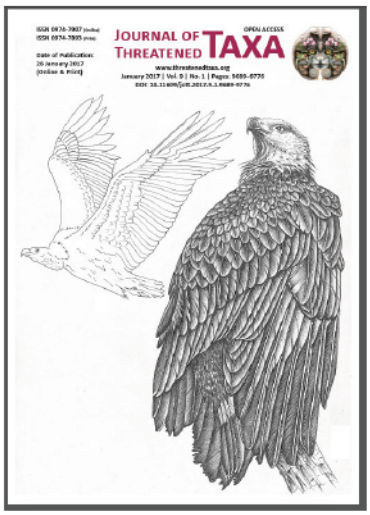

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SHORT COMMUNICATION

FIRST RECORD OF THE WOOLLY-NECKED STORK *CICONIA EPISCOPUS* BODDAERT, 1783 (AVES: CICONIIFORMES: CICONIIDAE) BREEDING IN THE LOWLAND WET ZONE OF SRI LANKA

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First record of the Woolly-necked Stork *Ciconia episcopus* Boddaert, 1783 (Aves: Ciconiiformes: Ciconiidae) breeding in the lowland wet zone of Sri Lanka

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Abstract: The Woolly-necked Stork *Ciconia episcopus* is a resident bird species commonly found breeding in the dry lowlands of Sri Lanka, preferably nesting in remote areas with minimal disturbance, although the breeding and nesting behavior has not yet been adequately documented. Here we report its nesting behavior, for the first time in lowland wet zone Sri Lanka, from Thalagolla, Beddawela in Kegalle District. Although its usual breeding season is in the dry zone from February to March with a second breeding cycle from November to early January, here we report breeding in the lowland wet zone from July–October in 2013–2014. Further, it was interesting to note presumably the same couple of birds used the same nest in 2014 with minimum renovation. In 2015 the nest had disintegrated and fallen due to continuous heavy rain and there have been no records till June 2016. Breeding was again recorded from June–September in 2016 with a new nest in a different platform of twigs in the same tree.

Keywords: Breeding, first record, Sri Lanka, wet zone, Woolly-necked Stork.

Sri Lanka has a rich avifauna of 453 species, including 237 species of birds that are known to breed in Sri Lanka (Weerakoon & Gunawardena 2012). The rest of the 216 species are migrants of which 72 species are encountered rarely and considered as vagrants (Weerakoon & Gunawardena 2012). The distribution of every resident species in Sri Lanka except those endemic to the island extends northward either as the same or a different sub species (Warakagoda & Siriwardena 2009). According to geographical and topographical conditions Sri Lanka can be divided into three major climatic zones providing a wide variety of habitats (Wijesinghe et al. 1993; Newton 2003).

The Woolly-necked Stork *Ciconia episcopus* is locally known in Sinhalese as 'Padili Manava' (Kotagama & Wigeshinha 1998) and 'Padili kokka' (Henry 1971); and in Tamil as 'Venkaluthu naarai' (Henry 1971; Kotagama & Perera 1983). It can easily be identified by its large blackish stork, white neck and the rest of plumage (ridge, rim and tip) with white tail coverts (Legge 1880; Warakagoda et al. 2012). The breeding season varies with the range, from India to Indonesia in July–September and in December–March, usually in the dry season throughout Africa, and in February–May and August–November in Southeast Asia where they probably breed all year round (del Hoyo 1992; BirdLife International 2016).

Tree species like *Samanea* spp., *Salmalia* spp. and *Ficus* spp. were recorded as preferred trees (fork of a parallel branch of a tall tree) for nesting. The nest is

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a large stick platform 10–30 m (and occasionally up to 50m) up on a fork of a parallel branch of a tall tree located on land or in a water body with a slight depression in the middle with diameter of 0.8m and 1m (Maduranga 2002; Choudhary et al. 2013; Bird Life International 2016).

In Sri Lanka, breeding of *C. episcopus* has been noted from February to March with a second breeding cycle from November to early January mainly with isolated pairs in deep jungles. This has been found to be breeding, though uncommonly, in the dry lowlands (northern, eastern and south eastern divisions) (Legge 1880; Maduranga 2002; Warakagoda et al. 2012). Its eggs are bluish-white with a maximum of four eggs per clutch (Henry 1971; Maduranga 2002). The breeding and nesting behaviors of *C. episcopus* have been inadequately documented in Sri Lanka and the available literature states that the species prefers to nest in remote parts of the dry zone with least disturbance (Maduranga 2002). Here we record nesting of *C. episcopus* in a highly residential area from the wet zone, at the Thalagolla junction, Beddawela in the Kegalle District of Sri Lanka, with photographic evidence.

Methods

Data on the nesting behavior of *C. episcopus* in the newly recorded location were consistently collected from initial observations in July 2013 through direct visual observations as well as from indirect methods such as interviewing villagers and the owner of a shop located under the nesting tree. Direct visual observations were made using a pair of 8x40 Nikon Monarch 7 binoculars approximately 20m away from the tree at an angle of about 45^0. The diameter at breast height of the nesting tree was measured by a standard tape measure, while the tree height and height of the nest were measured by the Sine Method (Bragg et al. 2011). A DULEX Lux meter was used to measure the light intensity under the tree crown and adjacent open area (Sunlight reaching the ground without any disturbance) on the same day, within 3min intervals. Further, the latitude, longitude and mean altitude of the location were measured with 10m accuracy using a Nokia C6 01 GPS info application. Pieces of egg shell collected from the nest were used to reconstruct the egg with plaster of Paris and the approximate diameter was measured using a digital caliper (with 0.1 mm accuracy). Cannon 7D with a 400mm F5.6 USM lens, Cannon Powershot HS260HS, and Nikon Coolpix L120 cameras were used for photography. Field identification of the species was facilitated using common field guides including Legge (1880), Henry (1971), Kotagama & Perera (1983), Harrison (2010), Warakagoda et al. (2013). Difference between male and female (sexual dimorphism) familiarized since the mating time; identified based on size (males-comparatively larger) plumage differentiation (male-bright color) (Image 1).

Results

A pair of *C. episcopus* was first observed nesting on a *Albizia saman* (Mara) tree at Thalagolla junction ($6^0$58'21.59"N & $79^0$54'53.56"E; elevation 48.5m), on the (Rambukkana - Mawanella) road, about 5km away from Mawanella, within the Kegalle District, on 27 July 2013 around 11:02hr (Fig. 1). The *A. saman* tree used for nesting has been declared a tree of historical significance and hence protected due to its old age (100 years). This tree is located in a highly urbanized setting, with a high level of roadside activities. The diameter at breast height was ~4m and tree height and height of the nest were 50m and 47m respectively. The lux level under the crown cover was 3070 whereas it was 14300 lux in the adjacent open area.

Initially we observed a pair of *C. episcopus* roosting approximately 25m above ground on this *A. saman* tree. Close observation revealed that this pair was gathering nesting material and flying in to the roosting site with dry sticks. The gradual progress of construction of the nest was recorded henceforth. The nest-building site was approximately 47m above ground level between two "V" shaped small branches of the tree (approximately 3m below the canopy). According to secondary information collected through interviews, construction of the nest had commenced three days prior to our initial observation (i.e., 24 July 2013). On the 03 August 2013 it was further observed that both male and female (sexual dimorphism) identified based on plumage differentiation (Authors personal observation during the mating), were involved in the process of constructing the nest with both fresh and dry *A. saman* sticks. All the sticks observed were obtained from *A. saman* trees, either from the same nesting tree or from adjacent *A. saman* trees (other tree species in the vicinity were Coconut *Cocos nusifera*, and Jackfruit *Artocarpus heterophylus*).

On the same evening (03 August 2013, around 17:15hr), we were able to observe mating on the nest and recorded three mating attempts each spanning 24–32 seconds (Image 1). The nest was widened by the next day (04 August 2013); with both female and male getting involved in nest preparation by carrying in sticks from the adjacent *A. saman* tree in intervals ranging from 3.59 to 12.68 minutes. According to secondary information

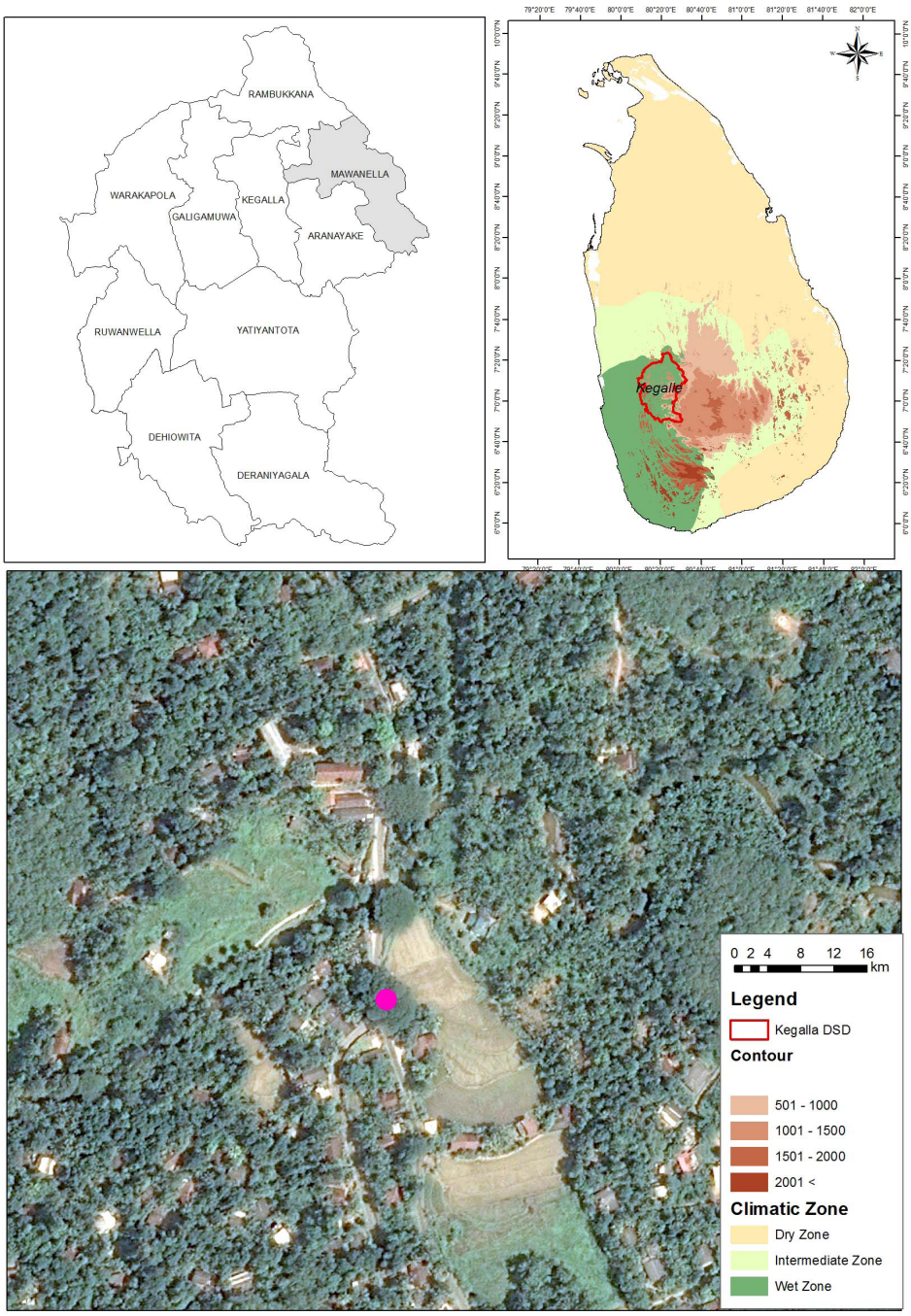

Figure 1. Study area (red circle indicates the nested *Albizia saman* tree)

supplemented by our personal observations, both individuals were found feeding in surrounding paddy fields and bare lands during the mornings between 06:45–07:30 hr, while they were observed busy in nest preparation throughout the day from around 07:30hr until about 17:45hr, excluding the midday period from 11:30hr to about 15:00hr. Further it was observed that the female spent more time on stick arrangement on the nest using its beak, while the male spent more time on bringing sticks in from elsewhere. On 10 August 2013 the female was observed not engaging in nest building, instead it stayed on the nest for longer periods of time while standing up from time to time for short spells of approximately 5.45–9.20 minutes. The same nesting behavior was recorded only for the female bird until 14 October 2013, and we believed it was incubating eggs. It rained on the 17th and 18th of August 2013, during which the male was observed bringing more fresh *A. saman* sticks for renovating the nest. It was also observed that the size of the nest (thickness) expanded with

Image 1. A pair of Woolly-necked Stork mating

Image 2. Ticked nest (incubation period)

Image 3. Woolly-necked Stork nestlings

time (Image 2). It was further observed and confirmed through secondary information from villagers, that the incubation duty was exchanged among the female and male birds within a given day. Usually the male individual was found roosting very close to the nest during the night while the female was incubating. A broken piece of an eggshell was found on the ground on the 14 October 2013, hence we assumed the eggs had already hatched. Nevertheless, the hatchlings could not be seen. The size of the egg was estimated to be approximately 47mm in width and 67mm in length, while their color was bluish, brown and white. Our observations indicated an incubation period of around 34 days. Throughout this incubation period the male bird was observed carrying in new sticks from the adjacent *A. saman* tree for the female to use in the nest upgrading process.

Three heads of nestlings could be observed in the nest, by the 23 October 2013. They had grown to about half the size of adults with a plumage pattern very similar to the adults (Image 3). The nest size and its thickness kept increasing with time, while adult individuals always stayed close to the nest (approximately within a radius of 20m). The nestlings kept growing at a fast and steady rate, while the adults stayed further from the nest. According to information collected from interviews, a variety of food, ranging from frogs, snakes, and fresh-water crabs were brought in by the adults for the nestlings. The juvenile birds were recorded trying to fly on 06 November 2013, as they were fully grown by then, almost similar to the adults, both in their size and plumage, while the adults kept away from the nest. Interestingly it was also observed that the juveniles hide within the nest when Crows *Corvus splendens* were around, in order to avoid mobbing attacks. The juveniles fledged on 12 November 2013 and they were recorded flying with the parents, though only for short distances during the next six days, while they returned to the nest every evening around 16:30–18:30 hr. They were recorded on 15 November 2013 feeding in a paddy field approximately 50m away from the nesting site.

Discussion

According to Legge (1880), preferred nesting sites of the Woolly-necked Storks are confined to remote parts of the dry zone forests where human disturbances are minimal. On the contrary, the current observation was made in an area that belongs to WL_3 (Wet Zone Low country) Agro Ecological Zone with a mean annual rainfall of 1800mm (Punyawardena 2008), making this observation from the wet zone the first of its kind. Also the recorded nesting site in a highly urbanized setting is

quite contradictory to a species known to prefer isolated sites within forests. The breeding record of the present observation from July to October is also different to what was hitherto known (Legge 1880; Henry 1971; Maduranga 2002). According to Henry (1971) the Woolly-necked Stork lay four bluish and white eggs; measuring 67×47 mm, which is similar to our observations with three nestlings. The height of the nest from the ground level is also within the heights that have been reported so far, Choudhary et al. (2013) and Bird Life International (2016), i.e., 10-30 m (sometimes up to 50m). During our observations on rainy days during the incubation period, the male was recorded bringing fresh sticks for nest renovation. It is believed that those fresh sticks help maintain the heat in the nest. It was also observed that the female stood up during incubation from time to time on the nest to engage in some activity in the nest, using its beak, which could have been attempts at rolling the eggs. The parents were initially recorded feeding the nestlings by regurgitating, which provided partially digested food for small individuals.

Further, it was interesting to note that presumably the same pair of *C. episcopus* used the same nest in the consecutive year (2014) to lay eggs. According to secondary information gathered from villagers, the birds have renovated the old nest by adding new sticks before egg laying. In 2015 the nest disintegrated and fell due to continuous heavy rain. Therefore, there have been no records of nesting *C. episcopus* in the same locality till June 2016. Moreover, breeding was recorded from June–September in 2016 with a new nest on a different platform of twigs in the same tree

Conclusion

This paper describes the first breeding record of the *C. episcopus* from the Kegalle District and thereof the wet zone of the island. It was further interesting to record presumably the same pair of storks using the same nest to lay eggs in consecutive years, with some renovations. This new record is believed to help in a further understanding of the ecological biogeography of the species, with possible climate induced range shifts as well as in their conservation in terms of updating the IUCN Red List status of the species and future conservation decision making.

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Article

Influence of substrate features on distribution of polypores (Fungi: Basidiomycota) in central part of Peechi Vazhani Wildlife Sanctuary, Kerala, India
-- Muhammed Iqbal, Kattany Vidyasagaran & Narayan Ganesh, Pp. 9689–9699

Reviews

Nepal's National Red List of Birds
-- Carol Inskipp, Hem Sagar Baral, Tim Inskipp, Ambika Prasad Khatiwada, Monsoon Pokharel Khatiwada, Laxman Prasad Poudyal & Rajan Amin, Pp. 9700–9722

Current status, distribution and conservation status of Algerian bats (Mammalia: Chiroptera)
-- Mourad Ahmim, Pp. 9723–9733

Short Communications

Incipient loss of a rainforest mutualism?
-- Johannes H. Fischer, Heiko U. Wittmer, Endro Setiawan, Sarah Jaffe & Andrew J. Marshall, Pp. 9734–9737

First record of the Woolly-necked Stork *Ciconia episcopus* Boddaert, 1783 (Aves: Ciconiiformes: Ciconiidae) breeding in the lowland wet zone of Sri Lanka
-- Hemachandra Kularatne & Susantha Udagedara, Pp. 9738–9742

Bibliography and checklist of the dragonflies and damselflies of Bhutan
-- T. Gyeltshen, T. Nidup, P. Dorji, T. Dorji & V.J. Kalkman, Pp. 9743–9747

Checklist of terebrantian thrips (Insecta: Thysanoptera) recorded from India
-- R.R. Rachana & R. Varatharajan, Pp. 9748–9755

Notes

Two jasmine (Oleaceae: *Jasminum* L.) taxa newly recorded in Vietnam
-- Bui Hong Quang, Vu Tien Chinh, Le Thi Mai Linh & Ritesh Kumar Choudhary, Pp. 9756–9760

First record of Rusty-spotted Cat *Prionailurus rubiginosus* (Mammalia: Carnivora: Felidae) from Ramgarh-Vishdhari Wildlife Sanctuary in semi-arid landscape of Rajasthan, India
-- Sailaja Nayak, Sunny Shah & Jimmy Borah, Pp. 9761–9763

Re-sighting record of Fulvous Leaf-nosed Bat *Hipposideros fulvus* Gray, 1838 (Mammalia: Chiroptera: Hipposideridae) from Thar Desert, Rajasthan, India
-- Sumit Dookia, Gajendra Singh & Rajlakshmi Mishra, Pp. 9764–9767

Record number of Yellow-billed Oxpeckers *Buphagus africanus* Linnaeus, 1766 (Aves: Passeriformes: Buphagidae) foraging on a single host
-- Diogo Veríssimo, Jean-Christophe Cugnière, Suzanne Cugnière, Julien Cugnière, Géraldine Cugnière & Laure Cugnière, Pp. 9768–9770

First record of the Two-striped Box Crab *Calappa bilineata* Ng, Lai & Aungtonya, 2002 (Brachyura: Calappidae) from St. Martin's Island, Bangladesh
-- Muntasir Akash & Mostafa A.R. Hossain, Pp. 9771–9773

A record of *Limenitis rileyi* Tytler, 1940 (Lepidoptera, Nymphalidae, Limenitidinae) from Arunachal Pradesh, India
-- Purnendu Roy, Pp. 9774–9776

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