MIGRATION AND MORTALITY OF SHARP-SHINNED HAWKS RINGED AT DULUTH, MINNESOTA, USA

DAVID L. EVANS[1] & ROBERT N. ROSENFIELD[2]

1 *2928 Greysolon Road, Duluth, MN 55812, USA*
2 *College of Natural Resources, University of Wisconsin—Stevens Point, Stevens Point, WI 54481, USA*

ABSTRACT

About 0.5 percent of all Sharp-shinned Hawks ringed at Duluth, Minnesota, on migration were recovered, showing that the winter distribution spanned about 35° of latitude, from central Wisconsin to Costa Rica. Females migrated before males of corresponding age, and wintered substantially further south.

INTRODUCTION

The western tip of Lake Superior is well known as a concentration point for raptor migration (Hofslund 1966; Harwood 1975). We have operated a raptor migration research station since 1972 at the Hawk Ridge Nature Reserve, Duluth, Minnesota. From 1972 to 1980, we captured 15,647 of 66,069 (23.0%) Sharp-shinned Hawks (*Accipiter striatus*) observed on fall migration. Captured birds were aged, sexed, ringed with U.S. Fish and Wildlife Service leg bands and released. We know of 73 (0.47%) recoveries of Sharp-shins ringed at Duluth during this period. We grouped the recoveries into four seasons for some of the analyses: Fall (16 August to 31 October), Winter (1 November to 28 February), Spring (1 March to 15 May) and Summer (16 May to 15 August).

PROPORTION RECOVERED

Major causes of recovery were, in order of decreasing frequency: birds found dead, collision with windows, shooting, and recapture at other ringing stations (*Table 1*). All but one of the 13 birds reported as shot occurred south of the United States–Mexico border. We suspect that the incidence of shot birds in the United States may have been higher, but such birds were reported as 'found dead' due to fear of reprisal from law enforcement agencies. Eight Sharp-shins were released alive from other ringing stations and six after recovery from other causes. Analysis of the remaining 59 indicated that the proportion recovered dead was considerably higher for females than for males (*Table 2*); the recoveries in winter and spring

Table 1: Causes of recovery of Sharp-shinned Hawks ringed at Duluth, Minnesota.

Cause	Recovered	Recovered dead[1]
Found dead	26	26
Collision with window	15	13
Shot	13	13
Trapped at ringing station	8	0
Miscellaneous	11	7
Total	73	59

Note: 1. Recovered minus those released alive.

Table 2: Proportion of Sharp-shinned Hawks ringed at Duluth, Minnesota, which were recovered.

Year	Numbers banded		Numbers recovered dead		% recovered[1]	
	Male	Female	Male	Female	Male	Female
1972	66	93	0	0	0.00	0.00
1973	387	317	0	2	0.00	0.63
1974	868	711	5	2	0.58	0.28
1975	1,061	861	5	5	0.46	0.58
1976	1,856	1,321	4	11	0.22	0.83
1977	994	1,056	2	5	0.20	0.47
1978	948	1,138	5	5	0.53	0.44
1979	835	891	2	3	0.24	0.34
1980	1,106	1,121	1	2	0.09	0.18
Total	8,138	7,509	24	35	0.29	0.47

Note: $t = -1.56$, 8df, $0.1 < P < 0.2$.

Table 3: Seasonal distribution of recoveries of male and female Sharp-shinned Hawks ringed at Duluth, Minnesota.

Season	Numbers recovered dead		% recovered		Proportion of males/females
	Male	Female	Male	Female	
Fall	6	4	0.07	0.05	0.7
Winter	9	14	0.11	0.19	1.7
Spring	6	14	0.07	0.19	2.5
Summer	3	3	0.04	0.04	1.1

Table 4: Seasonal distribution of recoveries of immature and adult Sharp-shinned Hawks ringed at Duluth, Minnesota.

Season	Numbers (%) of immatures	Numbers (%) of adults
Fall	7 (26.9)	3 (9.1)
Winter	12 (46.2)	11 (33.3)
Spring	4 (15.4)	16 (48.4)
Summer	3 (11.5)	3 (9.1)
Total	26 (100.0)	33 (100.0)

contributed predominantly to the disparity (*Table 3*). Although the proportion of juveniles recovered dead was highest in fall and winter, almost 50 percent of the adults recovered dead came in spring (*Table 4*). Over 70 percent of the spring recoveries were north of 41°N and within 700km of Duluth, as Sharp-shins approached or entered the breeding range. Thus it appears that the rigours of spring migration may cause a high proportion of adult mortality.

MIGRATION ROUTES AND WINTERING AREAS

Recoveries suggested that Sharp-shinned Hawks migrated from Duluth in a southeasterly direction to about 40°N (Illinois) and then south-west toward eastern Texas and Mexico (*Figure 1*). This pattern conformed to the prevailing winds encountered by birds along the migration route (Mueller & Berger 1967).

Sharp-shins recovered in winter spanned about 35° in latitude, from central Wisconsin to southern Costa Rica, some 4200km from Duluth (*Figure 2*). Females migrated before males of corresponding age (Rosenfield & Evans 1980) and wintered substantially farther south ($t = 1.92$, 24df, $P \approx 0.07$). This difference in latitude would have been significant ($t = 2.73$, 23df, $P < 0.02$) had it not been for one errant male recovered in Costa Rica, our farthest recovery. The mean latitude of winter recoveries was 33°20′ N for males and 24°50 N for females, a difference of more than 900km. Only 4 of the 16 recoveries in Mexico and Central America (all seasons) were males and 9 of the 16 females recovered in winter were south of the United States. The five Sharp-shins recovered south of the United States in spring and summer (*Figures 3* and *4*) may have resulted from delayed reporting; four were reported after 1 May, when all other recoveries were north of 45°N (northern Wisconsin). If we include these five birds with the winter recoveries, on the assumption that they were at least as far south in winter, then 12 of 19 females (63%) wintered south of the United States. This longer migration may have contributed to the greater proportion of female Sharp-shins recovered dead.

Sharp-shins on spring migration appeared to retrace the general route followed during fall migration, splitting to pass around Lake Superior (*Figure 3*). The few recoveries during summer (*Figure 4*) did not reveal much about the origins of Sharp-shins passing through Duluth. Probably the bulk originated in the boreal forest regions of northern Minnesota, western Ontario, Manitoba, and possibly Saskatchewan, Alberta and British Columbia. We occasionally captured relatively dark-plumaged Sharp-shins, suggesting origins in the Pacific Northwest (Wattel 1973). Similarly, some Goshawks (*A. gentilis*) ringed at Duluth were recovered from as far as Alberta and British Columbia (Evans, unpublished data).

IMPLICATIONS OF SHARP-SHIN MIGRATION

Sharp-shinned Hawks may have suffered substantial DDE-related declines prior to 1971, particularly in the northeastern United States (Hackman & Henny 1971; Snyder *et al.* 1973; Robbins 1974). Data subsequent to the 1972 ban on DDT use in the United States indicated an upward trend (Evans 1982). It appears that at least half of the female Sharp-shins that pass through Duluth may winter in Mexico and Central America, an area where the use of DDT and other persistent organochlorines is increasing. The ramifications concerning organochlorine-induced reproductive problems in this population are unknown. The decreasing numbers of Sharp-shins relative to other hawks observed at Duluth suggest a steady decline of 30 percent since 1977. However, weather and other variables may also be responsible for these trends.

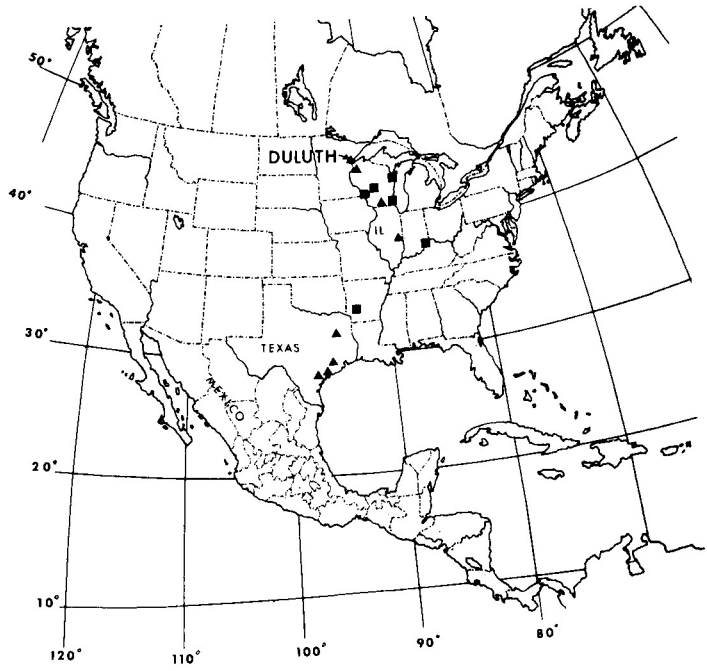

Figure 1: Fall (Autumn) recoveries of Sharp-shinned Hawks ringed at Duluth, Minnesota. Triangles = males; squares = females.

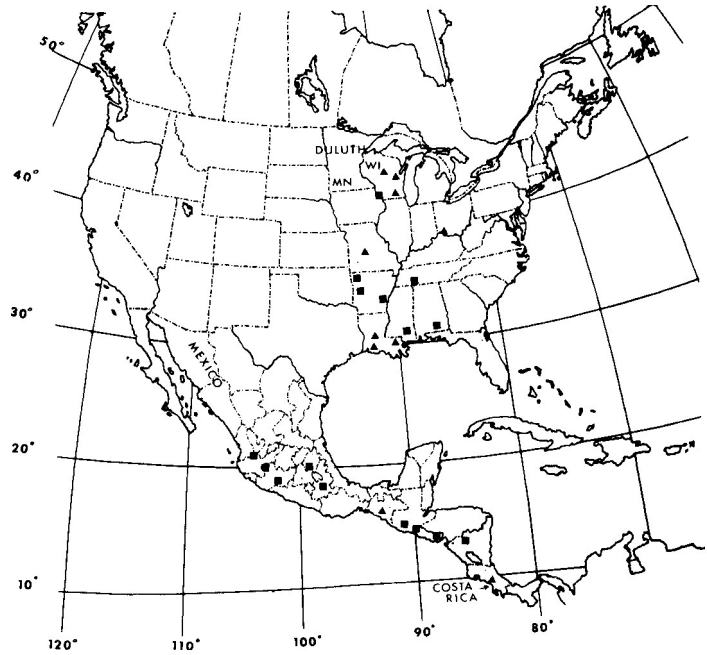

Figure 2: Winter recoveries of Sharp-shinned Hawks ringed at Duluth, Minnesota. Triangles = males; squares = females.

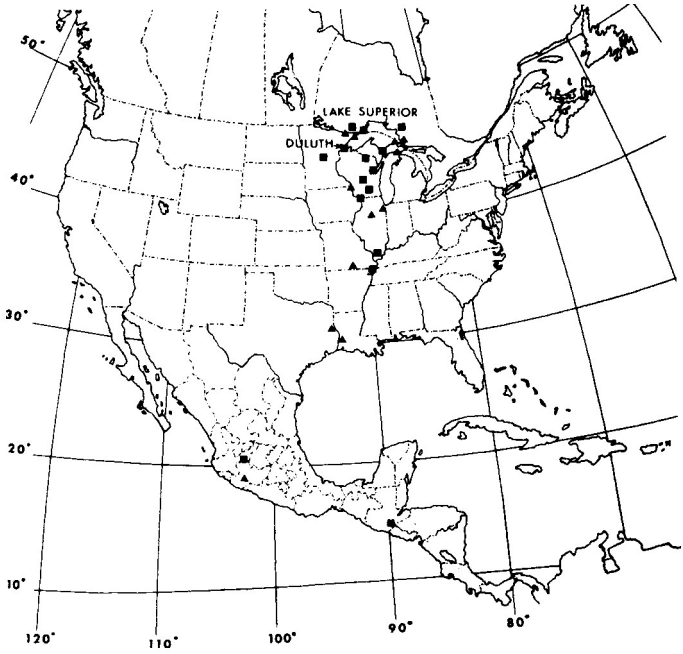

Figure 3: Spring recoveries of Sharp-shinned Hawks ringed at Duluth, Minnesota. Triangles = males; squares = females.

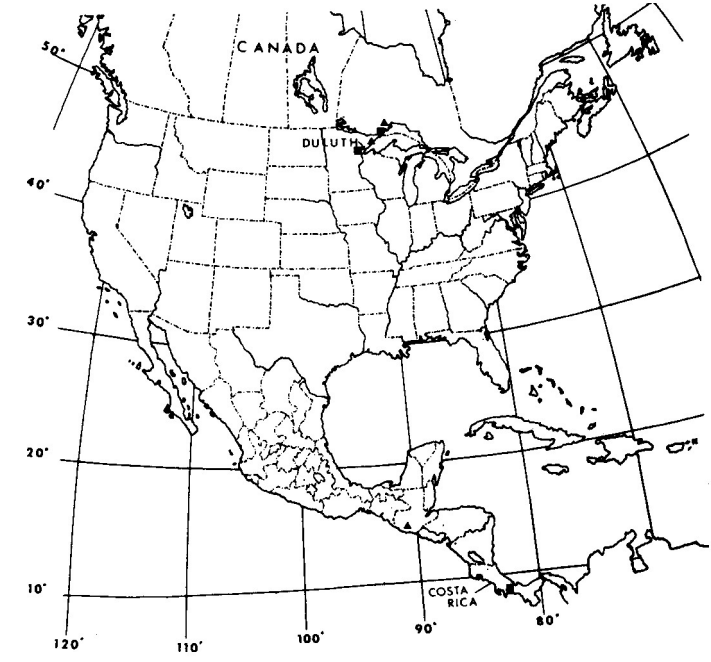

Figure 4: Summer recoveries of Sharp-shinned Hawks ringed at Duluth, Minnesota. Triangles = males; squares = females.

ACKNOWLEDGEMENTS

We thank the many contributors to Friends of Hawk Ridge and L. Carson, D. Gilbertson, G. Kristensen, D. Meier, A. Rosenfield and D. Scheer for their volunteer assistance in the research programme.

REFERENCES

EVANS, D. L. 1982. Status reports on twelve raptors. *U.S. Fish Wildl. Serv. Spec. Sci. Rep. Wildl.* **238**.

HACKMAN, C. D. & HENNY, C. J. 1971. Hawk migration over White Marsh, Maryland. *Chesapeake Sci.* **12**, 137–41.

HARWOOD, M. (editor) 1975. *Proceedings of the North American Hawk Migration Conference.* April 18–21, 1974, Syracuse, New York. Hawk Migration Assoc. of N. America.

HOFSLUND, P. B. 1966. Hawk migration over the western tip of Lake Superior. *Wilson Bull.* **78**, 79–87.

MUELLER, H. C. & BERGER, D. D. 1967. Fall migration of Sharp-shinned Hawks. *Wilson Bull.* **79**, 397–415.

ROBBINS, C. S. 1975. A history of North American hawkwatching. Pages 29–40. *In:* Harwood, M. (ed.), *Proc. N. American Hawk Migration Conf.*, April 18–21, 1974, Syracuse, New York. Hawk Migration Assoc. of N. America.

ROSENFIELD, R. N. & EVANS, D. L. 1980. Migration incidence and sequence of age and sex classes of the Sharp-shinned Hawk. *Loon* **52**, 66–9.

SNYDER, N. F. R., SNYDER, H. A., LINCER, J. L. & REYNOLDS, R. T. 1973. Organochlorines, heavy metals, and the biology of North American accipiters. *BioScience* **23**, 300–5.

WATTEL, J. 1973. Geographical differentiation in the Genus *Accipiter*. *Publ. Nuttall Ornithol. Club* **13**.