

Observations on the breeding behaviour of Sula Scrubfowl *Megapodius bernsteinii* in the Banggai Islands, Sulawesi, Indonesia

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Field notes relating to Sula Scrubfowl are presented from a survey of the Banggai Islands in 1991. Nesting behaviour and social organization of this species are described for the first time. The present study underscores the need to conduct a systematic study of this bird's ability to tolerate secondary forest habitat.

INTRODUCTION

The Sula Scrubfowl *Megapodius bernsteinii* Schlegel 1866, is found only in the Banggai and Sula Island-groups (White and Bruce 1986), between Sulawesi and the main islands of Maluku, in eastern Indonesia (Fig. 1). This is the only species of scrubfowl in the Banggai islands; its congener, the widely distributed Philippine Scrubfowl *Megapodius*

cumingii is apparently absent from the island group (White and Bruce 1986; this study).

The Sula Scrubfowl has been virtually unknown in the wild and was believed to be vulnerable to extinction, due to commercial logging of the forest habitat (Collar and Andrew 1988). However, more recent surveys indicated that the bird is still widespread within its restricted range, although local declines due to trapping and hunting were apparent

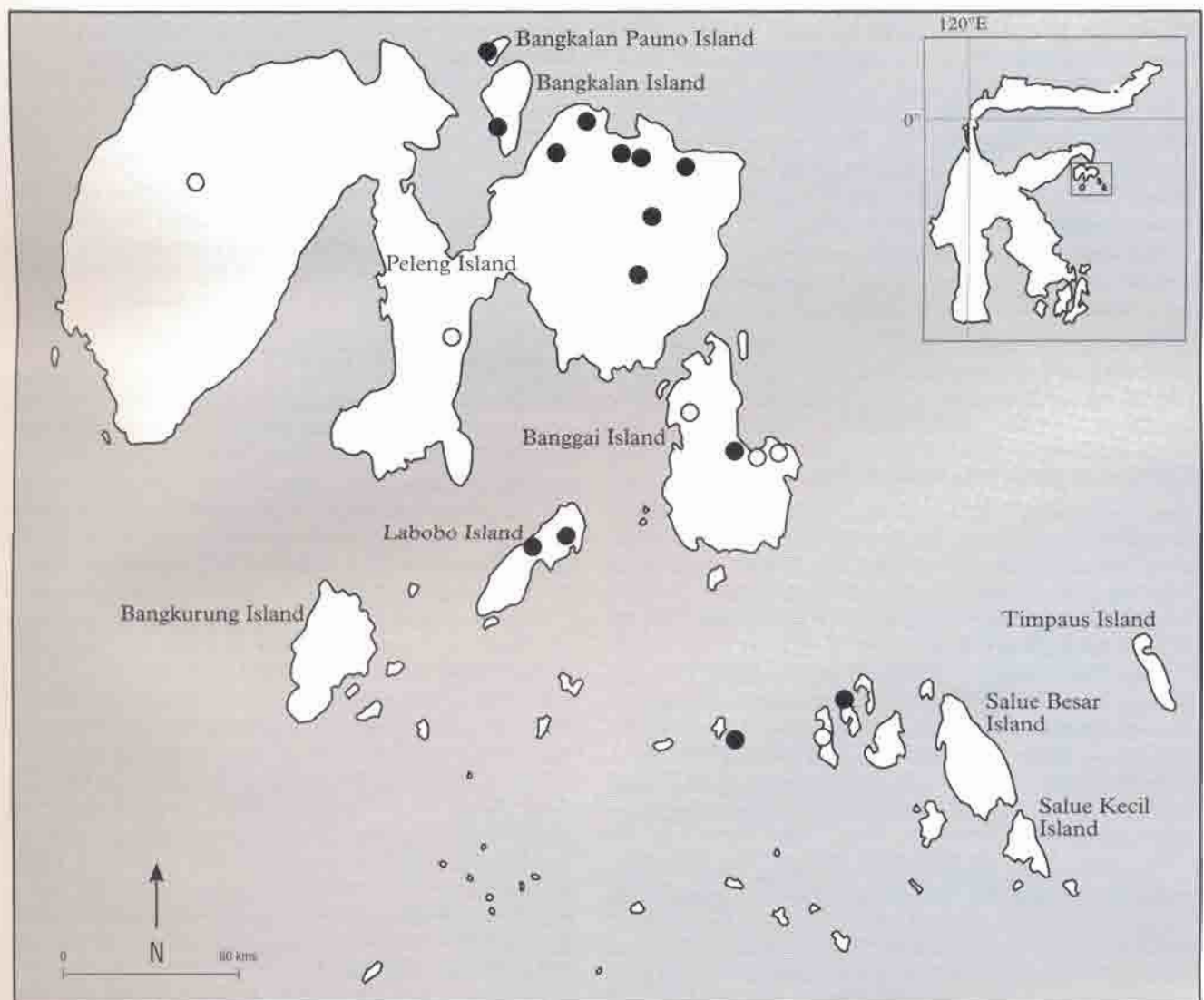


Figure 1. Location of Sula scrubfowl observation site. ● denotes where the scrubfowl was found; ○ where it was rare or absent.

(Davidson *et al.* 1991, Lucking *et al.* 1992, Indrawan *et al.* 1993); and the species has now been categorized as near-threatened (Collar *et al.* 1994).

The Sula Scrubfowl is a medium-sized ground-living megapode with a rufous colour, a slight crest, and red (or orange-red), disproportionately large legs and feet. The claws and toes of captive birds were relatively long: Peleng Island, claw: 19.4 mm, toe: 40.5 mm; Labobo Island, claw: 20.8 mm, toe: 37.8 mm; Kongkudang Island, claw: 19.4 mm, toe: 41.1 mm. Wing lengths were 193 mm, 193 mm and 209 mm (Peleng) and 205 mm (Labobo). The sexes were indistinguishable in the field (this study).

Here, the authors collate field notes on the biology of this little-known bird, based on work in the Banggai Islands (Indrawan *et al.* 1993). The breeding behaviour of this bird is given an emphasis as - although interesting - it has never been documented previously.

METHODS

A broad survey in the Banggai Islands (1°08' to 2°15'S and 122°44' to 124°08'E) was carried out, including observations from a blind (hide), from 9 October to 9 December 1991. The observations from the blind covered a total period of 24 days, between 8 November and 9 December 1991, and comprised 18 mornings (from ca 05h30, the local sunrise, to 09h30) and 12 afternoons (from 15h00 to 17h30). On 11 November 1991 observations were made throughout the day.

The blind was constructed on the ground using *Nypa* palm fronds, in a 'fallow' area of yam cultivation. The fallow area was bordered by a small patch of degraded jungle and was about 1 km from 'Lalong' village, Labobo Island. The blind was built only 2-3 m from an active mound, which became our focal subject.

The active mound was in the centre of a row of three mounds arranged in a line (Fig. 2). In the vicinity, a total of nine birds, including one unpaired bird, were detected as they frequently vocalized together.

RESULTS

General ecology and behaviour

The species was found in a broad range of habitats, from dry coastal scrub to intact forests, mostly in the lowlands, although once recorded at 450 m. Twenty-three nests (including seven which were active) were found in these habitats, and on the small Bangkalan Pauno Island, only 20 m from the highest tide line.

Birds were usually seen in pairs, while foraging close (3-4 m) to each other. On only one occasion, at Bangkalan Pauno Island, a party of about five birds was seen together, possibly a feeding group of adults and young birds.

The birds fed on young roots and invertebrates, including worms. Fresh droppings from a flushed bird also contained sand grains.

The species was heard calling during the course of this study, mostly in duets. The sequence usually started with a long drawn double-note *KLEEAA-KLEEOO* by one bird, followed by *COOR KOKOKOKOKO*, the cooing and clucking by a nearby bird. The duet appeared to be infectious; in a hill-valley terrain as many as 18 birds were heard to call in almost perfect sequence at about 02h00. The sequence

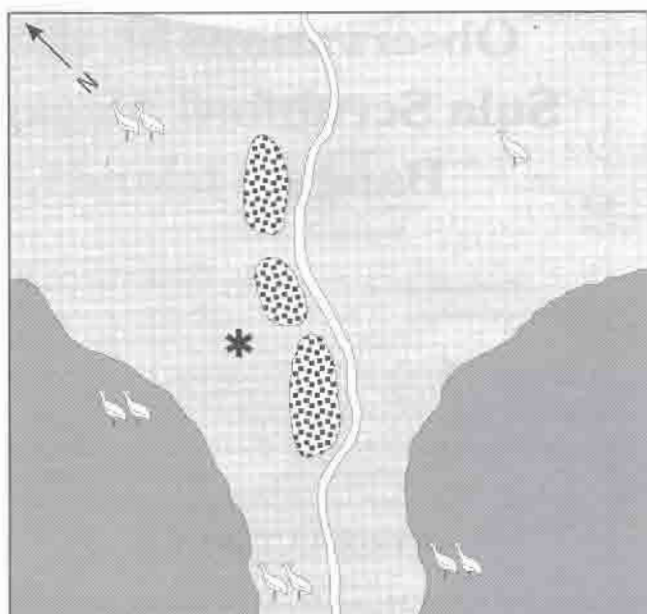


Figure 2. Sula Scrubfowl mound

of the duet was maybe reversed later during the breeding season; noted on three occasions in early December 1991 (near the end of our study). A loud honking *WAAH WAAH* cry was emitted when the scrubfowl was exposed to stressful situations, such as being handled by humans, or hunted by humans with dogs.

The complete breeding cycle of the bird was unknown, although the authors procured two eggs in December, and encountered a Sula Scrubfowl chick, estimated to be less than two weeks old, in December. It is unknown whether breeding seasonality varies in different islands.

Description of the nests

The Sula Scrubfowl buries eggs within nest-mounds of sand, occasionally adding organic matter. Two types of mounds (after Dekker 1992) were recognized during our survey.

- 1 true mounds (type A), built in an open spot, with the main heat coming from sun-heated sands. Mounds like these were seen in cultivated areas on Labobo Island, including the focal mound and its two neighbours.
- 2 burrow-mounds (type C), built against buttresses or stems of dead (rotting) trees, either standing or fallen. These are typically found in more wooded areas, especially on Peleng Island.

Another type of mound, in which mounds were built against the buttresses or stems of a large living (instead of dead) tree (type B, Dekker 1992) was not seen during this survey.

The mounds are located on both slopes and flattened tops, especially in the hilly terrain on Peleng Island. On sandy beaches, the sands may constitute as much as 90% of the mound-composition, but inland there is a higher proportion of clay. The focal mound had 75% clay (a sample was analysed by the Center for Soil and Agroclimate Research, Bogor) and encompassed two rotting trunks of about 10-20 cm in diameter.

The mounds have variable shapes, i.e., conical, half-conical, and at times an elongated, narrow ridge. The focal

mound, a half-cone, was approximately 2 m in diameter and 0.60 m high. The second mound, 4 m away, was inactive and had an irregular half-cone shape. The third mound, 1-2 m on the other side of the active mound had the shape of an elongated ridge, and had evidently been worked only on the last day of our observations.

Activity at the mound

The birds near the focal mound were mostly active in the morning and to a lesser degree in the afternoon. Prior to approaching the nest-mound birds called frequently, while feeding and walking in denser undergrowth.

Every morning the four pairs and the solitary bird in the vicinity of the focal mound seemed to call regularly, from localized directions. There were both duets and apparent choruses (i.e. pairs responding to each other), with the single bird joining in only occasionally. The morning chorus lasted between 13 and 123 minutes ($x = 45.6$, $SD = 29.6$; $n = 18$ days). Apparently, the birds called less frequently in the afternoon. The bird near the mound also called irregularly at other times of day, and at night.

The focal mounds were visited by the scrubfowl as frequently as 16 out of the 24 days of observations. These visits were in the morning (12 days), afternoon (7 days) and, occasionally, both periods (3 days). Seemingly the birds rested during the hottest part of the day, especially since the area has scarce, if non-existent, running water.

At least one bird, but more frequently a pair, carries out actual work at the focal mound (respectively 7 and 12 observations). However, no more than one pair was seen working together. When a bird worked singly, sometimes another (its mate) was heard calling nearby, though the latter was rarely seen due to the undergrowth.

The bird started raking at the mound upon arrival. Occasionally the unsexed bird emitted a soft repeated whine *CU-UH CU-UH CU-UH* as it approached and began to work the mound. Sand was scraped backward as the bird raked from top to bottom, head first. When raking, the feet were used alternately, 4-20 strokes each turn, with an average of 2 (backward) strokes per second. If undisturbed by other vertebrates, the scrubfowl(s) at the mound were recorded working continuously for as long as 116 minutes in a single period.

The raking may be combined with feeding and sometimes walks around the mound, probably to check the surroundings. The birds also returned to the mound as early as 10 minutes after being flushed by passing humans.

Reaction to disturbances

On four occasions at the focal mound, and twice at a nearby mound, raids by monitor lizards *Varanus* were observed. On at least two occasions, the monitors seemed to have watched the mound from nearby, rather than raiding the mound on arrival and did so when the birds had been working extensively at the mound, usually around mid-morning. On one occasion, a pair at the mound were able to fly quickly out of range, before the lizard covered the final 4 m separating them.

The lizard used its front feet to scrape off sand from the mound. It was noted that a monitor may have to rake 7-8 times to remove the same amount of sand as that removed by a single stroke of a scrubfowl. The duration of raking was 6 minutes for the monitor compared with 60 minutes for the scrubfowl. None of the raids observed was successful.



Plate 1. Sula Scrubfowl

The scrubfowl kept a constant watch on its surroundings, even when working at the mound. They only looked at the ground infrequently, for instance when catching insects. The scrubfowl obviously has keen hearing; they stopped digging and froze at the slightest irregular sound, but then resumed digging when the source of disturbance had passed. Birds flushed by humans frequently fly off silently.

Screeching of other birds, e.g. Blue-backed Parrot *Tanygnathus sumatranus* and Spangled Drongo *Dicrurus hottentottus* in two separate instances, also alerted the scrubfowl. Suspicion was shown by the adoption of a sweeping motion, with extended neck and a peering motion, supplemented with head-bobbing (Y. Masala pers. obs.). Y. M. spent about five days in an area known to be frequented by scrubfowl, sitting quietly on the ground, until an individual bird had become habituated, and fed intermittently as close to him as 3 m.

CONCLUDING REMARKS

The effect of the blind's proximity to the focal mound was unknown, but since the materials used to make the blind seemed to blend well with the surroundings we did not anticipate a strong bias. Furthermore, the large number of scrubfowl observations at the mound, despite the bird's sensitivity to disturbance, suggested that this bias is minimal, or that the birds can habituate to human activity.

The present study found that the Sula Scrubfowl is primarily a mound nester. The bird shares a number of traits of breeding behaviour with some other mound-building megapodes. For example, the shapes of the mound, the method and the vigour of working the mound were similar to those described for other megapode species (e.g. Frith 1956, Lincoln 1974, Crome and Brown 1979, Coates 1985).

It was not established if more than one pair were using a mound in turn, as is known in some other scrubfowls (e.g. Crome and Brown 1979: 113). However, a farmer on Peleng Island (Latewe pers. comm.) reported that as many as 2-5 pairs were seen to work on a relatively large mound (3 m across, 0.75 m high), on a dead tree stump in a degraded lowland forest.

The following observations suggested that the birds might indeed maintain a pair bond. The birds kept to pairs and called mostly in duets. On one occasion, a pair perched on thick bushes, after apparently having regrouped by

calling, soon after being flushed by the sudden appearance of the observer. On two occasions, two birds were seen together on 'feeding holes' near the focal mound, with one pointing its bill to an invertebrate prey item and allowing the second bird to pick it up; apparently a food offering. That pairs constituted the basic unit of social organization has also been indicated for other scrubfowl species, whether nesting in mounds (e.g. Coates 1995) or burrows (e.g. Todd 1983, Coates 1985). Without the benefits of identification of individual birds, however, the possibility of extra pair interaction could not be ruled out.

As with some of its congeners, e.g. the Orange-footed Scrubfowl *M. reinwardt* (Holmes 1989, Lincoln 1974), the Sula Scrubfowl demonstrated a considerable adaptation to degraded woodland scrub. However, even though the Sula Scrubfowl and its nest are frequently found in secondary forests, this does not mean that secondary forests are not marginal habitats. The microhabitat requirement of this species, in terms of food and microclimate, needs to be further investigated.

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