

THESE LEGS WERE MADE FOR WALKING – TEMPORAL AND SPATIAL VARIATION IN THE DISTRIBUTION OF THE COMB-CRESTED JACANA *Irediparra gallinacea* IN NEW SOUTH WALES

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The range of the Comb-crested Jacana *Irediparra gallinacea* in New South Wales is thought to have extended southward from the north-eastern coast to near Sydney in the 1930s, and to be receding again now. We review all available atlas records, literature sources, sightings and other records to clarify the species' distribution and status in New South Wales. Records from Windsor in the early 1840s and from near Mudgee in 1889 suggest that Comb-crested Jacanas resided as far south as Sydney at the time of European settlement, and more recent records confirm that this southern distributional boundary has not changed. However, historical records do indicate that the southern edge of the distribution is unstable. Fluctuations in the presence and abundance of Comb-crested Jacanas along this edge appear to be the result of limited tolerance to extreme climatic events, such as drought, and reduced fecundity in southern latitudes. The draining and degradation of larger wetlands on the New South Wales coast will reduce the viability of vital drought refuges, and may increase the pressure on already unstable local populations along the species' southern distributional boundary. Wetland conservation will be essential to stop further population losses.

INTRODUCTION

The Comb-crested Jacana *Irediparra gallinacea* is distinguished by its huge toes – its feet are virtually as long as its entire body – that allow it to walk on floating vegetation. It inhabits permanent wetlands with a heavy surface cover of floating or emergent vegetation (Potter 1934; Hindwood 1940; Marchant and Higgins 1993), especially water-lilies, upon which it forages. The species feeds primarily on insects and other invertebrates, as well as seeds and green vegetation (Marchant and Higgins 1993; Dostine and Morton 2000; Mace 2000). In New South Wales the species breeds in spring and summer on a nest of floating vegetation (Marchant and Higgins 1993). Females can lay successive clutches sired by multiple males, and defend both the eggs and their territories from other females (Marchant and Higgins 1993; Mace 2000). The male builds the nest, incubates the eggs and broods the young (Marchant and Higgins 1993; Mace 2000).

When Australia was first settled by Europeans, Comb-crested Jacanas, as they are today (Crawford 1979; Dostine and Morton 2000; Barrett *et al.* 2003), were plentiful on swamps on the coastal plains of the Northern Territory, including Kakadu and Arnhemland, being recorded first in Darwin in 1843 (Le Souef 1903; Hill 1913; Barnard 1914; White 1917; Olsen 2001). The species was not recorded when the Gulf of Carpentaria was first explored (Leichhardt 1847; White 1917), and it appears generally less abundant in this region than on Cape York and The Top End of the Northern Territory (Blakers *et al.* 1984; Barrett *et al.* 2003). On the Queensland coast the species has remained present and abundant since European settlement near Cairns (Campbell 1900; Broadbent 1910; Campbell and Barnard 1917; Blakers *et al.* 1984; Barrett *et al.* 2003), Townsville (Mace 2000), Rockhampton (Barnard 1925; Blakers *et al.* 1984; Barrett *et al.* 2003) and south to Brisbane

(Jackson 1907; RAOU 1910; Favaloro 1931; Woodall 1985; Blakers *et al.* 1984; Barrett *et al.* 2003). The Comb-crested Jacana in Western Australia is moderately common in the north-east (Storr 1980), but has not been recorded along the western coast south of the Kimberley.

In New South Wales the range of the Comb-crested Jacana is thought by some authors to have extended south from the north-east coast to near Sydney in the 1930s (Potter 1934; Hindwood 1940; Hindwood and Hoskin 1954; Marchant and Higgins 1993). However, the species is also considered to be declining in the state by others (Lunney *et al.* 2000). In this paper we attempt to resolve these apparently conflicting ideas about the distribution and status of the Comb-crested Jacana in New South Wales.

Our aims were to:

1. collate all available records for the Comb-crested Jacana in New South Wales;
2. review temporal and spatial changes in the species' distribution, and correlate observed changes with possible threatening processes; and
3. provide suggestions for management of southern Australian populations.

METHODS

Sourcing of Locality Records

We collated locality records for the study species from several sources:

- (1) *The Atlas of Australian Birds*. We used the three datasets that comprise the Atlas of Australian Birds (Birds

Australia, Melbourne): the *Historical Atlas*, compiled from historical literature published between 1788 and 1977; the *First Atlas*, with records collected between 1977 and 1981 (Blakers *et al.* 1984) and the *Second Atlas* with records from 1998 to August 2002 (Barrett *et al.* 2003). The data from the Historical Atlas, First Atlas and Second Atlas have been compiled by Birds Australia under The Atlas of Australian Birds program as a single large database, which was obtained for this study.

- (2) *Museum records.* Locations were obtained for Comb-crested Jacana from egg and skin collections housed at the Australian Museum, Sydney; Queensland Museum, Brisbane; Museum Victoria, Melbourne; South Australian Museum, Adelaide; Western Australian Museum, Perth; Australian National Wildlife Collection, Canberra; and Macleay Museum, Sydney.
- (3) *Wildlife Atlases.* We used location records gathered by State Government conservation agencies. Atlas records from New South Wales (NSW: Department of Environment and Climate Change), and Queensland (Queensland Parks and Wildlife Service), were obtained for this study.
- (4) *Literature Records.* Systematic searches for locality records were made from all issues of *Australian Birds* (NSW Field Ornithologist's Club, Sydney, New South Wales), *Corella* (Australian Bird Study Association, Crows Nest, New South Wales) *Emu* (CSIRO, Collingwood, Victoria), and *The Sunbird* (Queensland Ornithological Society, Milton, Queensland). Precursors of these journals (*The Australian Bird Bander* and *The Australian Bird Watcher*) were also searched.
- (5) Extensive surveys in northern New South Wales and southern Queensland by the authors (Nye 2004; Nye *et al.* 2007).

Only reliable locations were used, as obtained from historical literature, published records, museum data or Birds Australia and National Parks databases (for such records, only those given the highest confidence ranking were used). Repeated sightings at the same locations were excluded, thus leaving only one record for a location and removing any overlap in sources. Locality records were grouped into discrete time periods (1788–1900 and then time blocks of twenty years) to explore the impacts of different processes that may have influenced the distribution and abundance of Comb-crested Jacana. Data from the First Atlas of Australian Birds, collected between 1977 and 1981, were allocated to the appropriate years within specified time periods (i.e. 1977–1980 and 1981).

For the purpose of identifying threatening processes that may have influenced changes in the distribution of Comb-crested Jacana, we noted comments in the historical literature about factors or events that may have influenced the species' occurrence. We also used comments in historical sources to compile rough estimates of abundance. This general approach is useful for describing patterns of change and for suggesting processes that are most likely to have influenced Comb-crested Jacana. However, we acknowledge that confirmation of currently influential factors can be obtained only by carrying out appropriate experiments.

RESULTS AND DISCUSSION

A total of 763 location records was collected in New South Wales; most were from the north-eastern corner of the state, but others were distributed along the coast to Sydney with occasional records west of the Great Dividing Range (Fig. 1).

Temporal and Spatial Changes in Distribution

The first specimen of the Comb-crested Jacana recorded by Europeans in Australia was painted by James Stuart in 1841 or 1842, from a location near Windsor, 45 kilometres north-west of Sydney (Olsen 2001). Despite this, the species was thought not to occur in the Sydney/Hawkesbury district until recorded there in 1930 (Potter 1934). In the late 1800s and early 1900s the southern limit of this species was thought to be the Clarence River catchment in north-eastern New South Wales (Campbell 1900; Jackson 1907). However, prior to 1900 the most southerly known location of the Comb-crested Jacana (excluding the Windsor location) was near Mudgee, 160 kilometres north-west of the Hawkesbury River, obtained by Cox and Hamilton (1889). In 1931 ten birds were sighted in the Gwydir reed-beds, near Moree, 400 kilometres inland (Hindwood 1940). It is possible that the species existed further south in New South Wales along the coast or inland, but went unobserved. Regardless, it appears that a large population has existed historically on the north-eastern swamps of the state (Jackson 1907). This has remained the case to the present, with the species now found commonly on floodplain swamps with surface vegetation (Gosper 1981; Morris *et al.* 1981). It was recorded during Atlas surveys (Blakers *et al.* 1984; Barrett *et al.* 2003); further surveys conducted during 2000–2003 confirm that the species has remained common in the state's north-east (Nye 2004).

Small populations of Comb-crested Jacana have occurred sporadically in the Sydney region since the 1930s. After the original sighting near Windsor in 1841–1842, the species was recorded again in 1930, and observed to be breeding in 1933 (Hindwood and Hoskin 1954). This small population peaked in 1939–1940, when over 30 individuals were recorded around Cattai (north-east of Sydney), and the species was not uncommon in other localities around Sydney, including Liverpool in the south-west and Eastlakes to the south (Hindwood and Hoskin 1954). The population declined after 1940, as drought seriously reduced the extent of viable wetland habitat. By 1948 the population had increased again, but widespread flooding in 1949 removed suitable vegetation and the population declined (Hindwood and Hoskin 1954). The species was spotted only occasionally after this, and disappeared by 1954 (Hindwood and Hoskin 1954). Locality records show that the species returned in 1961, and was recorded breeding on three occasions (Birds Australia unpublished data). The species remained in the area until 1979; a last date given as 1976 by Hoskin (1991) appears to be an error.

Unfortunately, the abundance of the Comb-crested Jacana is difficult to estimate from the historical literature, as most records provide neither individual numbers nor population estimates. Since 1979, the species has been sighted sporadically in the Sydney area, a single bird between October 1985 and

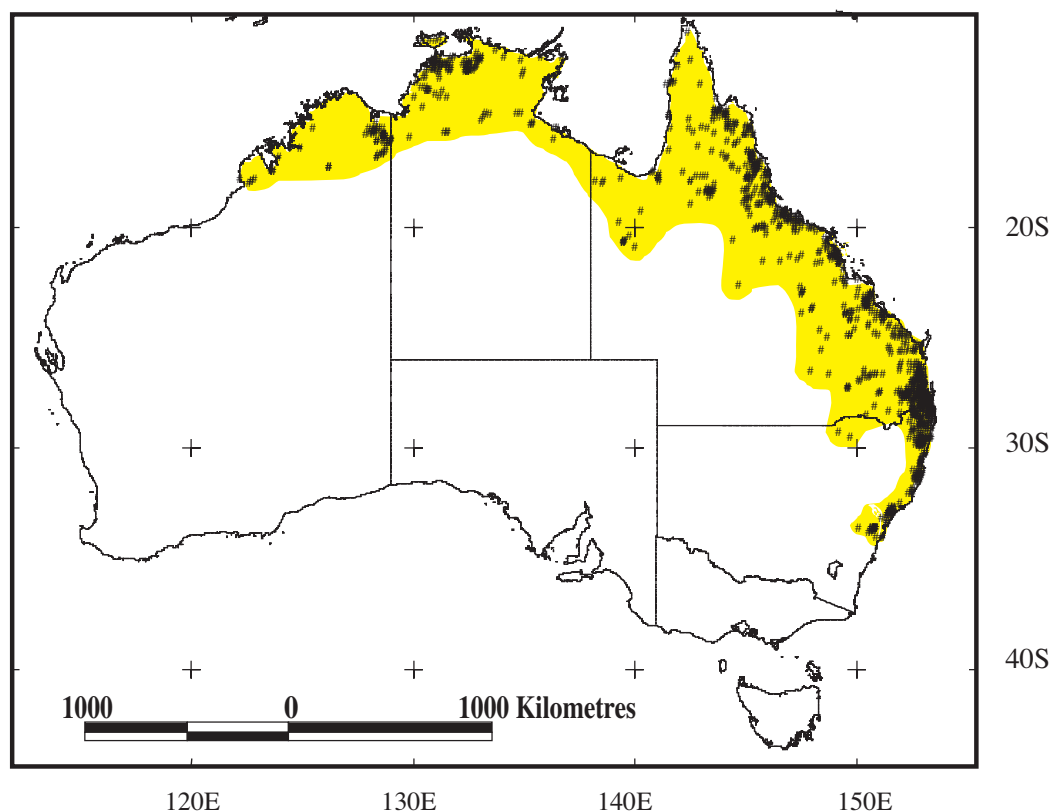


Figure 1. Location records ($n = 1\ 281$) of the Comb-crested Jacana in Australia, 1788-2002.

March 1986 (Hoskin 1991), and another in 1998. It was also observed further south near Wollongong in 1989 and 1990 (Ramsay and Ramsay 1990), the furthest south that the species has ever been recorded. During this time the Comb-crested Jacana persisted north of Sydney in the Newcastle district (D'Ombraïn 1966), albeit in small numbers (Gosper 1981; Albrecht and Maddock 1985), and during 2002 several individuals were again sighted in the Sydney area on Lake Parramatta (Edwin Vella, pers. comm.).

In summary, historical and current records suggest that the distribution of the Comb-crested Jacana has neither expanded nor contracted to a great extent in New South Wales in recent decades, and that the southern edge of the range remains relatively stable in the vicinity of the Hawkesbury/Sydney region. Temporary fluctuations in presence and abundance at the southern distributional boundary may result from limited tolerance to extreme climatic events. Scattered records of Comb-crested Jacana occur up the coast to north-eastern New South Wales, and populations then increase northward into Queensland and across tropical northern Australia.

Threatening Processes and Management

The Comb-crested Jacana is sensitive to extreme climatic events, which reduce the extent of its wetland habitat. Drought appears to have particularly damaging impacts on local population size (Crawford 1979; Marchant and Higgins 1993), but floods and cyclones are also important (Hindwood and Hoskin 1954; Mace 2000). Around Darwin, in the Northern Territory, drought conditions have been shown to reduce local populations by up to 90 per cent as all available wetland habitat,

including reliable drought refuges, dries up and competition increases with other species of waterbirds such as Magpie Goose *Anseranas semipalmata* and whistling ducks (*Dendrocygna arcuata* and *D. eytoni*) (Crawford 1979). Similar observations have been made for Comb-crested Jacanas on wetlands in north-eastern New South Wales following drought in 2002 (Greg Clancy, pers. comm.). Drought has also been cited as the reason behind the decline in populations around Sydney in 1940 (Hindwood and Hoskin 1954).

While drought appears to be the primary reason for rapid reductions in Comb-crested Jacana populations, low fecundity probably reduces the ability of the species to repopulate quickly after local extinction, especially on the edge of the species' range. The rate of clutch failure among the world's eight Jacana species is very high (Jenni 1974; Osborne 1982), with the Comb-crested Jacana being no exception (Mace 2000). Predators appear to be the primary cause of clutch loss (Mace 2000). In tropical and sub-tropical regions the high rate of clutch loss in Comb-crested Jacana is offset in part by the species' higher abundance and in part through laying of multiple clutches; females bond sequentially with several males, which then incubate the eggs (Mace 2000). It is not known whether birds in southern parts of the range are equally polyandrous, but their lower abundances there may not permit this to occur. Slow recruitment in southern parts of the range would reduce the ability of the species to re-colonise wetlands after events such as drought, and thus increase the vulnerability of populations on the edge of the distribution to local extinction.

Compounding the difficulties that Comb-crested Jacana populations face near the southern edge of the distribution is the

fact that available wetland habitats in coastal New South Wales have been greatly reduced and degraded. The coastal slopes and plains of New South Wales have been developed for human use since earliest European settlement, and all regions are so changed by drainage diversion and agriculture that waterbird habitat is greatly reduced (Cowan 1973). Goodrick (1970) identified the most important drought refuge habitats as the Tweed, Richmond and Clarence River catchments in the north-east of the State, with other useful areas adjacent to the Macleay and Maria Rivers, the Myall Lakes and the floodplains of the Hunter River. By 1969, 60 per cent of the wetlands (primarily ephemeral fresh meadows and seasonal fresh swamps) had been drained (Goodrick 1970; Pressey 1989a and b). These wetland types are recognised as important for Comb-crested Jacana (Marchant and Higgins 1993).

Comb-crested Jacanas prefer wetlands greater than one hectare (Schodde and Mason 1996), and of sufficient size that they will retain usable habitat even during drought. However, many wetlands now remaining in coastal New South Wales are small (less than 10 ha) (Pressey 1989a and b) and used primarily for agricultural purposes such as stock watering. As such small wetlands vary greatly in quality and extent during periods of drought and inundation, they are often unsuitable as drought refuges. This places more pressure on the few large remaining wetlands to sustain populations through drought; many of these are under threat too. As shown in the Northern Territory, Comb-crested Jacanas are among the first waterbird species to be displaced by other waterbirds through competition for resources and by their requirement for floating vegetation (Crawford 1979).

Draining of remaining suitable wetlands and predicted decreases in rainfall in New South Wales due to anthropogenically altered climate regimes (Hennessy *et al.* 2004) are of major concern for the continued stability of this species in its southern range. Reduced rainfall will increase the intervals between wetlands filling; impacts to waterbirds may include reduced breeding success and recruitment (Finlayson *et al.* 2006). Wetlands must thus be recognised as highly valuable and be protected. Construction of new wetlands on private land and in urban landscapes should help to provide adequate additional habitat for the species, but wetland designs need to incorporate more permanent drought resistant wetlands with adequate floating vegetation.

CONCLUSION

Populations of the Comb-crested Jacana have fluctuated periodically on the southern edge of the species' range in New South Wales, apparently in response to changes in habitat availability. At the time of settlement, the species probably occurred in the Sydney area (Olsen 2001), and this still appears to be close to the species' southern distributional limit. Despite substantial destruction of wetland habitat in New South Wales since European settlement, the distributional range appears not to have altered significantly overall. Local abundance may have been reduced, although historical records are not sufficient to quantify this. However, if draining of larger wetlands continues on the southern edge of the species' range in New South Wales and vital drought refuges disappear, local populations may fail and the species southern distributional limit will then contract to the state's far north-eastern corner.

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