delicata) in the central Brazos Valley of Texas. Thesis. Texas A&M University, College Station, USA.

McCLOSKEY, J. T. 1999. Sex and age determination and nutritional ecology of wintering Common Snipe. Thesis. Texas A&M University–Kingsville, Kingsville, USA.

McCLOSKEY, J. T. AND J. E. THOMPSON. 2000. Sex-related differences in migration chronology and winter habitat use of Common Snipe. Wilson Bulletin 112:143–148.

MERRITT, R. W. AND K. W. CUMMINS. 1996. An introduction to the aquatic insects of North America. Kendall/Hunt Publishing Co., Dubuque, Iowa, USA.

MOULTON, D. W., T. E. DAHL, AND D. M. DALL. 1997. Texas coastal wetlands; status and trends, mid-1950s to early 1990s. USDI, Fish and Wildlife Service, Albuquerque, New Mexico, USA.

MURPHY, M. E. AND J. R. KING. 1982. Amino acid composition of the plumage of the White-crowned Sparrow. Condor 84:435–438.

OWENS, J. 1967. Food habits of the Common Snipe (*Capella gallinago delicata*) in the pastures of south central Louisiana. Thesis. Northeast Louisiana State College, Monroe, USA.

REINECKE, K. J. AND R. B. OWEN JR. 1980. Food use and nutrition of Black Ducks nesting in Maine. Journal of Wildlife Management 44:549–558.

RUNDLE, W. D. 1982. A case for esophageal analysis in shorebird food studies. Journal of Field Ornithology 53:249–257.

SAS INSTITUTE INC. 1999. SAS/STAT user's guide. Version 8. SAS Institute Inc., Cary, North Carolina, USA.

SWANSON, G. A. AND J. C. BARTONEK. 1970. Bias associated with food analysis in gizzards of Blue-winged Teal. Journal of Wildlife Management 34: 739–746.

TUCK, L. M. 1972. The snipes: a study of the genus *Capella*. Monograph Series 5. Canadian Wildlife Service, Ottawa, Ontario, Canada.

WHITE, M. AND S. HARRIS. 1966. Winter occurrence, foods, and habitat use of snipe in northwest California. Journal of Wildlife Management 30:23–34.

WHITEHEAD, C. J. 1965. Foods and feeding habits of the Common Snipe (*Capella gallinago delicata*) in Cameron Parish, Louisiana, with ecological notes and a discussion of methods of sexing and aging. Thesis. Louisiana State University, Baton Rouge, USA.

The Wilson Journal of Ornithology 121(2):439–441, 2009

An Overlooked Cost for the Velvety Plumage of Owls: Entanglement in Adhesive Vegetation

Airam Rodríguez,[1,5] Felipe Siverio,[2] Rubén Barone,[3] Beneharo Rodríguez,[4] and Juan J. Negro[1]

ABSTRACT.—We used data collected during 1995–2007 at the only Wildlife Rehabilitation Center on Tenerife Island (Canary Islands) to quantify entanglement mortality of owls. At least 66 of 1,206 Long-eared (*Asio otus*) and 5 of 231 Barn (*Tyto alba*) owls admitted to the Wildlife Rehabilitation Center were entangled in burr bristlegrass (*Setaria adhaerens*). Twelve (18.2%) of the 66 Long-eared Owls died as a result of entanglement while one of five Barn Owls died. A higher incidence of entanglement occurred during summer, coinciding with seed-head ripening and dispersing recently-fledged owls. Velvety plumage may be an important cost for owls, and responsible for owls acting as seed dispersers. *Received 28 June 2008. Accepted 14 December 2008.*

Owls have evolved adaptations to hunt in poor light conditions, including frontally located and disproportionately large eyes or, in some species, an asymmetrical placement of the ear openings for improved hearing (del Hoyo et al. 1999). Owls also have feathers with traits which have been considered as adaptations for silent flight. The main structural feather adaptations of owls are: (1) elongated barbs on the leading edge at the outer prima-

[1] Estación Biológica de Doñana (CSIC), Avenida Américo Vespucio s/n, 41092 Sevilla, Spain.

[2] Los Barros 21, 38410 Los Realejos, Tenerife, Canary Islands, Spain.

[3] C/ Eduardo Zamacois 13-3°A, 38005 Santa Cruz de Tenerife, Canary Islands, Spain.

[4] C/ La Malecita s/n, 38480 Buenavista del Norte, Tenerife, Canary Islands, Spain.

[5] Corresponding author; e-mail: airamrguez@ebd.csic.es

ries, (2) a trailing edge on the flight feathers, and (3) modified distal barbules on the dorsal surface of feathers (del Hoyo et al. 1999). The last trait makes velvety plumage easily perceived by the unaided human eye (Mikkola 1983). This plumage is also exhibited by other nocturnal or crepuscular birds, including nightjars (Order Caprimulgiformes), Bat Hawk (*Macheiramphus alcinus*) (J. J. Negro, pers. obs.), and *Elanus* kites (Negro et al. 2006). Silent flight permits owls to go undetected by their prey, and improves their ability to detect noises (Taylor 1994, del Hoyo et al. 1999).

Development of velvety plumage may have associated costs, including increased risk of entanglement in dense vegetation during hunting (Glayre 1959, Mendelsohn 1983, Nozerand 1994, Molnár 1996). We describe mortality, caused by a grass species, of the resident owl community in the Canary Islands. Only two species of owls regularly breed in the Canary Islands: Long-eared Owl (*Asio otus*) and Barn Owl (*Tyto alba*).

Burr bristlegrass (*Setaria adhaerens*, Family Poaceae) is an annual species, possibly native in the Canary Islands (Izquierdo et al. 2004). It grows in orchards, abandoned farmlands, road ditches, and field margins. It flowers and dries during spring and early summer, and retains ripe seed-heads in the dry plant (R. Mesa, pers. comm.). Ripe seed-heads are adhesive and adapted to exozoocore dispersal.

OBSERVATIONS

Owls admitted during 1995–2007 were identified by the staff of the Wildlife Rehabilitation Center ''*La Tahonilla*'' (WRC), which annotated recovery circumstances. The center is in Tenerife, the largest island (2,034 km^2 and 3,718 m of altitude) of the Canarian archipelago (27° 37′–29° 24′ N, 13° 20′–18° 8′ W), and our data correspond to owls found only on this island.

At least 66 (5.5%) of 1,206 Long-eared and 5 (2.2%) of 231 Barn owls admitted were entangled in *S. adhaerens* plants. Entanglement in burr bristlegrass likely occurred when owls were hunting. Twelve of 66 Long-eared Owls (18.2%) and one of five Barn Owls died as a result of becoming entangled in the plants. Most entangled birds that were recovered alive would have died if not found because owls do not appear capable of freeing themselves from the plant. The highest incidence of entanglements occurred during summer with the largest number of reports in July and August.

DISCUSSION

The interaction between owls and a plant adapted to exozoocore dispersal can be a considerable cause of mortality in the Canary Islands. This factor has been overlooked, despite several published records, and has not been quantified in the literature. Entanglement of owls in vegetation appears to be the result of anthropogenic perturbations in the Canary Islands, even though *S. adhaerens* is possibly a native plant (Izquierdo et al. 2004). Burr bristlegrass is mainly associated with human-affected landscapes and is almost absent in natural areas. The highest densities of *S. adhaerens* are in human-transformed areas, which is where owls tend to become entangled. The temporal pattern with maximum values during the summer, may be related to ripening of seed-heads, as well as to dispersal of fledgling owls (age of affected owls is not available).

Entanglement of birds with velvety plumages has been reported involving Long-eared Owls, Barn Owls, and Black-winged Kites (*Elanus caeruleus*) (Glayre 1959, Mendelsohn 1983, Nozerand 1994, Molnár 1996). Entanglement as a cause of mortality is not exclusive to birds with velvety plumages. At least two instances involving Common Kestrels (*Falco tinnunculus*) entangled in *S. adhaerens* in the Canary Islands are known (WRC, unpubl. data; J. Curbelo, pers. comm.). The Common Kestrel is the most abundant raptor in the Canary Islands, and >1,200 have been admitted to the WRC in the study period. Whether Common Kestrels become entangled less often than owls due to different plumage characteristics or due to different micro-habitat use remains unknown.

It is possible that some owls escape unscathed from contact with *S. adhaerens*, but seeds of this species may become affixed to their plumage and transported elsewhere. This interaction implies a new ecological role for owls as exozoocore seed dispersers.

ACKNOWLEDGMENTS

We are grateful to those who helped rescuing owls and the staff of Wildlife Rehabilitation Center "*La Tahonilla*" (Cabildo Insular de Tenerife). Ricardo Mesa, Juani Curbelo, and Rubén García provided valuable information about the genus *Setaria* and entanglement observations. G. R. Bortolotti, J. S. Marks, an anonymous reviewer, and C. E. Braun provided useful comments on an early draft of the manuscript.

LITERATURE CITED

DEL HOYO, J., A. ELLIOTT, AND J. SARGATAL (Editors). 1999. Handbook of the birds of the world. Volume 5. Barn-owls to hummingbirds. Lynx Editions, Barcelona, Spain.

GLAYRE, D. 1959. Une Choutte effraie capturée pas des graminées. Nos Oiseaux 266:122.

IZQUIERDO, I., J. L. MARTÍN, N. ZURITA, AND M. ARECHAVALETA. 2004. Lista de Especies Silvestres de Canarias (Hongos, Plantas y Animales Terrestres). Consejería de Medio Ambiente y Ordenación Territorial, Gobierno de Canarias, Santa Cruz de Tenerife, Spain.

MENDELSOHN, J. M. 1983. Causes of mortality in Black-shouldered Kites. Bokmakierie 35:11–13.

MIKKOLA, H. 1983. Owls of Europe. T. & A.D. Poyser, London, United Kingdom.

MOLNÁR, G. 1996. Ragados muhar (*Setaria verticillata*) mint bagolycsapda. Túzok 1:185.

NEGRO, J. J., C. PERTOLDI, E. RANDI, J. J. FERRERO, J. M. LÓPEZ-CABALLERO, D. RIVERA, AND E. KORPIMÄKI. 2006. Convergent evolution of *Elanus* kite and the owls. Journal of Raptor Research 40:222–225.

NOZERAND, R. 1994. Hiboux Moyens-Ducs *Asio otus* emprisonnés dans des graminées. Alauda 62:116.

TAYLOR, I. 1994. Barn Owls. Predator-prey relationships and conservation. Cambridge University Press, Cambridge, United Kingdom.

The Wilson Journal of Ornithology 121(2):441–444, 2009

Aggressive Response of Adult Bobolinks to Neck Ligatures on Nestlings

Lynn P. Little,[1,2] Allan M. Strong,[3,5] and Noah G. Perlut[4]

ABSTRACT.—We monitored provisioning behavior at 18 Bobolink (*Dolichonyx oryzivorus*) nests during 240.5 min of videotape data from June to July 2006, and observed 64 nest visits by adults while nestlings were fitted with neck ligatures. Adults pecked or pulled at the ligatures, often aggressively, at 72% of nests (n = 18) and 52% of visits (n = 64). These behavioral responses by adults indicate the neck ligature technique is more invasive than previously believed. We documented no mortality as a result of ligature placement, but researchers should minimize the time that ligatures are in place to reduce stress to both parents and nestlings. *Received 8 September 2008. Accepted 30 January 2009.*

Quantitative assessments of avian diets may be critical for evaluating habitat quality. However, methods used to quantify avian diets have associated biases and/or shortcomings as most studies require techniques tailored to specific studies and hypotheses (Rosenberg and Cooper 1990). Neck ligatures have been used to quantify diets of nestling birds as this technique allows collection of prey items prior to onset of digestion. Modifications have been suggested to improve ligature function and minimize negative effects on nestlings. For example, Johnson et al. (1980) described abnormal behavior of nestlings after leaving ligatures in place for 1 hr and suggested that collection of prey immediately after each parental visit would minimize biases. Further, Mellott and Woods (1993) found that cable ties simplified ligature placement compared to coated wire, especially when used by untrained personnel.

Neck ligatures are considered an invasive technique (Rosenberg and Cooper 1990, Poulsen and Aebischer 1995), but most studies addressing their effects have focused on the be-

[1] Department of Animal Science, University of Vermont, Burlington, VT 05405, USA.

[2] Current address: 5060 Bentley Lane, Columbus, OH 43220, USA.

[3] Rubenstein School of Environment and Natural Resources, 81 Carrigan Drive, University of Vermont, Burlington, VT 05405, USA.

[4] Vermont Cooperative Fish and Wildlife Research Unit, The Rubenstein School of Environment and Natural Resources, University of Vermont, Burlington, VT 05405, USA.

[5] Corresponding author; e-mail: allan.strong@uvm.edu