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Frequency and behavioural accounts of interspecific interactions between a breeding pair of Eastern Ospreys *Pandion haliaetus cristatus* and other birds

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Abstract. Eastern Ospreys *Pandion haliaetus cristatus* at a nest in Kingscliff, New South Wales, were observed over three mornings, during which five bird species were recorded in interspecific interactions. Activity across observation periods ranged from 9.3 to 23.3 interactions per hour. The Torresian Crow *Corvus orru* was involved in 77% of interactions, mostly Crows and Ospreys eyeing each other from close stationary positions, though Crows investigating the nest, swooping on Ospreys and chasing them in flight were also recorded. In other interactions, Willie Wagtails *Rhipidura leucophrys* were recorded swooping Ospreys, eyeing them at close proximity, and investigating their nest, and Magpie-larks *Grallina cyanoleuca* were recorded descending on the nest and swooping on Ospreys. Only two interactions involved the Blue-faced Honeyeater *Entomyzon cyanotis*, in which an individual investigated the Osprey nest. Only one interaction involved an Australian Magpie *Gymnorhina tibicen*, in which a Magpie flying past the nest was briefly pursued by an Osprey.

Introduction

The Osprey *Pandion haliaetus* is a cosmopolitan raptor found on every continent except Antarctica (Poole 2019). Separate subspecies are recognised, including the Eastern Osprey *P. h. cristatus*, which occurs in coastal regions of Australia, Indonesia, New Guinea and the Philippines (Dennis 2007a). Although some authorities have assigned full species status to the Eastern Osprey based on morphological and genetic differences from other Ospreys (Wink *et al.* 2004), its status as a subspecies is retained by other authorities (Gill *et al.* 2023), including the most recent *Working List of Australian Birds* (Version 4: BirdLife Australia 2022).

In Australia, Ospreys are a particularly conspicuous raptor because of their coastal distribution largely overlapping with the most populated areas of human settlement (Dennis & Clancy 2014) and their preference for nesting on tall, exposed structures (Clancy 2006; Thomson *et al.* 2019). Ospreys readily nest on artificial structures, which represents both a source of human–wildlife conflict when nests are built on utility and communications infrastructure (Washburn 2014) and a conservation opportunity in that purpose-built structures can be erected to increase local nesting opportunities for the species (Rhodes 1972). Breeding pairs of Ospreys typically produce a single clutch of two to four eggs and incubate over the winter months (Marchant & Higgins 1993; Clancy 2006).

Although the Osprey is considered of Least Concern by the International Union for Conservation of Nature (BirdLife International 2019), it is listed as Vulnerable under New South Wales (NSW Scientific Committee 2009) and as Endangered under South Australian (Detmar & Dennis 2018) environmental legislation. This coincides with a substantial amount of Osprey research from the North Coast region of New South Wales (Clancy 1989, 2005, 2006; Rose 2000; Bischoff 2001; Kennard & Kennard 2006) and south-eastern South Australia (Dennis & Baxter 2006; Dennis 2007a,b; Dennis *et al.* 2011; Detmar & Dennis 2018). The monitoring of breeding pairs has been a particular focus of study (Clancy 1989, 2006; Rose 2000; Bischoff 2001; Kennard & Kennard 2006; Dennis 2007a), within which interspecific interactions between Ospreys and other birds have been frequently documented.

I undertook a brief observational study of interspecific interactions at a single Osprey nest in the North Coast region of New South Wales. Here, I report on the frequency of interactions between Ospreys and other birds and provide behavioural accounts of these interactions.

Methods

An Osprey nest built on an artificial pole-and-cradle structure in Kingscliff, New South Wales (28.277°S, 153.573°E), was watched over three observation periods during May 2023. Observation periods were between *c.* 0640 and 0750 h on 17 May (*c.* 70 minutes of observation), between *c.* 0620 and 0750 h on 18 May (*c.* 90 min.), and between *c.* 0620 and 0750 h on 19 May (*c.* 90 min.). Thus, the total duration of observations was *c.* 250 minutes. During observations, interactions between the nesting Ospreys and other birds were recorded, noting details such as species, types of interaction [e.g. swooping on Ospreys, perching close to and/or standing off with Ospreys (two birds eyeing each other from stationary positions), landing on and investigating the Osprey nest], whether any physical contact was made, and time spent in interactions.

Results

The baseline behaviours of the Ospreys (i.e. when not engaged in interspecific interactions) throughout the three observation periods were: sitting on the nest, bringing nest materials to the nest, flights in the general vicinity, and perching on the crossbeam below the nest, either feeding

Table 1. Observations of interspecific interactions with the Eastern Osprey(s) at their nest site, Kingscliff, NSW, May 2023: number of interactions, mean rate/hour, and number of species involved (with number of interspecific interactions in parentheses). The number of species involved in interspecific interactions excludes the Osprey.

Date	*No. interactions*	*Mean rate/h*	*No. species involved*	*Species involved (and no. interactions)*
17 May	17	~14.6	3	Torresian Crow (14) Willie Wagtail (2) Magpie-lark (1)
18 May	35	~23.3	4	Torresian Crow (26) Willie Wagtail (5) Magpie-lark (2) Blue-faced Honeyeater (2)
19 May	14	~9.3	4	Torresian Crow (11) Australian Magpie (1) Willie Wagtail (1) Magpie-lark (1)

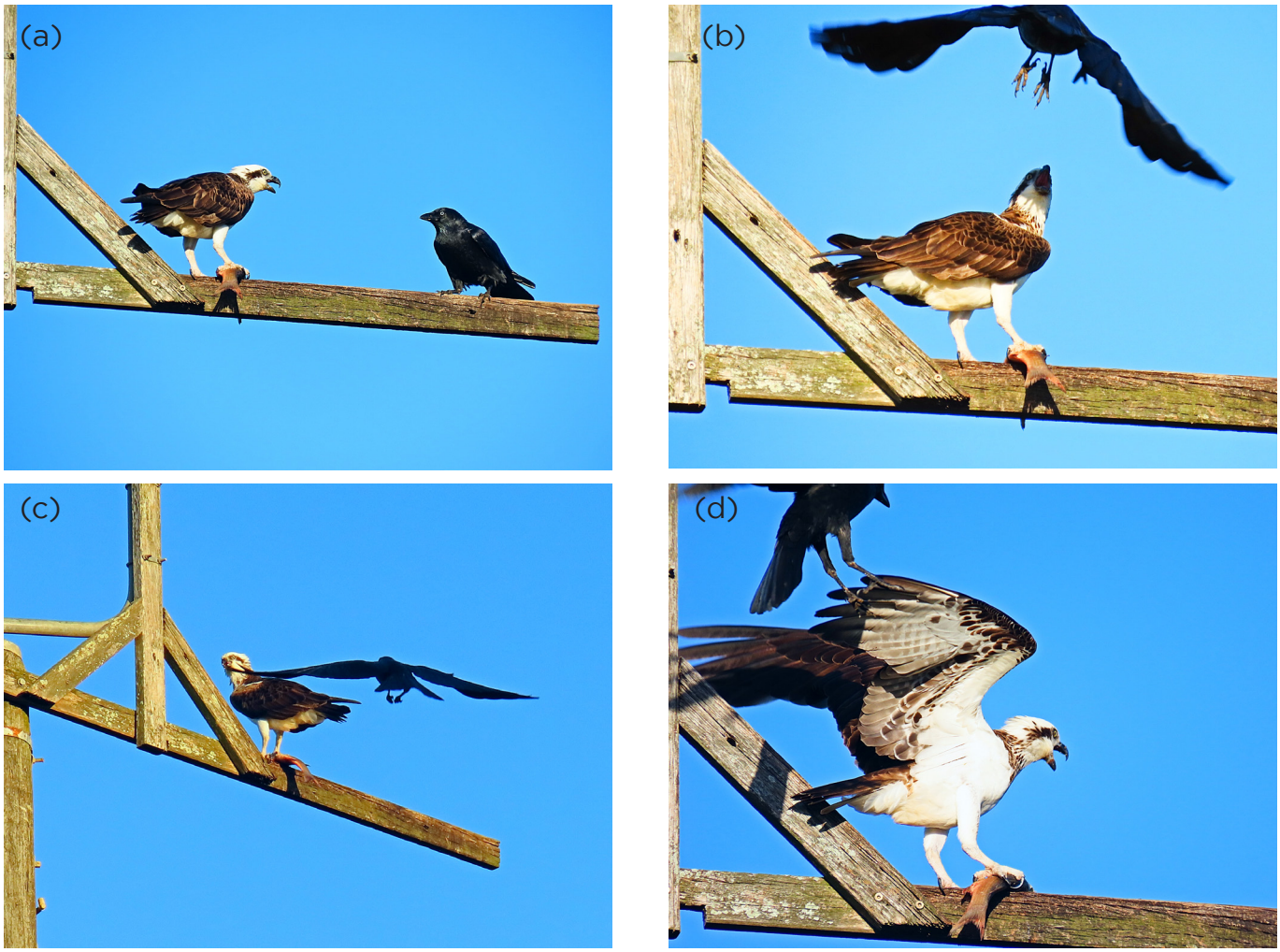

Figure 1. (a) A stand-off between a Torresian Crow and an Eastern Osprey. (b) The conflict escalates to the Crow taking flight and swooping the Osprey. (c) The Osprey tries to resume feeding but is interrupted by the Crow swooping from behind. (d) In one act of swooping, the Crow's talons almost make contact with the Osprey's right wing. Photos: Matthew Mo

on caught prey or just being vigilant. Throughout the observations, one or both Ospreys were always present on the nest or crossbeam.

There were 66 separate observations of interspecific interactions recorded across the three observation periods. Five species of birds were observed engaging in interspecific interactions with the Ospreys at the nest site, all passerines: Torresian Crow *Corvus orru*, Willie Wagtail *Rhipidura leucophrys*, Magpie-lark *Grallina cyanoleuca*, Blue-faced Honeyeater *Entomyzon cyanotis* and Australian

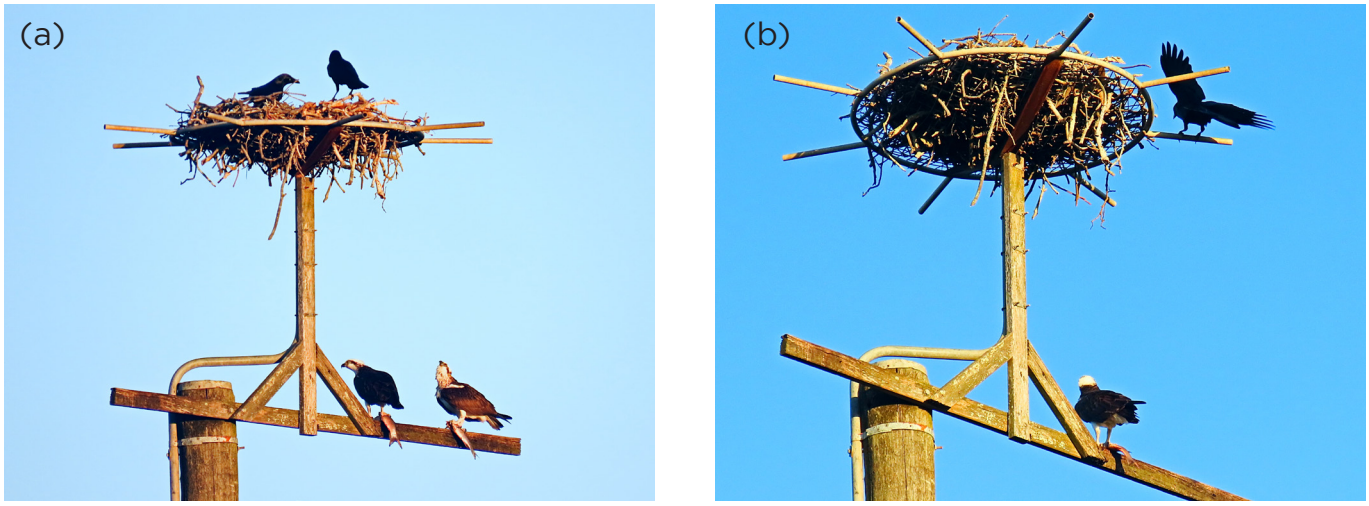

Figure 2. (a) The Eastern Ospreys respond with vigilance to two Torresian Crows investigating their nest. (b) A single Crow lands on the nesting platform while one of the Ospreys is perched below. Photos: Matthew Mo

Figure 3. An Eastern Osprey swooping a Torresian Crow successfully flushes it from the edge of the nest. Rainbow Lorikeets *Trichoglossus moluccanus* are visible flying past in the background but were not interacting with either species. Photo: Matthew Mo

Figure 4. A Willie Wagtail swooping an Eastern Osprey. Photo: Matthew Mo

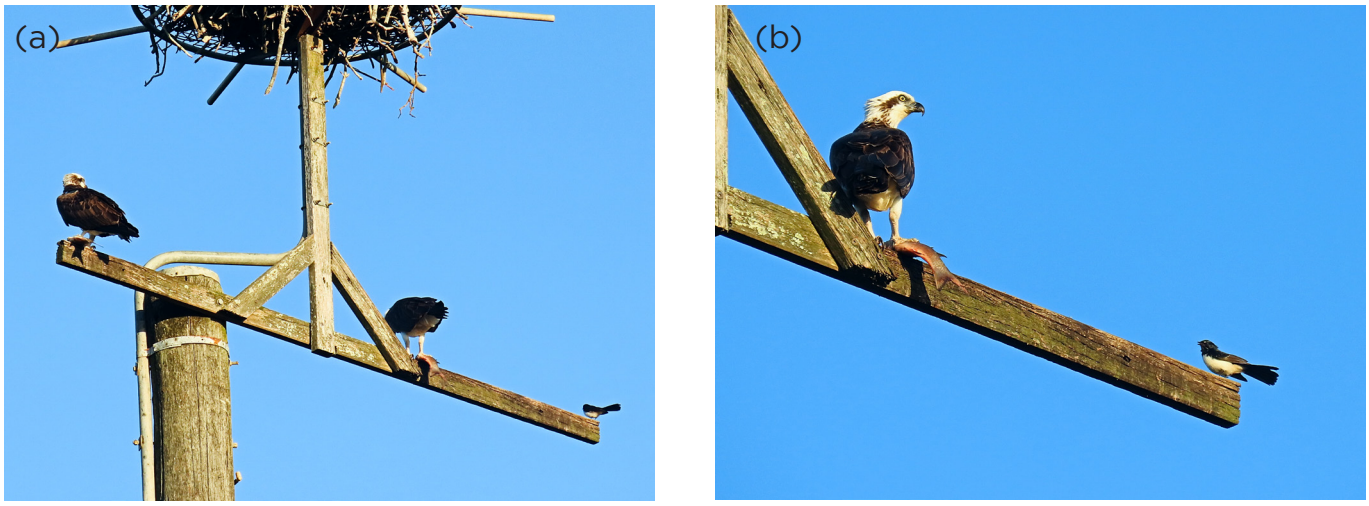

Figure 5. (a) A Willie Wagtail initiates a stand-off with the pair of Eastern Ospreys. (b) In a separate incident, a Willie Wagtail employs vocalisations as part of its mobbing strategy. Photos: Matthew Mo

Figure 6. A Magpie-lark retreats after performing a series of swoops on both Eastern Ospreys sitting on the nest. Photo: Matthew Mo

Magpie *Gymnorhina tibicen*. The number of bird species observed engaging in interspecific interactions with the Ospreys per observation period was three or four.

The frequency of interspecic interactions differed substantially between observation periods (Table 1). The mean rate of interactions was lowest on 19 May, with ~9.3 separate interactions per hour. In contrast, the observation period on 18 May had the highest mean rate of interactions, with ~23.3 separate interactions per hour, 2.5 times the rate observed on 19 May. These interactions ranged in duration and intensity from swooping, investigating the nest or stand-offs lasting <10 seconds to birds perching near the nest for 8–10 minutes. Details of all interspecific interactions are given in Appendix 1.

Torresian Crow

The Torresian Crow was the species most frequently recorded in interspecific interactions with the Osprey(s), accounting for 51 interspecific interactions during the study (77% of observed interactions). All interactions between Osprey(s) and Torresian Crow(s) were initiated by a single or pair of Crows as the aggressors, with the exception of one interaction in which an Osprey in flight swooped a Crow as the latter flew close to the other Osprey that was perched on the crossbeam. There were also four observations of Crows swooping perched Ospreys, three of which followed an initial stand-off between the Crow and Osprey on the crossbeam (Figure 1). Swooping by Crows was generally momentary, except for one observation that lasted between 10 and 20 seconds, which was the only interspecific interaction when a bird made physical contact with an Osprey. Other behaviours recorded included two observations of Crows chasing Ospreys in flight, one in which the Crow flew from the crossbeam to chase an Osprey flying close to another Crow, and another instance where a Crow chased an Osprey that was returning to the nest with new nesting material.

Most interspecific interactions involving Torresian Crows were stand-offs with the Ospreys, either with the Osprey(s) sitting on the nest and the Crow(s) standing off from the edge of the nest [12 observations; 24% of interactions between Osprey(s) and Crow(s)], or both species perched on the crossbeam [14 observations; 28% of interactions between Osprey(s) and Crow(s)]. In all these cases, Crows engaged as a single bird or as a pair. Stand-offs ranged in duration from <20 seconds to up to 6 minutes. In four stand-offs on the crossbeam, a Crow also took flight to swoop a perched Osprey (three observations, one shown in Figure 1) or another Osprey that was already in flight as it flew close to another Crow (one observation). Apart from when swooping occurred, the Ospreys generally only responded actively to stand-offs when the Crow(s) approached to within ~50 cm (distance judged based on comparison with body length of the Crow) or when a pair of Crows perched on either side of one of the Ospreys. Otherwise, the Ospreys mostly reacted only with minor vigilance towards the Crows.

In 12 interactions [24% of interactions between Osprey(s) and Crow(s)], Crow(s) landed on and perched on the nest when the Ospreys were not sitting. In all these cases, the presence of the Crows drew the attention of the Ospreys, which were either perched on the crossbeam (Figure 2) or in flight. These interactions ranged in duration

Figure 7. (a) A Blue-faced Honeyeater investigates the Eastern Osprey nest. (b) The same Honeyeater is flushed by an Osprey gliding overhead. Photos: Matthew Mo

Figure 8. An Eastern Osprey returning to the nest with new nesting material briefly pursues an Australian Magpie. Photo: Matthew Mo

from <20 seconds to 5 minutes. In these interactions, the Crows were perched on the edge of the nest or, in two observations, single Crows were investigating the centre of the nest. In one of these observations, a Crow had been perched on the edge of the nest for 2–3 minutes and was finally flushed away by an Osprey (which was already in flight) swooping the Crow (Figure 3).

In 11 interactions [22% of interactions between Osprey(s) and Crow(s)], Crow(s) perched on the crossbeam and directed their attention to the sitting Osprey(s) on the nest above. In these instances, the Crow(s) were generally out of view of the Osprey(s), so that the interactions were generally one-way. These interactions ranged in duration from <30 seconds to 8–10 minutes.

Willie Wagtail

There were eight interspecific interactions involving the Willie Wagtail, accounting for 12% of interspecific interactions recorded during the study. They were spread across all three observation periods. In all cases, only one Willie Wagtail engaged in interactions. The most common interaction involved a Willie Wagtail swooping one of the Ospreys (four observations), three of which were directed at an Osprey perched on the crossbeam (Figure 4) and one at an Osprey as it sat on the nest. In all cases, swooping lasted for <10 seconds. There were also two observations of a Willie Wagtail perched on the crossbeam standing off with an Osprey perched across from it: one was a brief interaction lasting <10 seconds, and the other lasted 1–2 minutes (Figure 5). Two other observations were passive in nature, in which a Willie Wagtail landed on and perched on the edge of the nest; in the first, both Ospreys were perched on the crossbeam below and paid no apparent attention to the Willie Wagtail, and in the second, both Ospreys were sitting on the nest but responded only with vigilance even though the Willie Wagtail investigated the nest for 30–40 seconds.

Magpie-lark

There were four observations of interspecific interactions involving the Magpie-lark, accounting for 6% of interspecific interactions recorded during the study. Despite the low number of observations, they were spread across all three observation periods. In all cases, only one Magpie-lark engaged in the interactions. Interactions ranged from one passive interaction, in which a Magpie-lark landed on and perched on the edge of the nest, eliciting only minor attention from an Osprey sitting on the nest, to three observations of a Magpie-Lark swooping stationary Osprey(s). Two observations of swooping were directed at one Osprey perched on the crossbeam, both lasting <10 seconds. The third observation of swooping was directed at both Ospreys as they sat on the nest (Figure 6). This was the longest interaction observed between the two species, lasting 40–50 seconds.

Blue-faced Honeyeater

There were two observations of interspecific interactions involving the Blue-faced Honeyeater, which involved the same individual and occurred 2 minutes apart on 18 May. In the first, the Honeyeater landed on and perched on the edge of the nest, investigating the nest for 20–30 seconds, until one of the Ospreys, which was already in flight, glided over the nest and flushed the Honeyeater (Figure 7). In the second, the Honeyeater descended on the edge of the nest and investigated the nest for a further 1–2 minutes. In both interactions, the Honeyeater elicited only cursory attention from an Osprey perched on the crossbeam below.

Australian Magpie

There was only one interaction involving an Australian Magpie, which was observed on 19 May. In this interaction, the Osprey was already in flight and carrying a stick back to the nest, during which the Magpie flew close to the nest, eliciting a brief aerial pursuit by the Osprey (Figure 8). This interaction lasted <5 seconds. It was not apparent if the Magpie had shown any interest in the nest.

Discussion

Aggression of Torresian Crows towards the nesting pair of Ospreys was prominent in this study. This was unsurprising given the scientific literature reporting corvids mobbing other species, including larger raptors (Shivprakash *et al.* 2006; Marzluff *et al.* 2015; da Cruz 2023). At least one source specifically reports their mobbing Ospreys (Marchant & Higgins 1993), and other literature documents their mobbing other raptors (James 2004; Lutter *et al.* 2004). Apart from mobbing as an anti-predator behaviour, the Crows might have also directed aggression towards the Ospreys as attempts of kleptoparasitism. Kleptoparasitism is commonly reported in corvids (e.g. Baglione & Canestrari 2009; Krohn 2016; Simes *et al.* 2017), with the Torresian Crow specifically reported harassing raptors as large as White-bellied Sea-Eagles *Haliaeetus leucogaster* for their prey (Le Souef 1915). Potentially supporting this explanation, incidents of Crows mobbing in the present study were more frequent during the observation period when the Ospreys were handling prey (18 May: 23.3 interactions/hour) compared with the other observation periods (17 May and 19 May: 14.6 and 9.3 interactions/hour, respectively).

In this study, Torresian Crows approached the nest both when the Ospreys were sitting and when they were perched on the crossbeam below. When the nest was unattended, the Crow(s) appeared to be investigating the

nest rather than directing attention to the Ospreys below, so their perching on the edge of the nest was unlikely to be because they were using the overhead structure to watch the Ospreys or to descend from it to launch mobbing attacks. Corvids are documented nest predators (Madden *et al.* 2015; Brinkman *et al.* 2018), which implies that the Torresian Crow could be a threat to the Ospreys' breeding attempt. In New South Wales, Ospreys typically do not lay eggs until July although they are known to have eggs anytime between April and July in northern Australia (Marchant & Higgins 1993); the long periods in my study in May when no Ospreys were sitting on the nest and their passive response to Crows investigating their nest imply that eggs were not yet present. There are also documented examples of corvids stealing nest material from other birds' nests (Garde 2011; Roshnath & Sinu 2021), including from raptors (Neema *et al.* 2021). Although Torresian Crows were not observed to remove any nest materials in my study, some of the sticks in the Osprey nest would have been suitable for a Torresian Crow nest (Rowley 1973).

In this study, the Australian Magpie was observed in only one interspecific interaction, initiated by an Osprey, probably in nest defence (which is common in Ospreys: Marchant & Higgins 1993). On the contrary, the Australian Magpie is a well-documented mobbing species, including of humans (van Vuuren *et al.* 2016), as well as of larger raptors (Higgins *et al.* 2006; Mo *et al.* 2016; Kaplan 2019). However, my study was outside the Magpie's nesting season (June–March) when this species' interspecific aggression would be especially prominent (Higgins *et al.* 2006). Potentially, the lack of attention to Magpies in the local area reflects the relatively narrow diet of the Osprey, mostly comprising fish (Clancy 2005), and therefore Ospreys not constituting a major predation threat to Magpies. There have been records of other bird species in the Osprey's diet, but these are few and mostly seabirds (e.g. Abbott 1982; Saunders & de Rebeira 1985; Smith 1985; Walker 1987). Despite passerines representing a large proportion of the diversity of bird species locally and globally, their appearance in the diet of the Osprey is rare (Marchant & Higgins 1993), though one study found a Torresian Crow skull in prey remains from an Osprey (Clancy 2005).

Although the Magpie-lark and Willie Wagtail are both smaller than the Torresian Crow and Australian Magpie, both are well documented to mob known and potential predators, including larger species (Immelmann 1960; Harrison 2000). The Magpie-lark, for instance, has been reported attacking and chasing raptors such as the Black-shouldered Kite *Elanus axillaris* (Condon 1937), Square-tailed Kite *Lophoictinia isura* (Barnes *et al.* 1999), goshawks *Accipiter* spp. (Gray 1933), Brown Goshawk *A. fasciatus* (Burton 1993), Whistling Kite *Haliastur sphenurus* (Buchanan 1987), Black Falcon *Falco subniger* (Baker-Gabb 1989), Powerful Owl *Ninox strenua* (Bundock in Mo *et al.* 2016) and Southern Boobook *N. boobook* (Jurisevic & Sanderson 1994). Similarly, there are reports in the scientific literature of the Willie Wagtail mobbing raptors such as the Gurney's Eagle *Aquila gurneyi* (Garnett 1987), Wedge-tailed Eagle *A. audax* (Higgins *et al.* 2006), Brown Goshawk (Chandler 1938; Fulton 2006), Whistling Kite (Buchanan 1992), Brown Falcon *Falco berigora* (Debus 2022) and Peregrine Falcon *F. peregrinus* (Olsen *et al.* 1979). To my knowledge, mobbing of Ospreys by both Magpie-larks and Willie Wagtails has not been reported in the scientific literature previously. Although the Osprey is not a documented predator of either species, Magpie-larks and Willie Wagtails are preyed upon by similar-sized raptors (Morgan 1934; Calaby 1951; Debus 1983).

Interspecific interactions involving the Blue-faced Honeyeater were brief and the intention for perching on the edge of the Ospreys' nest was not clear. Past observers have reported this honeyeater stealing nest materials from other passerines (Campbell in Higgins *et al.* 2001) but, to my knowledge, they have not been recorded taking nest materials from raptors, and the main components of the Osprey nest would likely be too thick for a Blue-faced Honeyeater to use. Alternatively, the Osprey nest may have represented a feeding opportunity, with some authors documenting invertebrate fauna associated with raptor nests (Monti *et al*. 2019; Levesque-Beaudin *et al*. 2020), or merely a high vantage point for birds like the Blue-faced Honeyeater.

The conspicuous nature of the Osprey makes it an easy raptor to observe, which is reflected in published research of breeding pairs that have been monitored over time (e.g. Clancy 2005, 2006; Dennis 2007a). In comparison, my study of the Osprey was greatly limited in the quantity of observation hours but nevertheless provided some interesting insights of interspecific interactions associated with the nesting biology of this threatened species.

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Appendix 1. Observations of interspecific interactions between Eastern Ospreys and other bird species, Kingscliff, NSW, May 2023, recorded during this study. Durations of interspecific interactions are shown in parentheses.

Approximate time (h)	*Baseline Osprey behaviour*	*Interspecific interactions (in chronological order)*
17 May		
0640–0655	One bird sitting on nest, second bird not visible	1. Two Torresian Crows landed on and perched on edge of nest, standing off with sitting Osprey (1–2 minutes). 2. One Willie Wagtail swooped sitting Osprey (<10 seconds). 3. One Crow landed on and perched on edge of nest, standing off with sitting Osprey (30–60 seconds). 4. One Crow landed on and perched on edge of nest, standing off with sitting Osprey (30–60 seconds). 5. One Crow landed on and perched on crossbeam, directing attention towards nest (20–30 seconds). 6. One Crow landed on and perched on edge of nest, standing off with sitting Osprey (1–2 minutes).
0655	One bird sitting on nest, second bird brought nesting material to nest	None
0655–0710	Both birds sitting on nest	7. One Willie Wagtail swooped one of the Ospreys (<10 seconds). 8. Two Crows landed on and perched on edge of nest, standing off with Ospreys (3–5 minutes). 9. One Crow landed on and perched on crossbeam, out of view of Ospreys above but directing attention towards nest (20–30 seconds).
0710	One bird sitting on nest, second bird flew from nest and soared in vicinity	None
0710–0715	One bird sitting on nest, second bird in flight in vicinity	None
0715	One bird sitting on nest, second bird landed on and perched on crossbeam	None
0715–0730	One bird sitting on nest, second bird perching on crossbeam in a vigilant state	10. One Crow landed on and perched on crossbeam, standing off with perched Osprey (1–2 minutes). 11. One Magpie-lark landed on and perched on edge of nest, attracting only minor attention from sitting Osprey (<20 seconds). 12. Two Crows landed on and perched on edge of nest, standing off with sitting Osprey (3–5 minutes). 13. One Crow landed on and perched on edge of nest, standing off with sitting Osprey (1–2 minutes).
0730	One bird sitting on nest, second bird flew from crossbeam and soared in vicinity	None
0730–0735	One bird sitting on nest, second bird in flight in vicinity	None
0735	One bird sitting on nest, second bird landed on and sat on nest	None
0735–0750	Both birds sitting on nest	14. One Crow landed on and perched on edge of nest, standing off with Ospreys (20–30 seconds). 15. One Crow landed on and perched on edge of nest, standing off with Ospreys (1–2 minutes). 16. One Crow landed on and perched on edge of nest, standing off with Ospreys (1–2 minutes). 17. One Crow landed on and perched on crossbeam, out of view of Ospreys above but directing attention towards nest (3–5 minutes).

Appendix 1 continued

Approximate time (h)	*Baseline Osprey behaviour*	*Interspecific interactions (in chronological order)*
18 May		
0620–0645	Both birds perching on crossbeam feeding on prey	1. One Crow landed on and perched on edge of nest, attracting attention of Ospreys below (40–50 seconds). 2. One Crow landed on and perched on edge of nest, attracting attention of Ospreys below (10–20 seconds). 3. Two Crows landed on and perched on edge of nest, attracting attention of Ospreys below (3–5 minutes). 4. One Crow landed on and perched on crossbeam, standing off with Ospreys (3–5 minutes), during which one other Crow swooped one of the Ospreys (<10 seconds). 5. Two Crows landed on and perched on nest, one in centre and one at edge, investigating nest, attracting attention of Ospreys below (1–2 minutes).
0645	One bird perching on crossbeam feeding on prey, second bird flew from crossbeam but returned to land on crossbeam after <10 seconds	None
0645–0647	Both birds perching on crossbeam feeding on prey	6. One Crow landed on and perched on edge of nest, attracting attention of Ospreys below (1–2 minutes).
0647	One bird perching on crossbeam feeding on prey, second bird flew off to soar in vicinity	None
0647–0655	One bird perching on crossbeam feeding on prey, second bird in flight in vicinity	7. Two Crows landed on and perched on edge of nest, attracting attention of perched Osprey below (1–2 minutes). 8. One Crow landed on and perched on edge of nest (2–3 minutes), ceasing when flying Osprey swooped on Crow. 9. One Crow landed on and perched on crossbeam, standing off with perched Osprey, during which another Crow swooped (10–20 seconds) on this Osprey. 10. One Crow flew close to perched Osprey and received a swoop from flying Osprey.
0655	One bird perching on crossbeam feeding on prey, second bird landed on crossbeam to resume feeding on prey	None
0655–0656	Both birds perching on crossbeam feeding on prey	11. One Crow landed on and perched on edge of nest, attracting attention of Ospreys below (<10 seconds). 12. One Willie Wagtail swooped one of the Ospreys (<10 seconds).
0656	One bird perching on crossbeam feeding on prey, second bird flew off to soar in vicinity	None
0656–0658	One bird perching on crossbeam feeding on prey, second bird in flight in vicinity	13. One Crow swooped perched Osprey (20–30 seconds), then landed on and perched on edge of nest (10–20 seconds). 14. Two Crows landed on and perched on crossbeam, on either side of perched Osprey, standing off with it (20–30 seconds). 15. One Crow landed on and perched on edge of nest, attracting attention of perched Osprey below (10–20 seconds). 16. One Willie Wagtail landed on and perched on crossbeam, standing off with perched Osprey (<10 seconds).
0658	One bird perching on crossbeam feeding on prey, second bird landed on and perched on crossbeam to return to feeding on prey	None
0658–0705	Two birds perching on crossbeam feeding on prey	17. One Willie Wagtail landed on and perched on edge of nest, attracting no attention from Ospreys below (<10 seconds). 18. One Willie Wagtail landed on and perched on crossbeam, standing off with one Osprey (1–2 minutes).

Appendix 1 continued

Approximate time (h)	*Baseline Osprey behaviour*	*Interspecific interactions (in chronological order)*
18 May continued		
0705	One bird perching on crossbeam feeding on prey, second bird flew off to soar in vicinity	None
0705–0710	One bird perching on crossbeam feeding on prey, second bird in flight in vicinity	19. Two Crows landed on and perched on crossbeam, one on either side of perched Osprey, standing off with it (1–2 minutes), during which one of these Crows took flight to swoop on other Osprey as it flew close to crossbeam. 20. One Crow landed on and perched on edge of nest, attracting attention of perched Osprey below (<20 seconds). 21. One Crow landed on and perched on crossbeam, standing off with perched Osprey (10–20 seconds). 22. One Crow landed on and perched on crossbeam, standing off with perched Osprey (10–20 seconds).
0710	One bird perched on crossbeam feeding on prey, second bird landed on crossbeam to resume feeding on prey	None
0710–0720	Two birds perched on crossbeam feeding on prey	23. One Crow landed on and perched on crossbeam, standing off with Ospreys (10–20 seconds). 24. One Willie Wagtail swooped one of the Ospreys (<10 seconds). 25. One Crow landed on and perched on crossbeam, standing off with Ospreys (1–2 minutes). 26. One Crow landed on and perched within nest, attracting attention of Ospreys below (30–40 seconds).
0720	One bird perched on crossbeam feeding on prey, second bird flew off to soar in vicinity	None
0720–0750	One bird perched on crossbeam feeding on prey, second bird in flight in vicinity	27. One Blue-faced Honeyeater landed on and perched on edge of nest, investigating nest (20–30 seconds), ceasing when Osprey in flight glided close to nest and flushed Honeyeater. 28. Same Blue-faced Honeyeater landed on and perched on edge of nest, investigating nest, attracting only minor attention from perched Osprey (1–2 minutes). 29. One Crow landed on and perched on crossbeam, standing off with perched Osprey, and taking flight intermittently to swoop on this Osprey (5–6 minutes). 30. One Crow landed on and perched on crossbeam, standing off with perched Osprey (30–40 seconds). 31. One Crow landed on and perched on crossbeam, standing off with perched Osprey (10–20 seconds). 32. One Magpie-lark swooped perched Osprey (<10 seconds). 33. Two Crows landed on and perched on crossbeam, one on either side of perched Osprey, standing off with it (4–5 minutes). 34. One Magpie-lark swooped perched Osprey (<10 seconds). 35. One Crow landed on and perched on crossbeam, standing off with perched Osprey (1–2 minutes).
19 May		
0620–0710	Two birds sitting on nest	1. One Crow landed on and perched on edge of nest, standing off with Ospreys (30–40 seconds). 2. One Crow landed on and perched on crossbeam, out of view of Ospreys above but directing attention towards nest (1–2 minutes). 3. Two Crows landed on and perched on crossbeam, out of view of Ospreys above but directing attention towards nest (40–50 seconds). 4. One Crow landed on and perched on crossbeam, out of view of Ospreys above but directing attention towards nest (3–5 minutes). 5. One Willie Wagtail landed on and perched on edge of nest, attracting only minor attention from Ospreys (30–40 seconds). 6. Two Crows landed on and perched on crossbeam, out of view of Ospreys above but directing attention towards nest (3–5 minutes). 7. Two Crows landed on and perched on edge of nest, standing off with Ospreys (1–2 minutes). 8. One Crow landed on and perched on crossbeam, out of view of Ospreys above but directing attention towards nest (2–3 minutes).

Appendix 1 continued

Approximate time (h)	*Baseline Osprey behaviour*	*Interspecific interactions (in chronological order)*
19 May continued		
0710	One bird sitting on nest, second bird flew off and soared in vicinity	None
0710–0727	One bird sitting on nest, second bird in flight in vicinity	9. One Crow landed on and perched on crossbeam, out of view of sitting Osprey above but directing attention towards this Osprey (4–5 minutes). 10. One Australian Magpie flew close to nest and was chased off by Osprey in flight (this Osprey appeared to be en route back to nest with new nesting material). 11. One Crow chased Osprey in flight (<10 seconds).
0727	One bird sitting on nest, second bird landed on and sat there and deposited new nesting material	None
0727–0750	Two birds sitting on nest	12. One Crow landed on and perched on crossbeam, out of view of Ospreys above but directing attention towards nest (8–10 minutes). 13. One Magpie-lark swooped both Ospreys (40–50 seconds). 14. Two Crows landed on and perched on crossbeam, out of view of Ospreys above but directing attention towards nest (1–2 minutes).