI, TIM. 1991. *Bebek Hutan Bersayap Putih (Cairina scutulata) di Taman Nasional Way Kambas Propinsi Lampung, Sumatra, Indonesia*. HIMBIO UNPAO. Jatinangor.

