

NOCTURNAL FLIGHT BY MIGRANT "DIURNAL" RAPTORS

ROBERT W. RUSSELL¹

Cape May Bird Observatory

P.O. Box 3

Cape May Point, New Jersey 08212 USA

Abstract.—Observations of migrant Northern Harriers (*Circus cyaneus*) during the night at Cape May Point, New Jersey, suggest that hawk migration does not take place entirely by day as has previously been asserted. Occasional nocturnal flight by migrating falconiform raptors may represent an adaptive behavioral response to varied or changing weather or feeding conditions encountered en route.

VUELOS NOCTURNOS POR PARTE DE RAPACES MIGRATORIOS DIURNOS

Sinopsis.—Observaciones nocturnas de individuos migratorios de *Circus cyaneus*, llevadas a cabo en Cape May Point, New Jersey, sugieren que la migración de esta ave no se lleva a cabo exclusivamente durante horas diurnas. Vuelos nocturnos ocasionales llevados a cabo por Falconiformes migratorios podrían representar un patrón de conducta adaptativo a variaciones o cambios climatológicos y/o disponibilidad de alimento que puedan encontrarse a lo largo de la ruta.

A dominant idea in the raptor literature is that hawk migration is strictly diurnal (Brown and Amadon 1968, Heintzelman 1986, Newton 1979). Brown and Amadon (1968:64) claimed that "hawk migrations take place entirely by day," and Heintzelman (1986:40) agreed that "no satisfactory scientific data support statements that some species [of North American falconiform raptors] normally engage in nocturnal activity and/or migrations in addition to their diurnal behavior." Here I report some nocturnal observations of migrant Northern Harriers (*Circus cyaneus*). These observations suggest that "diurnal" raptors may occasionally migrate at night.

METHODS AND RESULTS

From 11 October to 10 November 1982, I conducted a nocturnal study of migrating owls at Cape May Point, New Jersey (ca. 38°56'N, 74°58'W). I used Zeiss 10× binoculars and an AN/PVS-3A night vision (image intensifier) scope to make observations, which were aided by sky glow, moonlight, ambient light from the towns of Cape May and Cape May Point, and the Cape May Point lighthouse beam. For further details on observation methods and a description of the study site, see Russell et al. (1991).

On 15 October at 0020 hours and again on 22 October at 0107 hours I observed individual migrant Northern Harriers. I obtained unambiguous views of the first individual in the lighthouse beam. I first noticed

¹ Current address: Department of Ecology and Evolutionary Biology, University of California, Irvine, California 92717 USA.

the second bird in natural light, and subsequently watched it in the night scope as it flew out over Delaware Bay. I estimated the altitude of the first bird to be 52 m in relation to the known height of the lighthouse, whereas the second bird's altitude was approximately 20 m. The tracks of both birds were straight, and their vanishing bearings were approximately 245° and 235°, respectively. The flight paths of both birds were similar to that generally used by harriers migrating in the day (pers. obs.). Neither bird appeared to be attracted to the lighthouse beam; rather, these were fortuitous observations of naturally behaving individuals.

DISCUSSION

Were these birds truly migrating, or could they have been local residents or stopped-over migrants foraging in the area? During their breeding season, Northern Harriers have been observed hunting 30 min before sunrise (Martin 1987), and during winter they often hunt in coastal marshes at first light and throughout evening civil twilight (pers. obs.). Whereas crepuscular foraging behavior is documented for this species, nocturnal foraging by Northern Harriers has never, as far as I am aware, been reported. Furthermore, these birds did not behave as if they were foraging. Foraging harriers typically fly within 10 m of the ground or surface vegetation at my study site (pers. obs.). The vanishing bearings of both birds were in the direction of their presumed destination (Delaware), and the second bird flew out over Delaware Bay; migrating Northern Harriers are known to undertake water crossings readily (Kerlinger 1989). In sum, the circumstances under which I observed the birds strongly suggested that they were migrating.

Most previous allusions to nocturnal migration of hawks have been based on ambiguous evidence (e.g., Christie 1983). Nocturnal movements are best documented for Peregrine Falcons (*Falco peregrinus*). Disparities between counts of peregrines seen on Texas beaches at first light and observations from the previous evening suggested that birds were arriving during the night (Enderson 1965). In studies using radiotelemetry, Cochran (1985) found that migration by peregrines over the ocean was common and frequently nocturnal. Away from the coast, however, a peregrine that was radio-tracked from Wisconsin to Mexico did not migrate at night (Cochran 1975).

As water crossings of over 500 km cannot always be completed during one day, nocturnal flight may be necessary for individuals whose migration routes include extensive overwater flights (Kerlinger 1989, MacRae 1985). Nocturnal flight may also be an involuntary consequence of adverse weather conditions encountered during a diurnal water crossing (Beaman and Galea 1974). Some of the peregrines tracked by Cochran (1985), however, initiated non-obligatory overwater flights in the evening and returned to land before dawn, indicating that nocturnal flight by these individuals was voluntary and not simply a consequence of encountering an extensive water barrier or adverse conditions while en route. These peregrines spent much of the night soaring (Cochran 1985), indicating that they were

exploiting the thermal convection that can develop over the ocean (Woodcock 1975).

Harwood (1980, cited in Heintzelman 1986) speculated that some hawks may migrate at night following nocturnally migrating prey. While there is no evidence to support this hypothesis, such an explanation is perhaps tenable for Northern Harriers, which are able to locate prey acoustically (Rice 1982). In addition, for hawks that, like harriers, frequently engage in powered flight (as opposed to soaring) during migration, overland flight may be energetically less costly at night than during the day because of characteristics specific to the nocturnal atmosphere (e.g., cool dense air, more laminar winds; see Kerlinger and Moore [1989] for further details).

Migrating birds encounter a wide range of weather and feeding conditions en route, and natural selection should favor the maintenance of behavioral plasticity in migrant species (Kerlinger 1989, McIntyre and Barr 1983, Morse 1980). Thus, while it is possible that nocturnal observations of migrant hawks derive from spurious circumstances (e.g., Cochran claimed that one of his birds was attempting to evade repeated attacks by ferocious mosquitoes), it seems more likely that flight by night represents a "local" strategy (*sensu* Martin 1990) adopted by some falconiform raptors to cope with unusual environmental situations at certain locations along the migratory route. My observations and other evidence suggest that current views on the diel timing of hawk migration may be biased by the prevalence of diurnal observations by hawkwatchers, and consequently in need of reevaluation.

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