OPDAM P., J. THIESSEN, P. VERSCHUREN, AND G. MÜSKENS. 1977. Feeding ecology of a population of goshawk *Accipiter gentilis*. *J. Ornithol.* 118:35–51.

PULLIAM, H.R. AND T. CARACO. 1984. Living in groups: is there an optimal group size? Pages 122–147 *in* J.R. Krebs and N.B. Davies [EDS.], Behavioural Ecology: an evolutionary approach, 2nd ed. Blackwell Science, Oxford, U.K.

REYNOLDS, R.T. AND C. MESLOW. 1984. Partitioning of food niche characteristics of coexisting *Accipiter* during breeding. *Auk* 101:761–779.

SCHNELL, J.H. 1958. Nesting behavior and food habits of goshawks in the Sierra Nevada of California. *Condor* 60:377–403.

SCHOENER, T.W. 1971. Theory of feeding strategies. *Ann. Rev. Ecol Syst.* 2:369–404.

SNYDER, N.F.R. AND J.W. WILEY. 1976. Sexual size dimorphism in hawks and owls of North America. *Ornithol. Monogr.* 20.

SQUIRES, J.R. 1995. Carrion use by Northern Goshawks. *J. Raptor Res.* 29:283.

——— AND R.T. REYNOLDS. 1997. Northern Goshawk (*Accipiter gentilis*). *In* A. Poole and F. Gill [EDS.], The Birds of North America, No. 298. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC U.S.A.

TORNBERG, R. AND A. COLPAERT. 2001. Survival, ranging, habitat choice, and diet of the Northern Goshawk *Accipiter gentilis* during winter in northern Finland. *Ibis* 43:41–50.

VANGILDER, L.D. AND E.W. KURZEJESKI. 1995. Population ecology of the eastern Wild Turkey in northern Missouri. *Wildl. Monogr.* 130.

WATSON, J.W., D.W. HAYS, S.P. FINN, AND P. MEEHAN-MARTIN. 1998. Prey of breeding Northern Goshawks in Washington. *J. Raptor Res.* 32:297–305.

WIDÉN, P. 1989. The hunting habitats of goshawks *Accipiter gentilis* in boreal forests of central Sweden. *Ibis* 131: 205–213.

WRIGHT, R.G., R.N. PAISLEY, AND J.F. KUBISIAK. 1996. Survival of Wild Turkey hens in southwestern Wisconsin. *J. Wildl. Manage.* 60:313–320.

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A HELPER AT THE NEST OF PEREGRINE FALCONS IN NORTHERN JAPAN

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KEY WORDS: *Peregrine Falcon*; Falco peregrinus japonensis; *feeding*; *helper*; *juvenile*; *territory*.

Peregrine Falcons (*Falco peregrinus*) are widely distributed throughout the world, and primarily breed in monogamous pairs that display aggressive territorial behavior around their nest sites (Cade 1982). Despite numerous studies of this species in Europe, North America, and elsewhere (e.g., Cade et al. 1988), information on the ecology of Peregrine Falcons (*F. p. japonensis*) in East Asia is very limited. Cooperative breeding is infrequent in this species (Skutch 1987) with reported exceptions in North America and in France (Spofford 1969, Monneret 1983). Here, we describe an observation of helping at the nest of a Peregrine Falcon in Hokkaido, northern Japan.

STUDY AREA AND METHODS

We recorded observations on the behavior and the breeding status of Peregrine Falcons for about 120 hr each year from 1993–2002 at a study site on the Etomo Peninsula in Muroran Hokkaido, northern Japan (42°19′N, 140°59′E). Six pairs of non-migratory Peregrines (pairs B to G) occur on a 10-km stretch of vertical cliffs, part of which is more than 100 m in height, along the narrow Etomo Peninsula (1.0–3.5 km in width; Kumagai 1989, Ueta et al. 1995). The six sites fledged 1.1 young (±1.1 SD) per pair per year from 1993–2002. This peninsula is also a major landfall and point of departure for migrating songbirds and raptors, and in 1998 the banding station on the peninsula recorded 57 species of small- to medium-sized land birds (T. Banno pers. comm.), which are suitable prey for Peregrines in Japan (Yamada 2002).

We used 20× binoculars and a 77× spotting scope to make observations. Because no peregrines in Japan have been marked, we attempted to identify individual birds by their characteristic features such as malar patches, ventral marks (Enderson and Craig 1988), favorite look-out perches and behavior toward the observers.

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RESULTS AND DISCUSSION

The territorial pairs in the study area usually showed aggression toward intruding peregrines that flew <5 m above, or close to (<100 m) the nesting cliffs. On 17 March 2001, however, we observed a Peregrine with vertically striped breast and belly perched on a crossarm of a power pylon about 3 m from an adult male in the territory of the "F" pair. The former was obviously larger than the adult male. The adult male showed no sign of aggression toward this juvenile. About 5 min later, the juvenile peregrine departed to chase a feral rock dove (*Columba livia*), but came back without the prey and probably perched out of sight on the cliff, ca. 100 m from the male. An adult pair had been seen together on the wing at this site two days earlier, on 15 March. Moreover, later on 17 March we observed a copulation between the adult pair on the nesting cliff.

On 24 May 2001, a peregrine with juvenile plumage carried a small prey item into the nest of the same pair. There were three nestlings with white down in the nest; they appeared to be about 2-wk old. The juvenile fed the nestlings for about 10 min and then flew around the point to the other side of the cliff. During this feeding bout, the adult pair were out of sight and neither called or came to chase away the juvenile. The territorial adult female glided by the nesting cliff about 20 min after this feeding. The clutch of three young fledged successfully in mid-June, when this juvenile helper was no longer observed at this site.

Peregrine Falcons have a broad range of post-nesting dependency periods, and particularly, non-migratory populations of falcons are reported to have prolonged juvenile-dependency periods (Sherrod 1983). In our study area, some juvenile peregrines were observed to stay in the natal territories long after the breeding season; five cases recorded in October (ca. 4 mo after fledging), one in December, and two in March. We assumed that these juveniles were the offspring of the territory owners for several reasons. First, they provoked no aggression from the territorial pairs. Secondly, no tolerated juveniles were observed in the territories of the pairs that failed to raise broods that year or the previous year.

Similar to our observations, Monneret (1983) reported the helping behavior of juvenile peregrines at nests of adult pairs in the 1970s and 1980s. He suggested that juveniles were tolerated in their natal territories well into the breeding season, through the period when eggs and nestlings were present. The appearance of chicks probably triggered brooding or feeding behavior by the juveniles, inducing them to become helpers at the nests. Monneret emphasized the importance of the kinship of the adult pair to the third falcon for the development of helping behavior to occur, because the parents would tolerate their own young more easily than strangers in their territory. Delayed dispersal is a common route to the evolution of cooperative breeding in many birds including raptors (Kimball et al. 2003).

Recent reviews on cooperative breeding suggest that both ecological constraints and life history traits such as low adult mortality and low dispersal rate are important factors in the evolution of cooperative breeding (Arnold and Owens 1999, Hatchwell and Komdeur 2000). Peregrines nest on cliffs over much of their range, which restricts their breeding distribution (Newton 1988). They are relatively long-living with low adult mortality (Ratcliffe 1993). Also this species is known to be philopatric (Newton and Mearns 1988). Therefore, Peregrine Falcons in Muroran Hokkaido may provide an interesting example of an early stage in the evolution of a cooperative breeding system. This sporadically-expressed behavior should be monitored and documented in other peregrine studies and observers should look for factors that correlate with and may foster this breeding system.

RESUMEN.—Lo halcones peregrinos (*Falco peregrinus*) usualmente procrean en parejas monogamas que despliegan un comportamiento territorial agresivo alrededor de sus sitios nido. A pesar de su territorialidad y agresión hacia los intrusos, una hembra juvenil fue observada en el territorio de una pareja adulta durante la estación reproductiva en un sitio de anidación del halcón peregrino (*F. p. japonensis*) en Muroran, Hokkaido, norte del Japón. Esta trajo comida y alimento a los polluelos de la pareja que estaba anidando sin que fuera expulsada. Adicionalmente a este individuo, otros juveniles fueron tolerados en sus territorios natales largo tiempo después de la estación reproductiva, lo cual puede ocasionalmente conducir a que cooperen en el nido, en la región de Hokkaido. Esta especie en el norte del Japón puede ser un ejemplo interesante de un temprano estado en la evolución de la reproducción cooperativa en rapaces.

[Traducción de César Márquez]

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LITERATURE CITED

ARNOLD, K.E. AND I.P.F. OWENS. 1999. Cooperative breeding in birds: the role of ecology. *Behav. Ecol.* 10:465–471.

CADE, T.J. 1982. The falcons of the world. Cornell Univ. Press, Ithaca, NY U.S.A.

———, J.H. ENDERSON, C.G. THELANDER, AND C.M. WHITE. 1988. Peregrine Falcon populations: their

management and recovery. The Peregrine Fund, Boise, ID U.S.A.

ENDERSON, J.H. AND G.R. CRAIG. 1988. Population turnover in Colorado Peregrines. Pages 685–688 *in* T.J. Cade, J.H. Enderson, C.G. Thelander, and C.M. White [EDS.], Peregrine Falcon populations: their management and recovery. The Peregrine Fund, Boise, ID U.S.A.

HATCHWELL, B.J. AND J.KOMDEUR. 2000. Ecological constraints, life history traits and the evolution of cooperative breeding. *Anim. Behav.* 59:1079–1086.

KIMBALL, R.T., P.G. PARKER, AND J.C. BEDNARZ. 2003. The occurrence and evolution of cooperative breeding among the diurnal raptors (Accipitridae and Falconidae). *Auk* 120:717–729.

KUMAGAI, M. 1989. "Etomo hanto ni ikiru Hayabusa tachi" (Peregrines on the Etomo Peninsula). *Anima* 196:59–64.

MONNERET, R-J. 1983. L'aide à l'élevage chez le Faucon pèlerin. *Alauda* 4:241–250.

NEWTON, I. 1988. Commentary—population regulation in Peregrines: an overview. Pages 761–770 *in* T.J. Cade, J.H. Enderson, C.G. Thelander, and C.M. White [EDS.], Peregrine Falcon populations: their management and recovery. The Peregrine Fund, Boise, ID U.S.A.

NEWTON, I. AND R. MEARNS. 1988. Population ecology of Peregrines in south Scotland. Pages 651–665 *in* T.J. Cade, J.H. Enderson, C.G. Thelander and C.M. White [EDS.], Peregrine Falcon populations: their management and recovery. The Peregrine Fund, Boise, ID U.S.A.

RATCLIFFE, D.A. 1993. The Peregrine Falcon, 2nd Ed. T. & A.D. Poyser, London, U.K.

SHERROD, S.K. 1983. Behavior of fledgling Peregrines. The Peregrine Fund, Ithaca, NY U.S.A.

SKUTCH, A.F. 1987. Helpers at birds' nests. Univ. of Iowa Press, Iowa City, IA U.S.A.

SPOFFORD, W.R. 1969. Extra female at a nesting site. Pages 418–419 *in* J. Hickey, [ED.], Peregrine Falcon populations: their biology and decline. The Univ. of Wisconsin Press, Madison, WI U.S.A.

UETA, M., R. KUROSAWA, AND T. KUROSAWA. 1995. The home ranges of Peregrine Falcons in the Etomo Peninsula, Hokkaido. Pages 83–89 *in* "Kisho yasei doushokubutushu seisokujokyo chosa hokokusho" (Reports on the status of rare wildlife: Steller's Sea Eagle, Goshawk, and Peregrine Falcon). The Environment Agency, Tokyo, Japan.

YAMADA, I. 2002. Status of Peregrine Falcons *Falco peregrinus* in the Setouchi District, western Japan. *Goshawk* 3:4–8.

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TWO CASES OF COOPERATIVE BREEDING IN EURASIAN HOBBIES

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KEY WORDS: *Eurasian Hobby*; Falco subbuteo; *cooperative behavior*; *polyandry*; *polygamy*.

Polygamy is a common mating system in birds (Alcock 1993), and it can involve either polygyny (a male breeding with two or more females) or polyandry (a female breeding with two or more males). A recent review of literature shows that group breeding has been documented in 42 species of diurnal raptors (Kimball et al. 2003). Furthermore, these authors suggest that cooperative breeding is more common in terms of the number of species and in frequency than the available data indicate. In addition, they reported that 21 species of raptors showed polyandrous behavior and four other species may be polyandrous.

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