

SPECIES REVIEW:

BROLGA (*Grus rubicunda*)

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(with inputs from John Grant, Richard Hill, and Elinor Scambler)

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Brolga and chick in breeding habitat near Normanton, Queensland, Australia (Photographer: Tim Nevard, International Crane Foundation Associate)

Red List Category: Least Concern

Population Size: 50,000–100,000

Population Trend: Unknown; decreasing in parts of its range

Distribution: Australia, New Guinea



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DISTRIBUTION AND STATUS OF KEY SITES

Populations

The Brolga is a monotypic species, which occurs in New Guinea and Australia. Single individuals have been recorded in New Zealand in 1947 and 1968 (Marchant and Higgins 1993), but the species is an accidental visitor there.

The Australian population occurs in northern and southeastern parts of the country; the species is mostly absent from the dry interior (Marchant and Higgins 1993). The northern and southeastern populations may be considered discrete due to geographic isolation and different timing of wet and dry seasons (DuGuesclin 2003). These populations were assigned a subspecies status in the past (Johnsgard 1983) but are currently considered to be one species (Marchant and Higgins 1993).

New Guinea

The distribution and status of key sites in New Guinea is unknown. There is practically no information on any aspects of the species' biology, ecology, movements, or threats in New Guinea.

Northern Australia

In northern Australia, distribution of the Brolga extends from northwestern Western Australia, across northern to southeastern Northern Territory through to Queensland. In Queensland, the species has been recorded throughout the state (Marchant and Higgins 1993).

Brolgas are common to abundant in northern Australia and their status is 'Least Concern' (IUCN 2012). During the dry season, large flocks of 100s to 1,000s gather together (Marchant and Higgins 1993), and breeding occurs throughout the range (Marchant and Higgins 1993, Barrett et al. 2003).

Little is known about location and details of key breeding and flocking sites, or about inter-annual variability in site use in northern Australia. The information outlined below is based on aerial counts (Chatto 2006, Kingsford et al. 2012), BirdLife Australia atlas data (Blakers et al. 1984, Barrett et al. 2003), and unpublished accounts.

Breeding sites: In Queensland, breeding sites are found in high densities in the Normanton-Karumba area southeast of the Gulf of Carpentaria (John Grant, personal comm.). Cape York Peninsula may also hold concentrations of breeding Brolgas (Marchant and Higgins 1993, Chatto 2006).

In Northern Territory, a number of major Brolga breeding sites have been identified (Chatto 2006). These sites include wetlands associated with McKinley, Margaret, and Upper Adelaide Rivers, Liverpool floodplain, Blythe River floodplain and coastal flats between Millingimbi and the mouth of the Glyde River, Buckingham Bay, and Goromoru River along the southern shore of Arnhem Bay, Grindal and Jalma Bays, Walker River, and Bennett Bay, Miyankala Creek, and Roper River (Chatto 2006).

Breeding records from Western Australia are scant, although there are some records in the Kimberley region (Marchant and Higgins 1993, Collins 1995, Barrett et al. 2003). It is unclear whether this scarcity is due to lack of breeding habitat or survey effort.

Flocking sites: The current global population estimate for Brolgas is approximately 50,000 (Kingsford et al. 2012) to 100,000 individuals (Meine and Archibald 1996). Sites of national or international significance are those that have more than 1% of the global population of a species (Ramsar Convention on Wetlands 1971). For Brolgas such sites would be defined as those containing at least 500–1,000 individuals based on the current population estimate.

Key flocking sites, which fit the above criteria, are listed below (Blakers et al. 1984, Collins 1995, Halse et al. 1998, Barrett et al. 2003, Halse et al. 2005, Chatto 2006; Elinor Scambler, personal comm.; John

Grant, personal comm.). Little is known about many of these sites and much of the information below is based on occasional counts.

- Western Australia: the Kimberley area including Roebuck Plains (Lake Eda), Munja Swamp (northeast of Derby), Mandora Marsh/Eighty Mile Beach area, and Lake Gregory/Paraku;
- Northern Territory: Fogg Dam/Kakadu, Blyth River, Finnis River floodplain, Alligator Rivers, Arnhem Bay, Caledon Bay, Calvert River area, Anson Bay, Arafura Swamp, Blue Mud Bay, Gove area, Boucaut Bay, and Tomkinson River floodplain south of Maningrida;
- Queensland: southeastern part of the Gulf of Carpentaria area, Cape York Peninsula, areas along the east coast from south of Townsville to Cairns, and adjacent inland areas, including the Atherton Tablelands.

Southeastern Australia

In southern Australia, distribution of the Brolga extends from southeastern New South Wales, through Victoria and into southeastern South Australia (Marchant and Higgins 1993). The southeastern populations of Brolgas are threatened and listed under each state's legislation.

Breeding sites: Breeding has been recorded throughout the Brolga's range in southeastern Australia, but records are based on infrequent surveys or occasional observations. In New South Wales, breeding has been recorded in the Riverina area in southeastern part of the state (Herring 2001, Barrett et al. 2003). In the northern part of the state, Macquarie Marshes are also thought to be an important breeding area (Meine and Archibald 1996, Barrett et al. 2003). In Victoria, concentrations of breeding records are from the Skipton, Streatham, Darlington, Derrinallum, Lake Bolac, Lake Corangamite areas, between Peshurst and Portland, and west and south-west of Casterton (Blakers et al. 1984, Barrett et al. 2003). In South Australia, Penola, Naracoorte, Mt Gambier, and Millicent areas appear to be important for breeding Brolgas (Bransbury 1991, Marchant and Higgins 1993). There are also records from the Lake Eyre basin (Marchant and Higgins 1993).

Flocking sites: The total southeastern population of Brolgas was estimated to consist of approximately 1,000 individuals (Meine and Archibald 1996). Due to the small size of the population, few of the known flocking sites would qualify as nationally or internationally significant using the >1% criterion. The definition used here for key flocking sites is therefore based on a >1% criterion for the southeastern Brolga population, thus including sites that regularly have more than 10 individuals from year to year (Herring 2001, Sheldon 2004, Victorian Department of Environment, Land, Water and Planning [DELWP], unpublished data).

- New South Wales: Leeton, Jerilderie, and Barooga;
- Victoria: Corop, Dingee, Cressy, Peshurst, Willaura, Streatham/Nerrin Nerrin, Darlington, and Kaladbro;
- South Australia: Bool Lagoon, and Mingbool.

ECOLOGY

Movements and dispersal patterns of Brolgas are poorly understood (Marchant and Higgins 1993). The Brolga undertakes seasonal movements between non-breeding (flocking) and breeding habitats in response to rain and wetland availability similar to other species of cranes in Asia and Africa (Marchant and Higgins 1993, Meine and Archibald 1996). Flocks are formed during dry parts of the year and pairs

disperse to breeding sites during wet parts of the year. Pairs may stay at breeding sites during wet years and not disperse until breeding sites dry up (Marchant and Higgins 1993).

Brolgas nest and roost in wetlands (Marchant and Higgins 1993) and forage in multiple habitats, primarily using freshwater wetlands and agricultural crops (Marchant and Higgins 1993, Pizzey 1994, King 2008). Brolgas are omnivorous and opportunistic, and their diet consists of various grains, insects, frogs, small mammals, birds, and reptiles, as well as sedge tubers in northern Australia (Marchant and Higgins 1993).

Nesting biology of Brolgas is well known and documented, especially their wetland habitat requirements (Arnol et al. 1984, White 1987, Harding 2001, Herring 2001, Myers 2001). Brolgas prefer shallow freshwater marshes and meadows that are herb dominated (Corrick 1982, White 1987, Marchant and Higgins 1993). Of known nesting attempts in three different studies, 20–39% have been observed to be successful with at least one chick fledging (Herring 2001, 2005; Myers 2001). Rates of post-fledging survival are poorly known. In a recent study, all 19 chicks that were captured and banded as pre-fledglings survived to fledging and 16 of these survived at least 12 months post fledging (I. Veltheim, unpublished data). Predation by the European red fox (*Vulpes vulpes*) is considered to be the main factor contributing to chick mortality and low breeding success (Arnol et al. 1984, Herring 2001, Myers 2001, DuGuesclin 2003). Maintaining water levels until fledging is likely to be important to improve post-hatching chick survival (Herring 2005).

NUMBERS AND TRENDS

The Brolga population in northern Australia is considered stable and was estimated to consist of 50,000–100,000 individuals (Meine and Archibald 1996, Kingsford et al. 2012). The southeastern population has been estimated at 1,000 individuals and is thought to be declining (White 1987, Bransbury 1991, Meine and Archibald 1996, DuGuesclin 2003). Precise numbers and trends are absent due to a lack of systematic multi-year surveys.

Currently, the minimum population estimate for the global population is 50,000 (based on Kingsford et al. 2012; see below), while there is as yet no evidence to change the upper limit of 100,000 from Meine and Archibald (1996).

Northern Australia

The only on-going systematic surveys have been carried out in northeastern Queensland, with 4,000–4,500 individuals being recorded (Elinor Scambler, personal comm.). In Northern Territory, surveys of coastal wetlands between 1990 and 2005 recorded just over 15,100 individuals (Chatto 2006). Morton et al. (1993) estimated a maximum population of 24,000 in the Cooper and Alligator River region of Northern Territory during aerial surveys in 1981–1984. However, they stated uncertainty in the reliability of this figure due to a large difference between aerial and ground survey data.

Kingsford et al. (2012) provided the most comprehensive count of Brolgas for the entire continent of Australia, as part of a nationwide waterbird survey undertaken in 2008. A total of 51,969 Brolgas were recorded during these surveys, with 51,834 of these being from northern Australia. Although this is not a population estimate as such, it provides important information on the numbers of Brolgas in northern Australia. At least for southeastern Australia, the count of 135 individuals is an underestimate.

Southeastern Australia

Although the southeastern Australian Brolga population has been the focus of more attention than the northern Australian population, estimating numbers and trends is impossible due to lack of systematic

efforts. The account below provides information on counts. A more robust population estimate for the region is currently unavailable.

Anecdotal observations and reports document range contraction and reduction in numbers in southeastern Australia since the early 1900s (White 1987, Bransbury 1991). In Victoria, flocks of over 1,000 individuals recorded up until 1915 are no longer seen (White 1987). At Willaura, which is one of the key flocking sites, there is a report of 1,450 birds counted on one day between 1939 and 1945. Since then, a maximum count for this site has been approximately 200 (White 1987).

White (1987) estimated numbers of Brolga in Victoria at 600–650 individuals, which is the current accepted population estimate (DuGuesclin 2003). However, this was based on a count of three sites—Bool Lagoon (South Australia), Willaura (Victoria), and Streatham (Victoria)—and informed guesses for numbers in small flocks and breeding pairs remaining at breeding sites elsewhere within the state. More recent counts in southwestern Victoria have included several more flocking sites and counts from the early 1990s to 2012 have fluctuated between 402 and 694 individuals for southwestern Victoria (Sheldon 2004, DELWP, unpublished data). In 2012, a more systematic count was carried out simultaneously at multiple flocking sites in southwest Victoria. The count total for sites in southwest Victoria and South Australia was 907, comprised of adults and sub-adults (Richard Hill, personal comm.). The difference between the White (1987) and the more recent count is the number of sites counted. Simultaneous counts in 1980 (White 1987) included three sites and age structure was not reported. The more recent 2013 DELWP count included these three and five additional sites: Bool Lagoon in South Australia, and Willaura, Streatham, Peshurst, Lake Bolac, Darlington, Camperdown, and Strathdownie in Victoria.

In northern Victoria 50–100 individuals have been counted (White 1987). Between 60–70 individuals were recorded from 1981 to 1996 in northern Victoria (DuGuesclin 2003), and similar numbers were counted by Herring (2001, 2005) in the early 2000s. There are no recent formal counts from New South Wales.

THREATS

Major threats throughout Australia are related to loss and degradation of habitat due to farming practices; changes to hydrological processes due to water impoundment and crop irrigation; predation of eggs and chicks by introduced feral pest species; hunting and poisoning; collision and mortality from power lines and fences; and potential displacement and mortality due to wind farm development (White 1987, DuGuesclin 2003, DSE 2011; Elinor Scambler and John Grant, personal comm.). Mortality due to hunting and poisoning is mentioned as being historically significant threats contributing to the species' decline, but it is not known if these practices continue to be threats (White 1987). None of these threats has been quantified, and it is not known which are more serious, or if there are regional differences in major threats.

Hybridization with Sarus Cranes (*Grus antigone*) has been considered a threat in the past, but observations suggest that hybrid pairs are rare (Elinor Scambler and John Grant, personal comm.). As well as current threats outlined below, predicted climate change in the future is likely to affect drying and flooding regimes of wetlands. These factors may have substantial effect on Brolga habitats and population persistence due to potential further losses of wetland habitat in southeastern Australia and intrusion of saltwater into freshwater wetlands in coastal areas of northern Australia. The potential impact of future climate change on Brolgas has received no attention to date.

Threats specific to northern Australia include:

- Spread of invasive weed species into floodplain systems and wetlands;
- Grazing and burning regimes; and
- Harvesting of eggs.

Threats specific to southeastern Australia include:

- Loss of breeding habitat due to blue gum (*Eucalyptus globulus*) plantations;
- Reduced breeding success due to loss and modification of breeding habitat; and
- Disturbance, particularly at flocking sites during duck-hunting season;

CONSERVATION AND RESEARCH EFFORTS UNDERWAY

Brolga is protected as a migratory species under the Australian federal Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). It is also protected under each territory and state's legislation. The majority of Brolga habitat occurs on private land, suggesting that traditional strategies such as protecting areas under legislation are ineffective. Government, other management authorities, and non-government conservation organizations have initiated some habitat protection programs on private land since 1996, particularly in Victoria. Other efforts include:

- Regular, systematic counts of Brolga in the northern Queensland (Elinor Scambler, personal comm.);
- Research into breeding ecology in northern Australia, undertaken in conjunction with Sarus Crane research (John Grant, personal comm.);
- Collaborative projects among academic, government, non-government, community groups, and private landholders involving habitat protection initiatives and development of educational pamphlets to landholders (e.g., Herring 2007);
- Development of crane-friendly fencing guidelines and liaison with non-governmental organizations to encourage safer wetland fencing for wildlife (Elinor Scambler, personal comm.);
- Basic ecological and behavioural studies, including studies into breeding ecology and habitat use in Victoria and New South Wales (Harding 2001, Herring 2001, Myers 2001, Sheldon 2004; King 2008, unpublished information);
- Government program, 'The south-west Victoria Brolga Project', including a doctoral research project into movements, habitat use, and population ecology of Brolgas; development of a population viability analysis to assess impacts of wind farms on Brolga in Victoria (McCarthy 2008); and establishment of a scientific panel overseeing methodologies to assess and mitigate Brolga and wind farm infrastructure interactions;
- Yearly population counts in Victoria, organized by the Department of Environment, Land, Water and Planning (DELWP);
- A captive breeding program at Serendip Sanctuary that resulted in a release of individual birds into the wild in Victoria in the mid-1990s. No further releases are planned;
- Updated Flora and Fauna Guarantee Act 1998 action statement with recommended management actions (DuGuesclin 2003);
- Establishment of a community-based friends group in Victoria, 'The Brolga Recovery Group', which focuses on advocacy, education and provision of information to landholders on protecting Brolgas and their habitat; and

- Six BirdLife International Important Bird Areas (IBA) that together contain >1% of Brolga's global population: Lake Gregory/Paraku; Mandora Marsh/Anna Plains; Cadell/Blyth Floodplains; Blue Mud Bay; Arafura Swamp; and Alligator Rivers Floodplains.

CHANGES SINCE 1996

The main changes in conservation, management, and research efforts since 1996 are outlined in the previous section. The majority of priority conservation measures in management and action plans have been addressed only partially. In Victoria, management actions outlined in DuGuesclin (2003) that have been addressed include conducting annual counts of adults, juveniles, and first year birds at breeding sites; submission of breeding and flocking records into the government fauna database; undertaking a banding program to mark pre-fledged young; predator control at some sites; restoration of breeding sites; and covenanting wetlands and promotion of wetland conservation through support schemes.

The lack of knowledge on the New Guinean population remains unchanged since 1996.

The distribution of Brolgas appears to have remained unchanged since 1996 but requires confirmation through well-designed surveys. New key sites, particularly in northern Australia, have been identified during aerial surveys (Chatto 2006, Kingsford et al. 2012) and incidental observations (Blakers et al. 1984, Barrett et al. 2003). These sites have been detailed under the section 'Distribution and Status of Key Sites.' New key flocking sites identified in Victoria within the last 10 years include new sites in the Peshurst and Darlington areas. Systematic and longer-term surveys with robust landscape-scale design are needed to understand population numbers and inter-annual variations. The northern population consists of at least 50,000 Brolgas currently (Kingsford et al. 2012) and is considered to be stable and secure.

PRIORITY RESEARCH AND CONSERVATION ACTIONS

Surveys and Monitoring

Across the entire range of Brolgas, regular, annual, systematic, and standardized surveys are required to establish and refine the total population estimate, as well as status and trends. In Victoria and northeast Queensland, annual counts should be continued and expanded. In other states, key flocking sites should be identified and counted annually. Juveniles and sub-adults should be counted at all key sites to establish recruitment rates.

Regular, standardized, surveys will allow the monitoring of population trends and accurate establishment of the status of Brolgas in northern and southeastern Australia. These actions are important in order to establish whether the populations are stable or declining. Surveys and monitoring for the purposes of population counts should be undertaken during the driest part of the year when Brolgas congregate in large flocks.

Research

Many knowledge gaps remain in our understanding of basic ecology, population dynamics, and threat to habitats of Brolgas. This lack of knowledge makes it difficult to identify and quantify threats and apply appropriate management actions. As a first and most important priority, in conjunction with efforts towards habitat protection and enhancement, it is recommended that focused and high-quality research be undertaken into a number of aspects of the species' ecology.

As breeding success is poorly known and is important to understand for appropriate management and conservation planning, the following should be undertaken:

- Support and expand current research in northern Australia on breeding sites and breeding success; and
- Identify key nesting areas and factors affecting breeding success in Victoria, New South Wales, and South Australia.

Other priority research actions should include the following:

- Investigate survival and mortality rates and their causes for fledglings, sub-adults, and juveniles to identify the age groups most vulnerable to risks and factors limiting the populations; this information will aid in managing risks to prevent population decline;
- Complete and continue dispersal and movement studies beyond the current research project in southwest Victoria to help establish Brolga in the South Australian, Victorian, and New South Wales are one population or several sub-populations;
- Quantify known key threats to the northern Australian population, including effects on habitat, breeding success, recruitment, and population numbers;
- Undertake monitoring at wind farms overlapping Brolga habitat in Victoria (proposed and existing) to study their effects on the species. This effort would provide information on whether wind-farm development in southwest Victoria poses a threat to the regional Brolga population; and
- Movement studies for other important populations are also desirable, given the near-complete lack of information on this aspect for Brolgas.

Habitat Protection and Enhancement

- Undertake a thorough review of literature and a gap analysis of the extent of wetland habitat degradation and loss of suitable Brolga habitat in northern and southern Australia;
- Given the lack of knowledge about potential effects of climate change on the species' persistence, investigate how changing climate might impact habitat suitability, potential changes to distribution, changes to habitats through land-use shifts at a landscape scale, and effects of increased salinity through sea-level rise, especially in important coastal habitats;
- Identify how many of the currently known key flocking sites in northern Australia are in protected areas and on private land, to establish the current level of protection and threat to these habitats;
- Investigate the success of historical habitat protection and enhancement programs in Victoria (or the southeastern population more generally) and establish how many of these sites currently have breeding pairs and successful breeding;
- Develop and support programs to protect and enhance Brolga breeding habitat, especially in southern Victoria;
- Promote protection of key breeding habitat through legislation, landholder incentives, and cooperation with private landholders; and
- Find strategies to protect flocking habitat in southern Australia as it is limited.

Education and Communication

- Support international and collaborative links between Australia and other countries on crane research, conservation, and management; and
- Further educate private landholders on crane-friendly fencing and breeding habitat enhancement, especially in southeastern Australia where the population is threatened with extinction.

Socio-economic Studies

The majority of Brolga habitat is within private properties; therefore, any successful management and conservation program needs to incorporate working with landholders to achieve successful outcomes. For example, in Victoria, up to 95% of Brolga breeding sites are on private properties. The following activities are important:

- Understand land owners' attitudes towards cranes and their habitats, and explore mechanisms to strengthen their ability to protect and restore populations; and
- Enhance knowledge of landholders sympathetic to protecting Brolgas on their property and highlight their efforts to help inspire further such conservation efforts.

New Guinea

Virtually no information exists on the Papua New Guinea population of Brolgas. It would be pertinent to establish population numbers, flocking, and breeding sites as well as whether there is movement and population exchange between Australia and Papua New Guinea. However, this is currently considered a low priority for global Brolga conservation and management.

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