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A SEX-SPECIFIC DISPLAY IN THE SEXUALLY MONOMORPHIC HOODED PLOVER *Thinornis rubricollis*

MICHAEL A. WESTON[1]

Department of Zoology, University of Melbourne, Parkville, Victoria, 3052
[1]Present address: Birds Australia, Research and Conservation Department, 415 Riversdale Rd, Hawthorn East, Victoria, 3123

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INTRODUCTION

One of the most dramatic displays in the Hooded Plover *Thinornis rubricollis* is the 'Crazy Bird Display', so named because the bird performing the display appears out of control (after Weston 1998). This display involves lifting the tail, sometimes several times ('tail-bobbing'), and flicking the wings while rotating, sometimes in complete circles, or jumping sideways (Fig. 1). The display is distinctive, with other experienced birdwatchers considering it one of the most energetic and bizarre displays they have seen in waders (C. Tzaros, pers. comm.). Weston (1998) noted that the display had been seen in juveniles and adults, and that it was usually, but not always, performed in close proximity to other Hooded Plovers. Apart from those observations, no other information is available on the display (see Marchant and Higgins 1993).

Between 1995 and 1999, an intensive study of Hooded Plovers was conducted along the Victorian coast (Weston 2000). This study produced some data on the behaviour of Hooded Plovers and allowed a closer examination of this interesting display. Observations on breeding pairs, where at least one bird was colour-banded, suggested that only one bird in each pair performed the display. Several observations were made of the same bird within a pair performing the display but there were no examples of both members of a pair performing this display. This raised the possibility that only one sex was associated with this behaviour.

The Hooded Plover is not sexually dimorphic and so cannot be readily sexed in the field or in the hand. Apart from behaviours used during copulation, no sex-specific display has been recorded in Hooded Plovers (Marchant and Higgins 1993). As part of a larger study of the biology of Hooded Plovers, the sex of many birds was determined using a molecular approach (Weston 2000). This permitted an examination of sex-specific behaviour; no previous behavioural studies of this species have used sexed individuals.

METHODS

The 'Crazy Bird Display' is defined either as a bird performing the full display, or one obviously 'tail-bobbing'. An important distinction is that the latter behaviour is not the same as 'tail-pointing', where birds point their tails at a threat, such as a raptor. When 'tail-pointing', birds often crouch, whereas they always stand when 'tail-bobbing'. A 'tail-pointing' bird also turns its head to view the threat, whereas a 'tail-bobbing' bird does not.

The identity and age of all birds seen performing the display were noted during the course of general fieldwork from 1995 to 1999. Observations were made for set periods and began and ended at predetermined times. Observations were focused on birds that were colour-banded which made them individually recognizable. All observations of colour-banded birds were made in Victoria, between Cape Otway (38°45'S, 143°23'E) and Wilson's Promontory (39°04'S, 146°20'E).

Hooded Plovers are impossible to sex in the field, so birds were sexed genetically using deoxyribonucleic acid (DNA) extracted from blood samples, although a few were sexed from observations of copulation. Upon capture, blood was obtained from the brachial vein. DNA was extracted from the blood using phenol/chloroform and precipitated DNA was dried and dissolved in buffer (Sambrook *et al.* 1989). The sexing technique was based on polymerase chain reaction using universal bird sexing primers developed by Griffiths *et al.* (1996), and employing the additional step of enzyme digestion with Hae III (*Haemophilus aegyptius*). Detailed methods are presented in Weston (2000) and Weston *et al.* (2004).

RESULTS AND DISCUSSION

The display was very infrequent. On average, an individual performing the display was identified every 59.2 hours of observation. Consequently, the data available for analysis and discussion are limited despite over 1 000 hours of observations from a population containing 137 sexed birds — over 20 per cent of the entire Victorian population (Marchant and Higgins 1993). The difficulty of studying this display means that detailed analysis of this apparently unique behaviour is unlikely to become available for many years.

For adults, 16 birds of known identity, plus an unbanded partner of a bird of known identity, were observed performing the display. Of these, the sex of 13 adults was known and the sex of the unbanded adult was deduced. In total, 13 of these birds were male, and one was a female, which represented a statistically significant bias towards males ($\chi^2 = 8.64$, df = 1, p = 0.003; Yate's correction applied). The female performing the display had been sexed by observations of copulation, and had not been sexed genetically. Reversed and same-sex copulatory behaviour has been recorded in some species of birds (e.g. Ridpath 1972; Craig 1980) and thus the possibility of mis-sexing cannot be definitely excluded. Nevertheless, mis-sexing seems unlikely as the eleven birds sexed in the field by observing copulations was verified by the molecular technique. Therefore, it is more likely that the display could be performed occasionally by females — in many animals activities customarily performed by one sex may occur in the other sex in particular circumstances (Smith 1977). The

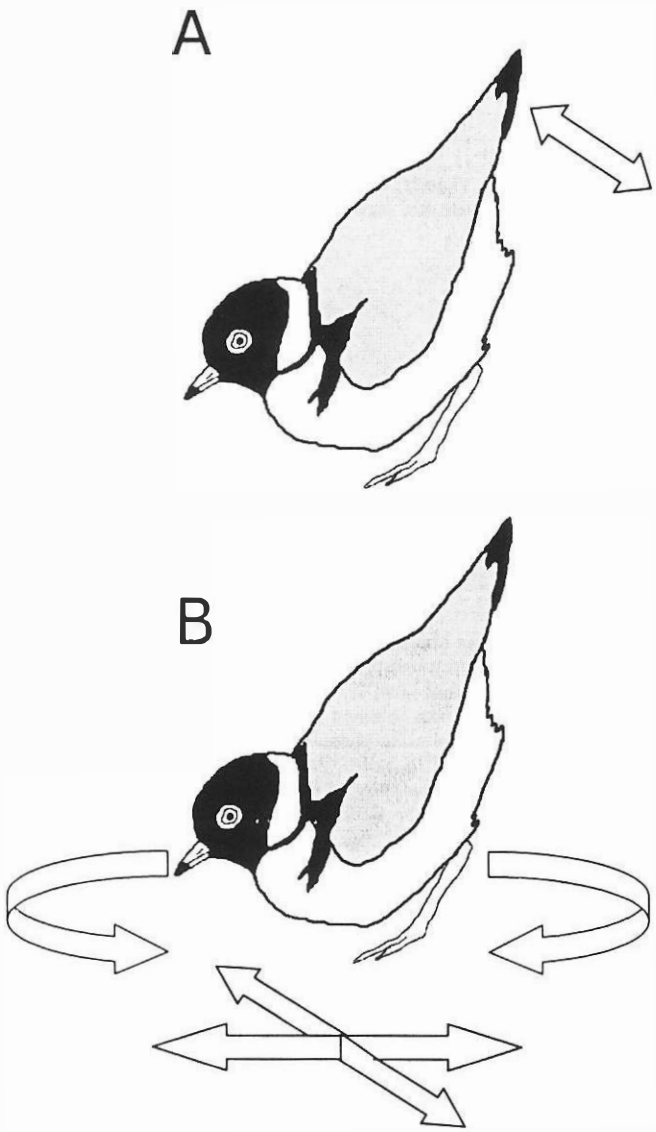

Figure 1. *Representation of the 'Crazy Bird Display'. A — Tail-bobbing showing the direction of movement of the tail; B — full display showing possible direction of movement of the bill/tail axis (phase B is associated with wing-flicking which is not depicted). Modified from drawings by K. Bartram.*

sample size of sexed birds seen performing the display was inevitably limited by the low frequency of the display and the rarity of the species (Garnett and Crowley 2000).

For juveniles, the identity of only one displaying bird could be determined; this was a female. In many animals, juvenile displays are thought to lack the functionality of adult displays (Smith 1977), and the display may become sex-biased with maturity. Clearly, data from more juveniles are needed to form any conclusions about any sex-specificity of the display in juveniles. Collecting such data is also limited by poor reproductive success, which means relatively few juveniles are available for study (Weston 2000).

In conclusion, among adult Hooded Plovers this infrequently performed display seems to be performed mostly but not invariably by males (93%). Thus, it might have some utility as a field indicator of sex in this sexually monomorphic species. However, two factors will limit its use. Firstly, it will probably mis-sex a small percentage of birds because it is not exclusively performed by one sex. Secondly, its low frequency of occurrence means few birds will be sexed unless an intense observational effort is employed. If known sex birds are required, then effort would be better directed at genetic sampling and molecular sexing. It is noteworthy that on time-budgeting scans conducted as part of the general study, the display was recorded in exactly the same (low) frequency as copulation, the other behavioural event where sex may be determined — 3 of 18 272 bird scans (= 0.02%) (unpubl. data).

The context of a display may provide clues to its function. The display discussed here occurred in flocks during the non-breeding season, in pairs during the breeding season, in adults and in juveniles (Weston 1998; pers. obs.). Thus, the context in which it occurred is ill-defined, and the function of this display remains a mystery. In adults, the level of both sex-specificity and the occurrence during the breeding period suggests the display might have a role in courtship or maintaining the pair bond. While the function of the display is worthy of further investigation, any study will have to face the challenge of studying an infrequent display in a rare species.

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