

## SEX DETERMINATION OF AUSTRALIAN CRANES (GRUIDAE)

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### SUMMARY

Sexual dimorphism and cloacal characters provide field methods for determining the sex of individuals in approximately three-quarters of the Australian crane populations.

### I. INTRODUCTION

In the course of long-term studies of the biology and ecology of the cranes (Gruidae) in Australia, methods of determining the sex of live birds in the field were sought.

### II. MATERIALS AND METHODS

Brolgas (*Grus rubicundus* (Perry)) and eastern Sarus cranes (*Grus antigone sharpii* Blanford) were observed throughout the main distribution ranges of the species in north-eastern Australia (see Lavery and Blackman 1969; Blackman 1971) during 1959–1971.

Samples were taken in all months, particularly from the following categories of brolgas which comprised the total population of this crane. *Adults*, i.e. birds with orange-red caruncle (comb) lacking occipital feathers—in twos, and *not noticeably in twos*; *immatures*, i.e. sub-adults having orange comb with interspersed grey occipital feathers, yearlings having comb with more feathers than pale orange skin, and birds-of-the-year including downy young with heads fully feathered. Data subsequently taken were weights and lengths (body (tip of bill to base of tail); wing; head (tip of bill to the posterior edge of the postparietal bone); culmen; tarsus; mid-toe and claw). Reproductive systems and bursas of Fabricius were examined. Cloacas, in particular, were searched for any sex character. Cloacal examination was by means of modified elastrator pliers (Figure 1); live, cage-reared birds were restrained on an adjustable cradle (Figure 2), also smearing 5% lignocaine hydrochloride ointment on the cloaca with an absorbent plug inserted into the rectum.

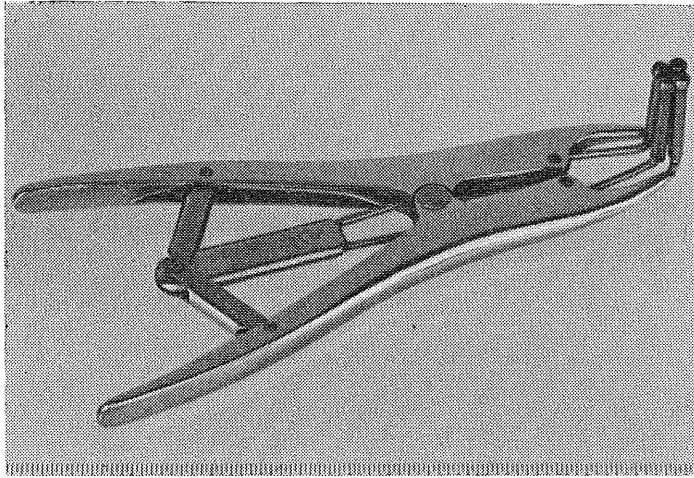


Fig. 1.—Modified elastrator pliers for sexing purposes.

Eggs located during the breeding seasons were measured along long and short axes.

### III. RESULTS

*Adult brolgas.*—On an average male brolgas were larger than female brolgas in all measurements made (Table 1); however, considerable overlap generally rendered sexing by this method impracticable.

**TABLE 1**  
SIZES OF ADULT BROLGAS COLLECTED IN NORTH-EASTERN AUSTRALIA,  
1959-1971

Measurement	Sex	No. of Birds Examined	Mean $\pm$ Standard Deviation	Range
Weight (g)	♂	321	6,838 $\pm$ 649.04	4,761-8,729
	♀	217	5,663 $\pm$ 560.11	3,628-7,255
Length (mm)				
Body	♂	215	1,140 $\pm$ 49.21	1,055-1,235
	♀	142	1,052 $\pm$ 33.32	965-1,150
Wing	♂	43	611 $\pm$ 19.57	568- 650
	♀	25	573 $\pm$ 13.36	547- 593
Culmen	♂	94	166 $\pm$ 7.22	152- 181
	♀	62	153 $\pm$ 6.12	140- 167
Tarsus	♂	173	299 $\pm$ 13.63	265- 360
	♀	114	273 $\pm$ 14.56	235- 308
Mid-toe	♂	112	115 $\pm$ 4.63	102- 125
	♀	73	108 $\pm$ 4.71	97- 125

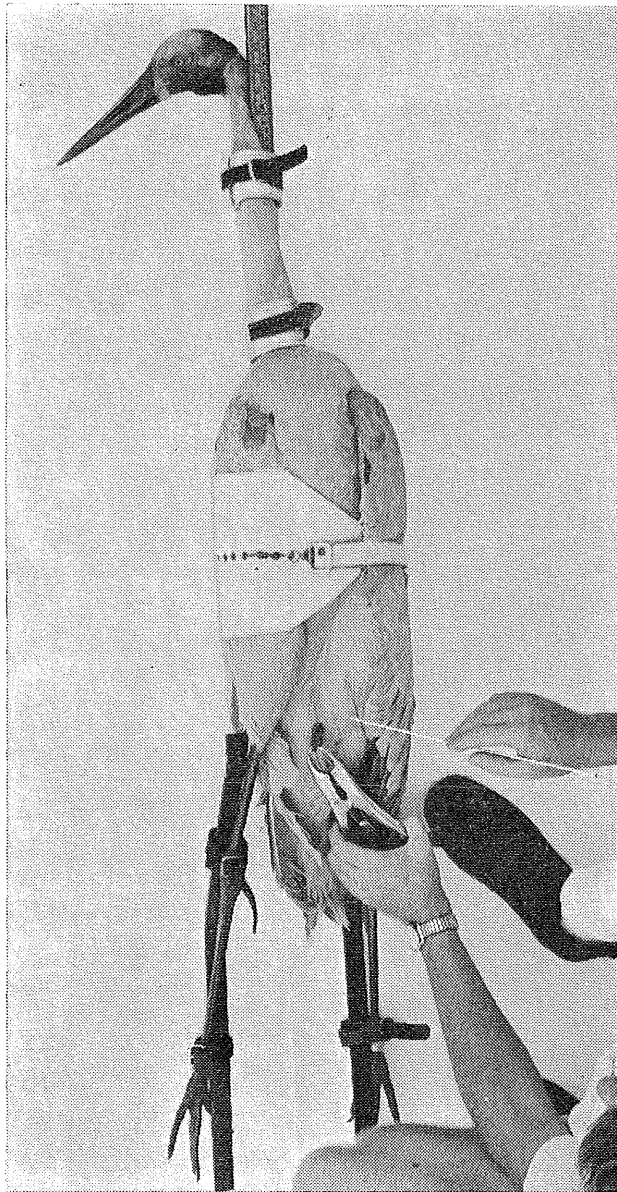


Fig. 2.—Brolga restrained in cradle for cloacal examination.

The cloaca of all adult male brolgas possessed two vascularized erectile papillae, each approximately 2.5 mm in height and terminal to the vas deferens ducts; the papillae were lateral to the vent and medial to the ureter openings (Figure 3). Using presence/absence of this character, all brolgas subsequently were sexed correctly (79 ♂♂, 52 ♀♀).

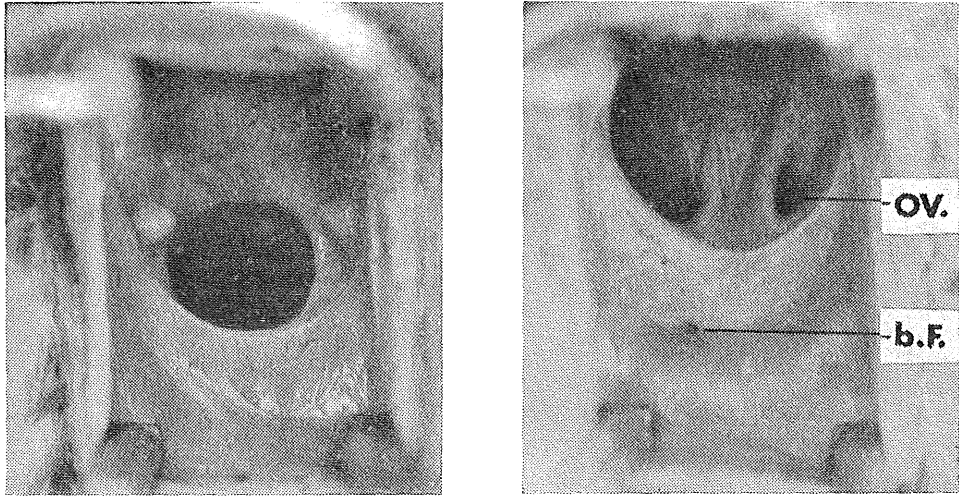


Fig. 3.—Left, cloaca opened to show cloacal papillae in an adult male brotga. Right, appearance of an adult female brotga: oviduct (ov.) on left of rectum (opening in 51/52 adult ♀♀); bursa of Fabricius (b.F.) posterior to rectum (in 78/160 adult brotgas).

*Adult brotgas in twos.*—Twenty such groups were sexed according to papillae and gonads. Each group comprised one male and one female and the male was always larger than the female in weight and length of body, head and tarsus. The pairs were frequently accompanied by immature birds.

*Immature brotgas.*—Table 2 gives the incidence of cloacal papillae in individuals of each sex of each immature age class.

TABLE 2

INCIDENCE OF CLOACAL PAPILLAE IN IMMATURE BROTGAS  
COLLECTED IN NORTH-EASTERN AUSTRALIA, 1959-1971

Age Class	Sex	No. of Birds Examined	Incidence of Cloacal Papillae
Sub-adult .. ..	♂	12	7
	♀	4	Nil
Yearling .. ..	♂	9	2
	♀	9	Nil
Bird-of-the-year ..	♂	3	Nil
	♀	4	Nil

*Eggs.*—Wolstenholme (1952) noted markedly different shapes of eggs in a clutch of the brolga and caused subsequent speculation, e.g. by Bunn (1925), that shape of the egg denoted sex: thus the "elongate" egg in a 2-egg clutch was a male and the "round" egg was a female. In 40 clutches of two eggs each from Townsville-Inkerman, north Queensland, during 1968–1971, one egg was always longer but the other was rounder on only 20 occasions; thus in the latter circumstance a 2-egg clutch measured, for example, (i) 92.9 x 61.7 mm, and (ii) 91.0 x 59.5 mm. In any event, size was not related to sex because the "elongate" eggs in nine 2-egg clutches were found to comprise five males and four females. Moreover, an additional 10 clutches comprised only one egg, and one clutch consisted of three eggs.

#### IV. DISCUSSION

Sex determination in the field is practicable for adult pairs of brolgas because of the sexual dimorphism discernible then. It is less practicable but of wider application to determine sex by examining all adults in the hand for presence of the cloacal papillae of males. These methods are either impracticable or inapplicable when dealing with immature birds and eggs.

Table 3 illustrates the age compositions based on plumage appearances in flocks of brolgas in north Queensland during 1968–1970. Hence, approximately one-half of a population, i.e. adult birds in twos, could be sexed in the field at a distance (by sexual dimorphism) and an additional one-fifth, i.e. adults not noticeably in twos, could be sexed in the hand (using cloacal papilla character); moreover, approximately one-fifth of the immature birds, i.e. some sub-adults and yearlings (see Table 2), could be sexed with certainty in the hand as males (also by cloacal papillae).

TABLE 3  
COMPOSITION OF FLOCKS OF BROLGAS OBSERVED AT TOWNSVILLE TOWN  
COMMON, 1968–1970

Category	Nos. of Birds			Mean Composition 1968–1970 (%)
	July 1968	July 1969	July 1970	
Adults				
In twos . . . . .	78	54	58	48
Not noticeably in twos	9	29	47	22
Immatures				
Sub-adults and yearlings	21	30	1	13
Birds-of-the-year . .	54	Nil	11	17

Preliminary results suggest the same order of value of these methods for sexing the Sarus crane, in which papillae occur, and in which similar population compositions in Australia to brolgas have been noted (e.g. 9 immature brolgas in 38 birds, 23 immature Sarus cranes in 107 birds, Atherton Tableland, north Queensland, September 1969).

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