ORNITOLOGÍA NEOTROPICAL
(2016) 27: 67–71

SHORT NOTE

ANDEAN CONDOR (*VULTUR GRYPHUS*) NESTING IN NORTHEASTERN COLOMBIA AND DIFFERENCES IN LAYING DATES ALONG THE ANDES

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ABSTRACT Little is known about the breeding behavior of the Andean Condor in the wild, especially in the Northern Andes, where densities of this species are low and their nests are difficult to find. We describe an active Andean Condor nest found in March 2015 on the western slope of the eastern Colombian Andes, representing the first country nest record since 1972, and report observations on nesting behavior. We recorded behavior of the male and female attending the nest using direct observations and a camera trap during two months. Both parents attended the nest, but the female did so significantly longer than the male. We assume that the nesting attempt failed because our photographic observation showed no evidence of the adults, the egg, or any chick at the end of the observation period. In addition, we collated available information about the nesting and incubation periods of Andean Condors in the wild along the Andes range. We found latitudinal differences in laying dates. Egg laying occurs in the second half of the year in southern latitudes of the Andean Condor's range (Chile, Argentina), and primarily in the first half of the year in northern latitudes (Colombia, Ecuador, Peru).

RESUMEN · Nidificación del Cóndor Andino (*Vultur gryphus*) en el norte de la cordillera oriental de Colombia y diferencias en las temporadas de incubación en los Andes
El comportamiento reproductivo del Cóndor Andino es poco conocido, especialmente en el norte de los Andes, en donde las poblaciones de la especie se encuentran reducidas en número y sus nidos son difíciles de encontrar. En éste artículo presentamos el hallazgo de un nido activo de Cóndor Andino en el páramo del Almorzadero, en la Cordillera Oriental colombiana en marzo de 2015. Este sería el primer registro de un nido de cóndores silvestres para Colombia desde 1972. Se presentan adicionalmente descripciones del comportamiento de los adultos en cuanto al cuidado del nido y atención del huevo realizadas mediante observaciones con binoculares y fotografías capturadas con una cámara trampa durante un periodo de dos meses. Mediante los dos métodos de registro (observación directa y fotografías de la cámara trampa), se encontró que, aunque los dos padres atendieron el nido y el huevo, la hembra lo hizo durante un tiempo significativamente mayor. Se consideró que el evento de reproducción fue fallido dado que no se obtuvieron registros de los adultos, el huevo o el polluelo al final de la temporada de observación. Debido a que las variaciones climáticas generadas por la latitud afectan la fisiología y biología reproductiva de las aves, se realizó una revisión de los artículos disponibles sobre las temporadas de anidación de la especie a lo largo de la Cordillera de los Andes. La información disponible sugiere que la latitud puede tener un efecto sobre las temporadas de incubación del Cóndor Andino, ocurriendo en el sur de los Andes (Chile, Argentina) en el segundo semestre del año y para la región norte (Colombia, Ecuador, Perú) durante el primer semestre.

KEY WORDS Andean Condor · Breeding · Latitude · Nest · Northern Andes

Received 29 July 2015 · Revised 16 October 2015 · Accepted 2 June 2016 · Published online 15 June 2016

Communicated by Martina Carrete

The Andean Condor (*Vultur gryphus*) is an avian scavenger distributed along the Andes from Venezuela to Argentina (Ferguson-Lees & Christie 2001, Houston et al. 2016). The species is globally classified as "near threatened" and is included in CITES I (BirdLife International 2012). Populations of condors are particularly low in the northern Andes; in Venezuela the species is almost extinct and in Ecuador it is considered as "critically endangered" (Lambertucci 2007). In Colombia, the Andean Condor is classified as "endangered" (Rodríguez-M & Orozco 2002). Little is known about the breeding behavior of the Andean Condor in the wild (Lambertucci 2007, Houston et al. 2016) and most of the information comes from captive studies (Dekker 1967, Bruning 1984). The Andean Condor has low reproductive rates and lays only one egg every two years (Ferguson-Lees & Christie 2001, Lambertucci 2007). The incubation period takes approximately two months (Dekker 1967, Houston et al. 2016), and periods of egg laying and incubation may vary widely. For example, egg laying in captivity was recorded in January, March, and April at Bronx Zoo, New York (Bruning 1984). In Argentine Patagonia and central highlands, incubation begins between August and October (Lambertucci & Mastrantuoni 2008, Heredia & Piedrabuena 2010, Gargiulo 2014). In Peru, incubation occurs between February and June (Wallace & Temple 1988), and between September and October in Chile (Pavez & Tala 1995, Ferguson-Lees & Christie 2001).

Andean Condors often nest in rocky ledges and caves along steep cliffs (Ferguson-Lees & Christie 2001) and inaccessible canyons (McGahan 1972). Nests have also been found on the ground, in cliffs overlooking water, and close to urban areas (Lambertucci & Speziale 2009). Andean Condors lay their eggs directly on the ground rather than constructing a nest (Olivares 1963). The nests of Andean Condors in their northern range are particularly difficult to find due to low population densities (McGahan 1972).

Here, we report an active Andean Condor nest on the western slope of the East Colombian Andes and describe the behavioral differences between male and female condors attending the egg. We also collated available information about the nesting and incubation periods in the wild along the Andes range to determine the possible effects of latitude on the reproductive biology of the species.

An active Andean Condor nest was found on 7 March, 2015 at 10:45 h at Páramo del Almorzadero in the municipality of Cerrito, in the Santander Department, on the western slope of the East Colombian Andes (6°56´N, 72°43´W) (Figure 1). We located the nest on a sandstone cliff of 952 m width and 170 m height. The top of the nesting cliff (4104 m a.s.l.) was oriented toward the northeast and received sunlight most of the day. The nest was located 30 m below the cliff top on a rocky ledge c. 5 m wide and 12 m long that was likely inaccessible to terrestrial predators, such as cougars (*Puma concolor*), foxes (*Cerdocyon thous*, *Urocyon cinereoargenteus*), or dogs (*Canis lupus familiaris*). Dogs are often found in Colombian paramos and could be predators of Andean Condor chicks. The center of this ledge showed no vegetation cover, although there were grasses and low-growing shrubs across its edge. We monitored the nest later from 30 March to 2 April 2015 between 08:00 and 17:00 h every five minutes, for a total of 28.5 hours of direct observation. Direct observations were made with Nikon™ 8x42 binoculars from the top of a cliff 40 m away from the nest. We also installed a camera trap (Reconyx™ HC600) at this spot, which was set to capture images (2.07 MP) of the nest every five minutes between 06:00 and 18:00 h from 30 March to 24 April 2015 (26 days). We calculated the proportion of time that each member of the pair attended the nest using the total number of observations and the number of photographs of each sex. We examined possible differences in the behavior of adult male and female condors using a one sample z test for proportions.

Direct observations. During the first observation (7 March), we observed an adult Andean Condor female lying next to a single egg in the middle of the ledge that was placed in a small trough composed of soil and dry grass (Figure 2). The female flew away for five minutes after seeing us and returned to continue nesting. This disturbance happened only on our first observation. On subsequent observations we were more cautious during our approach to the observation point. The female stayed at the nest during the rest of our first observation period (one hour). After the first observation session (15 min later), we saw an adult male condor (apparently the father) flying near the nest.

Both parents incubated the egg, although the female did so for a significantly longer period of time than the male (63%, compared to the male's 23%, $z = 7.13$, $P < 0.001$). The breeding pair took turns at the nest every day between 08:00 and 13:00 h. During these exchanges, both adults flew together for 10–30 minutes. When the non-incubating adult arrived at the nest, the other adult left the observable area.

Camera-trap records. We accumulated a total of 312 hours of photo-trapping and 1354 photographs during 26 days. In these photographs, 906 (84%) contained images of the adults or the egg, while the remaining 175 photographs (16%) were obscured by fog. The presence of one adult at the nest was observed in 83% of the 906 photographs without fog, and both adults were never photographed simultaneously at the nest. We identified the sex of the adult in 540 pictures (50%). Out of these, the female (61%) was observed attending the nest (incubating or perched near the egg) significantly more often than the male (39%) ($z = 6.8$, $P < 0.001$). The same adult was observed at 18:00 h (near sunset) on the nest and at 06:00 h (near dawn) of the next day, so we assume that the condors spend all night incubating. Exchanges between the two adults were recorded

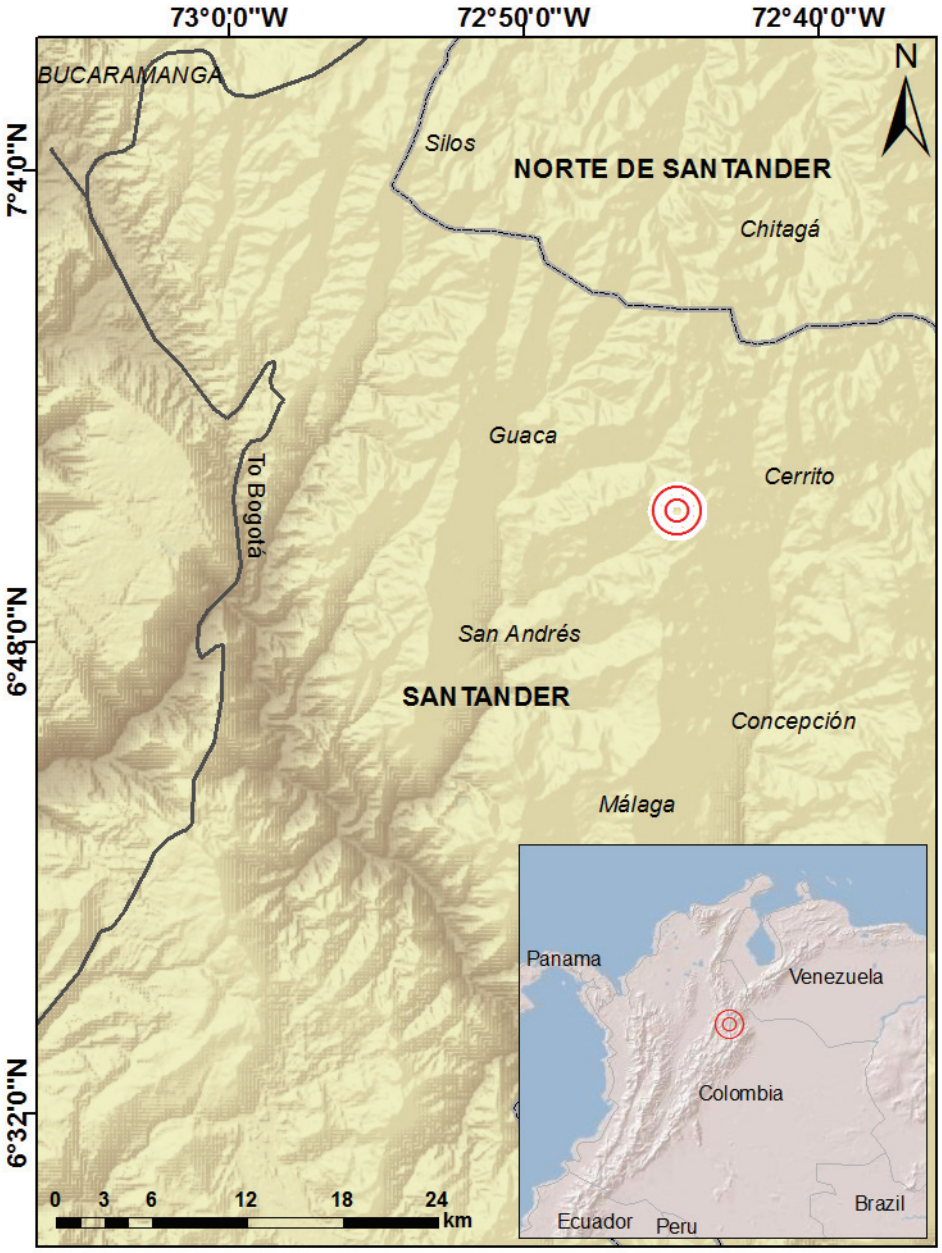

Figure 1. The study area (Páramo del Almorzadero) in the eastern Andes of Colombia. The double circles indicate the location of the Andean Condor (*Vultur gryphus*) nest described in this study.

only five times (at 08:45, 10:07, 12:15, 13:50, and 15:00 h). The adults and egg were continuously recorded by the trap camera until 20 April at 12:15 h. After this time, images showed no evidence of the condors, the egg or any chick. Two weeks after the end of our observations, we descended to the nest using climbing equipment and found eggshells, but no evidence of the chick. We assume that the nesting attempt failed. Given that we were minimally invasive in the nesting zone (most of the records were gathered with a camera trap) we do not believe that our surveys were the cause of failure.

Information about the breeding behavior and the nests of wild Andean Condors in Colombia is scarce. McGahan (1972) provides one of the few descriptions of two nests located in a canyon at the confluence of the Juanambú and Pasto rivers in Nariño Department. The few reports available indicate that breeding probably begins between April and December in the southwest of Colombia (Hilty & Brown 1986, Ferguson-Lees & Christie 2001, Rodríguez-M & Orozco 2002). Restrepo-Cardona & Betancur (2013) suggest that hatching may occur in November or December, based on an observation of a chick that fledged after around six months from an egg produced by a condor pair raised in captivity and reintroduced to Los Nevados Natural Park (central mountain range), Colombia.

Considering that our observations were made between early March and the end of April over nearly two months of incubation, the egg was probably laid

Figure 2. Nesting area of the Andean Condor (*Vultur gryphus*) on a rocky ledge at Páramo del Almorzadero, Colombia, showing female and nesting trough with exposed egg (background).

TABLE 1. Variation in the timing of breeding of the Andean Condor at different locations along the Andes. Abbreviations correspond to the months of the year.

Region	Locality (reference)	Nesting stages		
		Incubation	Hatching	Chick rearing
Northern Andes	Almorzadero, Colombia (this study)	Feb–Apr		
	Pasto, Colombia (McGahan 1972)	Apr		
	Pasto, Colombia (McGahan 1972)	Oct		
	Papallacta, Ecuador (Köster 1997)	Jan	Feb	Mar–Nov
Central Andes	Olmos Ñaupe, Perú (Wallace & Temple 1988)	Feb–Jun		
	Cordillera Real, Bolivia (McGahan 1972)	Aug–Oct		
Southern Andes	Vallenar, Chile (McGahan 1972)	Oct		
	Santiago, Chile (McGahan 1972)	Sep–Oct		
	Río Gallegos, Argentina (McGahan 1972)	Oct–Nov		
	Cerro Blanco, Argentina (Heredia & Piedrabuena 2010)	Oct–Dec	Dec	
	Cerro Blanco, Argentina (Gargiulo 2014)	Aug–Oct	Oct–Dec	Oct–Jul & Dec–Sep
	Río Negro, Argentina (Lambertucci & Mastrantuoni 2008)	Oct–Dec	Dec	Dec–Jun

in late February or early March (during the dry season). Our findings are consistent with those of Wallace & Temple (1988) in Peru, who concluded that egg laying in Andean Condors begins in February. Variation in environmental conditions, such as temperature, humidity, and day length, affect the physiology and reproductive biology of birds and these conditions change with latitude (Cooper et al. 2005). Based on a review of the available information about Andean Condor nesting along the Andes range, we

suggest that Andean Condor laying date varies with latitude (Table 1). Egg laying in the southern Andes occurs in the second half of the year (Lambertucci & Mastrantuoni 2008, Heredia & Piedrabuena 2010, Gargiulo 2012), while in contrast, across the northern Andes of Peru (Wallace & Temple 1988), Ecuador (Köster 1997) and Colombia (McGahan 1972, this study), egg laying occurs in the first half of the year.

Our study is the first record of an active, wild Andean Condor nest in Colombia since McGahan's 1972 observations in Nariño (McGahan 1972), and the first record of a nest in the East Colombian Andes. Although our observations were made for a short period of time, they provide new insights into the reproductive behaviors of the Andean Condor and may add valuable data to conservation efforts for the increasingly threatened populations of this species in the Northern Andes.

ACKNOWLEDGMENTS

We acknowledge Fredy Villamizar, Gilberto Conde, Adriana Hernández, Alexander Chaves, David Ramírez Duarte, José Luis Correa, and Francisco Galvis for their help and field assistance. We also thank Alan Lieberman and San Diego Zoo Global for the donation of some field equipment. The research had partial financial support by a COLCIENCIAS doctoral scholarship granted to FS-J.

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