

Among the large storks that nest singly, the maximum number of fledglings recorded is three, with one exceptional record of a Jabiru *Jabiru mycteria* nest with five chicks fledging (Thomas 1981) and one record of four Black-necked Stork chicks fledging in Australia, where the species has been well-studied (D. Richards *in litt.* 2006). There are no records of four Black-necked Stork chicks fledging from a single nest in South-east Asia, where the species is sparsely but widely distributed (J. Barzen, T. Clemens, W. Duckworth, T. Evans and R. Timmins *in litt.* 2005).

ACKNOWLEDGEMENTS

KSGS thanks R. Chauhan, R. Kirby, S. Sinclair and T. Sinclair for their company during the observation in Mainpuri district, and G. Clancy and D. Richards for information from Australia. AD and YB thank the farmers for information on the nest of the Black-necked Stork in Jodiya. SPN thanks SACON and S. N. Prasad for facilities under the project "Structural and functional attributes of the wetlands in Indo-Gangetic Plains of India with reference to Uttar Pradesh", and S. Chauhan for his company during the observation at Etah district.

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A recent record of Storm's Stork *Ciconia stormi* in Thailand

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Storm's Stork (*Ciconia stormi*) is one of the rarest species of storks in the world and very little is known of its natural history (Luthin 1987, BirdLife International 2001, Wetlands International 2006). The species is classified as Endangered due to its small (250–500 individuals) and rapidly declining population, caused primarily by the destruction or conversion of its preferred lowland evergreen forest habitat (BirdLife International 2001, Wetlands International 2006).

In this note we report the first sighting of this species in Thailand for 18 years. The observation was made on 3 April 2004 by an infrared camera trap device (placed at c. 100 m above sea level at c. 9°10'N 98°40'E) within Klong Saeng Wildlife Sanctuary in Surat Thani province.

Most observations of the species come from Borneo where individuals and small groups have been sighted alongside rivers in forested areas, but it also occurs in peninsular Malaysia and Sumatra (Luthin 1987, BirdLife

International 2001). There is only one previous record from Thailand, where a nesting pair with chicks was observed in detail in a lowland evergreen forest area (at c. 9°05'N 98°30'E, 69 m) during September/October 1986 (Nakhasathien 1987). Recent rangewide assessments have suggested that the species is probably extinct in Thailand (BirdLife International 2001, Bird Conservation Society of Thailand 2004).

METHODS

The record was made during a camera-trap survey for fishing cat (*Prionailurus viverrinus*) in a remote area of Surat Thani province in southern Thailand. The survey used six passive infrared-triggered camera traps which were rotated among several evergreen forest sites along the banks of smaller streams and lakes surrounding the



Plate 1. Storm's Stork (*Ciconia stormi*) recorded on 3 April 2004 at Klong Saeng Wildlife Sanctuary in Surat Thani province, Thailand.

Ratchaprapa (formerly Chiew Larn) Reservoir in Khlong Saeng Wildlife Sanctuary. The survey resulted in a total of 528 camera trap days during January–April 2004 (see Boontua 2004 for further details).

Created in 1987/88, the Ratchaprapa Reservoir flooded an area of approximately 165 km² of what, at the time, was one of southeast Asia's most pristine lowland evergreen forest areas and the only extensive lowland valley-bottom protected forest habitat in peninsular Thailand (Nakhasathien 1987). The extensive reservoir now falls within the boundaries of Klong Saeng Wildlife Sanctuary and Khao Sok National Park—both part of the c.4,285 km² Khao Sok protected area cluster, spanning Surat Thani, Chumphon, Phangnga, and Ranong provinces, Southern Thailand.

OBSERVATIONS

One camera, active at a single site for a period of 24 days, recorded four pictures of at least two Storm's Storks on 3 April 2004 (Plate 1). The camera was set in a relatively open area along a seasonal stream draining into the large Khlong Ya branch of the Chiew Larn Reservoir. One individual was photographed in a wing-droop spread-wing position (see Kahl 1971 for nomenclature). Photographed birds were standing on the pebbly part of the river out of the water.

DISCUSSION

The single detection despite the high intensity of sampling in potential habitat underscores the rarity of Storm's Storks in the region. Although the species has also recently been detected in the Thanintharyi division of Myanmar (J. Eames *in litt.* 2006), the prospect of finding this species elsewhere in Thailand is highly unlikely given that there is almost certainly no other remaining site in the country that holds sufficient lowland forest habitat to support this species. This record thus highlights the great conservation

significance of the Khao Sok–Klong Saeng Forest Complex.

Throughout the entire Sunda subregion, lowland valley bottom forests are being converted at an escalating rate, threatening this stork and other species dependent on this habitat. Other globally threatened species that occur within the Klong Saeng–Khao Sok forest complex include birds such as Masked Finfoot *Heliopais personata*, Wallace's Hawk-eagle *Spizaetus nanus* and Blue-banded Kingfisher *Alcedo euryzona*, and mammals such as tiger *Panthera tigris*, Malayan tapir *Tapirus indicus*, and Asian elephant *Elephas maximus*.

The photographs document an open-winged posture which has not been described previously for this species (Kahl 1971). This reflects one of the benefits of remote camera-traps that can capture behavior that might otherwise be difficult to observe.

Specific threats to the site of this observation (and indeed to much of the entire Klong Saeng–Khao Sok forest complex) include illegal hunting, trapping and fishing, collection of non-timber forest products, and dramatic changes in vegetation structure brought about by the construction of the reservoir as well as the sometimes large water level fluctuations that occur at the margin of the reservoir and the surrounding forest (Nakhasathien 1987, 1989). These patterns have likely increased since the dam was built as the reservoir provides easy access to remote areas. Overall human traffic continues to increase due in part to the construction of numerous floating tourism bases. Additionally, there are now plans for a road through the northern region of the complex (Bangkok Post 2006).

Given that this record opens the possibility that a small breeding population is still present at this locality, targeted survey efforts for the species and nest sites should be a priority, and special protection measures should be implemented at any confirmed nest sites. More generally, increased protection and monitoring efforts are needed to conserve the natural communities of the Klong Saeng–Khao Sok Forest Complex as a whole, especially the extremely limited lower evergreen areas around the Chiew Larn Reservoir. Designation of the area as one of Thailand's Important Bird Areas should also be considered in light of this highly significant record and the other globally threatened birds that occur at the site.

ACKNOWLEDGEMENTS

Funding for these surveys was provided by the Cincinnati Zoo and Smithsonian Institution. We are grateful to Thailand's National Park, Wildlife, and Plant Conservation Department who facilitated the surveys. Thanks also to Philip Round and K. S. Gopi Sundar and for reviewing earlier drafts of this report.

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Infanticide-cannibalism in the Oriental Pied Hornbill *Anthracoceros albirostris*

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We report here infanticide followed by cannibalism in the Oriental Pied Hornbill *Anthracoceros albirostris*, which to our knowledge has not been previously reported in hornbills.

In December 2005 to January 2006, video cameras were placed in four Oriental Pied Hornbill nest cavities (before they were occupied), in the forests of Pulau Ubin, an island off Singapore, as part of the Singapore Hornbill Project. Pulau Ubin (1°24'N 103°58'E) lies in the Straits of Johor, north-east of the main island of Singapore; it is 8 km in length and 1.3–1.7 km in breadth and has an area of 10.2 km². The habitat is mainly mixed secondary forest with old fruit plantations, primarily durian *Durio zibethinus*. The nest trees were 0.6–2.7 km apart, at an altitude of 1–5 m. The cavity openings were 7–12.1 m above the ground.

Three CCTV cameras with infra-red capabilities were positioned at each nest: one inside the nest cavity, one at the nest entrance and one 5–10 m away. A DVD recorder, portable 120A batteries, inverter and monitor powered by 80A batteries were connected to the cameras. Images from all cameras were recorded 24 hours daily by a digital video recorder running the Telexper programme (Telexper International Inc, California, U.S.A.). Data were transferred fortnightly to external hard disks for storage. Data were reviewed and analysed daily, with the timing of events noted directly from the recordings.

Dimensions (e.g. egg size and beak length) were obtained by measuring the images and multiplying by the relevant magnification factor. Magnification factors were derived from an image of a reference object (a ruler placed inside the nest cavity). Parallax effects were minimized by taking the measurements at the bottom of the nest.

OBSERVATIONS

Three of the nests were subsequently occupied by females. The female in the first nest first entered the nest cavity on 27 December 2005, and she was sealed in by both her mate and herself on 4 January 2006. She laid four eggs, with the first on 10 January and the others at 3–4 day intervals. The nestlings hatched on 6–16 February, 28–29 days after the eggs were laid. The male brought food to the nest up to 31 times a day during the nesting period. During the 15 days from the hatching of the first chick to the death of the fourth chick, the items brought by the male comprised 50% fruits, 40% insects and 10% lizards. The duration of visits by the male ranged from 30 seconds to three minutes, depending on the size and amount of food.

All the chicks positioned themselves just under the opening through which the male brought the food, which was distributed whole by the female to the chicks. Visual estimations of the food intake by the individual chicks over these 15 days indicated that the food mass received by each of the eldest three chicks was similar. During individual feeding visits, chicks that were satiated did not fight for food as much as the hungrier chicks, and the female appeared to distribute food to the chicks that begged most vigorously.

The fourth (youngest) chick appeared to receive much less food than the other three chicks (Fig. 1a) and it looked much smaller and weaker. Whereas the mean feeding frequency of the three larger chicks during their first four days was 17.4 times a day, the fourth chick received just eight feeds on its second day after hatching and three on its fourth day. The three older chicks grew steadily and at