

# SPIZAETUS

NEOTROPICAL RAPTOR NETWORK NEWSLETTER

ISSUE 12

DECEMBER 2011

**STUDYING *ASIO STYGIUS*  
*ROBUSTUS* IN BELIZE**

**A NEW CONCEPT IN  
ENCLOSURES FOR LARGE  
ACCIPITRIDAE**

**DIET OF *ATHENE*  
*CUNICULARIA* IN BRAZIL**

**A SEASONAL ANALYSIS OF  
DIURNAL BIRDS OF PREY  
IN BRAZIL**



## TABLE OF CONTENTS

Studying the Stygian Owl *Asio stygius robustus* in Mountain Pine Ridge, Belize.....2

A new concept in enclosures for large Accipitridae: A case study with a Harpy Eagle (*Harpia harpyja*) .....7

Diet of the Burrowing Owl *Athene cunicularia* in pastureland during the nesting/summer season in Northwestern Espírito Santo, Brazil.....13

Diurnal Birds of Prey in Estação Biológica de Santa Lúcia: a Seasonal Analysis in Santa Teresa, Espírito Santo, Brazil.....18

Of Interest.....25

The NRN is a membership-based organization. Its goal is to aid the research and conservation of Neotropical raptors by promoting communication and collaboration among biologists, ornithologists, raptor enthusiasts, and other conservationists working in the Neotropics.



*Spizaetus*: NRN Newsletter

Issue 12 © December 2011

English Edition

ISSN 2157-8958



### Cover Photo:

*Asio stygius robustus* photographed in Mountain Pine Ridge, Belize.

©Yeray Seminario, Whitehawk  
Birdwatching and Conservation

Graphic Design: Marta Curti  
NRN Coordinator: Marta Curti

Editors/Translators:

Angel Muela, Edwin Campbell, Hernan Vargas, Mosar Lemos, and Marta Curti

### Back Cover Photo:

*Asio stygius robustus* photographed in Mountain Pine Ridge, Belize

© Ryan Phillips, Belize Raptor  
Research Institute





# STUDYING THE STYGIAN OWL *ASIO STYGIUS ROBUSTUS* IN MOUNTAIN PINE RIDGE, BELIZE

By **Ryan Phillips**, Belize Raptor Research Institute (BRRI), [harpiabz@yahoo.com](mailto:harpiabz@yahoo.com). This article first appeared in the Summer 2011 issue of the BRRI Newsletter. It is reprinted here with permission.



*Asio stygius robustus* at roost. © Ryan Phillips

In March 2009, we began a long-term study on the Stygian Owl, one of the least known Neotropical owls. Our study area is located in the Mountain Pine Ridge region of the Cayo District, Belize. The objective of this study is to better understand all ecological aspects of this rare owl, including their nesting biology, abundance, home-range, movement patterns, habitat usage, foraging ecology, and response to fires and deforestation.

The Stygian Owl, *Asio stygius*, has a patchy distribution from northwestern Mexico to northern Argentina, where it has been recorded in Mexico, Guatemala, Belize, Honduras, Nicaragua, Cuba, Dominican Republic, Haiti, Colombia, Venezuela, Ecuador, Brazil, Bolivia, Paraguay, and Argentina (Birdlife International 2009, König and Weick 2008). In Belize, it is considered a rare resident and has only been recorded in three localities (Jones 2003).

The Stygian Owl is a poorly known species and its status is uncertain, making it a species with high research priority (Stotz et. al. 1996, Ko-

nig and Weick 2008). The Mexico and Central America subspecies, *Asio stygius robustus*, is restricted to pine forest and pine savanna making it vulnerable to population declines (Howell and Webb 1995, Jones 2003, Phillips pers. obs.). Of the *A. s. robustus* subspecies, only one nest has been described and diet analysis has been limited to anecdotal information (Franz 1991).

In March 2009, we located a roosting site, where a pair was seen nearly every day. We collected pellets for a full year at this site to determine their prey base. Of 194 prey remains in 145 collected pellets, we observed that their diet was comprised of 61.9% birds, 19.1% bats, 12.4% beetles, 6.2% lizards, and .5% frogs. Of the total prey items, 31% were nocturnal species. On average, from February-May the diet con-

sisted of 70% birds; whereas from June-August their diet was comprised of 37% birds, 32% bats, and 28% beetles; and from November-

February it consisted of 81% birds. The change in diet coincides with the emergence of beetles in June-August, and the influx of wintering migrant songbirds. According to biomass and quantity of prey items consumed, passerines were the most important dietary component. We



**Pellets collected near the roost site. © Ryan Phillips**

located this roost site in March, and have since located another seven roosting sites of other individuals. Pellets will continue to be collected to obtain a larger sample size and to include more individuals.

To better understand these elusive, nocturnal raptors, we trapped and radio-tagged (using VHF transmitters) two male Stygian Owls in December 2010. This is the first time this species has been trapped and fitted with radio transmitters.

We continuously monitored these two individuals but in February we lost a signal on one of them. Possible reasons for this include: the antenna of the transmitter





**Left: Biologist Roni Martinez releases a recently trapped Stygian Owl. Right: A young chick in the nest. © Ryan Phillips**

was chewed off; the transmitter malfunctioned; or the individual left the area. If the male returns to his usual roost site we should be able to more accurately determine what occurred.

The other male eventually led us to a nest containing a single chick, approximately 2 weeks old, on March 30th. This represented only the second nest of this species to be discovered in Belize and only the third such nest to ever be studied anywhere. From this tagged male, we've obtained data on their home-range, movements, foraging ecology, and habitat usage. This male was ob-

served feeding upon a Least Bittern (*Ixobrychus exilis*), the second largest prey item ever to have been documented for this species.

We discovered that Stygian Owls may not be the pine-oak or pine specialists that we once thought them to be. The tagged male moved nearly 15 kilometers through broadleaf forest and into cleared farmlands where he foraged for songbirds, bats, and insects before returning to his nest and roost site in pine-oak forest. They may only nest and roost in pine-oak or pine, but other habitats may be critical in their foraging ecology and survival





**A pair of *Asio stygius robustus* roosting in a pine tree, Belize. © Ryan Phillips**

---

when pine-oak and pine habitat is lost or altered. It is too early to determine if this is consistent across the population, but as we radio-tag more individuals we will be able to unravel this mystery.

This project will continue for a minimum of five years and we will continue to radio-tag individuals and collect data on home-ranges, movements, foraging ecology, nesting biology, as well as assessing how fires and deforestation affect Stygian Owl populations.

To view a movie about this project visit <http://www.youtube.com/watch?v=i5DckfqTXmI>

## References

- Bird, D. M., K. L. Bildstein, D. R. Barber & A. Zimmerman. 2007. Raptor: research and management techniques. Hancock House Publishers, Blaine, Washington, USA.
- BirdLife International 2009. *Asio stygius*. In: IUCN 2009. IUCN Red List of Threatened Species. Version 2009.2. <[www.iucnredlist.org](http://www.iucnredlist.org)>. Downloaded on 25 January 2010
- Borrero, J. I. 1967. Notas sobre hábitos alimentarios de *Asio stygius robustus*. El Hornero 10 (4):445-447.

- Dod, A. S. 1983. The Stygian Owl (*Asio stygius noctipetens*) in the Dominican Republic. American Birds 37: 266-267.
- Franz, M. 1991. Field observations on the Stygian Owl *Asio stygius* in Belize, Central **America**. (Abstract). J. Raptor Res. 25:163.
- Jones, H. L. 2003. Birds of Belize. University of Texas Press, Austin, Texas, United States.
- Kirkconnel, A., D. Wechsler & C. Bush. 1999. Notes on the Stygian Owl (*Asio stygius signapa*) in Cuba. El Pitirre 12: 1-3.
- Konig, C. & F. Weick. 2008. Owls of the World. Yale University Press, New Haven, United States.
- Lopes et al. 2004. Observations on a nest of the Stygian Owl (*Asio stygius*) in the central Brazilian Cerrado. Ornitologia Neotropical 15 (3): 423-427.
- Motta Junior, J. C. & V. A. Taddei. 1992. Bats as prey of Stygian Owls in southeastern Brazil. J. Raptor Res. 26: 259-260.

\* \* \*



# A NEW CONCEPT IN ENCLOSURES FOR LARGE ACCIPITRIDAE: A CASE STUDY WITH A HARPY EAGLE (*HARPIA HARPYJA*).

By **Paulo Roberto Neme do Amorim**. Reserva Particular do Patrimônio Natural REVECOM, e-mail: [revecombr@bno.com.br](mailto:revecombr@bno.com.br); **Môsar Lemos**, NAL – Núcleo de Animais de Laboratório, UFF – Universidade Federal Fluminense, e-mail: [lemosmosar@hotmail.com](mailto:lemosmosar@hotmail.com); **Roberto da Rocha e Silva**. Curso de Medicina Veterinária, Universidade Estácio de Sá, e-mail: [rrochaesilva@gmail.com](mailto:rrochaesilva@gmail.com) e **Maria Lucia Barreto**. NAL – Núcleo de Animais de Laboratório, UFF – Universidade Federal Fluminense, e-mail: [mlbarreto@gmail.com](mailto:mlbarreto@gmail.com).

The Harpy Eagle (*Harpia harpyja*) is a large Accipitridae that is found in several Brazilian states, though their populations are best preserved in the Amazon. They can measure one meter in length with a wingspan that reaches more than 2 meters. Females, which can weigh up to 9 kg, are much larger than the males, which weigh around 5 kg. Harpy Eagles have a slow reproductive rate, reaching maturity at around five years of age and each pair raises only one offspring at a time, although they can lay up to two eggs. The adults may care for their young for up to three years. This low fecundity, coupled with the destruction of large areas of forests, have made the Harpy Eagle an endangered bird in Brazil (Brown 1976; Sick 1997; ICMBIO, 2008).

---

A male Harpy Eagle *Harpia harpyja* © Angel Muela, Whitehawk Birdwatching and Conservation





In January 2007, an injured Harpy Eagle was brought to REVECOM Private Natural Heritage Reserve (RPPN - for its acronym in Portuguese), state of Amapá, Brazil. The initial clinical examination revealed lesions on the inside of the right wing (with some joint exposure); the right pectoral region had significant loss of feathers with dermal exposure and abrasion; foreign bodies were found under the nictitating membrane, and it had traumatic keratitis and episcleritis with secondary bacterial infection in its right eye (Amorim et al, 2010). Due to its injuries, it was not a candidate for release back into the wild and so an aviary needed to be built to house it.

Though, in some regards, housing birds of prey can be relatively simple, it is also very difficult considering that they require large spaces in which to fly. When it is necessary to hold a bird in permanent captivity, for reasons that may include injuries or behavioral traits that make it unlikely that it will survive in the wild, it is important to provide suitably-sized enclosures. Inactivity can lead to behavioral disorders, as well as diseases typical of birds in captivity, such as the dreaded bumblefoot, which can cause the

bird to lose toes and even the whole foot due to the infectious process that takes place when the conditions of captivity are inadequate (Enderson 1976; Cooper 2002; Amorim et al. 2010). At the same time, maintaining birds in captivity using falconry techniques is a laborious task, requiring long periods of time and dedication to the bird as well as an experienced handler. However, this latter technique does allow for a significant reduction in the space requirements for housing, as it provides the bird with time to exercise and fly freely, while only spending part of each day in an enclosure. (Cooper 2002 and Parry-Jones 2001). In Brazil, the Brazilian Institute of Environment and Natural Resources (IBAMA) regulates the captive management of large Accipitridae. Normative Instruction (NI) No. 04, March 4, 2002, which amended NI 001/89-P (Table 1), states the obvious fact that the accommodation should allow freedom of flight. But it is not enough that the enclosure is large, it needs to meet volumetric conditions to allow the bird to exercise and perform certain flight maneuvers that occur in the wild. Perches should be arranged so as to force the bird to exercise. An inadequately designed chamber can lead the bird to immobility (Amor-

**Table 1. Normative Instruction 001/89-P for housing birds of prey, IBAMA**

Family	Size	Density	Observations
<b>Cathartidae, Accipitridae and Falconidae</b>	Small bird	1 bird/ 5m <sup>2</sup>	Sandy ground or lawn, woody vegetation for shading, a pool for bathing. Must allow freedom of flight.
	Medium bird	1 bird/10 m <sup>2</sup>	
	Large bird	1 bird/25 m <sup>2</sup>	

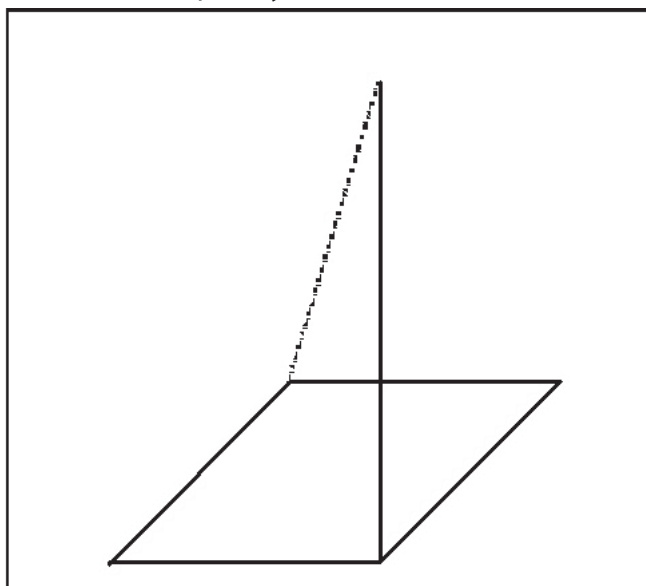
Family	Size	Density	Height (m)		Observations
Cathartidae, Accipitridae and Falconidae	Small bird	2 birds/10 m <sup>2</sup>	Cathartidae	4	Sandy ground or lawn, woody vegetation for shading, a pool for bathing. Must allow freedom of flight.
	Medium bird	2 birds/20 m <sup>2</sup>	Accipitridae	3,4,6	
	Large bird	2 birds/50 m <sup>2</sup>	Falconidae	3,4,5	

**Table 2. Normative Instruction 04/2002 for housing birds of prey, IBAMA**

im et al. 2010). The analysis of two regulatory laws shows progress in addressing the problem of housing birds of prey in Brazil (Brasil 1989; Brasil 2002).

The IN 04/2002 (Table 2), though an improvement, does not correct for the failures in NI 01/89. Though it goes beyond two-dimensional regulations by setting the height of the enclosure, it still does not provide adequate flight space.

**Figure 1. Enclosure model based on Normative Instruction 001/89-P, IBAMA**



### RPPN REVECOM Model

Using an enclosure of 25 m<sup>2</sup> (one bird) with a ceiling height of 6.0 m. as an example, it is evident that there is a disharmony between height and base. Though, in theory, there would be enough height for the bird to fly, there would not be enough linear extension, parallel to the surface of the enclosure, for lift. This could force the bird into relative immobility, and could cause atrophy of the pectoral muscles, which is, of course, not desirable.

As demonstrated in Figure 1, the enclosure would have a base of 25.0 m<sup>2</sup> (5.0 m x 5.0 m), a height of 6.0 m and a diagonal of 7.07 m. The bird would have, at most, an extension of only 4.0 to 5.0 meters in which to fly. This is too small a space for a bird with as large a wingspan as the Harpy Eagle.

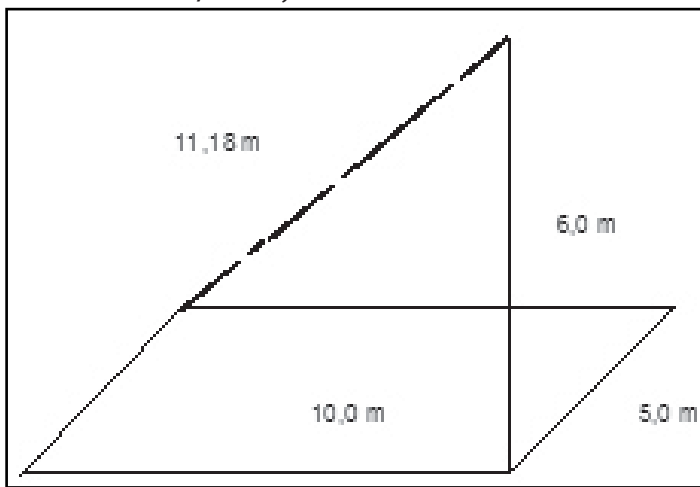
We designed our enclosure to measure 50.0 square meters, as follows: base of 5.0 × 10.0 m = 50.0 m<sup>2</sup>; height 6.0 m, resulting in a diagonal of 11.18 m (Figure 2).



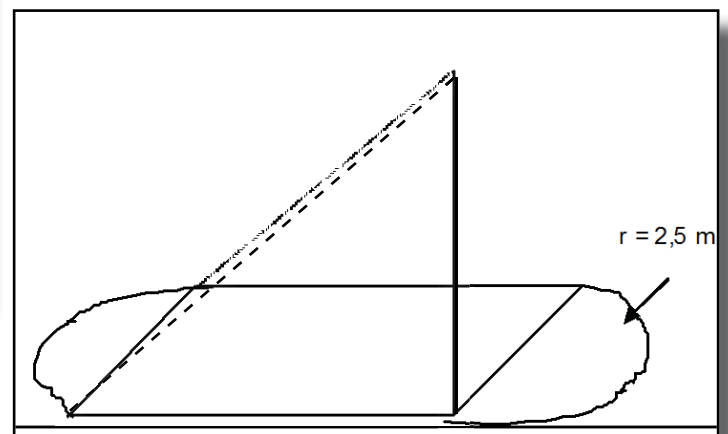
With these dimensions the enclosure has a volume of 300 m<sup>3</sup>. We added two semicircular attachments ( $R = 2.5$  m) to the base and gained space for a shelter at one end, and room for access doors at the opposite end. Thus the bird has an area of 50.0 m<sup>2</sup> for flight and exercise. We added a pool for bathing (Figure 3 and 4). The addition of the two semicircles also provides space for a security area and holding room.

The enclosure should be equipped with perches and platforms strategically placed to stimulate the bird's flight. The structure was covered with plastic canvas that provides 75% shading. On the roof, above the shading canvas, we placed a transparent plastic cover (Figure 5). At the top of the enclosure we placed three lines of sprinklers, to obtain the necessary microclimatic control of the enclosure (Figures 6 and 7).

**Figure 2. Enclosure model based on Normative Instruction 04/2002 , IBAMA**



**Figure 3. Addition of semi-circles**



**Figure 4. Base of the enclosure**

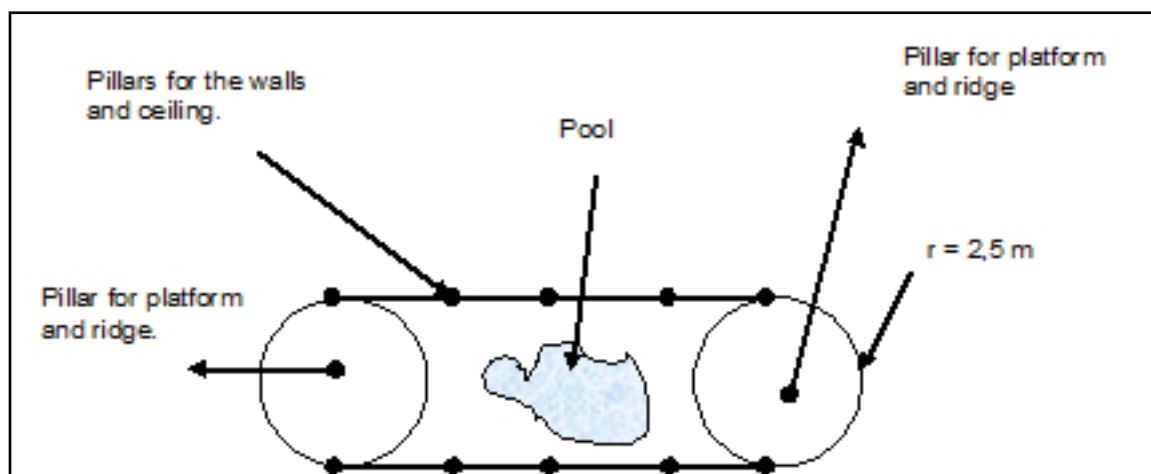


Figure 5. Roof structure

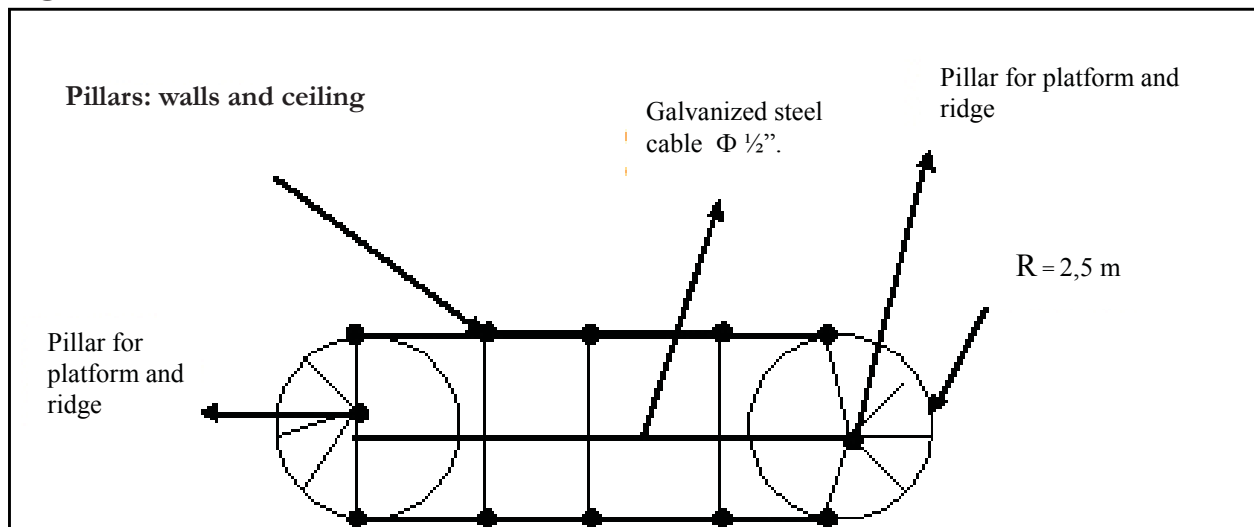


Figure 6. Lines of sprinklers on the ceiling

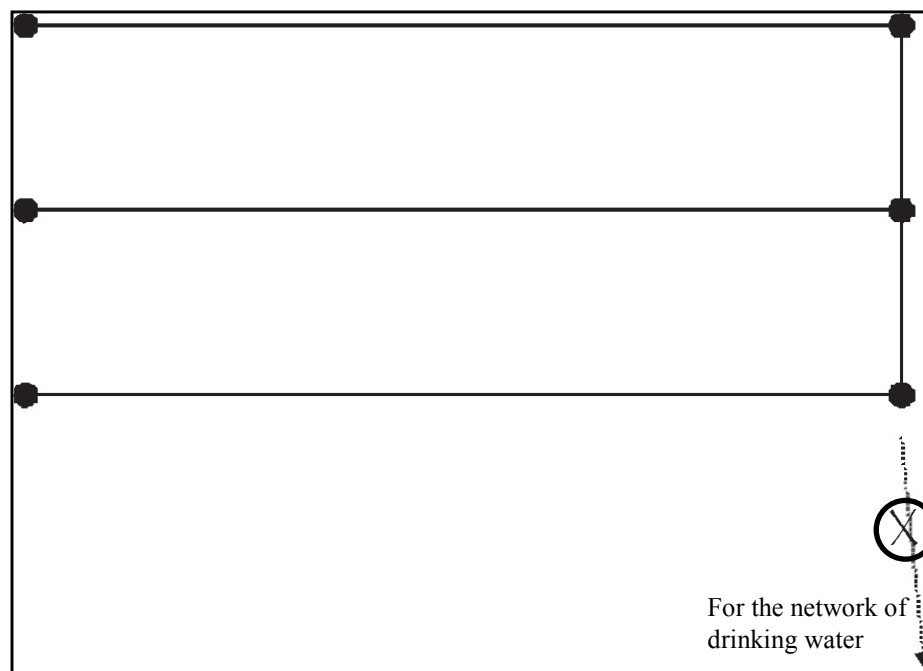
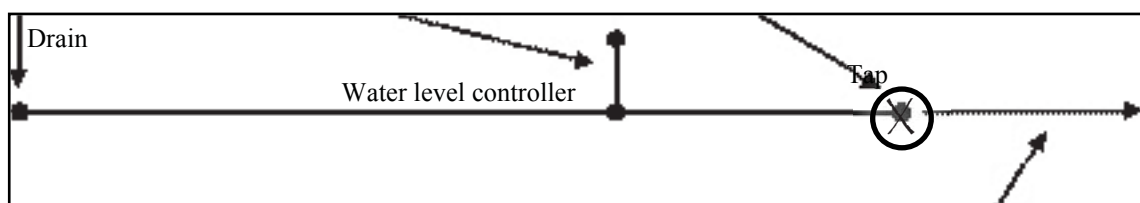


Figure 7. Sewer line





## Conclusion

The new enclosure model developed by RPPN REVECOM is fully satisfactory for housing this *Harpia harpyja* and would easily accommodate another individual as well. The cost of construction of the enclosure was offset by the rapid adaptation of the bird housed in it. In addition, the enclosure built in this way meets the regulations set forth by IBAMA's Normative Instruction No. 04/2002.

## Acknowledgements

We thank the team of the RPPN REVECOM for their efforts in the construction of the enclosure and in the full recovery of the Harpy Eagle.

---

*Harpia harpyja* housed in its new enclosure © RPPN REVECOM



## References

Amorim, P. R..N., R.R. E. Silva, M. Lemos, M.L Barreto. 2010. Recuperação de um Uiraçu (*Harpia harpyja*) na Reserva Particular do Patrimônio Natural REVECOM. *Spizaetus*, v.10, p.16 - 22.

Brasil, Instrução Normativa No. 001/89-P de 19 de outubro de 1989. Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis. Brasília, 1989.

Brasil, Instrução Normativa No. 004/02 de 04 de março de 2002. Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis. Brasília, 2002.

Brown, L. 1976. *Birds of Prey, their biology and ecology*. Hamlyn: Londres.

Cooper, E. 2002. *Birds of prey: Health and disease*. 3.ed. Willey-Blackwell: Ames, 384p.

Enderson, J. 1986. Husbandry and captive breeding of birds of prey. In: FOWLER, M.E. *Zoo & Wild Animal Medicine*, 2ed. W. B. Saunders Company: Philadelphia, p.376-379.

ICMBIO. Plano de Ação Nacional para a Conservação de Aves de Rapina. Instituto Chico Mendes de Conservação da Biodiversidade. Brasília, 136p. 2008.

Parry-Jones, G. 2002. *Training birds of prey*. David & Charles Publishers: Devon, 160p.

Sick, H. 1997. *Ornitologia Brasileira*. 2a impressão, Editora Nova Fronteira S.A. Rio de Janeiro, 912p.

\* \* \*

# DIET OF THE BURROWING OWL (*ATHENE CUNICULARIA*) IN PASTURELAND DURING THE NESTING/SUMMER SEASON IN NORTHWESTERN ESPÍRITO SANTO, BRAZIL.

By **Mikael Mansur Martinelli**, Museu de Biologia Prof. Mello Leitão (Zoologia) - Av. José Ruschi, 4, Centro, 29650-000 - Santa Teresa, ES – Brasil. E-mail: [mansurmartinelli@yahoo.com.br](mailto:mansurmartinelli@yahoo.com.br)

The Burrowing Owl (*Athene cunicularia*) is a long-legged terrestrial owl that occurs from Canada to Tierra del Fuego in Argentina (Sick, 1997). A small to medium sized Strigiforme, it measures 22 cm in length and weighs between 120-250 grams (Bozinovic and Medel, 1988, Marks et al, 1999). This owl occurs in a variety of landscapes, especially in open areas such as fields and savannas; however, due to the fragmentation of its habitats for agricultural and urban development, some Burrowing Owl populations live close to human inhabited areas (Gervais et al. 2003) where they often take advantage of the artificial light to

hunt insects. Perhaps, due to this fact, they prefer living in human populated areas, as they are common in cities, fields and farms. According to Sick (1997) and Antas and Cavalcanti (1998), this species inhabits holes in the ground dug by other species or which it makes itself (hence its common name of Burrowing Owl). This owl shows a remarkable ability to adapt to capturing a wide variety of prey including insects, and occasionally small rodents, amphibians and other birds, which it depends on for its survival (Sick, 1997, Motta-Junior and Alho, 2000, Motta Junior et al. 2007).

Though *A. cunicularia* is known as a generalist species, feeding on a very diverse selection of prey, and the presence of vertebrates in their diet has been documented in several studies, (Martins and Egler, 1990), generally, invertebrates (mainly insects) prevail over vertebrates (Thomsen 1971, Silva-Porto and Cerqueira, 1990, Green et al. 1993, John and Romanow, 1993, Teixeira and Melo, 2000, Motta-Junior and Bueno, 2004, Zílio, 2006; Vieira and Teixeira, 2008).

---

*Athene cunicularia* in Brazil ©José Nilton da Silva,  
Museu de Biologia Prof. Mello Leitão





The objective of this study was to present quantitative data (number of individuals and gross ingested biomass) in *A. cunicularia* diet by identifying prey remains from pellets collected in a northwest grassland area in the state of Espírito Santo, Brazil.

## Methods

The study was conducted at Chácara Irmãos Martinelli [Martinelli Brothers' Ranch] (19 ° 28'23"S and 40° 44'22"W, 98 m altitude) in a rural area between Córrego São João Pequeno and Córrego do Almoço, 15 km away from the center of Colatina, Espírito Santo, Brazil. The region is warm during the summer with highs of 40° C and lows of 24° C, with little constant rain. This 32 ha ranch consists predominantly of coffee monoculture (12 ha), a pasture area for cattle breeding (8 ha), and a small Atlantic Forest remnant (6 ha).

Weekly, during the summer (January and February) of 2008, we collected pellets and identified prey remains found within a radius of three meters around three different nests. A total of five intact pellets and several fragments of pellets, which were estimated to represent about 40 samples, were collected. Prey identification was made by comparing undigested parts such as heads, chitin, shells and bones (jaw and pelvis), to the insect collection in Prof. Mello Leitão's Biology Museum. The number of individuals was es-

timated by counting the number of heads found in each pellet.

## Results

The material analysis revealed that of the over 155 prey species that formed the diet of *Athene cunicularia* (Table 1) insects were predominant (97.5%), with *Onthophagus gazella* (African Dung Beetle) being the most prevalent (95.5%). We found evidence of vertebrate consumption (lizards and rodents) in only one of the three nests. We found rodent remains, which included bones and hair, in only two pellets. Lizard remains found in pellets included only jaws and other bones. Owls tend to hunt lizards during the day, as these reptiles are often foraging during the hottest hours of the day; while they prey on rodents during their crepuscular/night hunts.

Considering that invertebrates were the most common prey items consumed or brought to the nest by adult owls (62.25%), it is worth mentioning that we may have overestimated the Arachnida biomass, as we found the legs and cephalothorax of a partially eaten individual around the nest, but not in any of the collected pellets. In terms of ingested biomass, vertebrates are an important component (37.75%) in this species' diet.

## Discussion

The results show that the diet of *A. cunicularia* in this region consists primarily of insects, mainly

*Onthophagus gazella*. The high presence of this invertebrate in their diets may be due to the prevalence of this beetle in pastures where there is an abundance of cattle feces. Our study nests are located near the center of a pasture with extensive cattle breeding. *O. gazella* is an important agent for pasture restoration. Cattle feces often carry the eggs and larvae of flies, which get buried, along with the feces, by the dung beetles at a depth of about 25 cm. Doing this, and destroying the fecal masses deposited on the soil surface, contributes to pasture support (Silva and Vidal, 2007), especially in the case of the horn-fly, which is very harmful to cattle herds.

Small mammals such as rodents, marsupials and bats, have been identified in regurgitated pellets in several owl species (Silva-Porto and Cerqueira, 1990; Motta-Junior, 2004; Motta-Junior, 2006, Roda, 2006, Zilio, 2006). Martins and Egler, 1990 recorded a predominance of rodents in the diet of *Athene cunicularia* in a pasture in southeastern Brazil, though our results did not. The absence of certain prey items in our study that have been documented in considerable quantities in several other studies, is due probably to the large supply of Coleoptera in our research area, which in biomass terms, is not very advantageous in comparison to vertebrates, especially rodents.

**Table 1. Species preyed upon by *Athene cunicularia* with mean body mass (g) of adult individuals. Estimated number (N) and ingested biomass (g) found in regurgitated pellets collected in a pasture northwest of Espírito Santo, Brazil**

Prey	Mean Body Mass	N (%)	Biomass (%)
<b>Insect</b>			
Coleoptera		151 (92,42)	
Scarabidae		150 (96,78)	151
<i>Onthophagus gazella</i>	1	148 (95,5)	148 (58,75)
spp. 1	1	1 (0,64)	1 (0,4)
spp. 2	2	1 (0,64)	2 (0,8)
Carabidae spp	1	1 (0,64)	1 (0,4)
<b>Arachinidea</b>			
Mygalomorphae	5	1 (0,64)	5 (1,9)
<b>Reptilia</b>			
<i>Tropiduros torquatos</i>	15	1 (0,64)	15 (5,95)
<b>Mammalia</b>			
Rodentia (unidentified)	40	2 (1,3)	80 (31,8)
<b>TOTAL</b>		<b>155 (100,0)</b>	<b>252 (100,0)</b>

Different studies throughout this species' distribution show evidence of opportunism in *Athene cunicularia*, whose hunting strategy is concentrated on the most abundant prey in their region. This opportunistic behavior allows the owls to occupy multiple trophic levels, filling a very broad niche. This affords them the ability to survive in different environments and may be the main factor that explains the success of this species in disturbed areas.

### Acknowledgements

To my father (Alaércio Jorge Martinelli) who found the nests and called my attention to them. José Carlos Motta-Junior for references and ideas. To Thais de Assis Volpi and Dra. Luisa Maria Sarmento-Soares for reviewing this manuscript.

### References

- Antas, P. T. Z. and R. B. Cavalcanti 1988. Aves comuns do Planalto Central. Brasília: Editora Universidade de Brasília.
- Bozinovic, F. and R. G. Medel 1988. Body size, energetic and foraging mode of raptors in central Chile. *Oecologia* 75:456-458.
- Gervais J. A., D. K. Rosemberg and R. G. Anthony 2003. Space use and pesticide exposure risk of male burrowing owls in an agricultural landscape. *Journal of Wildlife Management* 67:155–164.
- Green, G. A., R. E. Fitzner, R. G. Anthony and L. E. Rogers 1993. Comparative diets of Burrowing Owls in Oregon and Washington. *Northwest Science* 67:88-93.
- John, R. D. and J. Romanow 1993. Feeding behaviour of Burrowing Owl, *Athene cunicularia*, in Ontario. *Canada Field Natural.* 107:231-232.
- Marks, J. S., R. J. Cannings and H. Mikkola 1999. Family Strigidae (Typical Owls), p. 76-242. Em: Del Hoyo, J., A. Elliot and J. Sargantal (eds.) *The handbook of birds of the world. Volume 5: Barn-owls to Hummingbirds.* Barcelona, Lynx Edicions.
- Martins, M. and Egler, S. G. 1990. Comportamento de caça em um casal de corujas buraqueiras (*Athene cunicularia*) na região de Campinas, São Paulo, Brasil. *Revista Brasileira de Biologia* 50:579–584.
- Motta-Junior, J. C. 2006. Relações tróficas entre cinco Strigiformes simpátricas na região central do Estado de São Paulo, Brasil. *Revista Brasileira de Ornitologia* 14(4):359-377.
- Motta-Junior, J. C. and Bueno A. A. 2004. Trophic ecology of the Burrowing Owl in southeast Brazil, p. 763-775. Em: Chancellor R. D.; Meyburg B. U. (org.). *Raptors Worldwide.* Berlin/Budapest: World Working Group on Birds of Prey and Owls and MME/Birdlife Hungary.
- Motta-Júnior, J. C., Bueno, A. A. and Braga, A. C. R. 2007. Corujas Brasileiras. [on line]. Available



- at [http://www.ibcbrasil.org.br/noticias/detalhes.asp?cod\\_noticia=49](http://www.ibcbrasil.org.br/noticias/detalhes.asp?cod_noticia=49)). (Accessed in november 2010).
- Roda, S. A. 2006. Dieta de *Tyto alba* na Estação Ecológica do Tapacurá, Pernambuco, Brasil. *Revista Brasileira de Ornitologia* 14(4):449-452.
- Sick, H. 1997. *Ornitologia brasileira*. Rio de Janeiro: Nova Fronteira.
- Silva, P. G. and Vidal, M. B. 2007. Atuação dos escarabeídeos fimícolas (Coleoptera: Scarabaeidae sensu stricto) em áreas de pecuária: potencial benéfico para o município de Bagé, Rio Grande do Sul, Brasil. *Revista de Ciências Agroveterinárias* 6:162-169.
- Silva-Porto, F. and Cerqueira, R. 1990. Seasonal variation in the diet of the burrowing owl *Athene cunicularia* in a resting of Rio de Janeiro State. *Ciência e Cultura* 42:1182-1186.
- Teixeira, F. M. and C. Melo 2000. Dieta de *Speotyto cunicularia* Molina, 1782 (Strigiformes) na região de Uberlândia, Minas Gerais. *Ararajuba* 8:127-131.
- Thomsen, L. 1971. Behavior and ecology of Burrowing Owls on the Okland Municipal Airport. *Condor* 73:117-192.
- Vieira, L. A. and Teixeira, R. L. 2008. Diet of *Athene Cunicularia* (Molina, 1782) from a sandy costal plain in southeast Brazil. *Boletim do Museu de Biologia Mello Leitão. Nova série*. 23:5-14.
- Zílio, F. 2006. Dieta de *Falco sparverius* aves falconidae e *Athene cunicularia* aves strigidae em uma região de dunas no sul do Brasil. *Revista Brasileira de Ornitologia* 14:379-392.

\* \* \*

# DIURNAL BIRDS OF PREY IN ESTAÇÃO BIOLÓGICA DE SANTA LÚCIA: A SEASONAL ANALYSIS IN SANTA TERESA, ESPÍRITO SANTO, BRASIL

By 1\* **José Nilton da Silva**; 2 **Thaís de Assis Volpi** & 3 **Rosemberg Ferreira Martins**. 1\* - Museu de Biologia Prof. Mello Leitão, Avenida José Ruschi, n. 4, Centro Santa Teresa, ES – 29650-000. E-mail: [josnsilva@yahoo.com.br](mailto:josnsilva@yahoo.com.br). 1,2 Centro Universitário Norte do Espírito Santo (UFES/CEUNES); Rodovia BR 101 Norte, km 60, bairro Litorâneo, CEP 29932-540, São Mateus – ES. E-mail: [taisvolpi@gmail.com](mailto:taisvolpi@gmail.com). 1,3 E-mail: [Rosembergfm@terra.com.br](mailto:Rosembergfm@terra.com.br).

**B**razil is home to an estimated 1,832 species of birds (CRBO 2011) of various orders, families and subfamilies (Sick 1997). Among these birds, there are many seasonal and migratory species (Sick 1983, 1997) whose behaviors are affected by annual climatic variations (Sick 1983). These variations not only influence the availability of resources, but also physiological changes in the birds themselves (Newton 1979, Sick 1983, Thio-llay 1996).

According to Newton (1979) and Calder & King (1974) the breeding season of some birds can be influenced by seasonal factors in temperate regions. The movement of Brazilian avifauna is directly related to climatic changes that occur over spring, summer, fall and winter (Sick 1983).

Within the Accipitridae and Falconidae families (order Falconiformes), and the Carhartidae family (order Ciconiformes), there are many seasonal and migratory species (Sick 1983, Sigrist 2007). Some of these are classic migrants such as *Ela-*

*noides forficatus* and *Falco peregrinus* (Frisch & Frisch 2005, Sigrist 2007). As with other species, many Falconiformes move from one region to another for nesting, while others of the same order migrate in search of better environmental conditions, more availability of resources, or more favorable temperatures (Newton 1979).

This study, therefore, provides a record of those diurnal raptors sighted across the four seasons, in the Estación Biológica de Santa Lucia (EBSL) [Santa Lucia Biological Station], and documents in which seasons greater numbers of these bird species were observed.

## Methods and Methodology

### Study Area

The Santa Teresa Municipality is located in the mountain region of Espírito Santo, Brazil (40° 36'06" W e 19° 56'10" S), (Tabacow 1992). The EBSL, an approximately 440 hectare remnant of Atlantic Forest from between 550 and 950 me-

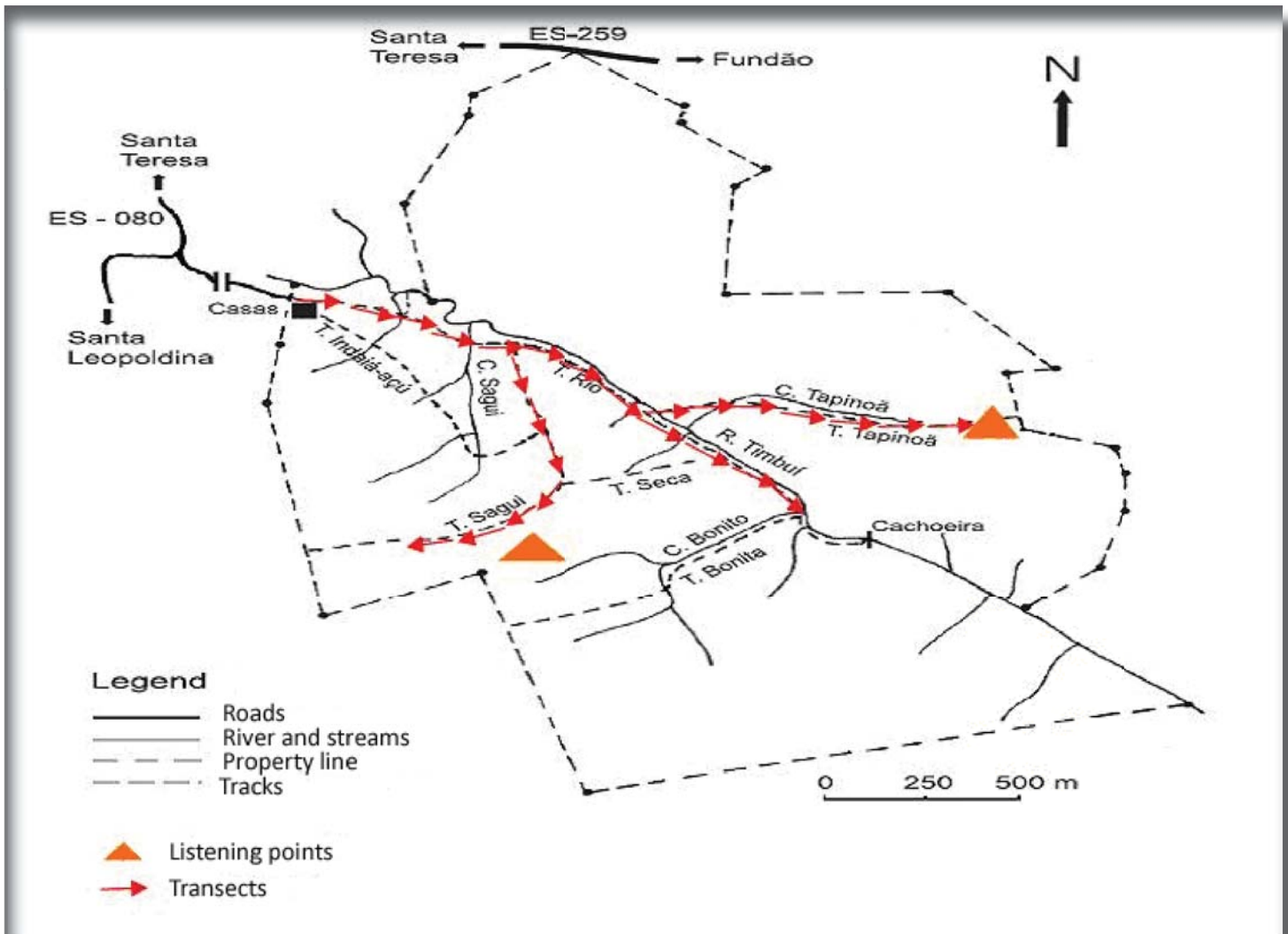


Figure 1. Map of the Estación Biológica de Santa Lucia and its trails (Source: Mendes & Padovan 2000)

ters (Mendes & Padovam 2000) is located within this municipality.

### Data Collection

Research activities were carried out between May 2006 and May 2007, with five visits being made during each season of the year. Each observation began at 0600 and finished at 1300, completing 7 hours in the field per visit for a total of 35 hours per season, and a total of 140 hours of observa-

tion in the field for the duration of the study. We used Breaker 20x50 and Tasco 12x25 binoculars with which to observe the birds, and Sony H5 and Sony H1 cameras for photographic records. We also recorded birds' vocalizations and monitored the temperature hourly during all of our field visits. Field activities included transects and listening points. The transects were carried out on the Timbuí, Tapinoã and Sagui trails. We used existing overlooks as our listening points, from



where we also made most of our observations.

There have been several raptor inventories conducted in Santa Teresa (Ruschi 1977, Willis & Oniki 2002, Simon 2000, 2006, Vieira 2002), however, the data we collected were compared only to the studies conducted by Simon (2000) and Ruschi (1977), since these were carried out in the same protected area as our research.

## Results

We recorded 19 species of raptors from the Accipitridae, Cathartidae, and Falconidae families. Of these, 10 were in the Accipitridae family, 2 in the Cathartidae family, and 7 in the Falconidae family. During this inventory, we noted differences in the species and numbers of raptors throughout the different seasons. Only those in the family Cathartidae maintained stable records across all the seasons (Table 1).

**Table 1. Raptor species observed at the Estación Biológica de Santa Lucia during the study.**

Species/Family	Seasons			
	Winter	Spring	Summer	Fall
<b>Accipitridae</b>				
<i>Accipiter striatus</i>	-	-	-	XR
<i>Geranoaetus albicaudatus</i>	-	-	-	XS
<i>Buteogallus urubitinga</i> *	-	-	XJ	-
<i>Elanoides forficatus</i>	-	-	XS	-
<i>Geranoospiza acerulescens</i>	-	-	XR	-
<i>Amadonastur lacernulatus</i>	XJ	XJ	-	XJ
<i>Pseudastur polionotus</i>	XR	XR	XR	XR
<i>Leptodon cayanensis</i>	XO	XO	XO	XO
<i>Rupornis magnirostris</i>	XS	XS	XS	XS
<i>Spizaetus tyrannus</i>	XO	-	XO	XO
<b>Cathartidae</b>				
<i>Cathartes aura</i>	XO	XO	XO	XO
<i>Coragyps atratus</i>	XO	XO	XO	XO
<b>Falconidae</b>				
<i>Carcara plancus</i>	XR	-	XR	XR
<i>Falco femoralis</i>	-	-	-	XJ
<i>Falco sparverius</i>	-	-	-	XR
<i>Herpetotheres cachinnans</i>	-	-	-	XO
<i>Micrastur ruficollis</i>	-	-	-	XR
<i>Micrastur gilvicollis</i>	-	-	-	XO
<i>Milvago chimachima</i>	-	XO	XO	XO

### LEGEND:

**XO** - records documented during all three studies conducted in the EBSL, including our present study;  
**XR** - records documented by Ruschi (1977) and by our study;  
**XS** - records documented by Simon (2000) and our study;  
**XJ** - records documented by our study.

\* possible vagrant, this is its first record in the municipality.

The temperatures were in constant flux throughout our time in the field. Minimum temperatures were recorded at 17 °C in the winter and maximum summer temperatures reached 36 °C . The highs and lows for each season are detailed in Table 2.

**Table 2: Median of minimum and maximum temperatures per season, during our study.**

Seasons	Minimum	Maximum
Winter	17° C	30° C
Spring	17° C	34° C
Summer	18° C	36° C
Fall	17° C	33° C

## Discussion

Raptors' dietary needs vary according to the seasons and their body size (Calder & King 1974, Gessamam 1987). Small species (< 370g) from temperate regions require a large supply of biomass, about 25% of their own body mass, during the winter. Birds of medium to large size (700

– 1200 g) need between 10 and 15%, and large eagles (> 3000g) in similar regions and in captivity consume about 5% of their mass in prey (Gessamam 1987). Studies show that the average consumption of food in winter is 20 to 30% higher than in the summer (Gessamam 1987, Del Hoyo et al 1994).

Therefore, the oscillations in sightings during different seasons could be related to the availability of food, since many of these species are specialized in hunting certain prey (Bennet & Owens, 1997) Even so, some raptor species were observed during all the seasons including *Coragyps atratus*, *Cathartes aura*, *Leucopternis polionotus*, *Leptodon cayanensis* and *Rupornis magnirostris*. These species were very common throughout the study, but some, such as *Leptodon cayanensis* were recorded with less frequency in spring and fall. The birds observed during the study appear to use all of the 440 ha of the ESBL.

**Figure 2. (Left): *Cathartes aura*, present during each season of the study. Figure 3. (Right) *Spizaetus tyrannus*, present during some seasons of the study © José Nilton da Silva**



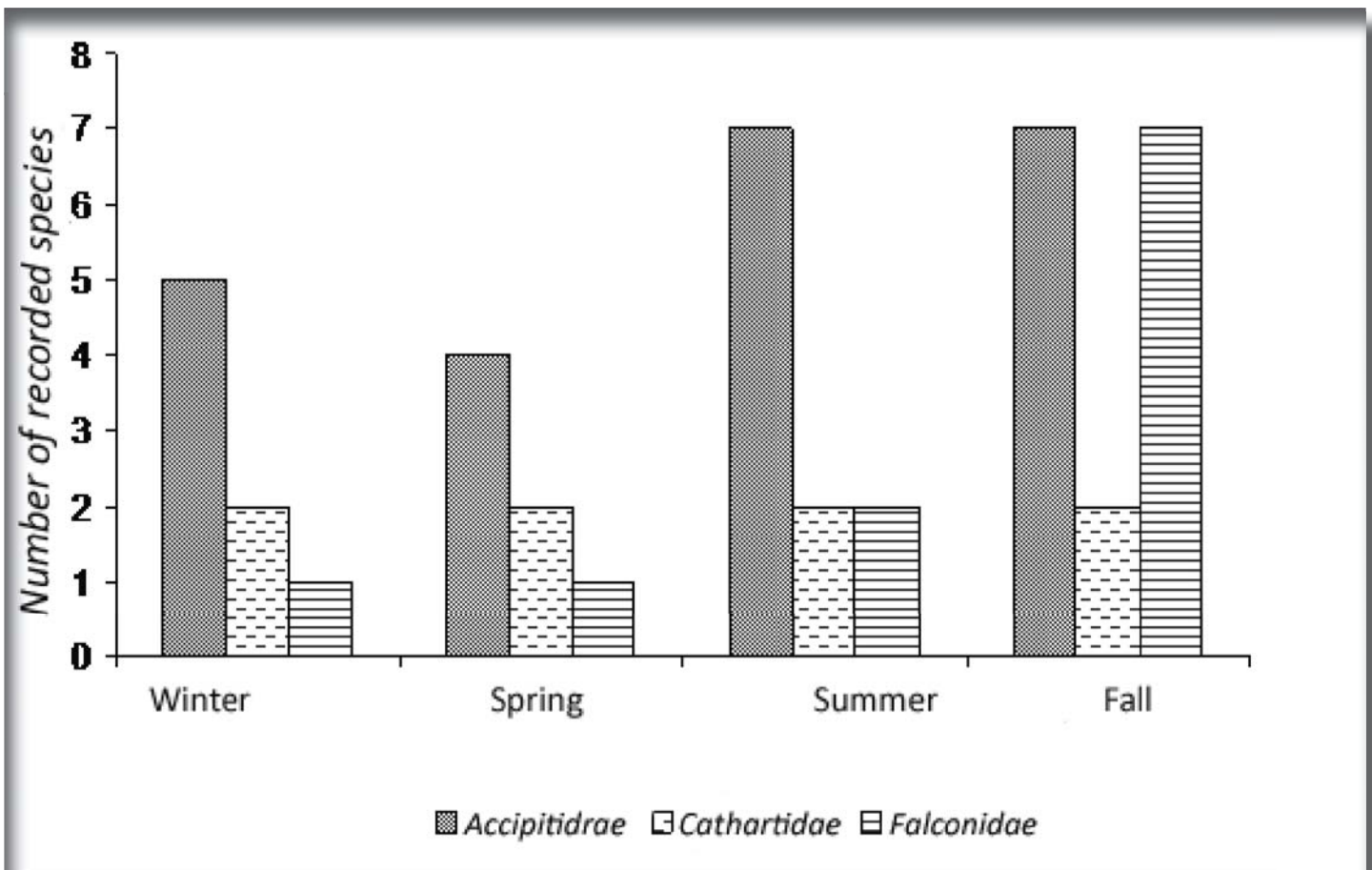


Figure 4. Variation in sightings of raptor species during the different seasons

Changing temperatures throughout the year can be one of the reasons for the disappearance of some of these species during certain seasons. As suggested by Sick (1997, 1983) and Newton (1979) very low or very high temperatures may influence low activity levels in raptors. Although some falconiformes don't migrate during seasonal changes, some weather patterns may cause them to alter their behavior, making them less likely to be seen (Sick 1983). According to Terborgh (1992), many top-of-the-food-chain raptors require thousands of hectares for their survival. This, coupled with periods of high activity and

low activity, may make it more difficult to find them, particularly in very large, forested habitats.

### Acknowledgements

To the Department of Biology and Administration of the Museo de Biología Professor Mello Leitão (MBML), whose support of this project was one of the principle causes for its completion. We also thank Fernando Moreira Flores, Mikael Mansur Martinelli and Luiza Maria Sarmiento for your help at various points during the project, from its inception to its conclusion.



## References

- Bennet, P. M. e I. P. F. Owens 1997. Variation in extinction risk among birds: chance or evolutionary predisposition? *Proc. Royal Soc. London (Series B)* 264: 401-408.
- Calder, W.A. & J.R. King, 1974. Thermal and caloric relations of birds. Pp 259-413. In: Del Hoyo, J., Elliot, A. & Sargatal, L.J. 1994. *Handbook of the birds of the world*, vol. 2. Barcelona: Lynx Editions. 639 pp.
- Comitê Brasileiro de Registros Ornitológicos CRBO 2011. <http://www.crbo.org.br>.
- Frisch, J.D. & C.D Frisch (2005). *Aves brasileiras e as plantas que as atraem*. 3.ed. São Paulo: Dalgas Ecoltec.
- Gessaman, J.A. 1987. Energetics. Pp. 289-320. In: Pendleton, B.A. et al, (Eds). *Raptor management. Techniques manual national Wildlife, Federation*, Sd. Tech. ser.10. Washington. DC.
- Mendes, S.L. & M.P. Padovan 2000. A Estação Biológica Santa Lucia, Santa Teresa, Espírito Santo. Espírito Santo: Boletim do Museu de Biologia Professor Mello Leitão 11/12: 7-34.
- Newton. I. 1979. *Population ecology of raptors*. Buteo Books. Vermillion, South Dakota. 399pp.
- espécies de Falconiformes: modelos nulos e bidimensionais. *Ararajuba*. 10 (2) 141-147.
- Ruschi, A. 1977. A ornitofauna da Estação Biológica do Museu Nacional. *Boletim Museu de Biologia Professor Mello Leitão (série Zoologia)*, 88: 1-10.
- Sick, H. 1983. *Migração de aves na América do sul continental*. CEMAVE.
- Sick, H. 1997. *Ornitologia brasileira: uma introdução*. Rio de Janeiro: Nova Fronteira 912p.
- Sigrist, T. 2007. *Aves do Brasil oriental*. Vol.1. Pp. 448. *Avis Brasilis*. São Paulo.
- Simon, J.E. 2000. Composição da avifauna da Estação Biológica de Santa Lúcia, Santa Teresa-ES. Espírito Santo: Boletim do Museu de Biologia Mello Leitão, Nova Série 11/12: 149-170.
- Simon, J.E. 2006. Efeitos da fragmentação da Mata Atlântica sobre comunidades de aves na região serrana de Santa Teresa, Estado do Espírito Santo, Brasil. Tese de Doutorado. Curso de Pós-graduação em Ciências Biológicas, Universidade Federal do Rio de Janeiro (UFRJ), Rio de Janeiro, RJ.
- Tabacow, J. 1992. Proposta de Zoneamento Ambiental para o Município de Santa Teresa. Monografia de Especialização na Universidade Federal do Espírito Santo. Espírito Santo.
- Terborgh, J. 1992. Maintenance of diversity in tropical forests. *Biotropica* 24: 283-292.
- Thiollay, J.M. 1996. Distributional patterns of rap-

- tors along altitudinal gradients in the northern Andes and effects fragmentation. *J. Trop. Ecol.* 12:553-560.
- Vieira, L.A. 2002. Caracterização da avifauna do Parque do Museu de Biologia Professor Mello Leitão, Santa Teresa-ES. Dissertação de Graduação em Ciências Biológicas na Escola de Ensino Superior São Francisco de Assis, ESFA.
- Willis, E.O. & Y. Oniki 2002. Birds of Santa Teresa, ES, Brazil: Do Humans add or subtract species? *Espírito Santo: Papéis Avulsos de Zoologia* 42: 193-264
- Zeller, N.S. & J.A. Collazo (1995). Abundance and distribution of wintering passerines in bottomland hardwood forests in North Carolina. *Wilson Bull.* 107: 698-708.

\* \* \*

# Of Interest...

## Bird Blogs

Read about biologists' field experiences from Asia and Africa to the Neotropics and North America (English only) [blogs.peregrinefund.org/](http://blogs.peregrinefund.org/)

Get updates on conservation news, scientific articles, book reviews, and hotspots for sighting raptors and other birds around the world (English and Spanish) [whitehawkbirding.com/en/blog.html](http://whitehawkbirding.com/en/blog.html)

© Marta Curti

## Workshops

The Belize Raptor Research Institute is hosting its **second annual Raptor Identification Workshop** in Belize. Led by Bill Clark, it will take place in December 2012.

For more information contact Ryan Phillips at [harpiabz@yahoo.com](mailto:harpiabz@yahoo.com)

© Ryan Phillips

## Conferences

**V NORTH AMERICAN ORNITHOLOGICAL CONFERENCE** 14-18 August 2012  
Vancouver, British Columbia, Canada. <http://www.naoc-v2012.com/>

**NEOTROPICAL RPTOR NETWORK, RAPTOR RESEARCH FOUNDATION AND WORLD WORKING GROUP ON BIRDS OF PREY AND OWLS** 21-25 October 2013  
Bariloche, Argentina. <http://www.raptorresearchfoundation.org/conferences/upcoming-conferences>

© Yeray Seminario



# SPIZAETUS

NRN NEWSLETTER

Issue 12, Dec. 2011

ISSN 2157-8958

To join the NRN, please e-mail  
[mcurti@peregrinefund.org](mailto:mcurti@peregrinefund.org),  
introducing yourself and  
stating your interest in  
Neotropical raptor  
research and  
conservation.

