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Intraspecific Adoption and Double Nest Switching in Peregrine Falcons (*Falco peregrinus*)

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ABSTRACT. We describe an observation of post-fledging double nest switching and alloparenting in the Peregrine Falcon (*Falco peregrinus tundrius*). During the summer of 2010, a 36-day-old male Peregrine Falcon that had been marked with leg bands was seen flying from its natal site and was subsequently observed at a neighboring nest site that contained two nestlings. Motion-sensitive camera images indicated that the adopted nestling remained at the neighboring site for several days, during which time it shared the nest ledge with the two resident nestlings and was fed by the adults that occupied the site. The juvenile falcon subsequently returned to its natal site, where it shared the nest ledge with its natural sibling and received care from its natural parents. This note is the first documentation of nest switching in wild Peregrine Falcons.

Key words: brood adoption, nest switching, alloparenting, peregrine falcon, avian, Arctic

RÉSUMÉ. Nous décrivons l'observation d'un double échange de nids après l'envol et d'alloparents chez le faucon pèlerin (*Falco peregrinus tundrius*). À l'été 2010, nous avons aperçu un faucon pèlerin bagué âgé de 36 jours en train de s'envoler de son site natal, après quoi nous l'avons observé à un site de nidification avoisinant qui comprenait deux oisillons. Les images de caméras détectrices de mouvement ont indiqué que l'oisillon adopté est resté au site avoisinant pendant plusieurs jours. Pendant ce temps-là, il a partagé la corniche avec les deux oisillons résidents et s'est fait nourrir par les adultes qui occupaient le site. Plus tard, le faucon juvénile a regagné son site natal, où il a partagé la corniche avec l'autre membre de sa fratrie et reçu des soins de ses parents naturels. Il s'agit de la première fois qu'un échange de nids a été documenté chez le faucon pèlerin sauvage.

Mots clés : adoption de nichée, échange de nids, alloparent, faucon pèlerin, aviaire, Arctique

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INTRODUCTION

An individual is considered an alloparent when it provides care for young that are not its own (Wilson, 1975). Riedman (1982) reviewed the phenomenon and proposed a suite of mechanisms that may explain its evolution in several taxonomic groups. In birds, several known mechanisms can result in alloparentalism. Among these, brood parasitism (Payne et al., 2001), brood adoption (Howitz, 1986; Simmons, 1992), and brood mixing (Patterson et al., 1982) are best known. Brood adoption and brood mixing are common among precocial and semi-precocial species and usually occur early in the development of the nestlings (Williams, 1994). Alloparental care can also be manifested through replacement of one or both adults after eggs have been laid (Grubb et al., 1988) or through nest switching once young have learned to fly but remain dependent on parental care. Nest switching occurs most often in altricial and semi-altricial species, and adoption usually occurs late in the development of the nestlings, resulting in short periods of alloparental care (Ferrer, 1993; Redondo et al., 1995). Post-fledging adoption by nest switching has been documented in several avian species, including American Crows (*Corvus brachyrhynchos*; Schaefer and Dinsmore 1992), White Storks (*Ciconia ciconia*; Redondo et al., 1995), and Alpine Swifts (*Apus melba*; Bize and Roulin, 2006). In raptor species, post-fledging nest switching has been documented in Northern Goshawks (*Accipiter gentilis*; Kenward et al., 1993), Egyptian Vultures (*Neophron percnopterus*; Donazar and Ceballos, 1990), Ospreys (*Pandion haliaetus*; Poole, 1989; Gilson and Marzluff, 2000), Eagle Owls (*Bubo bubo*; Penteriani and Delgado, 2008), Spanish Imperial Eagles (*Aquila adalberti*; Ferrer, 1993), and Lesser Kestrels (*Falco naumanni*; Tella et al., 1997). In these studies, nest switching was often attributed to high nesting density (e.g., colonial nesting) or attempts to improve food intake (e.g., subordinate siblings in large broods), or both.

In Peregrine Falcons (*Falco peregrinus*), replacement of adults within a breeding season is well known (Ratcliffe, 1993), and fostering of young into wild nests was widely

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employed in the recovery of the species (Cade, 1980; Craig and Enderson, 2004; Alberta Peregrine Falcon Recovery Team, 2005). To our knowledge, however, no case of post-fledging adoption between wild peregrine nest sites has previously been observed. We present here the first documented observation of nest switching in Peregrine Falcons.

Biologists have monitored a very dense (1 site/12 km^2) Peregrine Falcon population located near the hamlet of Rankin Inlet, Nunavut, Canada since 1982 (e.g., Franke et al., 2010, 2011). Territorial peregrines have routinely occupied the same general nest site locations each breeding season, with some sites holding pairs either more frequently over the course of the study, or for longer periods, or both. Each location was assigned a unique site identification number that has remained constant through time, despite annual variation in nest ledges on which pairs chose to lay eggs. Since 2008, motion sensitive cameras (RECONYX models PM35T25, PC85, and PC800 Hyperfire) have been employed each breeding season to monitor nest ledges continuously during incubation and nestling rearing. All nestlings received a federal leg band and a unique alphanumeric coded color visual identification band once they reached approximately 25 days of age. Cameras were positioned 1–4 m from the nest, allowing individual identification by reading the alphanumeric code on the leg band.

DESCRIPTION OF OBSERVATIONS

On 19 August 2010, at approximately 1730 (see Table 1), we arrived at Site 29 (the natal nest of a 36-day-old male and a 34-day-old female) to conduct routine sampling procedures (mortality check, weight, and nest camera maintenance). The male had previously been banded with identification tag No. 25 A. As the field crew approached the base of the nesting cliff, they saw this male flying from the cliff in the general direction of the neighboring Site 28, located 536 m to the south. After weighing the female nestling and collecting a blood sample, the crew left the site at 1746.

Routine site monitoring conducted during a previous visit (8 August) indicated that the male (25 A) at Site 29 weighed 636 g at 25 days of age. His female sibling was two days younger and weighed 764 g. In comparison, the male at Site 28 weighed 408 g at 24 days of age, and the female weighed 566 g at 25 days of age. In addition, images of all four nestlings collected at 34–36 days of age show 25 A to be much farther advanced in feather development (almost no trace of down on head, nape, and back) than any of the other three nestlings, all of which retained very large patches of down on legs, head, nape, and back.

On 30 August 2010, we retrieved the cameras located at Sites 28 and 29. The images collected at Site 28 from 19 to 30 August showed that 25 A joined two resident nestlings (banded 27 A and 73 E) on their nest ledge within three hours of leaving his natal site on August 19. Less than 11 hours later, photographs taken at Site 28 showed the resident adult female feeding her own nestlings and the now adopted nestling from Site 29. On 20 and 21 August, the adult female resident at Site 29 delivered prey items on four more occasions. Each time, 25 A was present on the nest ledge with the resident nestlings and competed for a share of the prey item that was delivered. Over the next two days, the camera recorded limited activity on the nest ledge, but the adopted nestling was observed together with an adult on the nest ledge on 23 August, more than three days after flying from its natal site. No further activity was recorded by the camera at Site 28.

From 19 to 23 August, the single remaining female nestling (62 E) at Site 29 was fed multiple times per day and was seen with distended crop several times over the five-day period. In addition, rather than immediately consuming prey delivered to the nest ledge, 62 E cached several items that were delivered during this period. On 24 August in the morning, an adult falcon delivered a prey item to 62 E; within a few seconds, 25 A appeared on the ledge at Site 29 with his sibling after spending nearly five full days away from Site 29, which included at least three days at Site 28. Both 25 A and 62 E were seen together at the nest ledge on two more occasions that day, but 62 E spent the night alone on the nest ledge. The following day, the resident adults made several prey deliveries, which were mostly consumed and cached by 62 E. However, photographs of 25 A indicated that the male was on the nest ledge at least twice that day. Images clearly show that 25 A either consumed or shared prey items that had previously been cached by 62 E. Although little activity was recorded on the nest ledge after this observation, 25 A was observed on the nest ledge four more times between 25 August at 1903 and 28 August at 1117. When the cameras were removed on 30 August 2010, we confirmed the presence of one free-flying juvenile falcon at Site 28 and another at Site 29.

DISCUSSION

This note records nest switching and adoption in Peregrine Falcons. Poole (1982) suggested that nest switching may result from attempts by subordinate individuals in large broods to increase their food intake. In this case, 25 A was not likely subordinate to his much less well developed female sibling, nor was food apparently in short supply, given the food caching behavior by 62 E that we observed. Furthermore, 25 A left a site where he was one of only two nestlings to join a site where he was one of three nestlings, where competition for food would likely have been higher. Moreover, the nestlings at Site 29 were about the same age as 25 A, but much less advanced in their development, suggesting that their feeding rate was perhaps lower than that 25 A had experienced at his natal site. Therefore, moving to Site 29 likely did not represent an advantage in this case.

Some authors (Poole, 1982; Donazar and Ceballos, 1990; Kenward et al., 1993) have suggested that the post-fledging nest switching phenomenon is related to high breeding density. The breeding population at Rankin Inlet is recognized

TABLE 1. Detailed activity of the juvenile male Peregrine Falcon (25 A) as recorded by the automatic scouting cameras positioned at Sites 28 and 29.

Date	Time	Site	Events
August 19	1730	29	Field crew arrived at Site 29. HY male (25 A) left natal site
	1746	29	Field crew departed from Site 29
	1953	28	25 A was seen at Site 28 for the first time
August 20	0720	28	Resident female fed 25 A and her own two offspring
	1116	28	Resident female delivered prey and 25 A competed for food with resident nestlings
	1229	28	Resident female delivered prey, and 25 A competed for food with resident nestlings
	1342	28	Resident female delivered prey, and 25 A competed for food with resident nestlings
August 21	1707	28	Resident female delivered prey, and 25 A competed for food with resident nestlings
August 23	0505	28	A resident adult and 25 A were observed together at nest ledge
August 24	0735	29	Resident adult delivered prey to 62 E; 25 A joined 62 E four seconds later
	1229	29	25 A and 62 E were observed together on the nest ledge
	1323	29	25 A left nest ledge
	1336	29	Resident adult delivered a prey item which was consumed by 62 E
	1555	29	25 A returned to the nest ledge but left shortly thereafter
August 25	1628	29	25 A retrieved a prey item previously cached by 62 E on the nest ledge
	1800	29	25 A and 62 E shared a prey item
	1801	29	25 A left the ledge
	1851	29	25 A arrived on the ledge
	1956	29	25 A left the ledge
August 26	1903	29	25 A arrived on the ledge
	1945	29	25 A left the ledge
August 27	1806	29	25 A arrived on the ledge
	1811	29	25 A left the ledge
August 28	0657	29	25 A arrived on the ledge
	0701	29	25 A left the ledge
	1117	29	25 A arrived on the ledge
	1118	29	25 A left the ledge
August 30	1520	29	Cameras were removed

as one of the densest known worldwide for the species (Court et al., 1988). Moreover, the close proximity (536 m) of the two sites in question likely facilitated nest switching. The nest switch co-occurred with a site visit by our field crew, and it is possible that their presence in part accounted for the movement from one site to the other; however, the nestling flew from the cliff before our field crew reached the base of the cliff, and once airborne, it gained altitude. Sherrod (1983) indicated that the nestling period ranged from 35 to 42 days, and Oliphant (2011) indicated that some precocious male nestlings are capable of sustained flight as early as 35 days after hatching. In this particular case, the proximity of the sites, combined with the advanced physical development of 25 A, likely contributed in large part to the switch from natal site to adopted site and back again.

Regardless of the mechanism that caused 25 A to leave his natal site, the fledgling male was adopted without any apparent aggression from either the nestlings or the adults present at the adopting site. In this regard, Judge (1981) suggested that adult Ospreys feed juveniles on the nest regardless of relationship, and Ferrer (1993) observed the same behavior in Spanish Imperial Eagles. Nest switching and adoption have also been documented in several other raptor species and may be more common than we think. Documenting these events requires marking of nestlings and continuous monitoring of nests. Increased use of automatic scouting cameras in raptor studies may increase the number of observations and bring new information regarding this phenomenon.

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