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OBSERVATIONS ON THE BIOLOGY OF THE WHITE-FACED HERON *Ardea novaehollandiae*

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The White-faced Heron *Ardea novaehollandiae* is not an uncommon species in the Hunter Valley, NSW, occurring individually or in small groups (two to five), with larger flocks in wet pasture after rain or flood. Its morphology is described and compared with those of egrets, and variations in the grey plumage pattern reported. Nests observed have been solitary, even when in same area as an egret colony, and very high in trees. Breeding behaviour for four pairs observed is described. Courting behaviour was conducted in general area of nest-site location. Pursuit flights, and typical heron-type 'back-bite', 'twig-shake' and 'wing-preen' (Hancock and Kushlan 1984) have been observed. Incubation time is estimated as 24–26 days. Young were observed to be left unattended at nine days, to clamber at 20 days and to fledge at 43. Breeding success at five nests for which outcomes were determined was 1.40 per nesting attempt. Both parents undertook incubation and care of young. Five cases of breeding commencement in spring (October, November), one summer (December), and one winter (July) were recorded. Incidents of agonistic interaction with a Noisy Miner, a Laughing Kookaburra and another White-faced Heron are reported.

While conducting field work for Project Egret Watch, the Hunter Wetlands Trust study of egrets, I have frequently encountered the White-faced Heron *Ardea novaehollandiae* and have maintained field notes on these encounters, recording numbers, appearance and behaviours. Breeding biology observations were obtained by using binoculars several days each week to monitor birds which nested in four years at my home at Glenoak in the Williams River Valley, about 40 km north of Newcastle. These observations add to the fragmentary published knowledge on the heron's biology.

OCCURRENCE IN THE LOWER HUNTER VALLEY

The White-faced Heron is not uncommon in the Lower Hunter Valley (Fig. 1), although its distribution is sparse away from the main river courses and wetland areas. In a one-day survey in June 1987 along 400 km of roadway in the Maitland-Raymond Terrace-Dungog area, 25 were counted in 13 sightings, frequenting pastures, farm dams and creek banks. Seven sightings were of single birds, the other six groups of two to five.

However, in November 1984, during an excursion by boat from Newcastle Harbour to Raymond Terrace along the Hunter River Estuary, a distance of about 30 km, more than 200 were counted. The birds were feeding singly on the fringe mudflats between the mangrove edge and the river channel between Newcastle and Hexham and on the banks and small beaches between Hexham and Raymond Terrace. A gathering of more than 20 birds was noted loafing and flying around a group of trees near the water's edge on Ashe Island.

The heron has been regularly encountered on almost daily road trips between Glenoak, north

of Seaham in the Williams River Valley, and Raymond Terrace, a distance of about 20 km, the route passing through pasture and wetlands on the flood plain (Fig. 1). It is usually alone or in small groups of up to three birds, but occasionally much larger groups have been recorded feeding in wet pastureland. For example, on five occasions between 29 May and 10 June 1987, five single sightings, two observations of two birds together, and two of a group of three were recorded. On 23, 24, 26 and 30 June, 10, 18, 10 and 14 birds respectively were recorded feeding as a flock near Irrawang Swamp, about 6 km north of Raymond Terrace. No rain had fallen between 18 May and 4 June, but on 5–8 June inclusive 54 mm were recorded.

After weeks of consistent rain in 1990, a congregation of more than 50 was recorded on wet pastureland on the floodplain of the Williams River near Mt Kanwary on 11, 12 April (I. Harvey, pers. comm.). When water is receding from the creek flat pastures after flooding at my property at Glenoak, it is not unusual to find 20 or more congregating together to feed.

Missen and Timms (1974) and Hobbs (1961) reported similar flocking around lakes in dry periods in Victoria and NSW respectively, while Gosper (1981) noted congregations on coastal mudflats in northeastern NSW during the winter dry season. Carroll (1970) observed gathering into flocks on mudflats and wet pastures in New Zealand during winter, with maximum size usually 15–30 birds, but with some containing as many as 60; the largest group was estimated at 723 birds at Kaipara Harbour in 1965. Lo (1982) recorded an average of 34 (maximum number 68) on the Manawatu Estuary in New Zealand in summer and autumn between 1976 and 1981, but only four birds during winter and spring. Lowe (1983) reported up to 60 feeding together on Western Port Bay, Victoria, during May and June.

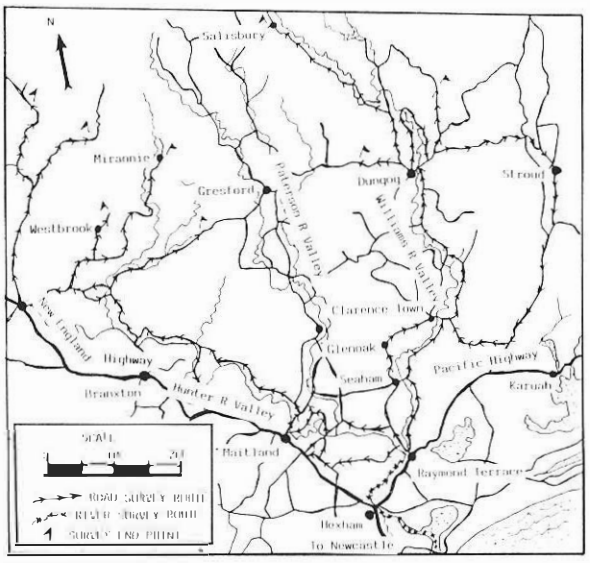

Figure 1. *Location map for Hunter Valley observations of the White-faced Heron.*

MEASUREMENTS

Measurements were obtained from a single adult specimen brought to the Shortland Wetlands Centre for rehabilitation after having been found injured. The measurements are shown in Table 1 with those of two specimens of Little Egret *Egretta garzetta*, one Intermediate Egret *E. intermedia*, one Great Egret *E. alba* and three Cattle Egret *Ardeola ibis*. Although the sample is small it gives an indication of relative dimensions of the White-faced heron to those of the other species.

The White-faced Heron has a somewhat slender profile, more akin to that of the Little Egret, in comparison with the more robust appearances of the Intermediate, Great and Cattle Egrets. The beak is thinner and more

TABLE 1

Measurements of White-faced Heron and four species of egrets.

	White-faced Heron	Little Egret			Intermediate Egret		Cattle Egret			Great Egret		
Weight (g)	500	390	320	310	405	365	355	355	305	490	735	835
Wingspan (mm)	1 060	850	900	910	900	870	880	—	—	1 050	1 200	1 210
Tarsus (mm)	90.0	89.0	84.4	91.8	94.5	87.3	81.6	93.0	82.5	135.0	135.0	130.0
Bill length (mm)	78.9	68.2	66.5	78.0	63.0	54.5	58.7	62.1	58.0	87.0	82.5	84.5

slender in comparison with those of Intermediate and Cattle Egrets, more closely resembling that of the Little Egret. The Great Egret is overall a much bigger bird.

PLUMAGE AND MORPHOLOGY

Plumage

The White-faced Heron is overall blue-grey, with soft pinkish-brown tones on its shoulders and flanks. Lanceolate pinkish-brown plumes become prominent on the nape, mantle and back during the breeding season. The white face which gives the heron its name is distinctive. Five birds examined in the field, two of which were further studied from colour transparencies, had the white patch extending back over the eye towards the crown, with a grey patch covering the ear (Fig. 2). A bird which frequented the Shortland Wetlands Centre during the winter of 1986 had a distinct variation from this pattern: a completely white neck, similar to that of the Pacific Heron *A. pacifica*.

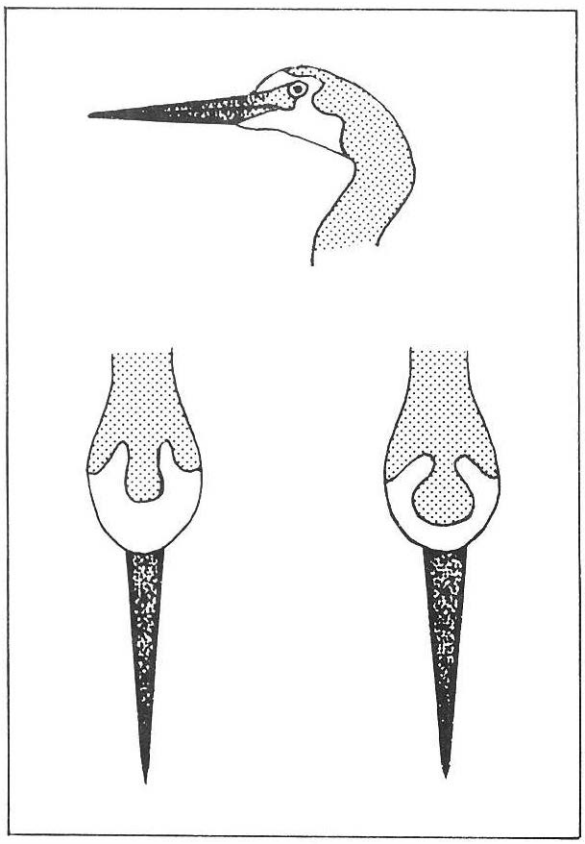

Figure 2. *Side view of typical White-faced Heron head and variations in crown pattern of grey and white plumage.*

Variation in the white head pattern was noted for a pair nesting at Glenoak in October 1988. The birds were closely observed during the process of nest building, when they exposed the crown of the head during placement of sticks in the nest. One had a round, grey crown-patch connected to the grey of the neck by a thin grey line, whereas the connection between crown and neck of the other bird was a wide stripe. The two patterns are illustrated in Figure 2.

The plumage of young at fledging and for at least one month after becoming independent is paler and duller than that of adults. A pinkish-grey tinge is more prominent on the breast and the whiteness of the face much less distinct than in the adults. There are no plumes on the back or breast.

Beak, face and legs

The notch at the posterior end of the beak gape is almost non-existent, being just below the iris of the eye similar to that of the Little Egret. This is in contrast to the distinct 'V' shaped notch which reaches the back of the circle of the eye in the Intermediate and Cattle Egrets and to distinctly behind the eye of the Great Egrets (Fig. 3). The specimen brought to the Shortland Wetlands Centre had the upper mandible black and the lower mandible about two-thirds black with a white tip.

In the breeding pair observed during courtship and nest-building at Glenoak in 1988, the beak and lores were grey-black and the legs were pinkish-orange. Lores of non-breeding birds are also grey-black.

HABITAT AND FORAGING

Favoured habitat

The White-faced Heron's most favoured foraging habitat in the Hunter area has been wet situations, such as dams, creeks, drains, small swamps, wet pasture and river mudflats. However, it has also been frequently observed feeding with or near Cattle Egrets in dry pasture. Lowe (1983) reported the species feeding in pasture land with cattle, either alone or in groups.

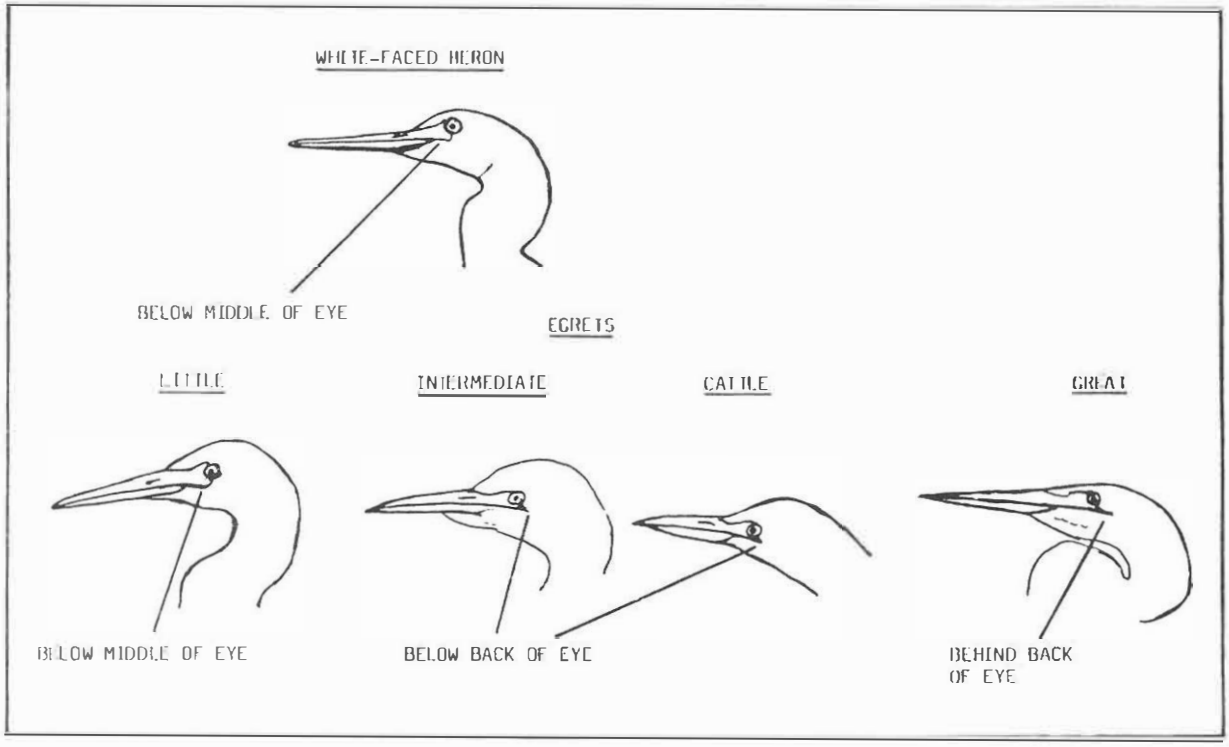

Figure 3. *Head profiles of White-faced Heron and four egret species showing position and shape of gape notch.*

Only one definitive observation of prey species was obtained during the study period. A heron hunting along the margins of a drain and on a flooded road verge in the built-up area of the village of Seaham captured and consumed a substantial yabby, probably *Cheras destructor*.

Co-operative feeding with Royal Spoonbill

On one occasion during 1986, a White-faced Heron was feeding in a shallow dam near my house, in company with a Royal Spoonbill *Platalea regia*. The Spoonbill was feeding in the shallow margin of the dam, swinging its head from side to side in the water, while the heron walked close alongside in jerky, high-stepping gait, stabbing at prey disturbed by and close to the head of the Spoonbill. The pair worked backwards and forwards along the one margin of the dam for about 10 minutes, turning together to retrace their path in a pattern which resembled a well choreographed dance.

BREEDING BIOLOGY

Nest site

A pair of White-faced Herons nested at what is now called the Shortland Wetlands Centre in the 1984–1985 and 1985–1986 breeding seasons. The nest was situated very high in a Broad-leafed Paper Bark Ti-Tree *Melaleuca quinquenervia* in an isolated position some 100 m from the active egret breeding colony.

A pair nested in an open grove of Grey Ironbarks *Eucalyptus paniculata* at Glenoak, in the Williams River Valley, each year during 1986–1989. The grove is on rising ground from the flood plain of a creek-tributary of the Williams River. Two dams, which the birds frequently use for feeding, are 30 m from the nest site, a wetland is about 0.5 km east, and the Williams River is about 1 km away. In the first two years, the same fork of one tree was used. In 1988 and July 1989, the same fork of a different tree in the grove

about 20 m north was used. In December 1989, a further nest was built in the first tree. Although the birds were not marked, I suspect that because of the highly specific nature of their nest positions, they were likely to be the same pair each year.

The nest was constructed high in the trees about 11 m above ground level (estimated from the height of a step-ladder which was used as a viewing platform). This situation is similar to those described by Moon (1967), where nests were reported up to 22 m. The Ironbark sites were also well out on branches, away from the trunk, similar to those reported by Moon (1967) and Lo (1982). In 1987, the nest site was about 1 m from that of a Noisy Miner *Manorina melanocephala*.

Timing of nesting

The two nests established near the Wetlands Centre egret colony commenced in November, coinciding with nesting of the egrets. The nests at Glenoak began in October 1986, 1987 and 1988, and in July 1989. A nest was discovered in January 1990 by finding broken eggs beneath the tree. This nest would have been established in December 1989. Courting behaviours and occupation of the nest site were observed in July 1988, but no nesting eventuated; a nest was eventually built in October.

Nest structure, materials and building

All five nests resembled those typical of egrets: a rough platform of sticks. Birds collected dead sticks from the ground in the general vicinity of the nest site. At Glenoak, leafy twigs pulled from the foliage of nearby Ironbark trees were also used. One bird (presumed male, as is common in herons) did the stick collecting, while both birds were involved in placing the sticks in the nest, employing the 'tremble-shove' movements typical of herons (Hancock and Kushlan 1984). Maximum turn-around time for a stick-collecting trip was 1.5 minutes. Active building of the 1989 nest was recorded for 12 days before the birds began to sit, presumably incubating eggs. No data were collected on egg laying.

Nesting behaviour

Courting and nest care activities at Glenoak nests were observed over four seasons. Courting activities took place at a range of different locations within an area of about 1 ha surrounding the nest site.

'Twig-shake', 'wing-preen', 'back-bite' and 'bill clapper' behaviours (Kushlan and Hancock 1984) were recognized. These took place in a number of different trees. Weaving and swooping flights with a relatively slow wing-beat and neck outstretched, with one bird pursuing the other across the open pasture or among tree crowns, took place before the pair bond was formed. During these flights, the birds often gave a relatively high-pitched squawk (kar-kar-kar), followed by guttural croakings (grok-grok-grok-grok) when they landed in a tree, the sounds apparently coming from both birds. This latter call may be the one referred to by Moon (1967) as 'graw-graw-graw', although phonetically the sounds reported here were definitely of a clucking nature. They closely resembled those made by Great Egrets at the nest, but were generally softer in tone. 'Twig-shaking' and 'back-biting' in the tree followed these flights. The 'twig-shaking', presumably by the male (based on observations of egret behaviour), was quite vigorous.

In the 1987–1988 breeding season, three birds were observed in pursuit flight behaviour before the establishment of the pair bond. In July 1988 four birds performed the same behaviour, and five were seen before a pair became established at the nest in July 1989.

Carrol (1970) made the following comments on establishment of a nesting population in New Zealand:

> 'From a study of available data it appears that, excluding seasonal phenomena of flocking and dispersal, the maximum permanent colony size in any locality was usually not great and was soon attained. In large tracts of favourable habitat colonies have coalesced and heavy occupation resulted.
>
> 'The pattern of establishment of a colony occurs typically as follows: after preliminary visits by a solitary bird, extending over one or more years, a pair appears. Nesting usually ensues and a family group forms. The total resident population may remain at one pair for many years but the group may increase until apparently its

maximum size is attained, often three to five pairs. In the absence of a banding scheme it is impossible to determine whether subsequent colony members are birds from elsewhere or juveniles which, on reaching breeding age, remain loyal to their natal home.'

The number of birds involved in the pre-bond establishment phase in the three Glenoak records was consistent with that of a family group, two offspring having been produced in 1987–1988 and one in 1988–1989. However, in the absence of individual marking, it was impossible to identify these individuals or to confirm whether they were members of one family.

Incubation and care of young

Clutch size was not determined for any of the observed nests because of the height of the sites. Commencement of incubation and time of hatching were estimated from the behaviour of the parents.

In 1988, active nest building took place from 3 to 13 October. One bird was first observed sitting on 14 October, however, building continued until 15 October. Continuous sitting began on the following day and continued until 9 November, when one parent was seen peering at and apparently eating material from the floor of the nest, similar to behaviour of egrets with newly hatched chicks. Egrets begin feeding hatchlings by regurgitating into the nest, from where the chicks pick up the food; the adults then reconsume any surplus. This behaviour takes place about nine days before young become visible by holding up their heads above the rim of the nest.

On 12 November broken eggshells were found at the base of the tree, giving a maximum estimate for incubation time of 26 days. Similar observations of the July 1989 nest give a maximum estimate of incubation time of 24 days.

Both parents incubated the eggs and fed the young. At change-over of duty they displayed greeting behaviours very similar to those of Cattle Egrets. The neck was arched into a strong curve, touching or almost touching the back, and the plumes on the back were elevated, while the bird crouched (Fig. 4). On one occasion the arriving bird performed 'back-bite' behaviour (Hancock and Kushlan 1984) on its mate, emitting soft, guttural, croaking noises as it did so.

Once the young became active in the nest, they stimulated direct regurgitation from an adult by grasping its beak in the same fashion as in egrets. In the early stages of chick rearing one parent remained at the nest while the other hunted for food.

In the 1988 nest, the young were left unattended after nine days from the estimated time of hatching, in the July 1989 nest 15 days and in the January 1990 nest 13 days after locating the broken eggshells. All periods were shorter than the three weeks suggested by Moon (1967).

Nestlings clambered to adjacent branches 20 days after estimated hatching date and flew to adjacent trees at 43 days. At 20 days after fledging, young pursued parents around neighbouring trees, begging for food and being fed. The begging action, both at nest and away from nest, was closely similar to that of young egrets. Neck feathers were erected, wings were drooped and the body and wings moved in a wagging action.

In 1987–1988, the juveniles were still in the vicinity of the nest tree 18 days after first observed flying, foraging around the margin of the dam and flying to the neighbouring property. The two young from the July 1989 nest were present 25 days after fledging, pursuing the parents, begging and being fed. Both young from the 1990 nest were still in the vicinity 24 days after fledging, and one was still present at 40 days.

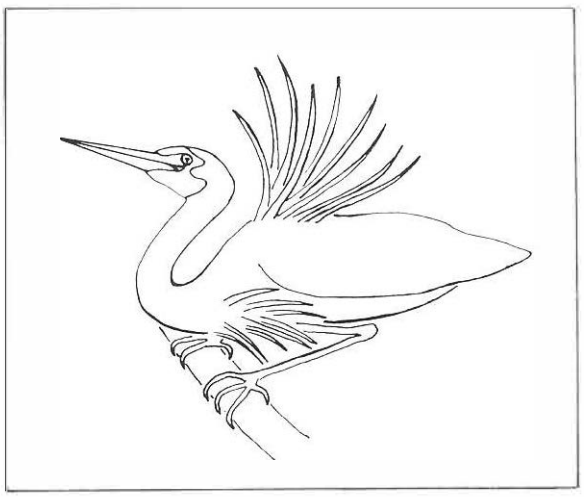

Figure 4. *Greeting position at change of nest duty.*

Breeding success

The breeding success of the Glenoak nests from 1986 to 1990 was determined by regular counts of young observed in the nest until they were successfully fledged, as judged by seeing them flying in the vicinity of the nest site.

The 1986 nest was abandoned after 14 days incubation. The number of successfully fledged young for 1987, 1988, 1989 and 1990 were two, one, two and two respectively, a mean success of 1.40 young per nesting attempt, or 1.75 per successful attempt.

BEHAVIOUR: INTERACTIONS WITH OWN SPECIES AND OTHER SPECIES

Three agonistic interactions were recorded, once between two herons, once between a heron and a Noisy Miner, and once with a Laughing Kookaburra *Dacelo novaeguineae*. In 1986 the heron nest was placed only about a metre from the Noisy Miner nest. The Miner was once observed pursuing a heron through the Ironbark grove. The heron's flight was weaving and swooping to evade pursuit and miss trunks and branches of the trees. In 1989 one of the nesting herons attacked and pursued a Kookaburra in the vicinity of the nest, chasing it well out into the open pasture. The heron emitted the 'kraaark', high pitched grating squawk at the commencement of pursuit. In 1989, a 'jump-up-and-down' sparring action was observed between two adult herons in the pasture adjacent to the nesting grove, during the period of courtship when the five herons were in the area. The herons appeared to be disputing foraging rights in the pasture space.

VOICE

I have identified three main calls, two of which are similar. When disturbed, the bird often gives a sharp 'kraaark' call when it flies off. During pursuit flight in courting, the call is similar to the alarm call, but of longer duration and higher pitched, and is repeated several times during the pursuit. A soft, gutteral 'croak' or 'cluck' (repeated 'grok, grok, grok . . .') (see Breeding) is made when the birds are in close proximity during courting or at the nest during changeover of duty. This is somewhat similar to the equivalent call of the Great Egret.

DISCUSSION

Mode of occurrence in the Hunter Valley, determined by this study, is similar to that reported elsewhere in Australia (Missen and Timms 1974; Hobbs 1961; Gosper 1981) and in New Zealand (Carroll 1970), with individuals to small groups and occasional larger aggregations. Gosper (1981) reported it as very common on Hunter Valley estuarine wetlands, with loose feeding aggregations up to 100, with 2-40 on Kooragang Island in July 1972. Gosper did not say whether this was a flock in a confined area or spread out along the estuary shore. The area forms part of the river route traversed in my 1984 survey where more than 200 were counted.

In the only specimen measured, bill-length and tarsus were close to that of the Little Egret specimens but the wing-span was considerably larger. The post-gape notches of the beak of the heron and egret are identical.

Heather (1983) commented on the variability of the distribution of white on the face, referring to a number of birds which had considerable areas of white. The different head patterns on the Glenoak pair were only minor variations, but the white-necked bird was closer to the more albinistic variants referred to by Heather (1983).

The six nest-sites were solitary, very high and well out on branches, consistent with reports by Moon (1967), Lo (1982) and Lowe (1983), and this seems to be the normal nesting pattern. However, Hobbs (1961) reported that during extensive flooding in south-western NSW, so many of the birds nested on the flooded plain that they were forced into "colonies", with some nesting in bushes only about a metre or so high. Gosper (1981) reported a few nesting in mangroves on Kooragang Island, in the Hunter and on the Richmond River estuary in northern NSW.

The solitary nesting behaviour differs from the colonial habits of the four egrets (Great, Intermediate, Little and Cattle). Unlike the egrets, where courting activities centre on displays at the nest site, the White-faced Heron performs its courting in the general nesting area, as well as at the site. The courting displays are similar to those of egrets. The common heron courting displays of

'twig-shake', 'wing-preen', 'back-bite' and 'bill-clapper' (Hancock and Kushlan 1984) are part of the courting ritual.

Hancock and Kushlan (1984) stated "courtship flighting with neck outstretched may form part of the ritual". Observations of the nesting birds at Glenoak suggest that aerial pursuit flights are an essential part of the ritual, moving the courting procedure from one location to another within the general nest-site area.

Estimated incubation times of 24 and 26 days are consistent with Hancock and Kushlan's (1984) 24–26 day interval, but considerably shorter than that determined by Lowe (1989) and Marchant (1988) for the Pacific Heron *Ardea pacifica*, and more like those of the egrets (author's data; Hancock and Kushlan 1984). However, the period of 9–15 days before the young are left unattended is much shorter than that of egrets (except the Little Egret) (author's data; Moon 1967). The estimated 43 days from hatching to fledging is consistent with Kushlan and Hancock's (1981) figure of "about another 40" after hatching.

The similarities of the White-faced Heron to the Little Egret in morphology, and to the Great Egret in the guttural courting and nest changeover calls, are interesting because of classification of the White-faced Heron as an egret (i.e. *Egretta novaehollandiae*) by Payne and Risley (1976) and Hancock and Kushlan (1984).

Hancock and Kushlan (1984) stated that juveniles stay with parents until the next nesting season and are then chased away. However, Carroll (1970), in describing the pattern of growth of a localized population in New Zealand, considered that "in the absence of a banding scheme" it is impossible to know whether the colony members are juveniles remaining loyal to the natal home. Lowe (1983) reported that some White-faced Herons remained near their natal place for extended periods (over three years). The growth of the Glenoak population to five birds in 1989 is consistent with that of an accumulating family group, but in the absence of individual marking it is impossible to draw firm conclusions.

Lowe (1983) commented that although they share feeding grounds, the White-faced Heron and Royal Spoonbill have strikingly contrasting feeding ecologies. The latter employs a tactile process, consumes more prey and takes a smaller range of prey species and sizes (Lowe 1982). In the light of these comments, the observation of the White-faced Heron apparently taking advantage of the feeding method of the Spoonbill is an interesting one. It was probably taking prey disturbed but ignored by the Spoonbill.

The observations reported here did not result from any intensive study of the species. However, they complement other reports and provide some additional information which helps fill gaps in the knowledge of the biology of the White-face Heron.

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