Neotropical records of Nearctic Raptors: observational data from Veracruz, Mexico

Author(s): Alan Monroy-Ojeda , Kashmir Wolf , Eduardo Martínez-Leyva , Laurie J. Goodrich , Rafael Rodríguez Mesa , Irving Chávez Domínguez , Gustavo Ramón Lara , Stephen W. Hoffman , and Elisa Peresbarbosa Rojas
Source: The Wilson Journal of Ornithology, 128(3):631-637.
Published By: The Wilson Ornithological Society
DOI: http://dx.doi.org/10.1676/1559-4491-128.3.631
URL: http://www.bioone.org/doi/full/10.1676/1559-4491-128.3.631

Kear, J. 1988. The Mute Swan. Shire Publications Ltd., London, United Kingdom.

Kear, J. (Editor). 2005. Ducks, geese and swans. Oxford University Press, Oxford, United Kingdom.

Miller, W. J. and L. S. Miller. 1958. Synopsis of behaviour traits of the ring neck dove. Animal Behaviour 6:3–8.

Taylor, C. R., R. Dmi'el, M. Fedak, and K. Schmidt-Nielsen. 1971. Energetic cost of running and heat balance in a large bird, the rhea. American Journal of Physiology 221:597–601.

Taylor, H. L., D. R. Jacobs Jr., B. Schucker, J. Knudsen, A. S. Leon, and G. Debacker. 1978. A questionnaire for the assessment of leisure time physical activities. Journal of Chronic Diseases 31:741–755.

Tyler, W. M. 1937. *Cathartes aura septentrionalis* Wied: Turkey Vulture. United States National Museum Bulletin 167:12–28.

Wood, K. A., R. A. Stillman, D. Wheeler, S. Groves, C. Hambly, J. R. Speakman, F. Daunt, and M. T. O'Hare. 2013. Go with the flow: water velocity regulates herbivore foraging decisions in river catchments. Oikos 122:1,720–1,729.

The Wilson Journal of Ornithology 128(3):631–637, 2016

Neotropical Records of Nearctic Raptors: Observational Data from Veracruz, Mexico

Alan Monroy-Ojeda,[1,5] Kashmir Wolf,[1] Eduardo Martínez-Leyva,[1] Laurie J. Goodrich,[2] Rafael Rodríguez Mesa,[1] Irving Chávez Domínguez,[1] Gustavo Ramón Lara,[1] Stephen W. Hoffman,[3,4] and Elisa Peresbarbosa Rojas[1]

ABSTRACT.—Extralimital records of birds, including diurnal raptors, are frequently set in localities along migration flyways. Normally, these records pertain to a few individuals that are away from their usual flight routes and found in areas that range from tens to a few hundred km from their usual distribution. Here, we report 77 migration records of Nearctic hawks and eagles from a site in the Neotropical region. These records belong to five well-known Nearctic species: Golden Eagle, Northern Goshawk, Bald Eagle, Ferruginous Hawk, and Rough-legged Hawk. The Veracruz River of Raptors Project's (VRR) observational data represent the most reliable and abundant data source of raptor migration along the region and country, including the southernmost cluster of records of these Nearctic species in the continent. *Received 24 September 2015. Accepted 12 January 2016.*

Key words: Bald Eagle, Ferruginous Hawk, Golden Eagle, Neotropical, Northern Goshawk, records, Rough-legged Hawk.

The most important migratory hawkwatch for diurnal raptors (vultures, hawks, falcons) in the world, where an average of 5.1 million birds can be observed annually during their spring and autumn migrations, is located in central Veracruz, Mexico (Ruelas Inzunza et al. 2000, 2009; Bildstein 2006; Bildstein et al. 2008; Smith et al. 2008). The site's concentrated flights result from its location, at the intersection of two major mountainous systems, the Sierra Madre Oriental and the Central Volcanic Belt, which constrain the width of the Gulf of Mexico Coastal Plain at about 19° N (Ruelas Inzunza et al. 2000). This geographic bottleneck within the course of the coastal plain reduces the area where thermal-soaring migrants can find reliable lift for energy-saving flights, and funnels the migrations of hundreds of Neotropical migrants, including vultures, hawks, falcons, pelicans, anhingas, and storks, through a corridor no wider than a few tens of kilometers (Ruelas Inzunza et al. 2005, 2010).

Migrations of diurnal raptors recorded here are dominated by four species of mostly Nearctic-breeding species (in order of abundance): Turkey Vulture (*Cathartes aura*), Broad-winged Hawk (*Buteo platypterus*), Swainson's Hawk (*Buteo swainsoni*), and Mississippi Kite (*Ictinia missis-*

[1] Pronatura Veracruz A.C., Coatepec, Veracruz, Mexico 91500.

[2] Hawk Mountain Sanctuary, Acopian Center for Conservation Learning, Orwigsburg, PA 17961 USA.

[3] HawkWatch International, Salt Lake City, UT 84106 USA.

[4] Present address: Montana Audubon, Helena, MT 59624 USA.

[5] Corresponding author; e-mail: alanmonroy_ojeda@yahoo.com.mx

sippiensis), although >20 raptor species have been recorded regularly migrating through the area (Ruelas Inzunza et al. 2009).

The Veracruz River of Raptors Project (VRR) is a cooperative, institutionalized effort among Pronatura Veracruz, Hawk Mountain Sanctuary Association, and HawkWatch International, founded in the spring of 1991 with the goal of assessing patterns and population trends of these migratory raptors and promoting their conservation. We have monitored their populations using standardized autumn migration counts since 1991 (Pronatura Veracruz 1999, Ruelas Inzunza et al. 2010), and recorded some rare, unexpected, or out-of-range individuals over time. Ruelas Inzunza et al. (2009, 2010), for example, reported the presence of migrating individuals of Jabiru (*Jabiru mycteria*), dispersing individuals of Harris's Hawk (*Parabuteo unicinctus*), and other species whose known distribution or migratory paths do not include Veracruz. Such records represent modest and possibly expected range extensions, or additions of our understanding of species movements, as they occur within a few hundred kilometers of their previously published ranges. However, during our long-term monitoring program, we also have recorded some individuals of truly Nearctic raptor species whose known winter ranges end north of the location of our work, and thus their records from a Neotropical locality are much more significant.

In this paper we present detailed records and photographic documentation (when available) of Nearctic raptor species whose known distributions (either during their breeding, migration, or nonbreeding seasons) does not include the Neotropical region, the Gulf Coast, or the state of Veracruz.

METHODS

Study Site.—We monitor the migration of raptors from two sites, one in Cardel, Veracruz (19° 22′ N, 96° 22′ W, 29 m asl), located atop a six-story hotel in the town's center, ~6.5 km of linear distance from the coast of the Gulf of Mexico. A second observation point is in Chichicaxtle, Veracruz (19° 21′ N, 96° 28′ W, 120 m asl), atop a small building erected as a bird observatory, ~11 km west of Cardel and 17 km from the coast. The two sites are located perpendicular to the migration front and are assumed to be two independent samples of the same migration flow (Fig. 1).

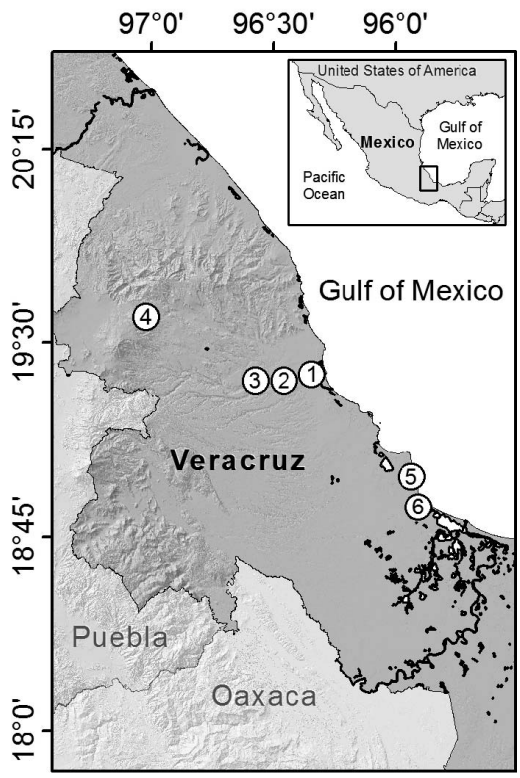

FIG. 1. Localities of Nearctic raptor records in Veracruz, Mexico: (1) Cardel, (2) Chichicaxtle, (3) Rinconada, (4) La Joya, (5) Las Barrancas, and (6) Alvarado Lagoon.

Central Veracruz is located well within the Neotropics, more than 4° latitude south of the tropic of Cancer (~450 km from it). It has the typical ecological conditions of the Gulf of Mexico Coastal Plain: its vegetation is dominated by mangrove and coastal sand dunes along the coast (0–50 m asl), tropical dry deciduous and semideciduous forest in the lowlands (50–900 m asl), and cloud forest (900–2,300 m asl) at midelevations (Castillo-Campos et al. 2011). Currently, agriculture and pastureland covers most (>76%; Ruelas Inzunza et al. 2005) of the state's lowlands.

Migration Count Data Collection.—We collected records of rare or unusual raptor species of Central Veracruz mainly from the Cardel and Chichicaxtle raptor migration monitoring sites during the autumn seasons of 1991–2014. Each annual count took place from 20 August to 20

November (92 consecutive days per field season) simultaneously at both sites. Data are collected for 9–10 hrs per day, from ~0800–1800 hrs Central Time (CT). At each site, field teams consisted of three persons that identified and estimated the number of migratory birds for 34 raptors (Families Cathartidae, Accipitridae, and Falconidae), as well as for six species of 'wading' birds (Families Pelecanidae, Phalacrocoracidae, Anhingidae, Ardeidae, Threskiornithidae, and Ciconiidae). Counts followed the Hawk Migration Association of North America standard protocol (Kerlinger 1989, Pronatura Veracruz 1999, HMANA 2009, Ruelas Inzunza et al. 2010). Identifications to species were made using binoculars, telescopes, and field guides, principally Howell and Webb (1995), Wheeler and Clark (1995), and Sibley (2000). Because of the methodological necessity of identifying and counting the numerous, large migratory raptor flocks, we collected few data on age, sex, and color morphs of the individuals observed. For additional details of the data collection protocol used onsite, please see Ruelas Inzunza et al. (2010). We also include records collected at nearby localities during non-systematic observations to supplement this information.

OBSERVATIONS

We collected 78 records of raptors of five species of Nearctic raptors (all Accipitriformes) in central Veracruz, Mexico. Below we summarize the records by species. Table 1 details the dates and localities of each record. Species are listed in the order given in the Checklist of the AOU (1983) and supplements.

*Bald Eagle (*Haliaeetus leucocephalus*).*—We recorded five individuals (two juveniles, three unrecorded age) in Cardel (See Fig. 2a).

*Northern Goshawk (*Accipiter gentilis*).*—Seventeen Northern Goshawk records in both migration monitoring sites, most within the month of October (Chichicaxtle, nine records; Cardel, eight records). Age was determined for only two individuals; one juvenile and one adult (See Fig. 2b).

*Ferruginous Hawk (*Buteo regalis*).*—Twenty individuals were observed at both monitoring sites, mainly in late ($n = 9$) and mid-October ($n = 5$) (Chichicaxtle, 10 records; Cardel, 10 records).We recorded the age of a single individual (a light-morph juvenile). The records from 2009, 2011, and 2004 are the most numerous: four, four, and three sightings respectively. An additional individual at Playa San Juan Ángel (19° 29′ N, 96° 19′ W, 5 m asl) was recorded by B. Clark (pers. comm.) on October 2002.

*Rough-legged Hawk (*Buteo lagopus*).*—Two individuals were recorded in different years, one at each migration monitoring site. Both birds were seen intermittently flapping and gliding in a straight line in the regular trajectory of autumn migrants recorded in Veracruz, NNW–SSE. With only two records, this is the rarest migrating hawk recorded in Veracruz (See Fig. 2c).

*Golden Eagle (*Aquila chrysaetos*).*—Thirty-two records of Golden Eagles in both monitoring sites, mainly in late-September and the first 2 weeks of October (Chichicaxtle, 14 records; Cardel, 18 records). In all observations (except one), Golden Eagles were seen flying in NNW-SSE direction; the single 2011 record, an AHY, was observed flying NNW. In six individuals, the age was recorded, three HYs and three AHYs (one 2Y/3Y).

We have three additional sightings of Golden Eagles from other localities in the state of Veracruz: one juvenile in Las Barrancas (18° 58′ N, 95° 58′ W, 20 m asl), one juvenile in La Joya (19° 36′ N, 97° 02′ W, 2,215 m asl), and one spring migration record from Rinconada (19° 21′ N , 96° 34′ W, 272 m asl) (Fig. 1).

DISCUSSION

Our data show that these five species of Nearctic raptors occasionally occur farther south of what is documented in their abundant literature, and their non-breeding movements can reach well within the boundaries of the Neotropics. Although rare compared to the other species recorded onsite, their presence appears to be regular (with the exception of Rough-legged Hawk). Here, we summarize previously published material that serves as a basis for establishing the value of our records. The Northern Goshawk is a species of northern boreal forests. Its range barely extends into the montane pine-oak forests of western and southwestern Mexico, also part of the Nearctic (Howell and Webb 1995, Squires and Reynolds

TABLE 1. Date and location of each recording of the five Nearctic raptors in central Veracruz.

Bald Eagle	Northern Goshawk	Ferruginous Hawk	Rough-legged hawk	Golden Eagle
19/10/1997[a]	22/09/2000[a]	06/11/1996[a]	13/10/2009[a]	06/10/1994[a]
18/10/1999[a]	10/10/2002[a]	24/10/1997[a]	13/10/2001[b]	25/09/1998[a]
23/10/2007[a]	11/10/2004[a]	19/10/2004[a]		29/09/2002[a]
20/10/2008[a]	11/10/2004[a]	22/10/2007[a]		01/10/2002[a]
01/09/2011[a]	18/10/2005[a]	07/10/2009[a]		05/11/2003[a]
	24/10/2007[a]	13/10/2009[a]		09/11/2003[a]
	04/10/2009[a]	28/10/2009[a]		30/09/2004[a]
	03/11/2010[a]	27/10/2010[a]		01/10/2004[a]
	14/10/2004[b]	10/10/2011[a]		13/10/2004[a]
	15/10/2004[b]	07/10/2012[a]		21/10/2005[a]
	12/10/2005[b]	11/10/2003[b]		11/10/2006[a]
	30/09/2006[b]	28/10/2004[b]		02/11/2006[a]
	11/10/2006[b]	11/11/2004[b]		12/10/2007[a]
	13/10/2006[b]	24/10/2005[b]		14/10/2007[a]
	24/10/2006[b]	07/10/2009[b]		06/10/2010[a]
	03/11/2010[b]	03/10/2011[b]		13/09/2011[a]
	06/10/2011[b]	11/10/2011[b]		05/10/2011[a]
		20/10/2011[b]		29/09/2012[a]
		10/10/2012[b]		05/10/2002[b]
		25/10/2013[b]		06/11/2003[b]
		00/10/0000[c]		24/09/2004[b]
				02/10/2004[b]
				06/10/2004[b]
				28/09/2005[b]
				02/10/2005[b]
				03/11/2005[b]
				26/09/2008[b]
				14/10/2008[b]
				04/10/2009[b]
				19/09/2011[b]
				05/11/2011[b]
				30/09/2014[b]
				24/03/1994[f]
				02/12/2012[d]
				12/04/2012[e]

[a] Cardel.
[b] Chichicaxtle.
[c] Playa San Juan Ángel.
[d] Las Barrancas.
[e] La Joya.
[f] Rinconada.

1997). Northern Goshawks are considered irruptive migrants and are regularly reported beyond their traditional winter ranges, reaching southern California (Small 1994), the Lower Colorado River Valley (Rosenberg et al. 1991), northern Texas (Oberholser 1974), etc. Individuals have been casually recorded south to the Gulf Coast of Texas (Oberholser 1974), but Christmas Bird Count data suggest this species is generally absent in the southeastern United States (Root 1988). We found only three records from eastern Mexico, all of them in Sierra Madre Oriental (Urban 1959; Gómez de Silva 2014; R. Valdés, pers. comm.).

Perhaps the most likely to be found this far south, the Bald Eagle has a few reports of individuals wintering in Mexico, including Gulfs of Mexico and California, Baja California, and along several river systems in Sonora and Chihuahua (Buehler 2000). Howell and Webb (1995) map this species as a rare winter visitor (Nov–Mar) in the Gulf Coast lowlands of northern Veracruz. G. Saunders (reported in Loetscher 1955) recorded one individual on 20 January 1939, near Tamiahua (21° 48′ N, 97° 43′ W, 19 masl) and one individual on 23 January 1947 at the northern end of Laguna de Alvarado (18° 51′ N,

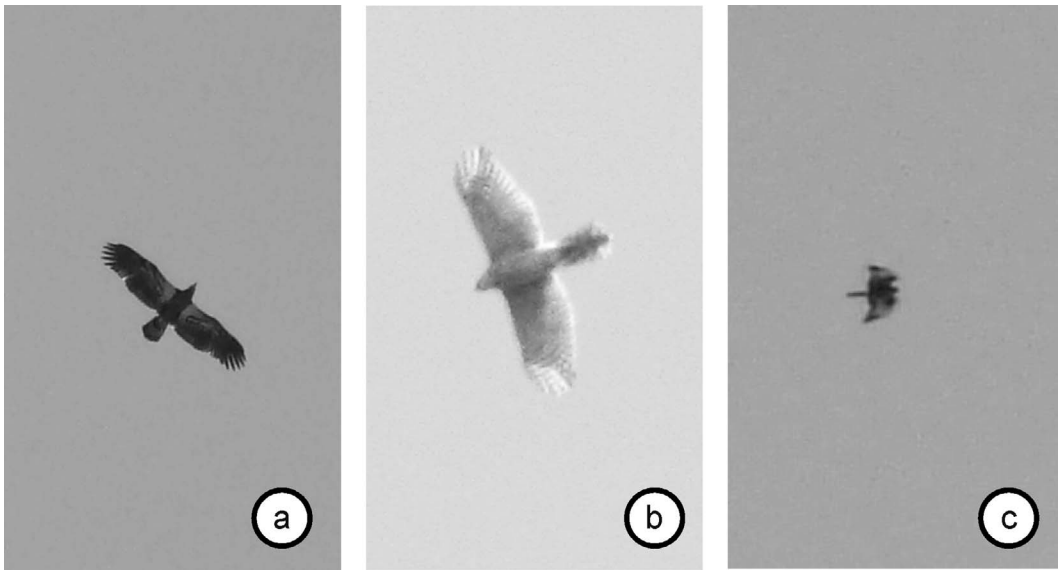

FIG. 2. Photographic records of migrating Nearctic raptors in Veracruz, Mexico: (a) Juvenile Bald Eagle photographed in Cardel, 20 October 2008 (photo by Kashmir Wolf), (b) Adult Northern Goshawk photographed in Chichicaxtle, 6 November 2011 (photo by Kashmir Wolf), and (c) Rough-legged Hawk photographed in Cardel, 13 October 2009 (photo by Rigoberto Mendoza).

95° 56′ W, 19 m asl), both in the state of Veracruz (Fig 1.). No other published record from 1947–1997 has been documented.

Ferruginous Hawks are known to winter primarily in the southwestern United States and northern Mexico. Even though band recoveries from Mexico are rare, as much as 20% of the winter range may be in the Mexican portion of the Great Plains (Bechard and Schmutz 1995), as far south as Guanajuato and Hidalgo (Howell and Webb 1995). Nonetheless, no records from eastern Mexico or the Gulf slope have been published.

The Rough-legged Hawk is a true Arctic species, and most individuals overwinter in Canada and the northern portion of the United States (Bechard and Swem 2002). The date, duration, and distance of migration can vary according to the southward extent of snow cover and prey cycles in their breeding range. In severe winters, these birds have been recorded as far south as northern Sonora (Sutton and Parmelee 1956, Russell and Lamm 1978). Howell and Webb (1995) map this species as an irregular, uncommon to rare winter visitor (Nov–Mar) to northern Mexico from Baja California and Sonora, Chihuahua and western Coahuila.

The distribution of Golden Eagles lies primarily within the United States and Canada, ranging south only into the highlands of central Mexico, including Baja California, northeastern Sonora, and from Chihuahua, Coahuila, Nuevo Leon south to Tamaulipas, San Luis Potosi, Guanajuato, and Queretaro (Howell and Webb 1995, Russell and Monson 1998, INE 1999, CONANP 2008, Sullivan 2010), plus several unpublished recent records as far south as the highlands of northern Oaxaca (M. Grosselet, pers. comm.). All these records come from localities of Mexico's central plateau, considered part of the Nearctic in all modern biogeographic classifications (e.g., Udvardy 1975). We are not aware of reports of breeding or overwintering individuals in Veracruz or the lowlands of the Gulf of Mexico (CONANP 2008, Tavizón García 2014).

For three species (Northern Goshawk, Rough-legged Hawk, and Ferruginous Hawk), our observations represent the first documented records of these Nearctic species on the Mexican side of the Gulf of Mexico coastal plain and in the state of Veracruz. Neither eagle species had been previously recorded in the central part of the state. Except for the Bald Eagle (the single 1947 record of Loetscher 1955), our observations represent the

southernmost records for these five species, all of them well inside the Neotropical region (the southern records of Golden Eagle in central Mexico's plateau come from localities within the Nearctic and Nearctic-affinity habitats). These records are relevant because most boreal and northern Nearctic migratory species are rarely or not known to cross the biogeographic boundary between the Nearctic and the Neotropics. Habitat and/or prey specialization may represent the most significant barriers that prevent them from crossing into the Neotropics (Newton 2008).

Occasional records of highly vagile species found outside their usual migratory or winter ranges are frequent among birds. These individuals, commonly referred to as vagrants, may result from normal dispersal over unusually long distances; drift, in which migrants are blown off course by winds; and migration overshoots, in which individuals migrate farther than usual, well beyond their normal or wintering range (Sutherland 1998, Newton 2008). Vagrant individuals are commonly juveniles in their first migration that drift off-course more often than adults. Poor navigation in juveniles, however, may only partially explain our records, since many of them (possibly half of the records, since not all the individuals were positively aged) were adult birds.

Our observation records, far from known species' distributions, may be facilitated by the fact that there is no large geographical break between these large biogeographic realms (e.g., no large water body, the mountain chains run mainly north–south, rather than east–west) and a consistent thermal pathway formed by powerful and constant thermal convection that facilitates migratory flights along the Gulf of Mexico coastal plain, particularly for soaring migrants. Considering the small numbers of individuals and the tiny proportion of the population being present at the site, we do not have evidence to support a proper range extension of the southern distributional limits of these species. On the other hand, dispersers, wanderers, and birds "off course" may be more common than previously known.

Our records indicate that the hard-boundaries between biogeographic regions are less well defined than assumed, and that the distribution of these Nearctic taxa extends farther south (and/or east) of what is currently known. A very important question remains unanswered by this work—where do these birds spend the non-breeding season? Further research during the poorly understood winter and spring migration seasons may result in a better understanding of the presence and status of these Nearctic species present in the northern Neotropics.

ACKNOWLEDGMENTS

Our project has been financed by the National Fish and Wildlife Foundation, John D. and Catherine T. MacArthur Foundation, U.S. Fish and Wildlife Service's Neotropical Migratory Bird Conservation Act, U.S. Fish and Wildlife Service Region 2, Center for the Study of Tropical Birds, American Bird Conservancy, American Birding Association, Lannan Foundation (special thanks to P. and A. Lannan, B. Johnston, and M. P. Day), The Nature Conservancy, Fondo Mexicano para la Conservación de la Naturaleza, The International Osprey Foundation, National Audubon Society, Rare Conservation, hundreds of members of Amigos del Río de Rapaces (especially J. and R. Speers, to whom we owe so much), and J. Faaborg at the University of Missouri. We thank the field crews of the Veracruz River of Raptors project for their dedicated work over the years. R. Mendoza kindly shared his photographic records with us. E. Ruelas participated in the writing of this paper while supported by a repatriation fellowship of Mexico's Consejo Nacional de Ciencia y Tecnología (CONACYT) and thanks D. Pérez-Staples and J. C. Noa at the Universidad Veracruzana for all their support. This is Hawk Mountain Sanctuary's contribution to conservation science number 261. We thank the editor and two anonymous reviewers for their constructive comments, which helped us to improve the manuscript.

LITERATURE CITED

American Ornithologists' Union (AOU). 1983. Check-list of North American birds. Seventh Edition. American Ornithologists' Union. Washington, D.C., USA.

Bechard, M. J. and J. K. Schmutz. 1995. Ferruginous Hawk (*Buteo regalis*). The birds of North America. Number 172.

Bechard, M. J. and T. R. Swem. 2002. Rough-legged Hawk (*Buteo lagopus*). The birds of North America. Number 641.

Bildstein, K. L. 2006. Migrating raptors of the world: their ecology and conservation. Cornell University Press. Ithaca, New York, USA.

Bildstein, K. L., J. P. Smith, E. Ruelas Inzunza, and R. R. Veit (Editors). 2008. State of North America's birds of prey. Series in Ornithology 3:1–466.

Buehler, D. A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). The birds of North America. Number 506.

Castillo-Campos, G., S. Avendaño-Reyes, and M. E. Mediana-Abreo. 2011. Flora y vegetación. Pages 163–179 *in* La biodiversidad en Veracruz: estudio de estado. Volume 1. Contexto actual del estado y perspectivas de conservación de su biodiversidad (A. C. Angón, Editor). Comisión Nacional para el

Conocimiento y Uso de la Biodiversidad, México, D.F., Mexico.

Comisión Nacional de Áreas Naturales Protegtidas (CONANP). 2008. Programa de Acción para la Conservación de la Especie: Águila Real (*Aquila chrysaetos*). Secretaría de Medio Ambiente y Recursos Naturales, Comisión Nacional de Áreas Naturales Protegtidas, México, D.F., Mexico.

Gómez de Silva, H. (Editor). 2014. Mexico. North American Birds 68:155.

Hawk Migration Association of North America (HMANA). 2009. Data sheets and protocols for data collection. Hawk Migration Association of North America, Plymouth, New Hampshire, USA. www.hmana.org/wp-content/uploads/2013/05/drf1.xls (accessed 1 Sept 2015).

Howell, S. N. G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press, Oxford, United Kingdom.

Instituto Nacional de Ecología (INE). 1999. Proyecto de protección, conservación y recuperación del Águila Real. Secretaría de Medio Ambiente, Recursos Naturales y Pesca, Instituto Nacional de Ecología, México, D.F., Mexico.

Kerlinger, P. 1989. Flight strategies of migrating hawks. University of Chicago Press, Chicago, Illinois, USA.

Loetscher Jr., F. W. 1955. North American migrants in the state of Veracruz, Mexico: a summary. Auk 72:14–54.

Newton, I. 2008. The migration ecology of birds. Academic Press, London, United Kingdom.

Oberholser, H. C. 1974. The bird life of Texas. University of Texas Press, Austin, USA.

Pronatura Veracruz. 1999. Veracruz río de rapaces: protocolo para conteos de migración. Pronatura Veracruz, Xalapa, Veracruz, Mexico.

Root, T. 1988. Atlas of wintering North American birds: an analysis of Christmas Bird Count data. University of Chicago Press, Chicago, Illinois, USA.

Rosenberg, K. V., R. D. Ohmart, W. C. Hunter, and B. W. Anderson. 1991. Birds of the lower Colorado River valley. University of Arizona Press, Tucson, USA.

Ruelas Inzunza, E., L. J. Goodrich, and S. W. Hoffman. 2010. North American population estimates of waterbirds, vultures, and hawks from migration counts in Veracruz, México. Bird Conservation International 20:124–133.

Ruelas Inzunza, E., S. W. Hoffman, and L. J. Goodrich. 2005. Stopover ecology of Neotropical migrants in Veracruz, México. Pages 657–672 *in* Bird conservation implementation and integration in the Americas: proceedings of the third international Partners in Flight conference. Volume 2. USDA, Forest Service, General Technical Report PSW-GTR-191. Pacific Southwest Research Station, Albany, California, USA.

Ruelas Inzunza, E., S. W. Hoffman, L. J. Goodrich, and R. Tingay. 2000. Conservation strategies for the world's largest raptor migration flyway: Veracruz the river of raptors. Pages 591–596 *in* Raptors at risk (R. D. Chancellor and B.-U. Meyburg, Editors). Hancock House Publishers, Surrey, British Columbia, Canada.

Ruelas Inzunza, E., L. J. Goodrich, S. W. Hoffman, E. Martínez-Leyva, J. P. Smith, E. Peresbarbosa Rojas, R. Rodríguez Mesa, K. L. Scheuermann, S. L. Mesa Ortiz, Y. Cabrera Carrasco, N. Ferriz, R. Straub, M. M. Peñaloza Pérez, and J. G. Barrios. 2009. Long-term conservation of migratory birds in México: the Veracruz river of raptors project. Pages 577–589 *in* Tundra to tropics: connecting birds, habitats and people. Proceedings of the Fourth International Partners in Flight Conference. Partners in Flight.

Russell, S. M. and D. W. Lamm. 1978. Notes on the distribution of birds in Sonora, Mexico. Wilson Bulletin 90:123–131.

Russell, S. M. and G. Monson. 1998. The birds of Sonora. University of Arizona Press, Tucson, USA.

Sibley, D. A. 2000. The Sibley guide to birds. Alfred A. Knopf, New York, USA.

Small, A. 1994. California birds: their status and distribution. Ibis Publishing Co., Vista, California, USA.

Smith, J. P., C. J. Farmer, S. W. Hoffman, C. A. Lott, L. J. Goodrich, J. Simon, C. Riley, and E. Ruelas Inzunza. 2008. Trends in autumn counts of migratory raptors around the Gulf of Mexico, 1995–2005. Series in Ornithology 3:253–277.

Squires, J. R. and R. T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*). The birds of North America. Number 298.

Sullivan, B. L. 2010. Golden Eagle (*Aquila chrysaetos*). Neotropical birds online (T. S. Schulenberg, Editor). Cornell Lab of Ornithology, Ithaca, New York, USA. neotropical.birds.cornell.edu/portal/species/overview?p_p_spp=129236 (accessed 1 Sept 2015).

Sutherland, W. J. 1998. Evidence for flexibility and constraint in migration systems. Journal of Avian Biology 29:441–446.

Sutton, G. M. and D. F. Parmelee. 1956. The Rough-legged Hawk in the American Arctic. Arctic 9:202–207.

Tavizón García, J. P. 2014. Dinámica poblacional y viabilidad espacio temporal del Águila Real. Dissertation. Universidad Autónoma de Nuevo León, Monterrey, Nuevo León, Mexico.

Udvardy, M. D. F. 1975. A classification of the biogeographic provinces of the world. International Union for the Conservation of Nature and Natural Resources Occasional Paper 18:1–48.

Urban, E. K. 1959. Birds from Coahuila, Mexico. University of Kansas Publications of the Museum of Natural History 11:443–516.

Wheeler, B. K. and W. S. Clark. 1995. A photographic guide to North American raptors. Academic Press, New York, USA.