

# A prolonged agonistic interaction between two Papuan Frogmouths *Podargus papuensis*

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**Abstract.** Papuan Frogmouths *Podargus papuensis* are large nocturnal birds about which relatively little is known. A prolonged aggressive interaction between two Papuan Frogmouths that involved interlocking beaks was filmed in the Lockhart River region on Cape York Peninsula, Queensland, and is described here. Two additional Papuan Frogmouths were present during the event, one of which gave a call-type (*OomWoom*) previously unrecorded for this species. Difficulties associated with detecting such agonistic behaviour mean that the prevalence of these contests and their behavioural significance are currently unknown and require further research.

## Introduction

Conflict between conspecifics can be motivated by territorial dispute, competition for mates, and/or competition for resources (West-Eberhard 1983; Begon *et al.* 2006). Many species have appendages of different forms that are used as weapons (e.g. horns, antlers, mandibles) to secure territories and attract mates (Clutton-Brock & Albon 1979; Kelly 2006), but weaponry is largely absent in birds, with the exception of spurs on some birds (Moller 1992) and larger body sizes in the males of some species (e.g. Mager *et al.* 2007; Piper *et al.* 2008). Weapons that can be used in competition for mates are instead replaced in most birds by mate-attracting attributes, such as complicated vocalisations (Krebs 1977; Catchpole & Slater 2008), plumage displays (Wiley 1973; Dalziel *et al.* 2013), or the placement of objects at nests or display structures (Borgia 1995).

The Papuan Frogmouth *Podargus papuensis* is an insectivorous, nocturnal bird that inhabits the edge of rainforest and woodland. It is widespread in New Guinea, but within Australia it is restricted to Cape York Peninsula (far north Queensland), extending as far south as the Paluma Range (85 km north of Townsville). Within the order Caprimulgiformes (which includes frogmouths, nightjars and owlet-nightjars), it is the heaviest (410 g) and (excluding the Lyre-tailed Nightjar *Uropsalis lyra*, which has a tail length of 63–84 cm) the longest (up to 60 cm) species (Cleere 2010).

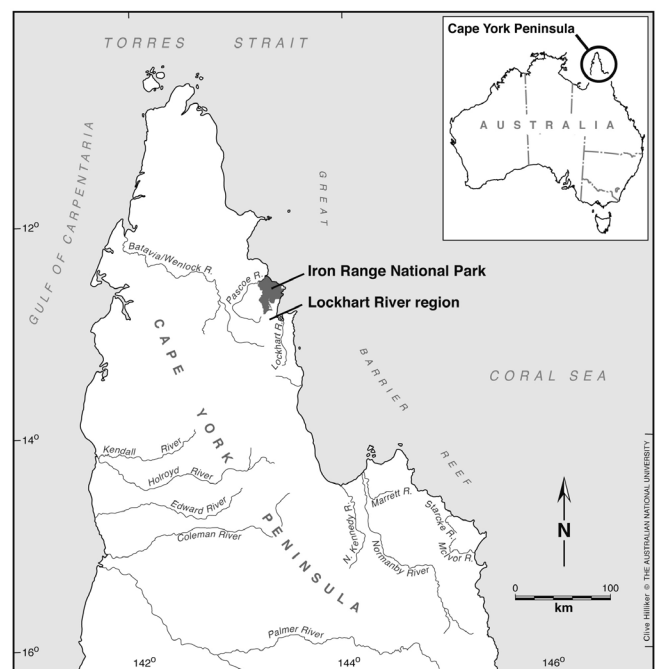
Little is known about the ecology and behaviour of the Papuan Frogmouth. No detailed studies have been conducted on this species, and observations have largely been limited to foraging behaviour (Angus 1994), breeding performance, social organisation, and vocalisations (Schodde & Mason 1980; Higgins *et al.* 1999; Holyoak 2001; Hollands 2008).

Here I report an observation of a prolonged aggressive interaction between two Papuan Frogmouths where the beak was used as a weapon.

## Study area and methods

On 19 August 2015, the observation was recorded at 1856 h in the Lockhart River region on Cape York Peninsula, Queensland (12°47'S, 143°18'E) (Figure 1). The following equipment was used to film the event: a Canon EOS 5D Mark III camera with a 400-mm (fixed) EF f5.6L IS USM lens and a directional Rode VideoMic pro external microphone (with a windshield; set to 0 dB gain boost). The lighting for the video footage was hand held using an Ay Up mountain bike light ([www.ayup-lights.com](http://www.ayup-lights.com)).

Using Audacity 2.1.0 (<http://audacity.sourceforge.net/>) on a MacBook Pro computer, the audio was split from the video file and noise-reduced by 10 dB. A spectrogram of the vocalisations in the audio file was then created using the program RavenPro v.1.5 (Charif *et al.* 2008), where



**Figure 1.** Location of the observed aggressive interaction between two Papuan Frogmouths.

sounds below 150 Hz and above 850 Hz were filtered out, and the following settings were used: a 16-bit sample format, frame overlap of 95%, DFT (Discrete Fourier Transform) of 512, frequency resolution of 124 Hz, 200 ms window frame, brightness of 60, contrast of 78, and in a Blackman window.

The site was surveyed for a total of nine nights. Surveys were conducted by listening and watching for Papuan Frogmouths in the evenings (from c. 1730 to 1930 h) on the night following the conflict, as well as once per week for the subsequent 4 weeks. The site had also been visited on one evening 2 days before the conflict, as well as twice in 1 week the previous month. During surveys, if there was movement or a sound heard in the dark, a spotlight and binoculars were used to visually confirm the species and observe behaviour.

## Results

A prolonged, agonistic interaction between two Papuan Frogmouths occurred 5 m from the edge of a gallery forest (riparian zone) in woodland dominated by Darwin Stringybark *Eucalyptus tetradonta*. Many Papuan Frogmouth calls were heard immediately beforehand but no other frogmouth behaviour was observed before this interaction. The birds were first observed with their beaks already interlocked, so it could not be determined how long the birds had been fighting before the observations began. During the interaction (Figure 2; video: <https://youtu.be/tsmdCEUVd6A>), two other Papuan Frogmouths were heard calling nearby. The interaction occurred on a branch of a 7-m-tall Clarkson's Bloodwood *Corymbia clarksoniana*, involved the interlocking of beaks, and lasted for >4 minutes. Throughout the interaction, the upper bird on numerous occasions quickly repositioned its beak to acquire more purchase and maintain grip over the other Frogmouth's upper mandible. The lower bird dangled in the air, unable to reach the branch with its feet (Figure 2, left). In an apparent attempt to either fight back or free itself, the lower bird flapped its wings to gain elevation to the top of the branch (Figure 2, right) (55 seconds from the start of

the observation period). The attempt failed, and the lower bird reluctantly returned to its hanging position for another 19 seconds. A second attempt (not filmed) resulted in the two birds finally separating, whereby the upper bird then flew off in the same direction as the lower bird.

The birds were clearly identified as Papuan Frogmouths and distinguished from other frogmouth species occurring in the region based on their call, large body size, and red iris colour. In contrast, the Tawny Frogmouth *P. strigoides* has a lemon-yellow to orange-yellow iris (Schodde & Mason 1980), and the Marbled Frogmouth *P. ocellatus* is nearly half the size of the Papuan Frogmouth (Higgins *et al.* 1999) and has distinctly different calls (pers. obs.).

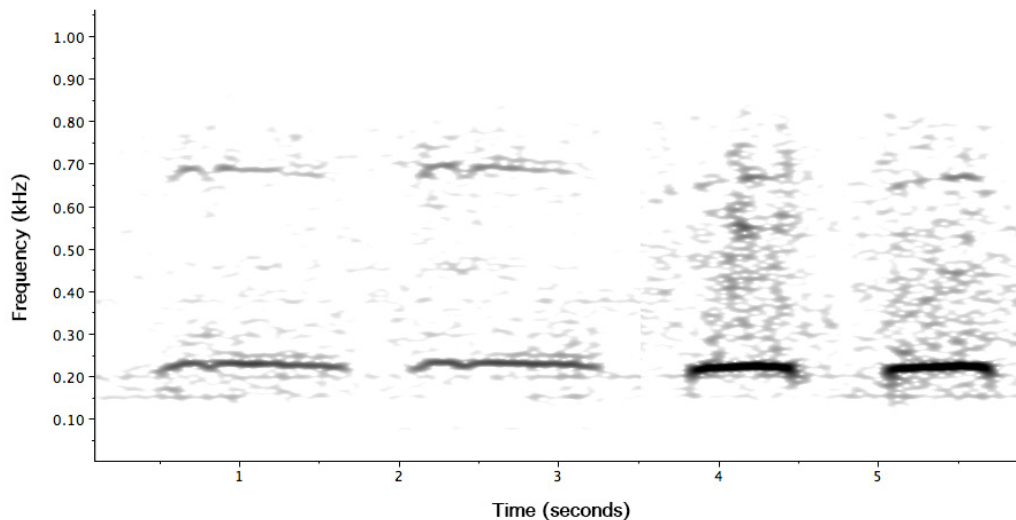
The sex of the birds could not be determined as only the front of one bird and the back of the other were visible during the interaction, but both birds appeared to be the same size and hence of the same sex. In this species, females are slightly lighter (340 g vs 410 g) and less bulky than males (Marchant & Higgins 1999). For this reason, and because aggressive behaviour between females is probably less frequent than between males (e.g. Piper *et al.* 2008), it is assumed that the battling birds were both males.

One of the Frogmouths nearby gave an altered version of the mono-syllabic *Oom* call during the bill-clasping interaction: a disyllabic variant (two syllables per call-bout), sounding like *OomWoom...OomWoom* (36 seconds into the observation: Figure 3).

The total survey time at the site during the evenings, including on days before, during, and after the interaction, was 10 hours 48 minutes (mean survey time/night 72 min.  $\pm$  standard deviation 40 min.). Only on the night of the event were more than two Papuan Frogmouths heard or seen at the site. Out of the nine survey evenings, a single Papuan Frogmouth was heard on one evening: the night after the interaction, a Papuan Frogmouth was heard calling for 2 minutes starting at 1826 h. Only once were two Papuan Frogmouths heard in the area, and this was the night before the interaction.



**Figure 2.** A prolonged physical interaction between two Papuan Frogmouths, interlocked at the beak for >4.5 minutes. Photos: C.N. Zdenek



**Figure 3.** Spectrogram of the *OomWoom* call (left two) compared with the *Oom* call (right two) of the Papuan Frogmouth, Cape York Peninsula, Queensland, 19 August 2015. Note: the two calls were recorded at different distances from the birds.

## Discussion

This observation is interesting in several respects. Agonistic behaviour has not previously been reported for this species. It has been reported on a limited number of opportunistic occasions within the Caprimulgiformes, but this has been limited to (1) moving toward call-playback speakers, (2) loud snapping of the bill, (3) calling, (4) fluffing of plumage, and (5) spreading of the wings and tail, sometimes with the bill open (Higgins *et al.* 1999; Holyoak 2001).

Physical contact during agonistic behaviour may be common in frogmouths but, probably because of the rarity of observing such behaviour in cryptic and nocturnal species, is rarely reported. Worldwide, there are 17 frogmouth species (Cleere 2010), but only two reports of agonistic behaviour were found in the literature: (1) Kaplan (2007) anecdotally detailed a mid-air ‘blow’ to the back of the head of a just-released, hand-raised Tawny Frogmouth by a resident male conspecific; (2) Territorial defence behaviour such as bill-clapping, chasing during flight, and static crouching with spread wings ‘in threat display’ has been reported in Plumed Frogmouths *P. ocellatus plumiferus* (Beruldsen 2003).

Frogmouths have relatively short and weak legs and small claws, which are probably ineffective as weapons in contests. Thus, it is perhaps not surprising that the observed Papuan Frogmouths used their beaks as weapons in the agonistic interaction. Possibly aiding in the prolonged contest of interlocking beaks is the fact that the frogmouth bill is heavily ossified. The lower mandible is “supported by thick mandibular rami, and the upper mandible has a huge premaxillary plate that extends back...to cover palatal bones with a bony shield” (Schodde & Mason 1980, p. 89).

The agonistic behaviour reported here, which was immediately preceded by many calls by Papuan Frogmouths, occurred at dusk, corresponding with the beginning of the active time for this species. August corresponds with the beginning of the breeding season (Schodde & Mason 1980). It is therefore likely that either

competition for a mate or territorial dispute could explain this behaviour. An observation of two Papuan Frogmouths seen in the same area on the night before the interaction suggests that a pair may have been regularly in the area and that the behaviour seen was a territorial dispute.

A new call-type for this species (*OomWoom*) was recorded as part of this interaction. Previously, only the *Oom* call—typically given in succession as *oom, oom, oom...*—has been recorded (Schodde & Mason 1980; Higgins *et al.* 1999; Hollands 2008). The *OomWoom* call reported here is unusual among birds in that the first harmonic is suppressed; it is the fundamental frequency and the second harmonic that are visible on the spectrogram (Figure 3). It is clearly different from the *more-pork* call reported by Barnard (1926) because, although Barnard did not publish a spectrogram, *OomWoom* does not have a “note rising on the first syllable and lowering on the second” (Barnard 1926, p. 5) and is instead a pure-tone call with a partial gap separating the two syllables. Prolonged calling bouts of the *Oom* call can last up to 30 minutes (Higgins *et al.* 1999), whereas the *OomWoom* call was heard (not seen being given) for 15 seconds. Given the context in which this call was made, and the known strong response to call-playback in the Tawny Frogmouth (Kaplan 2007)—a closely related species to the Papuan Frogmouth—suggests that the *OomWoom* call aids in territoriality in the Papuan Frogmouth.

This paper adds to the limited information about the Papuan Frogmouth in the literature (Schodde & Mason 1980; Angus 1994; Higgins *et al.* 1999; Holyoak 2001; Hollands 2008; Cleere 2010; Rae 2013), some of which includes many statements which are based on little information and could be considered conjecture (e.g. Schodde & Mason 1980). The difficulty in detecting such seemingly rare agonistic behaviour as is reported here means that these contests may be more widespread and have greater behavioural impact than currently thought. Further observations and research into the territorial and breeding behaviour of this cryptic species is thus recommended.

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