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NATAL ORIGINS AND WINTER SITE FIDELITY OF ROUGH-LEGGED HAWKS WINTERING IN CALIFORNIA

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Rough-legged Hawks (*Buteo lagopus*) are a relatively common winter resident in California (Small 1974), but to date there has been no information published on the breeding areas and movements of California's wintering population. Therefore, we analyzed encounters of banded birds to document natal origins, site fidelity, and migratory movements of Rough-legged Hawks wintering in California.

All currently known banding encounters ($N = 16$) involving Rough-legged Hawks in California were analyzed for this study. The Bird Banding Laboratory, U.S. Fish and Wildlife Service, provided 13 banding encounters of Rough-legged Hawks recovered in California or banded in California and recovered elsewhere between 1966 and 1991. In addition, three recaptures of banded birds were used in this study. P.H. Bloom captured and/or recaptured six birds using bal-chatris (Berger and Mueller 1959) baited with two domestic House Mice (*Mus musculus*) or one House Mouse in combination with other domestic rodents or House Sparrows (*Passer domesticus*; Bloom 1987).

Four encounters (Nos. 1–3 and 5) were of nestling Rough-legged Hawks banded on their natal areas and recovered during the winter period in California (Table 1). Three nestlings were banded in July at three different locations on the Colville River, Alaska, and the fourth nestling was banded in August at Franklin, Banks Island, Northwest Territories. A fifth banding encounter from a natal area was an immature (HY) bird (No. 4) that was banded September 1988 near Delta, Alaska and found dead August 1990 near Santa Cruz, California. The summer recovery date for bird No. 4 is atypical because it was found dead, and it is not known when the bird died. The four Alaska birds were recovered at different locations in California (Table 1).

Ten birds were banded in California and one bird was banded in Nevada during the winter period between November and February; all were recovered between December and April (Table 1). Of these 11 birds, 4 (36%, Nos. 9, 10, 15 and 16) were banded in California and recovered or recaptured in the same Lat-Long block where banded. Bird No. 15, banded by P.H. Bloom as an HY in December 1977, was recaptured in December 1978 in the same field where initially banded, while No. 16 was recaptured in January 1988 within 1.6 km of the banding location of February 1987 (L. Spiegel and P. Detrich pers. comm.). Three birds (27%, Nos. 6, 12 and 14) were recovered one Lat-Long block from the initial banding block, and four birds (36%, Nos. 7, 8, 11 and 13) were banded at different locations in California and Nevada and recovered at different locations in California, Oregon, and Nevada.

The length of time between banding and recovery for the 16 encounters averaged 540 ± 697 SD d. Young of the year (L and HY) ($N = 7$) birds averaged 413 ± 304 SD d between banding and recovery, while older birds (AHY, SY, ASY, U) banded on the wintering grounds averaged 640 ± 903 SD ($N = 9$) d. The difference between recovery periods for young of the year and older birds was

Table 1. Banding encounters of 16 Rough-legged Hawks recovered in California or banded in California and recovered elsewhere (L = Local, HY = Hatch Year, AHY = After Hatch Year, SY = Second Year, ASY = After Second Year, U = Unknown). The Lat-Long number represents the southeast corner of the 10-min block of latitude and longitude within which the encounter occurred.

BANDED				RECOVERED		
LOCATION	DATE	AGE	LAT-LONG	LOCATION	DATE	LAT-LONG
1. Umiat, AK	23/07/71	L	690-1541	Newell, CA	03/12/71	415-1212
2. Ocean Point, AK	09/07/85	L	700-1513	McArthur, CA	21/11/85	412-1203
3. Ocean Point, AK	21/07/88	L	700-1513	Klamath, CA	19/01/89	414-1241
4. Delta, AK	11/09/88	HY	634-1443	Santa Cruz, CA	15/08/90	370-1220
5. Banks Is., NW Terr.	06/08/75	L	715-1244	Sacramento, CA	15/02/78	383-1213
6. Rosamond Lake, CA	09/12/72	HY	344-1181	Rosamond Lake, CA	–/02/74	345-1180
7. Bishop Creek, CA	29/11/74	Unk	372-1183	Winnemucca, NV	22/12/82	405-1174
8. McKessick Peak, CA	03/01/76	AHY	401-1202	Malheur Lake, OR	01/04/76	432-1185
9. Pit River, CA	19/01/78	ASY	410-1210	Pit River, CA	26/04/78	410-1210
10. Fieldbrook, CA	22/01/85	SY	405-1240	Fieldbrook, CA	04/03/85	405-1240
11. Petrolia, CA	25/02/85	ASY	402-1242	Newell, CA	17/04/87	415-1212
12. Lancaster, CA	05/12/87	AHY	344-1181	Lancaster, CA	18/01/89	344-1180
13. Washoe Lake, NV	06/02/66	AHY	391-1193	Burns Reservoir, CA	22/12/66	373-1202
14. Bishop, CA	06/12/89	ASY	372-1183	Crowley Lake, CA	27/12/91	373-1184
15. Rosamond Lake, CA	03/12/77	HY	344-1181	Rosamond Lake, CA	10/12/78	344-1181
16. Dayton, CA	07/02/87	AHY	393-1215	Dayton, CA	31/01/88	393-1215

not significantly different (Mann-Whitney U-test, $U = 29.0$, $P < 0.780$). The shortest period was 41 d (No. 10), and the longest period was 8 years and 24 d (No. 7). Mortality causes were known for eight birds. One bird was shot (No. 6), and five birds were hit by automobiles (Nos. 3, 7, 10, 12 and 14). The remaining two birds died by hitting wires or towers (Nos. 9 and 11). A ninth bird (No. 8) was found dead on a road, indicating it may have been hit by a car.

In North America, Rough-legged Hawks breed across western and northern Alaska and northern Canada. Their winter range extends from southern Alaska south to southern California across Arizona, New Mexico, Texas, Missouri, Tennessee, and Virginia (American Ornithologists' Union 1983). Our results showed that Rough-legged Hawks wintering in California breed in several locations including the Colville and Tanana rivers, Alaska, and Banks Island, Northwest Territories, Canada.

The five recoveries in California of birds banded at natal areas suggest that Rough-legged Hawks from the western part of their breeding range migrate to the western part of their wintering range. Therefore, there may be a longitudinal migration corridor for Rough-legged Hawks west of the Rocky Mountains (Table 1). In addition, three birds from the Colville River were recovered at different locations indicating that birds from the same natal area may not necessarily winter in the same area.

Several authors have reported that Rough-legged Hawks maintain winter territories (Brown and Amadon 1968, Craighead and Craighead 1969, Newton 1979, Watson 1986a). Our data suggest that some Rough-legged Hawks maintain winter territories because two birds (Nos. 9 and 10) were recovered in the same Lat-Long block during the same winter.

In addition, some Rough-legged Hawks showed a strong affinity for returning to the same area in subsequent winters. Four encounters occurred in the same Lat-Long block where the birds were banded, and three encounters occurred in adjacent Lat-Long blocks. It should be noted, however, that distances between banding and recovery for encounters from adjacent Lat-Long blocks may be as close as encounters within the same Lat-Long block. The four birds recovered at locations different than where banded indicated that Rough-legged Hawks may use different wintering areas in subsequent winters, or these hawks were in transition between their breeding and wintering areas.

Wintering populations of Rough-legged Hawks fluctuate due to local prey conditions (Brown and Amadon 1968, Baker and Brooks 1981, Watson 1986b). Therefore, Rough-legged Hawks should be expected to move about during the same and subsequent winters in response to changes in prey populations, and birds would remain on their wintering territories when prey populations are adequate. In addition, weather conditions, particularly snow depths and ambient temperature, are known to influence Rough-legged Hawk populations by influencing availability of prey (Thiel 1985, Watson 1986b). Also, Watson

(1986a) found that Rough-legged Hawks shifted winter territories in response to inclement weather.

Most hawks in our sample were trapped or recovered in agricultural valleys. The observation that a substantial proportion of recoveries of Rough-legged Hawks showed strong winter site fidelity in subsequent years has important conservation implications since many of these agricultural areas in California are being lost to development (Garrison and Bloom pers. observation). Therefore, the link between natal and wintering areas suggests that the continued stability of Alaskan and Canadian breeding populations is predicated, in part, upon conservation of wintering areas, as noted by Bosakowski and Smith (1992) in southern New Jersey. This linkage has also been described by Terborgh (1989) for neotropical migrant birds breeding in North America where population stability is tied to habitat fragmentation on their wintering grounds in Central and South America.

RESUMEN.—Un total de 16 *Buteo lagopus* marcados fueron avistados en California y analizados para determinar sus áreas de nacimiento y fidelidad al sitio de invernada en California. Cinco aves, cuatro polluelos y un inmaduro, que fueron marcadas durante la estación reproductiva en tres diferentes localidades de Alaska y una en Canadá, fueron recuperadas en California durante el invierno. La localización occidental de las áreas natales indican la posibilidad de un corredor de migración longitudinal, donde *B. lagopus* puede migrar desde la parte oeste de su rango reproductivo hasta la parte oeste de su rango de invernada. Siete de los 11 (64%) encuentros de aves marcadas en las zonas de invernada ocurrieron en el mismo o en las inmediaciones de un cuadrante de 10 minutos de latitud-longitud, indicando que la mayoría de los *B. lagopus* presentaban fidelidad al sitio de invernada. No obstante, cuatro de los once (36%) encuentros tuvieron una diferencia sustancial entre su localización de marcaje y de recuperación, indicando que *B. lagopus* también puede presentar un movimiento considerable entre sitios de invernada.
[Traducción de Ivan Lazo]

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