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Short Note

Brood parasitism in the Green-backed Heron (*Butorides striatus*)

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The Green-backed Heron (*Butorides striatus*) was previously considered to be a rare non-breeding visitor to the northern Gulf of Eilat, occurring throughout the year (Shirihai 1996, Snow and Perrins 1998). (Note that this group includes sexually immature birds, floaters without mates, and individuals whose previous breeding attempts have terminated). Breeding in the Middle East was considered limited to the coastal zone of the southern Persian Gulf, south Arabia and the Red Sea to 28°N (Porter *et al*. 1996). However, Yosef *et al*. (2002) reported the first confirmed nesting at Eilat Israel (29°33'N, 34°57'E). During the 2003 breeding season (March–May) we successfully documented the nesting attempts of seven Green-backed Heron pairs. One of the most centrally located nests included an atypical number of eggs. We assumed that this was a case of brood parasitism wherein two or more individuals had laid their complete clutches in the parasitised nest. No previous accounts of egg-dumping have been reported for this species (Del Hoyo *et al*. 1992, Snow and Perrins 1998).

During spring in 2003 we monitored the breeding attempts of seven pairs of Green-backed Herons in the north-western part of the Gulf of Eilat/Aqaba. We measured all eggs and checked for variability in egg size of the different clutches in order to elucidate whether different females had laid their eggs in the parasitised nest.

Located approximately 500m offshore are aquaculture facilities that attract numerous pelagic bird species. In September 2002 we requested permission from the managers of the aquaculture facility to attach milk crates (300mm L x 300mm B x 140mm H) to the cables of the fish tanks. Green-backed Herons occupied seven of these boxes by mid March but eggs were laid in late June only. All clutches were completed and incubation was in progress when we measured all nests and eggs on 4 July 2003.

The length (L) and breadth (B) of eggs in the completed clutches were measured by RY with a Measy 2000 caliper to the nearest 0.1mm. Egg volume (V) was estimated following Hoyt's (1979) formula: $V = 0.51 \times L \times B^2/1000$. The within-clutch co-efficient of variation (CV) of egg volume was calculated according to a formula adjusted for small sample sizes (Sokal and Rohlf 1995). Mean values are given with standard deviations.

The atypical clutch (n = 9 eggs) was subsequently collected and is now housed at the National Natural History Museum at Tel Aviv University.

A total of 30 Green-backed Heron eggs from seven clutches were measured: three eggs (n = 3), four eggs (n = 3)

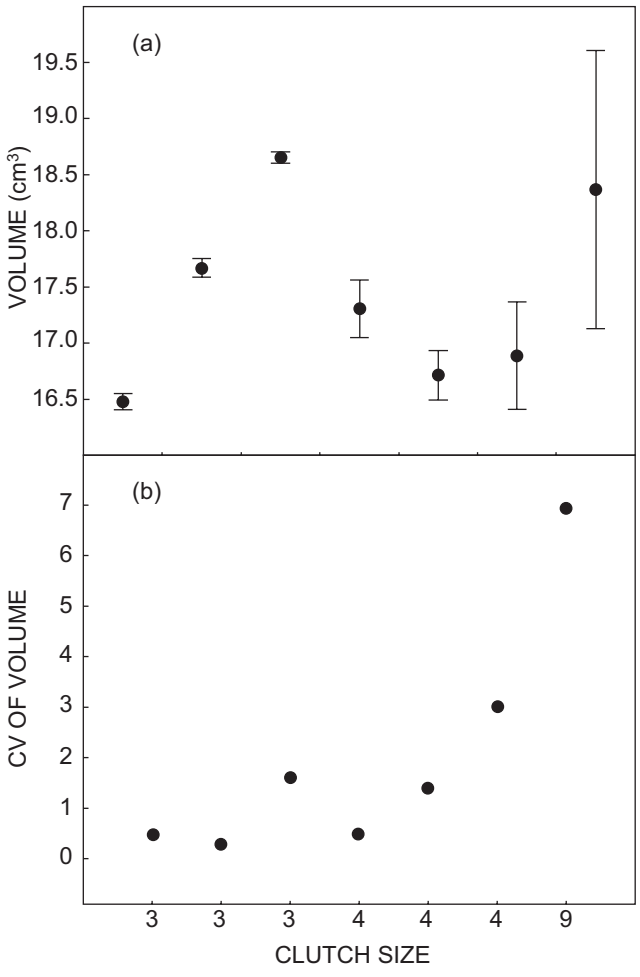

Figure 1: (a) The mean volume ± SD and (b) within-clutch co-efficient of variation of egg volume in clutches of different size of Green-backed Herons (*Butorides striatus*) at Eilat, Israel

and nine eggs (n = 1). Mean egg length was 37.80 ± 1.08mm, breadth 30.19 ± 0.60mm and volume 17.59 ± 1.03mm^3.

We found significant differences in egg volume between clutch size classes (one-way ANOVA, $F_{2, 26} = 5.10$, $P = 0.013$). The four-egg clutches had lower mean volume than the nine-egg clutch (*post-hoc* Tukey test; $P < 0.010$). In addition, the nine-egg clutch was characterised by high volume variance in comparison with the other clutches (Figure 1a). Moreover, the within-clutch coefficient of variation (CV) of egg volume was different in the individual clutch size classes (one-way ANOVA, $F_{2, 4} = 13.62$, $P = 0.016$). The CV of the nine-egg clutch was significantly higher than in the three-egg (*post-hoc* Tukey test; $P < 0.015$) and four-egg (*post-hoc* Tukey test; $P < 0.025$, Figure 1b) clutches.

The above data suggest that, other than the breeding pair, two or more other females laid eggs in the parasitised nest. These could either be neighbouring females, or non-breeding floaters (Sandell and Diemer 1999) that took advantage of the central location of the nest within the colony. Davies (2000) described three kinds of conspecific brood parasitism: the first is by a female that has already started laying her clutch in a normal manner but where the nest is destroyed (as a result of inclement weather, predation, etc.) and the female continues to lay her eggs in a neighbouring nest after her own is destroyed. The second type is parasitism where a female simply lays her eggs in the active nests of other conspecific females. In the third type, a female engaged in a normal breeding attempt also lays some eggs in neighbouring nests. In the case reported here, the third type is most probable, with females from the peripherally-located nests 'dumping' eggs into the centrally located nest.

Arnold and Owens (2002) suggested that brood parasitism is likely to be confined to species in which the provision of parental care is relatively inexpensive and fecundity is high. This may be the case in the colony at Eilat because parental investment in incubation and brooding is very low (RY, unpubl. data) owing to the relatively high temperatures in the region during the breeding months of May and June. However, the pair associated with the nine-egg clutch stopped incubating after the seventh egg was laid in their nest and eventually abandoned the breeding attempt.

This study documents the first record of inter-specific brood parasitism known for this cosmopolitan species, as well as the use of egg dimension variability to elucidate egg dumping in a breeding colony.

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