

Status and Conservation of North American Raptors Migrating to the Neotropics

Stanley E. Senner & Mark R. Fuller

INTRODUCTION

We initiated correspondence and reviewed recent literature to assess the status and knowledge of raptors that breed in the northern areas of the Western Hemisphere (Greenland, Canada and the United States) then migrate to Latin America (comprising Mexico, the West Indies, Central America and South America). We concentrated on the nonbreeding season because generally little is known about the conservation needs of birds away from their breeding grounds (Karr 1980), and recent information about the status of raptors in Latin America mostly concerned resident species (Chancellor & Meyburg 1986). We considered three general topics for this brief overview: 1) Distribution, 2) Ecology and 3) Conservation. We present some references to recent work, and describe some situations representative of the topics we reviewed.

DISTRIBUTION

We assigned migratory raptors to one of three categories according to the approximate proportion of the population that migrates to Latin America (Table 1). Species in the marginal category have a small percentage of individuals leaving the northern areas and then mostly into Mexico (e.g. *Buteo regalis*, Schmutz & Fyfe 1987). Among species in our regional category, individuals from certain geographic areas leave the northern areas, but birds from other areas do not enter Latin America. Continental migrants are those species in which nearly all individuals fly to Latin America. These categories provide a framework to begin considering the biological and socio-political factors that influence conservation strategies. However, conservation usually is implemented at a much more localised scale than that of these categories, so we reviewed information about the migration pathways and other areas occupied by migratory raptors during the nonbreeding season.

Raptor migration routes are well-known in the eastern half of southern Canada and the United States, but in the western regions migrants do not become as concentrated as in the east, and biologists are still discovering areas where birds regularly pass on migration (Haugh 1986; Harwood 1985). Descriptions of raptor migration in Mexico have been published for the eastern coast and mountains (Andrle 1966, 1968; Thiollay 1980), and observations continue there (R. Dominguez-Barradas, pers. comm.). From southern Mexico to Panama the fieldwork to locate migration

routes and describe raptor flights has just begun (e.g. J.C. Martinez-Sanchez, Nicaragua; L. Villar Anleu, Guatemala; pers. comm.). In Panama, Smith (1980, 1985a) has described the semiannual migrations in detail. We are not aware of any studies of raptor migration in South America and know of only a few people making incidental observations (e.g. H. Alvarez-Lopez, Colombia; N. Hilgert de Benevides and T. De Vries, Ecuador; T. Luscombe and D. Ricalde, Peru; pers. comm.).

TABLE 1. Categories of migration by raptors that breed in Greenland, Canada and the United States and migrate to Latin America.

Marginal

Ferruginous Hawk (*Buteo regalis*)
Red-tailed Hawk (*B. jamaicensis*)
Golden Eagle (*Aquila chrysaetos*)
Prairie Falcon (*Falco mexicanus*)
Barn Owl (*Tyto alba*)

Regional

Turkey Vulture (*Cathartes aura*)
Cooper's Hawk (*Accipiter cooperii*)
Sharp-shinned Hawk (*A. striatus*)
Northern Harrier (*Circus cyaneus*)
Merlin (*Falco columbarius*)
American Kestrel (*F. sparverius*)
Long-eared Owl (*Asio otus*)
Short-eared Owl (*Asio flammeus*)
Burrowing Owl (*Athene cunicularia*)
Elf Owl (*Micrathene whitneyi*)

Continental

Mississippi Kite (*Ictinia mississippiensis*)
Swallow-tailed Kite (*Elanoides forficatus*)
Swainson's Hawk (*Buteo swainsoni*)
Broad-winged Hawk (*B. platypterus*)
Zone-tailed Hawk (*B. albonotatus*)
Osprey (*Pandion haliaetus*)
Peregrine Falcon (*Falco peregrinus*)

It is useful to locate and describe congregations of migrating raptors, because in concentration areas the raptors resource needs (e.g. food, roosting sites) are high and the populations are more susceptible to such threats as persecution or environmental contaminants. When migratory routes and the relative number of migrants are known, we can attempt more effective resource management.

Similarly, it is important to know the distribution of the raptors during the period between migrations, while they remain in Latin America. We found little material available to modify general descriptions of distribution (e.g. Brown & Amadon 1968). However, analyses of banding data have provided more information about the extent of *Accipiter striatus* migration into Latin America and a suggestion of differences among age classes and between sexes (Evans & Rosenfield 1985). Banding data also have provided information about *Falco peregrinus* (Yates *et al.* in press), *F. columbarius* (Clark 1985), *B. regalis* (Schmutz & Fyfe 1987), and *Pandion haliaetus* (Santana & Temple 1987; Poole & Agler 1987). However, even for very common raptors, such as *B. platypterus*, we have little specific data and there is only a handful of banding recoveries.

Another common migrant, *B. swainsoni*, occurs over much of South America but, as with other migrants, we know little about the extent to which some areas support greater densities than others, or to which birds of different ages or sex use separate areas. Olrog (1967) raised the possi-

bility that changes in the distribution of *B. swainsoni* might be occurring with changes in land-use (e.g. natural areas converted to pasture or crops). White *et al.* (this volume) summarized recent observations based on road surveys. They found birds in the range previously documented for Argentina; however, like previous observers, they noted the clumped distribution of hawks and problems of detectability associated with the birds foraging on the ground. Consequently they were unable to provide much insight about potential shifts in distribution. In another paper in this volume, White *et al.* document observations of *F. peregrinus* from six South American countries and describe the diversity of habitats (urban, agricultural, coastal) used by the falcons and the difficulties of conducting the surveys.

Based on the paucity of data about the distribution of northern-area raptors during the nonbreeding season in Latin America, and the difficulties of survey work described by White *et al.* (this volume), we recommend initiation of carefully planned surveys. The locations for surveys could be selected by stratified sampling, based on available information about the occurrence of birds (Fuller & Mosher 1987). Also, we believe it is important to devote some effort to locales and habitats for which there are little or no data, and we suggest that the observers record data about all raptors observed and the habitats in which they are seen.

We especially want to encourage more capture-mark-release work with migratory raptors, in the northern areas as well as in Latin America. Analyses of banding data have provided much information about bird distribution as well as almost all the data we have about the links between breeding and nonbreeding areas used by birds (e.g. Evans & Rosenfield 1985; Poole & Agler 1987; Yates *et al.* 1988). Data about linkage are very important for the conservation of migratory raptors, because evidence about the status of species in the Western Hemisphere comes mostly from surveys for nesting birds (e.g. Fyfe *et al.* 1976) and counts of migrants (e.g. Nagy 1977; Ward *et al.* in press). A decrease in the number of breeding pairs might reflect mortality suffered during the nonbreeding season (see White *et al.* this volume, both papers), while a significant trend of decline in migrants counted could be caused by reduced productivity or a loss of resources where the birds spend the nonbreeding season. Usually, before wildlife managers can attempt to mitigate a threat, biologists must detect population declines and identify where the birds encounter threats. Thus we must conduct research to link the raptors' use of migration routes with other nonbreeding areas and with areas used for nesting.

ECOLOGY

Prior to or during migration, raptors must accumulate enough energy to make their long-distance flights and must find refuge from inclement weather and predators. The ecology of migrants has received little study, but there is some documentation of food habits (e.g. Ward & Laybourne 1985; Dekker 1987), activity budgets, habitat use and duration of stay at points along migration routes (Holthuijzen *et al.* 1985; Kerlinger & Gauthreaux 1985; Ward *et al.* in press). The energy requirements for migration can be estimated (Kirkwood 1985; Smith *et al.* 1986), but we have little idea of how and where raptors capture enough prey to meet these requirements. There is conservation of wetlands and management of refuges for shorebirds and waterfowl, but at present it would be difficult to justify such practices only for raptors. Should falcons and harriers disappear from coastal barrier islands, or eagles from ridge tops, it likely will be too late, or at best very expensive, to reclaim required habitat along migration routes. To ensure adequate resources for raptors during migration, we believe it prudent to initiate ecological studies now.

The ecology of migratory raptors after their arrival in Latin America is known only generally (e.g. Brown & Amadon 1968). F. Jaksic and J. Jimenez (pers. comm.) have been studying the relationships among raptors in South America. They characterize the migrants as having to share some resources with residents, and they point out that some species specialize on super-abundant prey. *Buteo swainsoni*, for example, eat many orthopterans and coelopteran insects, and have been found in groups of more than 430 birds (White *et al.* this volume). These hawks apparently congregate where swarms of insects occur in open areas, with a few large trees which are used for roosts. Smith (1985b) contrasts the occurrence of flocks (30-300 birds) of *B. swainsoni* to that of *B. platypterus*, which are found as individuals on territories in woodland-edge habitat. Certainly management strategies and conservation concerns for these two species are different. We know of only one ecological study of *Pandion haliaetus* in Latin America; Barradas (1984) conducted an under-

graduate thesis project in Oaxaca State, Mexico. The lack of other studies is surprising because *P. haliaetus* are quite visible and have attracted much international attention, due to their population declines and recoveries and their sensitivity to environmental contaminants. In part, the scarcity of ecological data about raptors in the nonbreeding season simply results from the great variety of species and of habitats and geographic situations that exist in Latin America and from an inadequacy of funds to support field work. We encourage people to undertake studies in Latin America on comparatively common raptors. Research on common birds has fewer problems associated with obtaining adequate samples. Thus there is a better chance to learn of their resource requirements and potential threats, and greater likelihood of providing wildlife managers and policy makers with data that can lead to efficient conservation.

CONSERVATION

In Latin America, as is true anywhere, basic biological and ecological data are needed before conservation measures can be implemented. Frequently we hear concerns expressed about the general loss of habitat or environmental contamination in Latin America that threatens raptors that breed in northern areas (e.g. Ellis & Smith 1986). White *et al.* (this volume) document some of these concerns regarding *F. peregrinus* and *B. swainsoni*. To be sure, habitat loss, pollution and persecution are legitimate concerns, but documentation of their negative effects on populations will be required before expensive management and conservation efforts are initiated.

There is evidence of threats to migratory raptors. Thiollay (1984) surveyed resident raptors in areas of tropical forest where hunters killed potential prey and raptors, and he found fewer raptors there than in areas where no hunting occurred. Iñigo (1986) and Iñigo and Barradas (pers. comm.), have documented the capture and sale of raptors, including some endangered species. White *et al.* (this volume) cite studies of contaminant levels in migratory *F. peregrinus*. Wiley (1986) reports threats to *F. peregrinus* and *F. columbarius* in the West Indies, and D. Ricalde (pers. comm.) has expressed concern about the impact of housing development, water pollution, agriculture and hunting on raptors using the Cusco Valley, Peru. Santana and Temple (1987) reported that 58% of 109 banded *P. haliaetus* recovered in the West Indies had been shot, and Poole and Agler (1987) found that 92% of the recoveries of all banded *P. haliaetus* shot since 1972 came from Latin America. Robbins (1986) found no evidence that the number of migrant raptors shot in Latin America has declined during the last 50 years.

What can be done to foster the conservation of migratory raptors in the Western Hemisphere? Public attitudes toward raptors, and about wildlife in general, must be changed. The public and members of governing agencies need to be educated about the value of wildlife and the implications of losses of these natural resources. Jaksic and Jimenez (1986) reported a favorable trend in public attitudes towards raptors in Chile, and attributed this to information conveyed through the newspapers, magazines and television. We encourage conservation organisations to provide material, written in Spanish and Portuguese, about the ecology and status of raptors, to make people aware of how these birds live and what their needs are, and to dispel erroneous beliefs based on folklore (Jaksic & Jimenez 1986; Martinez-Sanchez 1986).

If special considerations are required for raptor conservation, private organisations and government agencies carrying out management programmes must have basic raptor data to incorporate in their planning and decisions. Answering such questions as "How large a territory is required by *B. platypterus* during the austral summer?" and "Is there separation among age and sex classes of *A. striatus* on their wintering grounds?" is crucial to provide a framework in which conservation threats and management responses can be evaluated. We encourage biologists and agencies to conduct more banding studies and to analyse carefully the results of previous banding activities, as Poole and Agler (1987) effectively did regarding *P. haliaetus*. We also encourage more surveys and ecological studies to document the distribution, numbers, densities, food habits and habitat dependencies of migratory species, both en route and in their period of non-breeding residency. In this regard, birdwatchers, tour leaders and professional ornithologists conducting studies on species other than raptors can help by taking careful field notes and sharing copies of those notes with raptor researchers. Information about migrant raptors in Latin America is so limited that even anecdotal data, if carefully recorded, can provide useful insights and help to focus future research efforts.

REFERENCES

- ANDRLE, R.F. 1968. Raptors and other North American migrants in Mexico. *Condor* 70: 393-395
- ANDRLE, R.F. 1966. North American migrants in the Sierra de Tuxtla of southern Veracruz, Mexico. *Condor* 68: 177-184
- BARRADAS, R.D. 1984. Activities and behavior of a population of wintering *Pandion haliaetus* (Linnaeus) (Aves Pandionidae) at the dam Miguel Aleman, Oaxaca, Mexico. M.S. thesis, Veracruzana Univ., Xalapa, Veracruz.
- BROWN, L. & D. AMADON 1968. *Eagles, Hawks and Falcons of the World*. (2 vols.) McGraw-Hill, New York.
- CHANCELLOR, R.D. & B.-U. MEYBURG, eds. 1986. Proceeding of the Western Hemisphere Meeting of the World Working Group on Birds of Prey. *Birds of Prey Bull.* 3: 1-157.
- CLARK, W.S. 1985. Migration of the merlin along the coast of New Jersey. *Raptor Res.* 19: 85-9.
- DEKKER, D. 1987. Peregrine falcon predation on ducks in Alberta and British Columbia. *J. Wildl. Manage.* 51: 156-159.
- ELLIS, D.H. & D.G. SMITH 1986. An overview of raptor conservation in Latin America. *WWGBP Birds of Prey Bull.* No. 3: 21-25.
- EVANS, D.L. & R.N. ROSENFELD 1985. Migration and mortality of sharp-shinned hawks ringed at Duluth, Minnesota, U.S.A. In: I. Newton & R.D. Chancellor (eds.), *Conservation Studies on Raptors*. ICBP Tech. Pub. No. 5. Cambridge.
- FULLER, M.R. & J.A. MOSHER 1987. Raptor survey techniques. Ch. 4 In: B.A. Giron-Pendleton, B.A. Millsap, K.W. Cline & D.M. Bird (eds.), *Raptor Management Techniques Manual*. National Wildl. Fed., Washington, D.C.
- FYFE, R.W., S.A. TEMPLE & T.J. CADE 1976. The 1975 North American peregrine falcon survey. *Canad. Field-Naturalist* 90:228-273.
- HARWOOD, M. (ed). 1985. *Proceedings of Hawk Migration Conference IV*. Hawk Migration Assoc. N. Am.
- HAUGH, J.R. 1986. Raptors in migration. *Raptor Res. Reports* No. 5: 35-48.
- HOLTHUIJZEN, A.M.A., L. OOSTERHUIS & M.R. FULLER 1985. Habitat use by migrating sharp-shinned hawks at Cape May Point, New Jersey, U.S.A. In: I. Newton & R.D. Chancellor (eds.), *Conservation Studies on Raptors*. ICBP Tech. Pub. No. 5. Cambridge.
- INIGO, E. 1986. Active trade threatens Mexican avifauna. *Traffic U.S.A.* 6: 6-7.
- JAKSIC, F.M. & J.E. JIMENEZ 1986. The conservation status of raptors in Chile. *WWGBP Birds of Prey Bull.* No. 3:95-104.
- KARR, J.R. 1980. Patterns in the migration systems between the north temperate zone and the tropics. In: A. Keast & E.S. Morton (eds.), *Migrant Birds in the neotropics: Ecology, behavior, distribution and conservation*. Smithsonian Inst. Press, Washington, D.C.
- KERLINGER, P. & S.A. GAUTHREAU, JR. 1985. Seasonal timing, geographic distribution, and flight behavior of Broad-winged Hawks during spring migration in south Texas: a radar and direct visual study. *Auk* 102: 735-743.
- KIRKWOOD, J.K. 1985. Food requirements for deposition of energy reserves in raptors. In: I. Newton & R.D. Chancellor (eds.), *Conservation Studies on Raptors*. ICBP Tech. Pub. No. 5. Cambridge.
- MARTINEZ SANCHEZ, J. 1986. Causes affecting the survival of birds of prey in Nicaragua. *WWGBP Birds of Prey Bull.* No. 3: 43-47.
- NAGY, A.C. 1976. Population trend indices based on 40 years of autumn counts at Hawk Mountain Sanctuary in north-eastern Pennsylvania. In: R.D. Chancellor (ed.), *Proc. World Conference on Birds of Prey, Vienna, 1975*. ICBP, Cambridge.
- OLROG, C.C. 1967. Observaciones sobre aves migratorias del hemisferio norte. *Hornero* 10: 292-298.
- POOLE, A.F. & B. AGLER 1987. Recoveries of ospreys banded in the United States, 1914-84. *J. Wildl. Manage.* 51: 148-155.
- ROBBINS, C.S. 1986. Conservation of migratory raptors: an overview based on 50 years of raptor banding. *Raptor Res. Reports* No. 5: 26-34.
- SANTANA, E.C. & S.A. TEMPLE 1987. Recoveries of banded ospreys in the West Indies. *J. Field Ornithol.* 58: 26-30.
- SCHMUTZ, J.K. & R.W. FYFE 1987. Migration and mortality of Alberta ferruginous hawks. *Condor* 89: 169-174.
- SMITH, N.G. 1980. Hawk and vulture migrations in the Neotropics. In: A. Keast & E.S. Morton (eds.), *Migrant Birds in the Neotropics: Ecology, behavior, distribution and conservation*. Smithsonian Inst. Press, Washington, D.C.
- SMITH, N.G. 1985a. Dynamics of the transisthmian migration of raptors between Central and South America. In: I. Newton & R.D. Chancellor (eds.), *Conservation Studies on Raptors*. ICBP Tech. Pub. No. 5.
- SMITH, N.G. 1985b. The path between North America and limbo: the "wintering grounds" syndrome and future research on migratory raptors. In: M. Harwood (ed.), *Proc. of Hawk Migration Conference IV*. Hawk Migration Assoc. N. Am.
- SMITH, N.G., D.L. GOLDSTEIN & G.A. BARTHOLOMEW 1986. Is long-distance migration possible for soaring hawks using only stored fat? *Auk* 103: 607-611.
- THIOLLAY, J.-M. 1980. Spring hawk migration in eastern Mexico. *Raptor Res.* 14: 13-19.
- THIOLLAY, J.-M. 1984. Raptor community structure of a primary rain forest in French Guiana and effect of human hunting pressure. *Raptor Res.* 18: 117-122.
- WARD, F.P. & R.C. LAYBOURNE 1985. A difference in prey selection by adult and immature peregrine falcons during autumn migration. In: I. Newton & R.D. Chancellor (eds.), *Conservation Studies on Raptors*. ICBP Tech. Pub. No. 5. Cambridge.
- WARD, F.P., K. TITUS, W.S. SEEGAR, M.A. YATES & M.R. FULLER 1988. Autumn migrations of peregrine falcons at Assateague Island, MD/VA: 1970-1984. In: T.J. Cade, J.H. Enderson, C.G. Thelander & C.M. White (eds.), *Peregrine Falcon Populations: Their Management and Recovery*. The Peregrine Fund, Inc., Boise, Idaho.
- WILEY, J.W. 1986. Status and conservation of raptors in the West Indies. *WWGBP Birds of Prey Bull.* No. 3: 57-70.
- WHITE, C.M., D.A. BOYCE & R. STRANECK (this volume). Observations on migrant *Buteo swainsoni* in Argentina, 1984.
- WHITE, C.M., R.W. RISEBROUGH & S.A. TEMPLE (this volume). Observations on North American migrant peregrines in South America.
- YATES, M.A., K.E. RIDDLE & F.P. WARD 1988. Recoveries of peregrine falcons migrating through the eastern and cen-

tral United States, 1955-1985. In: T.J. Cade, J.H. Enderson, C.G. Thelander & C.M White (eds.), *Peregrine Falcon Populations: Their Management and Recovery*. The Peregrine Fund, Inc., Boise, Idaho.

Stanley E. Senner
Hawk Mountain Sanctuary Assn.
Rt. 2, Kempton
PA 19529, USA

Mark R. Fuller
Patuxent Wildlife Research Center,
Laurel,
MA 20707, USA

