



Call for Brolga Feathers

Australian Waterbird Genetics Research



Research Aims

This study seeks naturally-discarded feathers from Brolga, Australian wood duck and colonial waterbirds (ibis, spoonbills, egrets etc) to assess genetic diversity and connectivity and inform conservation plans for these species. Many Australian waterbirds lack vital information on their genetic structure, which can be used to assess their long-term persistence in the face of environmental changes and help prioritise colonies and wetlands for conservation. We are also exploring methods used to monitor waterbird assemblages using DNA naturally shed from waterbirds into their environment (environmental DNA or eDNA).

We are looking for volunteers to collect waterbird feathers across Australia to contribute to this study, particularly for the Brolga and wood duck. Any waterbird feathers contributed by the public will be identified to species-level where possible, and DNA extracted from the feathers of our target species will be sequenced using a next-generation sequencing technique. Other waterbird feathers collected by the public will be included in the eDNA component of the study.

Why study Brolga genetics?

The Brolga (*Grus rubicunda*) is an iconic waterbird found across New Guinea, northern and south-eastern Australia (Blakers et al. 1984, Marchant and Higgins 1993). Southern populations in Australia (NSW, SA and VIC) are state-listed as 'Vulnerable' owing to widespread wetland drainage. In Victoria it is estimated that only 200-250 nesting pairs remain, and these continue to be under threat. Brolga make seasonal movements between breeding areas and traditional flocking sites, but knowledge of the degree of genetic connectivity between Northern and Southern populations remains limited.

Previous genetic work based on mitochondrial markers found no genetic differentiation between Northern and Southern Brolga, suggesting historical population connectivity (Miller 2016). In contrast, an assessment of microsatellite markers (which evolve more rapidly) indicated potential contemporary genetic structuring across their range, with evidence of weak but significant differentiation between south-eastern and northern populations (Miller et al. 2019). This suggests migration and gene exchange might be limited between populations from northern Australia and Victoria. The small and potentially isolated nature of Brolga populations in VIC suggests they may be prone to loss of genetic diversity and the negative effects of inbreeding. Using higher resolution genetic data, this study will explore both historical and contemporary genetic structure and assess the impacts of environmental changes on the future genetic diversity, and thus long-term persistence, of this iconic crane species to help guide conservation efforts.

Want to contribute feathers from your area?

We are looking for volunteers across Australia to collect feather samples for our study. For Brolga and Australian wood duck, we are aiming to collect 10-20 feathers per site or wetland for several locations across Australia where these species are present. Colonial waterbirds will be targeted within the Murray Darling Basin – including Straw-necked ibis, Australian pelican, Brolga, Glossy ibis, Intermediate Egret, Great Egret, Little black cormorant, Little pied cormorant and Royal spoonbill. However, you can also collect for these species in other areas while you are collecting for Brolga and/or wood duck.

If you are aware of a good site for our target species near you and would be willing to collect feathers for the study, we can discuss arranging local landowner approval (private land) or national park access (certain sites only), and provide you with additional information on permits and postage (contact information on page 5). We welcome feathers collected any time of the year, but particularly during the upcoming breeding season (2020 to 2021).

For the Brolga, we have feather samples predominantly from south-west Victoria, and the Gulf of Carpentaria and Karumba Point (QLD) collected between 2009 and 2017, as well as fewer samples from the Macquarie Marshes (NSW), Gwydir wetlands (NSW), Combo and Long waterhole in mid-west QLD and Maria Lagoon in north-eastern NT. We are seeking additional samples from these sites, as well as other parts of the Brolga's range (see Figure 1 below).

Northern Brolga sites

Most of our existing samples from Northern populations of the Brolga are from the Gulf of Carpentaria, collected as part of the Feather Map of Australia project (ANSTO and UNSW). Additional samples are being sought from across QLD, NT and WA, including but not limited to:

- Clermont area (Central QLD) – Large brolga flocks and some isolated breeding pairs. Most feathers collected here should be Brolga as Sarus don't typically extend this far south.
- Mapoon, Cape York Peninsula (CYP) – Many Brolga are observed in small groups during the non-breeding season in the Gulf Plains and on Cape York Peninsula. Breeding is also more concentrated in the Gulf Plains and CYP compared to other northern regions. Small numbers of sarus may also occur here.
- Normanton-Karumba area in the southeast of the Gulf of Carpentaria (QLD) – A key Brolga breeding site.
- Darwin and Kakadu region – Kakadu National Park is a key breeding site for Brolga just after the wet season, however Sarus crane may also occur here.
- Atherton Tablelands – Brolga and Sarus may occur here in large numbers during the flocking season. However, most breeding pairs will have left the Tablelands from early November and by December most cranes (including non-breeders) disperse out of this site, so collection is at this site is best before December.
- Woodleigh station, Innot Hot Springs - mostly Brolgas as the two species rarely mix at this roost.
- Broome floodplains (WA) – Sarus may also occur here, though are much less common than Brolga.
- Cromarty Wetlands south of Townsville (QLD) – Possible large flocking site for Brolga.

The breeding season for Brolga can be variable and rain-dependent, but typically occurs between February and May in the north of Australia. Note that many Brolga (and Sarus) breeding sites can become inaccessible ones the rains begin. Collecting from flocking sites is recommended, or from more easily accessible breeding sites such as those in the coastal hinterland of Central QLD.

Southern Brolga sites

Although we have a large number of Brolga feathers from Victoria already, we are seeking more recent samples to cover the southern range of this species. Brolga are mostly restricted to the south-

west, the Northern Plains and adjacent parts of the Murray River in Victoria. Areas where Brolga have previously been recorded in VIC and SA include the following sites (samples may be able to be collected from NSW however Brolga typically occur in smaller, more scattered numbers across NSW):

- Skipton
- Darlington (flocking site)
- Derrinallum
- Mortlake
- Willaura (flocking site, existing samples)
- Digby/Dartmoor
- Peshurst (flocking site, existing samples)
- Kaladbro Swamp (flocking site)
- Lake Bolac (flocking site)
- Streatham (flocking site)
- Camperdown (flocking site)
- Strathdownie (flocking site)
- Bool Lagoon (flocking site)
- Rutherglen (flocking site)
- Nagambie (flocking site)
- Corop (flocking site)

The Brolga flocking season in Victoria is generally in summer and autumn, where they congregate in relatively large numbers at freshwater marshes, permanent open water and adjacent dryland areas. In late autumn and winter Brolga generally disperse to breeding sites. Most of these sites (flocking and breeding) are on private land in Victoria, and thus local landowner approval will be required to collect from these sites, which we can help arrange in advance.

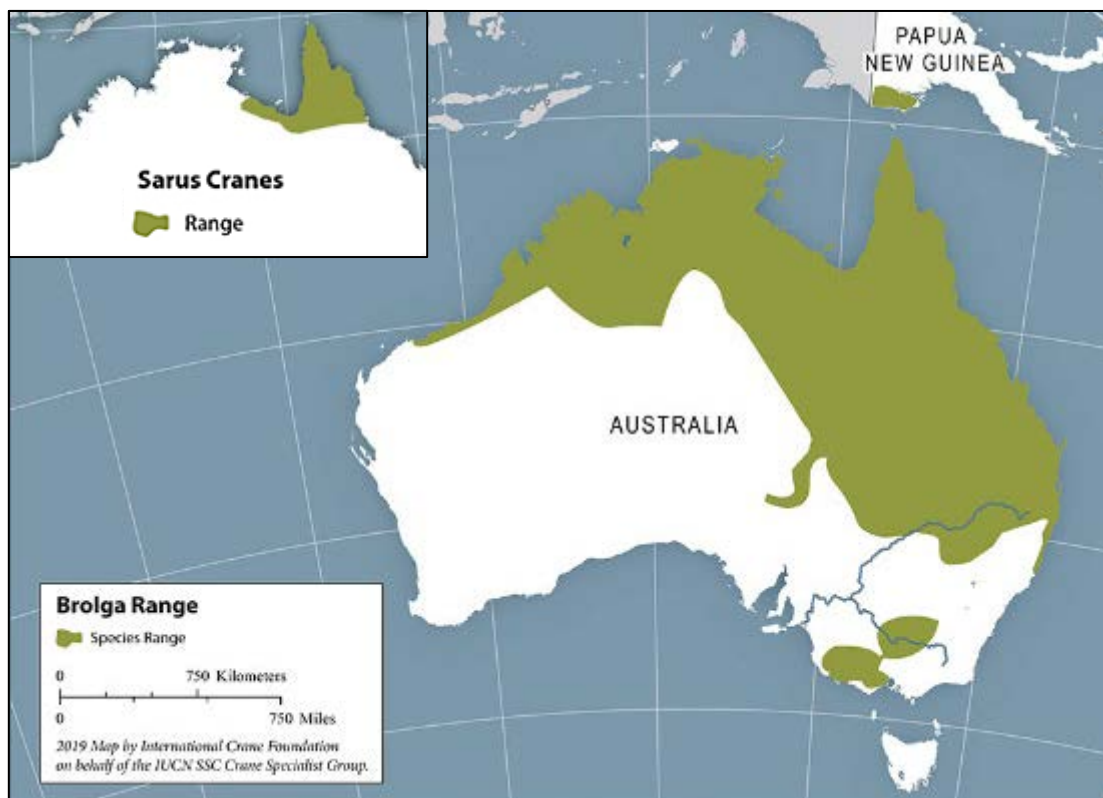


Figure 1. Map of Brolga distribution range across Australia and Papua New Guinea (Sarus crane range in box) (Source: Mirande CM, Harris JT, editors. 2019. Crane Conservation Strategy. Baraboo, Wisconsin, USA: International Crane Foundation).

Feather Sampling Protocol

If you are aware of a Brolga flocking site in or near your area, this may be a good opportunity to collect feathers because Brolga tend to moult lots of feathers during this period. Breeding sites enable better identification of feathers (to help distinguish Brolga from Sarus cranes, see details below) but may be limited in the number of feathers available for collection (you may need to observe the birds and wait for them to drop feathers). Take note of the breeding and flocking seasons in different regions:

- South - flocking occurs in summer and autumn (December to May), breeding typically occurs from September to December.
- North (monsoonal areas) – flocking occurs in the dry season, breeding commences just after the wet season (roughly February to July, but flocking groups may disperse around November to December e.g. in the Atherton Tablelands).

Collecting Feathers

1. Before collecting feathers from a flocking site or wetland and disturbing the birds, record the species (to the best of your knowledge) of waterbirds you observe using the site to help us identify which species feathers belong to. We can provide a datasheet to help with this, or you can write your own species list and include it in the bag of samples you post to us.
 - a. If you are collecting from a site where Brolga and Sarus are present, record how many of each you observe (and if possible, whether any hybrids (Sarolga's) are suspected).
 - b. If you are aware of species using the site previously but not on the day of collection, record this information too.
2. Collect Brolga feathers* from around the site into Ziplock bags and record the **site name**, **date** and **site coordinates** on the bag in permanent marker. Avoid touching the calamus of the feather as you pick them up as this is the main source of DNA for our study.
 - a. If you collect feathers from a deceased bird or directly after watching them fall from an individual bird, and you know the species, keep these feathers in a separate bag and record the species ID on the bag. Wear gloves if collecting feathers from deceased birds.
 - b. Similarly, if you find clumps of feathers close together, keep these separate from feathers found on their own (to help us minimise the risk of re-sampling the same individual).
 - c. **Important:** Volunteers should **not** collect directly from nests unless accompanied by an investigator who is listed on the permits.
3. Make sure to wash your hands before and after collecting feathers.

*If you are collecting from a wetland, there may be the opportunity to collect non-Brolga feathers for our study to contribute to the colonial waterbird and/or eDNA research. In this case, collect any waterbird feathers you find from the water, vegetation and/or shoreline. Follow the same protocol as for Brolga's regarding how to bag clumps of feathers found close together (or from individual birds) and what information to include with the samples.

Posting samples

Feathers collected wet need to be dried and stored at room temperature prior to posting them. We can provide postage-paid envelopes (these will need to be arranged in advance) or reimburse postage fees, depending on what you prefer.

Distinguishing Brolga and Sarus cranes

Brolga and Sarus often breed together where their ranges overlap (e.g. far north of Australia), so distinguishing between these two species is important to help us identify which feathers to include in our study. If collecting from mid-QLD or further south, you are unlikely to collect Sarus samples as

well, but areas like the Atherton Tablelands, Cape York Peninsula and Gulf Plains in QLD are known to be breeding or flocking sites for both species and thus feathers collected may come from both species (or from hybrids). This is particularly a risk when collecting feathers from foraging fields or communal roosts. When birds are still on their breeding territories, you can be more certain of the species using the territory and can wait for birds to drop feathers while preening and move away before collecting samples.

Brolga

Legs grey; Red area on head does not extend down neck; Dewlap on chin.



Sarus

Legs dull pink; Red area on head extends down neck; Grey feathering on chin in place of the Brolga's dewlap.



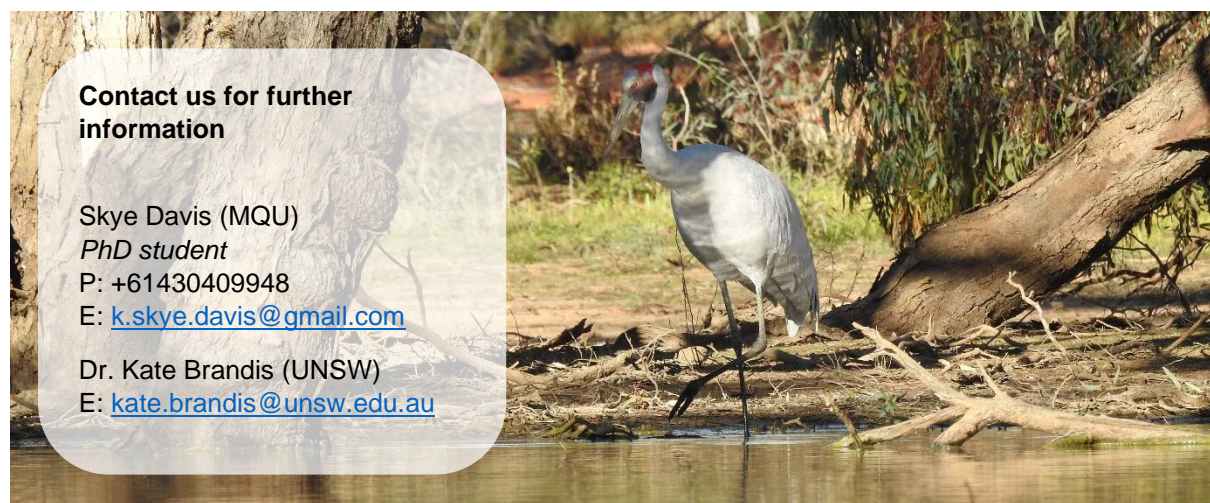
Salt glands enable them to exploit brackish waters (e.g. east coast marshes) as well as freshwater wetlands. Favours deeper, more coastal marshes compared to Sarus.

Avoids coastal wetlands (no salt glands), preferring well-drained rather than wetland foraging areas.

Both occur in open forest and woodland, grassland and cultivation

Hybrids may occur where ranges overlap and have been observed on the Atherton Tablelands - Sarolga are larger than Brolga, with pink tibia, hock joints and feet, notched comb and black tarsi. However, field characteristics may be insufficient to identify Sarolgas.

Images adapted from The field guide to the birds of Australia: The definitive work on bird identification, by Graham Pizzey and Frank Knight, Edited by Sarah Pizzey, Publisher: HarperCollins Publishers, 9 edn, 2012. ISBN 9780732291938.



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