

# Nest and Nest-site Characteristics, and Prey of the Solitary Eagle (*Buteogallus solitarius*)

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## Abstract

The Solitary Eagle, *Buteogallus solitarius*, is poorly known to the scientific community in all aspects of its ecology. It is local and exceptionally rare throughout its entire range from northern Mexico to northern Argentina and is restricted to steep mountainous and hilly terrain. Prior to our research, only three nests (2 in Mexico and 1 in Peru) of the Solitary Eagle had been located, only two of which were documented, throughout its entire range and none of those nests were studied. Here we describe three nests of the Solitary Eagle. One, discovered 30 June 2011 in a *Pinus occulta* tree in the sub-montane pine forest in the Mountain Pine Ridge region of Belize, fledged a single young in 2011; and a second nest of the presumed same pair on 31 July 2014 c. 3 km from the 2011 nest, which fledged a single young. The third nest was located on 7 January 2010 in the Loja Province in Ecuador in montane dry scrub in a rock outcropping, where a pair was observed perched on the nest. We also describe nest-sites from two additional locations in Belize, where dependent juveniles and adults were observed in 2011 and 2012, but nests were not located. During the nesting period of the Belize nest 1, we observed twenty prey deliveries to the nestling by the adults. Seventeen of the twenty (85%) prey items were snakes. This information provides the first detailed description of the Solitary Eagle nest and nest-site characteristics, as well as the largest study on its diet.

## Introduction

Scientific knowledge regarding the biology and status of the Solitary Eagle, *Buteogallus solitarius*, is negligible. In 2009, we initiated a long-term research project to better understand this enigmatic species.

There are fewer than 80 confirmed Solitary Eagle records between the 1800's and today throughout its range.

It is currently classified as Near Threatened by the IUCN (Birdlife International 2012). In Belize it is listed as Critically Endangered and Vulnerable in Ecuador (Meerman 2005, Granizo et al. 2002). Current estimates are between 1,500-4,000 individuals with a decreasing trend (Birdlife International 2012).

Prior to this research, there have been three nests (two in Sonora, Mexico in 1947 and 1958 and one in Peru in 1989) (Harrison and Kiff 1977, R. Ridgely pers. comm.) documented for this species, to our knowledge, none of which were studied.

- The 1947 nest was located in the Sierra Madre Occidental of Mexico in a large Mexican yellow pine (*Pinus ponderosa*) (Harrison and Kiff 1977).
- In the same region, at 1000 m a.s.l. another nest was found on 9 May 1958.
- The Peru nest was found by R. Ridgely and S. Hilty on 19 July 1989 at c. 1600 m asl situated high on a steep broad-leaved forest slope in the Cosñipata Valley.(R. Ridgely pers. comm.).

The habitat of the Solitary Eagle is characterized as humid, densely wooded foothills and other tropical and subtropical pre-montane and humid montane forest, mostly between 600 and 2,200 m a.s.l. (Birdlife International 2012).

## Methods

Ninety-seven hours of nest observations were made in 2011 from 30 June – 26 August.

On 18 March 2012, when the eagles were not in the nest area, we climbed into the first Belize nest using the single-rope climbing technique to take measurements and install a camera.

After the discovery of the Ecuador nest on 7 December 2010, the nest was again visited on 26 June 2012 to collect nest-site characteristics. Due to inaccessibility to the nest because of its obscurity on a rock outcropping, measurements of the nest could not be obtained, but nest-site characteristics were collected.

## Results

### Nest and Nest-Site Characteristics

#### BELIZE NEST 1

- On 30 June 2011, first Belize nest discovered with a single nestling in the Mountain Pine Ridge, Cayo District.

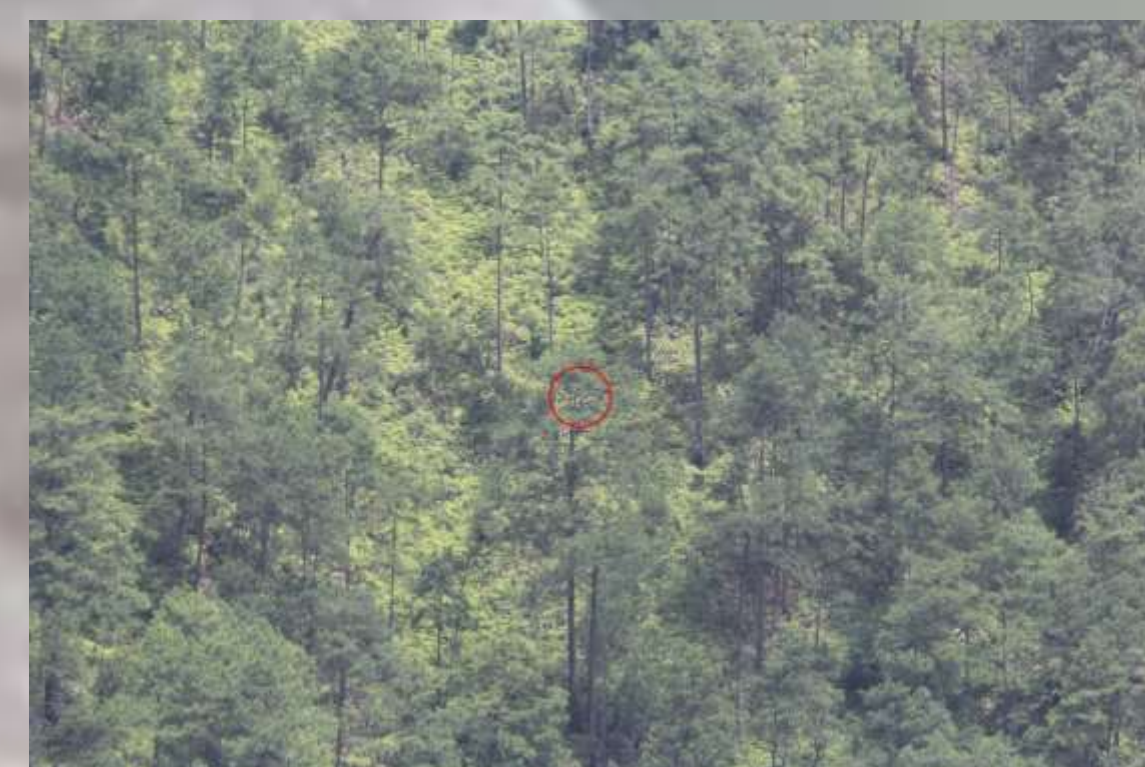


Nest and Nest-site Characteristics of Belize Nest 1					
ATTRIBUTE	MEAN	SD	SE	RANGE	N
Elevation a.s.l. (m)	667	-	-	-	1
Nearest broad-leaved forest (m)	386	-	-	-	1
Nearest water source (m)	166	-	-	-	1
Nest height (m)	20.1	-	-	-	1
Nest tree height (m)	23.1	-	-	-	1
DBH of nest tree (cm)	42.1	-	-	-	1
Canopy height (m)	17.5	1.8	0.9	15.6-19.7	4
Canopy cover (%)	71.7	14.2	5.8	49.9-85.3	5
Tree density (ha)	171.0	-	-	-	1
DBH of trees in the area (cm)	32.7	12.8	2.9	15.0-60.2	20
Slope (°)	39.2	4.8	2.1	31.0-46.0	5
Slope aspect (°)	101.8	25.7	11.5	72.0-142.0	5
Diameter of supporting branches (cm)	6.4	3.2	1.6	4.3-11.1	4
Diameter of nest branches (cm)	2.0	0.6	0.2	1.3-3.2	10
Standard deviation					
Standard error					



#### BELIZE NEST 2

- On 31 July 2014, a second nest, with a single nestling, was discovered in Belize 3.1km away from the 2011 nest. The habitat in both of these Belize nests was categorized as sub-montane pine forest with steep terrain located in the transitional karst zone between pine forest and broad-leaved forest.



#### ECUADOR NEST

- On 7 January 2010, a pair of Solitary Eagles were observed at a nest on a rock outcropping located in the Andes Mountains in the Loja Province c. 7 km south of Catamayo at 1368 m a.s.l. The habitat is characterized as montane dry scrub and is adjacent to agricultural fields.

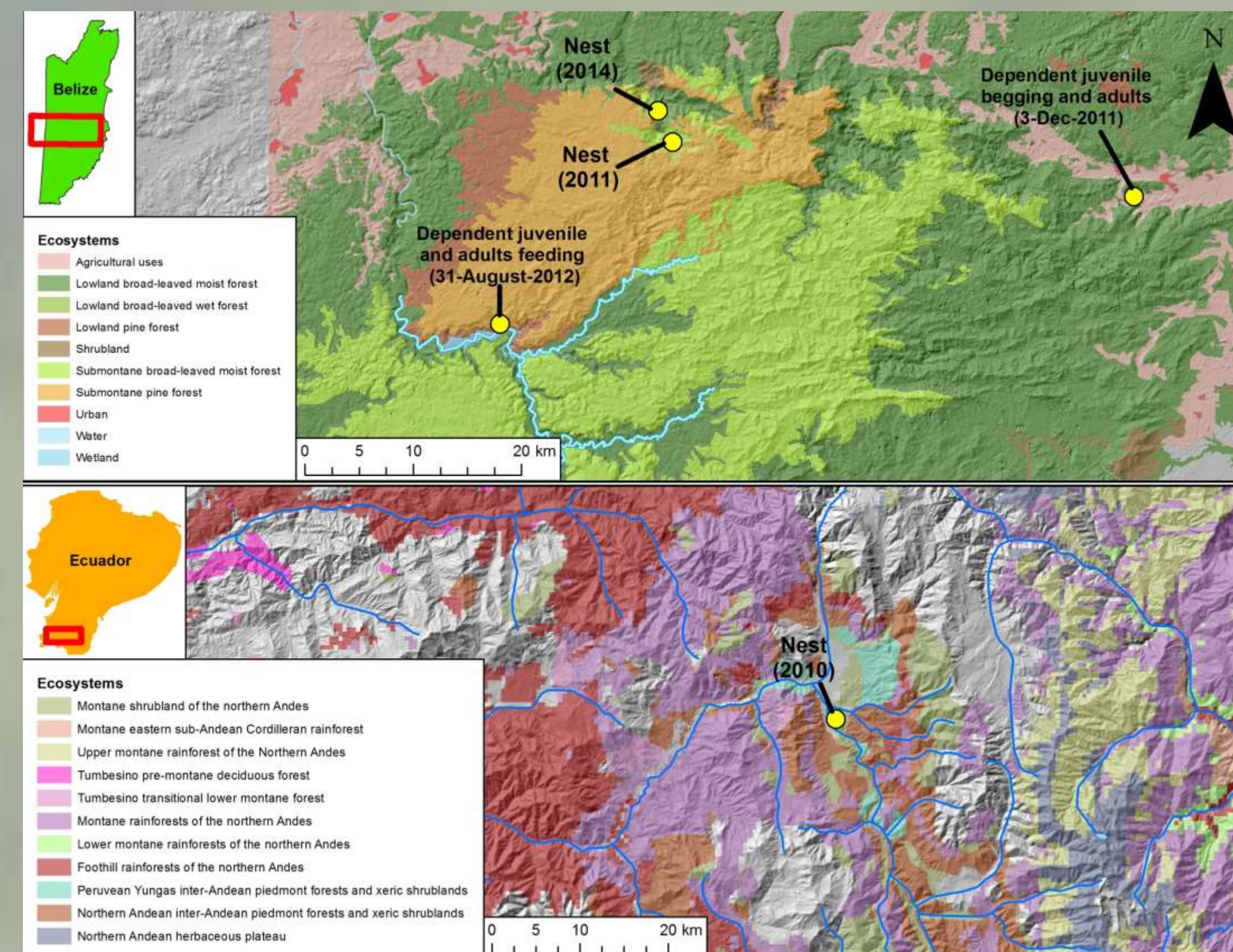


### Post-fledging Site Characteristics

- On 4 December 2011, a dependent juvenile Solitary Eagle was shot in Belize. The area is characterized as a mixture of citrus farms, clear cut and lowland moist broad-leaved forest and was at an elevation of 66 m a.s.l. in rolling, foothill terrain.



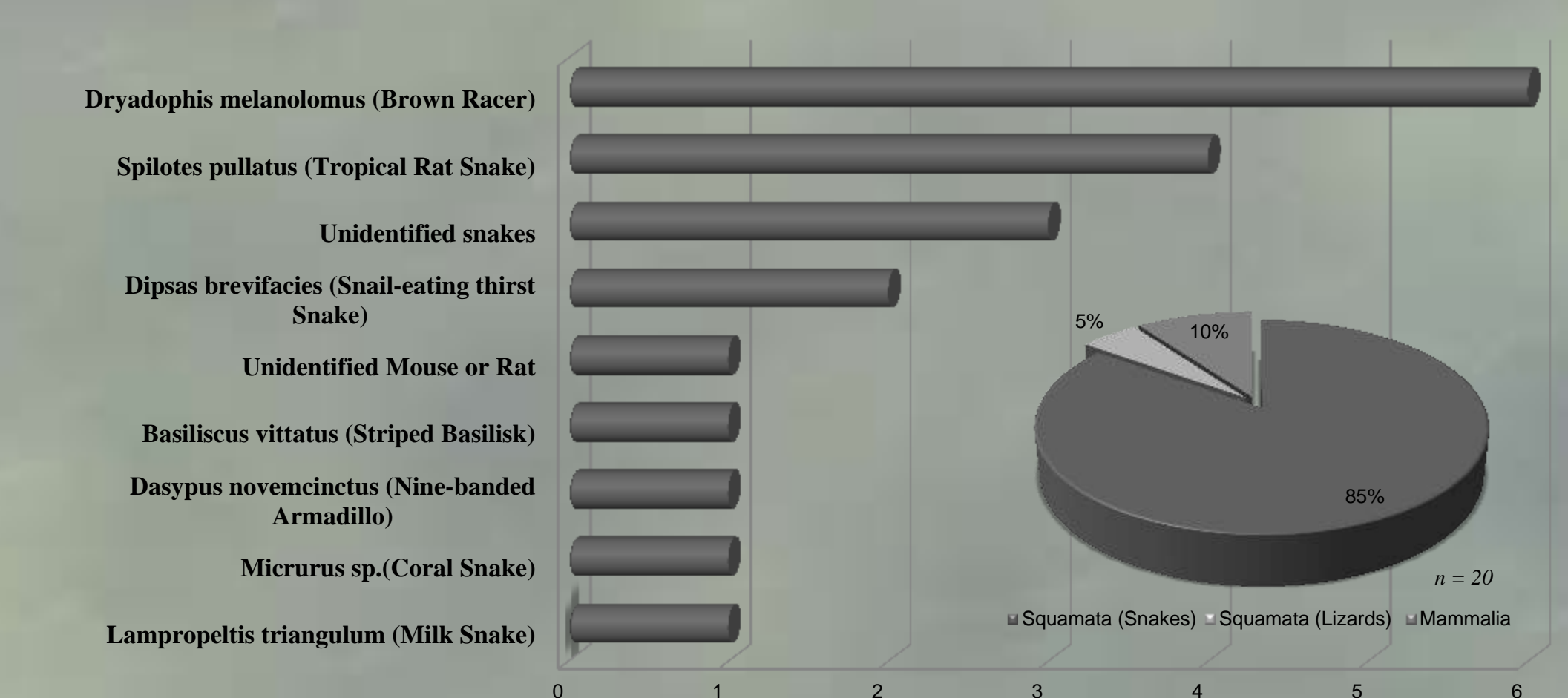
- On 31 August 2012, a dependent juvenile Solitary Eagle was observed in Mountain Pine Ridge Forest Reserve in Belize. A month later in the same location we observed an adult feeding the juvenile a boa and tropical rat snake. We suspect a nest within 3 km of this site. This area is characterized as sub-montane pine forest and is 520 m a.s.l. in the transition zone to broad-leaved forest.



### Prey Items

- Adults delivered prey to the nestling between 1-3 times per day ( $n = 20$ ) between 09:26 and 17:52. The female brought 60 % of the observed prey item deliveries.

Prey Items Observed at Solitary Eagle Belize Nest 1  
6 July- 16 August 2011



## Discussion

- The Solitary Eagle is apparently a specialized raptor in its diet and nesting habitat. Our observations confirm that the Solitary Eagle is a snake specialist in the northern extent of its range..
- We hypothesize that in the pine belt zone in the northern portion of the eagle's range they prefer the open habitat of the pine forest for nesting, but nest in close proximity to broad-leaved forest for foraging.
- The Ecuador nest represents the first record of the species using and nesting in montane dry scrub, as well as a non-forested habitat.
- Our data suggests that this species prefers steep terrain and that presence is not determined by elevation, but instead by the steepness of the terrain.
- The Solitary Eagle is currently listed as Near Threatened by the IUCN, with an estimated population between 1,500-4,000 individuals based on no scientific data (Birdlife International 2012). However, Belize is not included on the current range map. In Belize, we know of three pairs and suspect there to be between 10-25 pairs in the country. Currently, we consider the species to be data deficient.

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